JV-1901 D-955

JV TANK AND LEVEE SAMPLING PLAN FOR BRIDGEPORT RENTAL AND OIL SERVICES (BROS), BRIDGEPORT, NEW JERSEY

May 1985

Prepared for:

DEPARTMENT OF THE ARMY
KANSAS CITY DISTRICT, CORPS OF ENGINEERS
700 Federal Building
Kansas City, Missouri 64106

TAMS TIPPETTS-ABBETT-McCARTHY-STRATTON
ENGINEERS, ARCHITECTS AND PLANNERS

ecology and environment, inc.
International Specialists in the Environment

218259

TABLE OF CONTENTS

Section		Page
1	SCOPE/OBJECTIVES	1-1
2	SAMPLE LOCATIONS	2-1
	2.1 TANK FARM SAMPLING	2-1
	2.2 LEVEE SAMPLING	2-9
	2.3 QA/QC SAMPLES	2-16
3	SAMPLING METHODS	3-1
	3.1 GENERAL REQUIREMENTS	3-1
	3.2 PHASE DETERMINATION	3-1
	3.3 OIL/NON-AQUEOUS SAMPLING	3-3
	3.4 SLUDGE/SOLID/SEDIMENT SAMPLING (TANKS)	3-3
	3.5 TANK GAUGING	3-4
	3.6 SPLIT-BARREL SAMPLING AT LEVEE	3-4
	3.7 COMPATIBILITY TESTING	3-6
	3.8 COMPOSITING AQUEOUS AND NON-AQUEOUS SAMPLES	3-12
	3.9 COMPOSITING SLUDGE/SEDIMENT SAMPLE	3-13
	3.10 COMPOSITING LEVEEL SOIL SAMPLES	3-14
4	SAMPLE PREPARATION	4-1
	4.1 COORDINATION WITH ANALYTICAL LABORATORY	4-1
	4.2 MAJOR SAMPLING EQUIPMENT	4-2
5	FIELD PERSONNEL REQUIREMENTS	5-1
	5.1 TANK SAMPLING	5-1
	5.2 LEVEE SAMPLING	5-2
	5.3 TANK INSPECTION	5-2

Table of Contents (Cont.)

Section		Page
6	SITE LOGISTICS	6-1
7	SAMPLE HANDLING, PACKAGING, AND SHIPPING	7-1
8	DOCUMENTATION	8-1
	8.1 TANK SAMPLE IDENTIFICATION	8-1
	8.2 LEVEE SAMPLE IDENTIFICATION	8-2
	8.3 DATA SHEETS	8-3
	8.4 CHAIN OF CUSTODY PROCEDURES	8-3
9	DECONTAMINATION	9-1
10	OTHER SITE-SPECIFIC ACTIVITIES	10-1
	10.1 PHOTOGRAPHS	10-1
	10.2 SURVEYING	10-2

LIST OF ILLUSTRATIONS

Figure		Page
2-1	Tank Locations	2-2
2-2	Tank Data Sheet	2-8
2-3	Boring Locations, Sheets 1 and 2	Back Pockets
2-4	Sample Field Log - Subsurface Exploration	2-21
6-1	Field Operations Work Area	6-2
8-1	Sample Chain-of-Custody Form	8-5

LIST OF TABLES

Table		Page
1-1	Results of Analytical Sampling of Tank Materials	1-2
2-1	Tank Descriptions Bridgeport Rental and Oil Services Site	2-3
2-2	Tank Sampling Locations	2-10
2-3	Aqueous Sample Handling	2-11
2-4	Non-Aqueous Sample Handling	2-12
2-5	Sludge/Sediment Sample Handling	2-13
2-6	Sample Analysis Required	2-14
2-7	Grain Size and Moisture Content Sample Locations and Depths	2-17
2-8	Split-Spoon Chemical Sample Locations	2-18
2-9	Levee Sampling	2-19
2-10	QA/QC Sample Locations	2-20
4-1	Major Sampling Equipment List	4-3

recycled paper

ecology and environment

1. SCOPE/OBJECTIVES

The purpose of this plan is to provide details for gathering data for the remedial action required for the Bridgeport Rental and Oil Services (BROS) site. This plan is prepared in accordance and is consistent with the requirements of the United States Army Corps of Engineers (COE)/United States Environmental Protection Agency (EPA) sample handling protocol and the Environmental Engineering Regulation ER-1110-2-246. The information gathered will be used in the design and implementation of the following work:

- Removal and disposal of waste from approximately 95 tanks within the BROS tank farm.

- Decontamination and removal of approximately 95 tanks within the BROS tank farm.

- Recommendations for lagoon and levee operation, and measures to strengthen the levee or control seepage, if required, until the lagoon remediation is completed.

The contents of a selected number of tanks will be sampled to determine the best methods for disposal of the wastes. Table 1-1 lists the chemicals previously identified at the site during the remedial investigation conducted by NUS Corporation. Analysis under this plan will include tests for ignitibility, corrosivity, reactivity, EP toxicity (or by Toxicity Characteristic Leaching Procedure, when approved), priority pollutant metals, organic sulfur, BTU

recycled paper

ecology and environment

Table 1-1

RESULTS OF ANALYTICAL SAMPLING OF TANK MATERIALS*

Metals

Aluminum
Chromium
Barium
Beryllium
Cobalt
Copper
Iron
Nickel
Manganese
Zinc
Boron
Silver
Vanadium
Arsenic
Antimony
Selenium
Thallium
Tin
Cadmium
Lead
Mercury

Volatiles

Benzene
Chlorobenzene
1,1,1-trichloroethane
Ethylbenzene
Tetrachloroethylene
Toluene
Trichloroethylene
Methylene chloride
Acetone
2-butanone
4-methyl-2-pentanone
o-xylene
1,1,2,2-tetrachlorethane

Acid Compounds

p-chloro-m-cresol
2,4-dichlorophenol
2-nitrophenol
Pentachlorophenol
Phenol
2-methylphenol

Base/Neutral Compounds

1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
2,4-dinitrotoluene
2,6-dinitrotoluene
Flouranthene
bis-(2-chloroisopropyl)ether
bis-(2-chloroethoxy)methane
Hexachlorobutadiene
Isophorone
Nitrobenzene
N-nitrosodi-n-propylamine
di-n-octyl phthalate
di-n-butyl phthalate
benzo(a)anthracene
benzo(a)fluoranthene
benzo(k)fluoranthene
Chrysene
Fluorene
Phenanthrene
Pyrene
N-nitrosodimethylamine
Anthracene
Aniline
1,2,4-trichlorobenzene
Benzoic acid
N-nitrosodlamine
Napthalene
bis(2-ethylhexyl)phthalate
butyl benzyl phthalate
N-nitrosodlphenylamine
Acenaphthalene
Benzyl alcohol
2-methylnaphthalene
Acenaphthene
N-nitrosodiphenylamine

Pesticides

PCB-1242
PCB-1248
PCB-1254
PCB-1260

*As reported by NUS Corporation and CDM.

content, ash content, total PCBs, total organic carbon, filterable solids, total solids, percent moisture, and dioxin. A GC/MS scan will also be performed. The GC/MS scan will consist of a full analysis of volatile and semi-volatile fractions for all Hazardous Substances List (HSL) compounds and additional compounds according to current EPA protocols. Non-HSL compounds that show on the reconstructed ion chromatogram as peaks greater than 10% (total area) of the nearest internal standard peak will be identified and quantified up to a maximum of 10 such compounds in the volatiles fraction and 20 in the semi-volatiles fraction. Quantitation will be an estimate, based on an assumed response factor (RF) of 1.00. The GC/MS scan will not include pesticides, PCBs, or dioxin unless they are present in sufficient quantity to show visible peaks, in which case they will be identified and quantified using the same criteria as for non-HSL compounds. The dioxin analysis (when required) will be performed according to the EPA protocol for dioxin (with a detection level of at least 1/3 ppb) by a laboratory currently approved by EPA for dioxin analysis.

Development of disposal criteria will include:

- Selection of construction materials and equipment;
- Development of processing options; and
- Providing potential bidders with sufficient information for bidding purposes.

In addition to the sampling, visual inspections will be performed on all tanks to verify existing conditions as determined during the remedial investigation conducted by the NUS Corporation (NUS RI), and provide other information for the decontamination and disposal of the tanks, such as the determination of scale and best methods to remove it, and structural/foundation integrity of the tanks.

Subsurface conditions will be determined in the levee and its foundation through the subsurface exploration program. This sampling will characterize the levee and its foundation materials. The data will be used to analyze stability and seepage characteristics under

recycled paper

ecology and environment

conditions likely to exist during and after construction, and generate recommendations for lagoon operation and measures to strengthen the levee or control seepage.

Chemical and physical analyses will also be performed on soil to establish the extent of contamination of the soils within the levee, and disposal methods, if necessary.

In addition to subsurface exploration, a topographic survey of the levee and its immediate area will be used to determine levee and lagoon geometrics for use in analyses and in generating plans for recommended further work. This survey will also identify key points for establishing the grid system for the lagoon sampling plan.

2. SAMPLE LOCATIONS

2.1 TANK FARM SAMPLING

The NUS RI revealed that there are 95 tanks and process vessels at the BROS site. Most of these tanks appear to be empty or contain a relatively small quantity of waste. The majority of the waste is contained in a relatively small percentage of the tanks.

Figure 2-1 illustrates the locations of the tanks within the tank farm and provides the tank identification numbers assigned during the NUS RI. Table 2-1 lists the tanks by their identification numbers and provides a brief description of each tank, including tank dimensions, capacity, orientation, physical appearance, and estimated volume of waste. All tanks within the tank farm will be visually inspected to verify existing conditions, quantity and phases of materials, existence of scale (thickness and observations as to how it might be removed), and any other pertinent observable information regarding the tanks or their contents. The information will be recorded on a tank data sheet (Figure 2-2). This information together with structural observations and analyses will be used to determine the final disposition of the tanks. All observations will be made from outside the tanks (no one will enter a tank or confined space).

Fourteen of the tanks within the tank farm will also have their contents sampled. A Coliwasa sampler will be used to determine the number of phases present in the tank. Multiple samples will be collected from each phase in each tank. A composite sample of each phase in each tank will then be analyzed. Compositing procedures are discussed in Sections 3.8, 3.9, and 3.10. The number of sampling points

recycled paper

ecology and environment

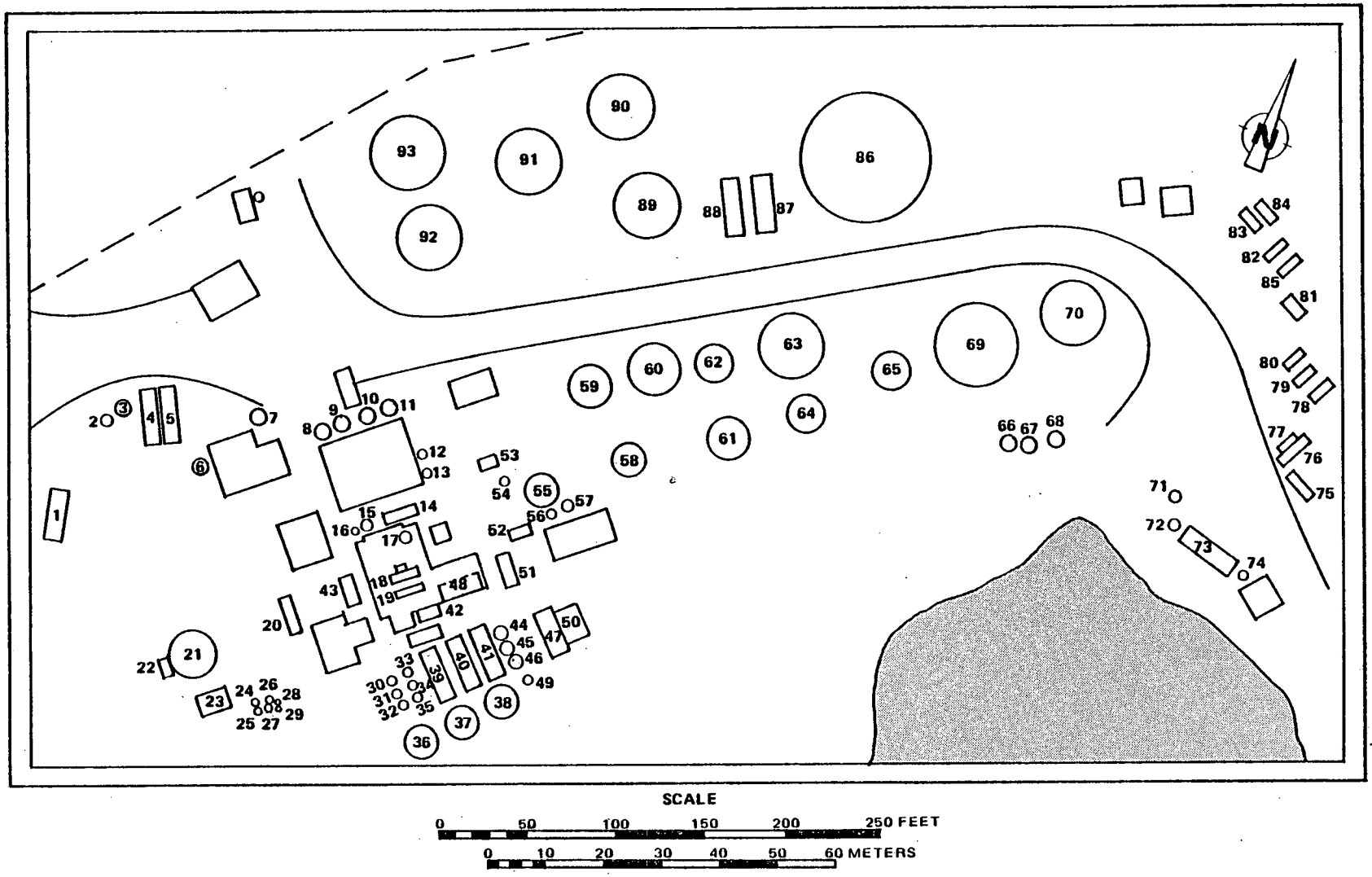


Figure 2–1 TANK LOCATIONS

Table 2-1

TANK DESCRIPTIONS
BRIDGEPORT RENTAL AND OIL SERVICES SITE

Tank No. (New)	Tank No. (Old)	Capacity (gallons)	Contents: Description	Contents: Volume (gallons)	Vertical	Horizontal	Diameter (feet)	Axis (feet)	Cone (feet)	Rivet	Weld	Notes
001	--	20,000	Sludge	2,570		X	10.5	30.12	--	X		Iron - rusted
002	--	33,600	Empty	--	X		8.0	29.75	--		X	Painted - rusted
003	--	8,000	Empty	--	X		10.0	13.7	--		X	Painted - rusted
004	--	15,000	Empty	--		X	9.0	29.8	--		X	Bare steel rusted - boiler htr/deaerator
005	--	15,000	Empty	--		X	9.0	29.8	--		X	Bare steel rusted - boiler htr/deaerator
006	--	20,000	Sludge	1,122	X		11.0	30.0	5.5	X	X	Painted - rusted, rivet/weld composition
007	--	10,000	Solvent	235	X		10.0	16.9	--		X	Painted - rusted
008	--	10,000	Prod. oil	680	X		10.0	16.9	--		X	Painted - rusted
009	--	10,000	Prod. oil	47	X		10.0	16.9	--		X	Painted - rusted
010	--	10,000	Prod. oil	245	X		10.0	16.9	--		X	Painted - rusted
011	--	10,000	Prod. oil	235	X		10.0	16.9	--		X	Painted - rusted
012	26	1,700	Prod. oil	10	X		6.0	8.0	--	X		Iron - rusted
013	25	1,700	Prod. oil	15	X		6.0	8.0	--	X		Iron - rusted
014	24	10,000	Empty	--		X	10.0	17.8	--		X	Iron - rusted - boiler htr/deaerator
015	31	1,880	Water	1,500	X		8.0	5.0	--	X		Cut down tank (scrap)
016	32	--	Air	--	X		4.0	6.0	--	X		Air compressor tank - painted rusted
017	--	1,500	Empty	--	X		5.0	10.0	--		X	Iron - rusted - heat distorted (scrap)
018	--	9,587	Sludge	2,554		X	8.0	25.5	--		X	Insulated oil htr tank - good condition
019	--	9,587	Sludge	691		X	8.0	25.5	--		X	Painted stirred/ filter/reactor - good condition
020	--	3,800	Not sampled			X	6.0	18.0	--			Rusted - boiler htr/ deaerator

recycled paper
ecology and environment

Table 2-1 (Cont.)

Tank No. (New)	Tank No. (Old)	Capacity (gallons)	Contents: Description	Contents: Volume (gallons)	Vertical	Horizontal	Diameter (feet)	Axis (feet)	Cone (feet)	Rivet	Weld	Notes
021	--	187,000	Water	22,841	X		36.0	24.5	--		X	Rusted - distorted (scrap)
022	--	1,268	Empty	--		X	6.0	8.0	--	X		Vertical tank on its side, rusted
023	--	187	Empty	--			3.0	3.5	--	X		Condensate pot
024	--	2,200	Empty	--	X		5.0	14.0	--		X	Condensate discharge phase separator, vessels common skid
025	--	2,200	Empty	--	X		5.0	14.0	4			Condensate discharge phase separator, vessels common skid
026	--	2,200	Empty	--	X		5.0	14.0	4			Condensate discharge phase separator, vessels common skid
027	--	2,200	Empty	--	X		5.0	14.0	4			Condensate discharge phase separator, vessels common skid
028	--	--	--	--	X		--	--	--			Condensers
029	--	--	--	--	X		--	--	--			Condensers
030	--	4,000	Oil	4,000	X		7.0	14.5	2.5	X		Process vessels/common pad - good condition
031	--	4,000	Oil	3,370	X		7.0	14.5	2.5	X		Process vessels/common pad - good condition
032	--	4,000	Empty	--	X		7.0	14.5	2.5	X		Process vessels/common pad - good condition
033	--	4,000	Empty	--	X		7.0	14.5	2.5	X		Process vessels/common pad - good condition
034	--	4,000	Empty	--	X		7.0	14.5	2.5	X		Process vessels/common pad - good condition
035	--	4,000	Empty	--	X		7.0	14.5	2.5	X		Process vessels/common pad - good condition
036	M1	82,000	Oil	11,000	X			34.6			X	Storage tanks - new construction
037	M2	82,000	Oil	4,790	X			34.6	--		X	Storage tank - new construction

Table 2-1 (Cont.)

Tank No. (New)	Tank No. (Old)	Capacity (gallons)	Contents: Description	Contents: Volume (gallons)	Vertical	Horizontal	Diameter (feet)	Axis (feet)	Cone (feet)	Rivet	Weld	Notes
038	M3	82,000	Oil	2,636	X			34.6	--		X	Storage tanks - new construction
039	M6	20,000	Oil	3,901		X	10.0	31.5	--		X	Storage tanks
040	M4	20,000	Oil	472		X			--		X	Storage tanks
041	M5	20,000	Oil	271		X			--		X	Storage tanks
042	M11	2,000	Chemical	790		X	6.0	10.0	--	X		Painted - chemical storage
044	M7	9,000	Oil	Empty	X		8.0	25.0	--	X		Common support frames - rusted
045	M8	9,000	Oil	--	X		8.0	25.0	--	X		Common support frames - rusted
046	M9	9,000	Oil	--	X		8.0	25.0	--	X		Common support frames - rusted
047	M10	9,000	Oil	687		X	8.0	25.0	--	X		Rusted
048	23	9,000	Oil	186		X	8.0	25.0	--	X		Rusted
049	--	900	Empty	--	X		5.0	6.0	--	X		Rusted
050	--	789 (ft^3)	Sludge	18,800			26 x 10	x 3	--		X	--
051	21	9,000	Oil	2,257		X	8.0	25.0	--		X	Buried
052	--	19,000	Oil/water	3,236		X	10.0	21.5	--		X	Buried
053	--	~6,000	Oil	1,346		X				X		Tank truck
054	--	2,000	Sludge	1,500	X		6.0	10.0		X		Rusted
055	16	33,785	Oil	9,517			18.0	17.75		X		Painted
056	20	34,000	Oil	1,690	X		16.0	21.0	6.66		X	Good condition
057	19	34,000	Water	880	X		16.0	21.0	6.66		X	Good condition
058	15	34,261	Oil	782	X		18.0	18.0	--	X	X	Painted - reconstructed - leaks
059	RP9	100,000	Empty	--	X		24.0	28.7	--	X	X	Painted - reconstructed - leaks
060	D3	180,000	Oil	11,406	X		30.0	35.0	--			Unpainted - new
061	RP5	91,000	Empty	--	X		25.0	25.0	--	X	X	Painted - reconstructed - leaks
062	RP4	69,000	Empty	--	X		22.0	24.3	--	X	X	Painted - reconstructed - leaks

recycled paper

ecology and environment

Table 2-1 (Cont.)

Tank No. (New)	Tank No. (Old)	Capacity (gallons)	Contents: Description	Contents: Volume (gallons)	Vertical	Horizontal	Diameter (feet)	Axis (feet)	Cone (feet)	Rivet	Weld	Notes
063	C4	250,000	Oil/PCB	216,497	X		35.0	34.5	--		X	New - unpainted
064	RP3	69,000	Empty	--	X		22.0	24.3	--	X	X	Painted - reconstructed - leaks
065	RP2	69,000	Empty	--	X		22.0	24.3		X	X	Painted - reconstructed - leaks
066	FP1		Oil	1,660	X			34.8			X	Painted - clean
067	FP2	20,000	Oil	820	X						X	Painted - clean
068	FP3	10,000	Solvent	1,859	X		10.0	17.0	--		X	Painted - clean
069	C6	500,000	Oil/PCB									New - unpainted
070	C5	250,000	Water	5,996	X		35.0	34.6	--	X	X	Painted - reconstructed leaks
071	--	1,900	Empty	--	X		6.0	9.0	--	X		Rusted
072	--	1,200	Sludge	70	X		6.0	6.0	--	X		Home-built upflow clarifier
073	--	15,000	Water	10,000		X	10.0	35.0	--	X		Home built flotator
074	--	1,200	Sludge	190	X		4.0	13.6	--	X		Home built flash mixer
075	--	20,000	Sludge	348		X	10.0	35.0	--			Unpainted - rusted
076	--	12,000	Empty	--		X	9.0	25.4	--			Unpainted - rusted
077	--	3,000	Sludge	150		X	5.0	20.0	--			Unpainted - rusted dry chemical sludge
078	--	6,000	Empty	--		X			--			Trailer tanker
079	--	1,200	Empty	--		X			--			Tank truck - 5 compartments
080												
081	--	7,500	Empty	--		X			--	X		Unpainted - rusted reactor tank
082	--	21,500	Oil/water	3,250		X	11.33	18.5	--		X	Unpainted - rusted storage tank
083	--	21,500	Empty	--		X	11.33	28.5	--		X	Unpainted - rusted storage tank
084	--	21,500	Oil	500		X	11.33	18.5	--		X	Unpainted - rusted storage tank
085	--	7,500	Empty	--		X			--	X		Unpainted - rusted vertical construction

Table 2-1 (Cont.)

Tank No. (New)	Tank No. (Old)	Capacity (gallons)	Contents: Description	Contents: Volume (gallons)	Vertical	Horizontal	Diameter (feet)	Axis (feet)	Cone (feet)	Rivet	Weld	Notes
086		750,000	Water	--					--			
087	00	25,000	Water Oil	918 1,815		X	11.0	35.0	--		X	Unpainted - rusted
088	0	25,000	Water Oil	1,815 7,045		X	11.0	35.0			X	Unpainted - rusted
089	RP-6	300,000										
090	RP-7	300,000										
091	C3	300,000	Empty									
092	RP-11	300,000	Empty									
093	C-2	300,000										
094	043		Pipe and connections									
095	--	1,200	Oil	712		X						Tank truck - 5 compartments

Source: NUS Corporation, July 1984, Remedial Investigation Report, Bridgeport Rental and Oil Services Site, Logan Township, New Jersey.

recycled paper

ecology and environment

TANK DATA SHEET

DATE: _____ TIME: _____

TANK NO.: _____ TANK DIAMETER: _____ TANK HEIGHT: _____

TANK AXIS: VERTICAL / HORIZONTAL

SAMPLING TEAM/ENTRIES BY: _____

_____

METHOD OF ACCESS: _____
(How tank was accessed)

TANK OPENINGS: _____
(Describe any existing tank openings where and how used [i.e.,sample location 1] and also describe new

_____
openings made, where, how made, and how used [i.e., sample location 2])

_____

VAPOR SPACE MEASUREMENTS: _____
(HNu, O_2, Explosivity, etc.)

TANK OUTAGE: _____
(Measure point to liquid; estimate of height of point above shell)

CONTENT PHASES AND PERCENTAGES: _____
(Coliwasa sampler)

_____

VISUAL INSPECTION: _____
(Phases observed, estimate levels, tank condition, tank connections, etc., scale)

_____

_____

SAMPLES COLLECTED: _____
(List ID numbers, quantities taken, analysis required)

_____

_____

_____

_____

_____

_____

Figure 2–2 SAMPLE TANK DATA SHEET

for each phase will depend on accessibility, safety, and diameter of the tank. With regard to tank diameter (or for tanks that are horizontal, horizontal length), the following guide will be used: two points will be sampled for tanks whose diameter is 6 feet or less; three points for tanks with a diameter of 6 to 15 feet; and five points for tanks with a diameter greater than 15 feet. An estimate of the phases and sample points by phase for the 14 tanks are given in Table 2-2. These figures are based on the information obtained during the NUS RI and are subject to change. The maximum number of sampling points (based on tank diameter) is listed. If access or safety is a problem, the number may be reduced as determined by the members of the task team. Volumes of material by phase for the various analyses and sampling containers required are given in Tables 2-3, 2-4, and 2-5. All samples will be taken to the hotline, as specified in the Site-Specific Safety Plan (SSSP) prepared for the BROS site and composited there. The volumes and containers required for each composite are the same as for individual samples used for the composite.

Non-aqueous phase samples will be tested for ignitibility, reactivity, organic sulfur, BTU content, ash content, percent moisture, and specific gravity. Aqueous phase samples will be tested for corrosivity, reactivity, priority pollutant metals, total organic carbon, and specific gravity, and a GC/MS scan will be made. The sludge/solid phase samples will be tested for ignitibility, reactivity, EP toxicity, organic sulfur, BTU content, ash content, filterable solids, total solids, percent moisture, and specific gravity. Additionally, the oil and sludge from tank 69 and the oil from tank 55 will be tested for total PCBs and dioxin. The required analyses are given by tank and phase in Table 2-6.

All sampling and sample handling will be in accordance with COE/EPA samples handling protocols and the Environmental Engineering Regulations ER-1110-2-246.

2.2 LEVEE SAMPLING

Subsurface conditions will be determined in the levee and its foundation through a limited field exploration program consisting of 28 borings spaced along the perimeter of the levee (see Figure 2-3, Sheets 1 and 2 in back pockets). The locations of some boreholes may

recycled paper

ecology and environment

Table 2-2

TANK SAMPLING LOCATIONS

Tank	Diameter	Contents Volume	Sample Location Required Per Phase		
			Non-Aqueous	Aqueous	Sludge
18	8	2,554	3	3	3
21	36	22,841	5	5	0
30	7	4,000	3	0	0
36	--	11,000	5	0	0
37	--	4,790	5	0	0
39	10	3,901	3	0	0
50	26	18,800	5	0	5
55	18	9,517	5	0	0
60	30	11,406	5	0	0
63	35	216,497	5	0	0
68	10	1,859	3	3	0
69	48	419,322	5	5	5
86	--	640,293	5	0	5
88	11	8,860	3	3	0

Table 2-3

AQUEOUS SAMPLE HANDLING

Type of Analysis	Volume of Sample	Number and Type of Container	Preservation	Maximum Holding Time
Total organic carbon	1 liter	One 1-liter polyethylene bottle with Teflon-lined cap	H_2SO_4, pH <2, 4°C	28 days
Reactivity				
• Sulfide	1 liter	One 1-liter polyethylene bottle with Teflon-lined cap	Zinc acetate and NaOH, pH >9, 4°C	7 days
• Cyanide	1 liter	One 1-liter polyethylene bottle with Teflon-lined cap	NaOH, pH >12, 4°C	14 days
• General tests	1 liter	One 1-liter polyethylene bottle with Teflon-lined cap	None	None
Coupon (NACE, TM-01-69)	1 liter	One 1-liter polyethylene bottle with Teflon-lined cap	None	None
Priority polluant metals	1 liter	One 1-liter polyethylene bottle with Teflon-lined cap	HNO_3, pH <2, 4°C	28 days
GC/MS extractable organics	1 gallon	Two 1/2-gallon amber glass bottles with Teflon-lined caps	4°C	7 days until extraction; 30 days after extraction
GC/MS volatile organics*	80 mL	Two 40-mL glass vials with Teflon-lined caps	4°C	14 days

*GC/MS volatile organics will not be composited, but will be analyzed from one location only, preferably the center sample point.

Note:

1. pH will be taken at the time of compositing and recorded in the task logbook.
2. Preservation and holding times are as listed in the Federal Register, dated October 26, 1984.

recycled paper

ecology and environment

Table 2-4

NON-AQUEOUS SAMPLE HANDLING

Type of Analysis	Volume of Sample	Number and Type of Container
Ignitibility, reactivity, organic sulfur, BTU content, ash content, percent moisture, specific gravity	16 oz. (two 8-oz. bottles)	Two 8-oz. glass bottles with Teflon-lined cap
Total PCB*	8 oz.	One 8-oz. glass jar with Teflon-lined cap
2,3,7,8-TCDD*	8 oz.	One 8-oz. glass jar with Teflon-lined cap

*Required for tanks 55 and 69 only.

Note: All samples are considered medium-level samples and will require no preservatives.

Dioxin analyses will be performed according to EPA protocol for dioxin by a laboratory currently approved by the EPA for dioxin analysis.

Table 2-5

SLUDGE/SEDIMENT SAMPLE HANDLING

Type of Analysis	Volume of Sample	Number and Type of Container	Maximum Holding Time
Ignitibility, reactivity, EP toxicity, organic sulfur, BTU content, ash content, percent moisture, specific gravity	16 oz. (two 8-oz. bottles)	Two 8-oz. glass bottles with Teflon-lined cap	7 days
Total PCB*	8 oz.	One 8-oz. glass jar with Teflon-lined cap	7 days until extraction, 30 days after extraction
2,3,7,8-TCDD*	8 oz.	One 8-oz. glass jar with Teflon-lined cap	7 days until extraction, 30 days after extraction

*Required for tank 69 only.

Note: All samples are considered medium-level samples and will require no preservatives.

Dioxin analysis will be performed according to EPA protocols for dioxin by a laboratory currently approved by the EPA for dioxin analysis.

recycled paper

ecology and environment

Table 2-6

SAMPLE ANALYSIS REQUIRED

		Analyses Required															
Tank No.	Phase†	Ignit-ibility	Corro-sivity	Reac-tivity	EP Toxi-city	Prior-ity Pollu-tant Metals	Organic Sulfur	BTU Content	Ash Content	Total PCB	Total Organic Carbon	Filter-able Solids	Total Solids	Percent Moisture	Specific Gravity	Dioxin	GC/MS Scan
18	N	X		X			X	X	X					X	X		
	A		X	X		X					X				X		X
	S	X		X	X		X	X	X			X	X	X	X		
21	N	X		X			X	X	X					X	X		
	A		X	X		X					X				X		X
	S*																
30	N	X		X			X	X	X					X	X		
	A*																
	S*																
36	N	X		X			X	X	X					X	X		
	A*																
	S*																
37	N	X		X			X	X	X					X	X		
	A*																
	S*																
39	N	X		X			X	X	X					X	X		
	A*																
	S*																
50	N	X		X			X	X	X					X	X		
	A*																
	S	X		X	X		X	X	X			X	X	X	X		
55	N	X		X			X	X	X	X				X	X	X	
	A*																
	S*																
60	N	X		X			X	X	X				X	X			
	A*																
	S*																

Table 2-6 (Cont.)

Tank No.	Phase†	Analyses Required															
		Ignit-ibility	Corro-sivity	Reac-tivity	EP Toxi-city	Prior-ity Pollu-tant Metals	Organic Sulfur	BTU Content	Ash Content	Total PCB	Total Organic Carbon	Filter-able Solids	Total Solids	Percent Moisture	Specific Gravity	Dioxin	GC/MS Scan
63	N	X		X			X	X	X					X	X		
	A*																
	S*																
68	N	X		X			X	X	X					X	X		
	A		X	X		X					X				X		X
	S*																
69	N	X		X			X	X	X	X				X	X	X	
	A		X	X		X					X				X		X
	S	X		X	X		X	X	X	X		X	X	X	X	X	
86	N	X		X			X	X	X					X	X		
	A*																
	S	X		X	X		X	X	X			X	X	X	X		
88	N	X		X			X	X	X					X	X		
	A		X	X		X					X				X		X
	S*																
TOTALS		18	5	23	4	5	18	18	18	3	5	4	4	18	23	3	5

†Phase abbreviation: N = Non-Aqueous
A = Aqueous
S = Solid/Sludge

*Not an expected phase (as determined by NUS RI).

recycled paper

ecology and environment

be changed, depending on the in-situ conditions encountered during the subsurface program. These points will be located in the field by a registered surveyor.

The number of split spoon samples and the sampling depths are indicated on Figure 2-3, Sheets 1 and 2 (found in back pockets). Moisture content and grain size tests will be run on 80 of the split spoon samples. Moisture and grain size analysis will be performed after the chemical analysis on the composite sample has been completed. If the composite is determined to contain high levels of toxic contaminants, the grain size and moisture content tests will not be performed. After drying for the grain size test, if the material will not pass through the sieves, the test will be terminated. After analysis on the levee samples, if additional information is required, methods to analyze the highly contaminated samples will be developed at that time.

The borehole number and depth of each split spoon to be analyzed are given in Table 2-7. Additional samples from each borehole will be analyzed for the following: cyanide, sulfide, organic sulfur, BTU content, ash content, total PCBs, EP toxicity (or by the Toxicity Characteristic Leaching Procedure, when approved), specific gravity, chloride (TOX modified), and a compatibility test (see Appendix A) will be performed. The samples will be from individual split spoons or from composited samples as detailed in Table 2-8. In addition to these tests, the geologist will be required to complete a borehole log. Figure 2-4 is a sample borehole log. The total volume and number of sample containers required by analysis type are given in Table 2-9.

2.3 QA/QC SAMPLES

QA/QC samples from the tanks and levee will be taken in accordance with Environmental Engineering Regulation ER-1110-2-246, at a rate of one QA/QC sample for every 10 samples (10%). QC samples required will be either blanks or duplicates and QA samples for the COE will be splits. The QA/QC samples will be taken from the tanks and phases as shown in Table 2-10.

The analyses for the QC samples from the tank farm are as follows:

Table 2-7

GRAIN SIZE AND MOISTURE CONTENT
SAMPLE LOCATIONS AND DEPTH (ft)

Boring No.	Boring Depth (ft)	Sampling Depth Intervals										
		0 - 1.5	3 - 4.5	5 - 6.5	6 - 7.5	7 - 8.5	8.5 - 10	9 - 10.5	11.5 - 13	12 - 13.5	15 - 16.5	18.5 - 20
1	13		X						X			
2	13		X			X						
3	13		X						X			
4	20	X	X		X			X		X	X	X
5	10	X					X					
6	13		X			X						
7	13		X						X			
8	20	X	X		X			X		X	X	X
9	10			X								
10	13		X			X						
11	13		X						X			
12	13		X						X			
13	13		X			X						
14	20	X	X		X			X		X	X	X
15	10	X					X					
16	13		X						X			
17	20	X	X		X			X		X	X	X
18	10			X								
19	13		X						X			
20	20	X	X		X			X		X	X	X
21	10	X					X					
22	13		X			X						
23	13		X						X			
24	13		X			X						
25	13		X						X			
26	13		X			X						
27	13		X						X			
28	13		X			X						

recycled paper
ecology and environment

Table 2-8

SPLIT SPOON CHEMICAL SAMPLE LOCATIONS

Boring No.	Boring Depth (ft)	Sample Depth (ft)	Total Sample Analyzed
1	13	3 - 4.5	1
2	13	3 - 4.5	1
3	13	3 - 4.5	1
4	20	Composite (0 - 1.5 and 3 - 4.5) Composite (6 - 7.5 and 9 - 10.5)	2
5	10	0 - 1.5	1
6	13	3 - 4.5	1
7	13	3 - 4.5	1
8	20	Composite (0 - 1.5 and 3 - 4.5) Composite (6 - 7.5 and 9 - 10.5)	2
9	10	0 - 1.5	1
10	13	3 - 4.5	1
11	13	3 - 4.5	1
12	13	3 - 4.5 and 7 - 8.5	2
13	13	3 - 4.5 and 7 - 8.5	2
14	20	0 - 1.5, 3 - 4.5, Composite (6 - 7.5 and 9 - 10.5)	3
15	10	0 - 1.5	1
16	13	3 - 4.5	1
17	20	Composite (0 - 1.5 and 3 - 4.5) Composite (6 - 7.5 and 9 - 10.5)	2
18	10	0 - 1.5	1
19	13	3 - 4.5	1
20	20	0 - 1.5, 3 - 4.5, Composite (6 - 7.5 and 9 - 10.50)	3
21	10	0 - 1.5	1
22	13	3 - 4.5, 7 - 8.5	2
23	13	3 - 4.5, 7 - 8.5	2
24	13	3 - 4.5	1
25	13	3 - 4.5	1
26	13	3 - 4.5, 7 - 8.5	2
27	13	3 - 4.5	1
28	13	3 - 4.5	1

Table 2-9

LEVEE SAMPLING

Type of Analysis	Volume and Number of Containers	Maximum Holding Time
Moisture content and grain size	One 8-oz. glass jar with Teflon-lined cap, sealed and maintained out of direct sunlight.	N/A
Total PCBs	One 8-oz. glass jar with Teflon-lined cap	7 days until extraction, 30 days after extraction
Cyanide, sulfide, organic sulfur, BTU content, ash content, EP toxicity, specific gravity, and chloride (TOX modified)	Two 8-oz. glass jars with Teflon-lined cap	7 days

Note: All samples are considered medium-level samples and will require no preservatives.

recycled paper

ecology and environment

Table 2-10

QA/QC SAMPLE LOCATIONS

Tank No.	Aqueous	Non-aqueous	Sludge/ Solid
55	--	X	--
69	X, D	X	X, S
86	--	X	X
50	--	X, S	X
18	X, S	X	X
21	X	X	--
30	--	X, D	--
39	--	X	--
36	--	X	--
37	--	X	--
88	X	X	--
63	--	X	--
68	X	X	--
60	--	X	--

X = Indicates an expected phase. (The non-aqueous phase indicated for tanks 18, 21, 88, and 68 may not be present. In that case, additional samples from other tanks will be obtained.)

D = Indicates that a duplicate will be taken from that tank and phase and analyzed as a QC sample.

S = Indicates that a split sample will be taken from that tank and phase and provided to the COE for their analysis.

Note: One field blank will be provided for analysis as a sludge sample to be tested for EP toxicity (or by the Toxicity Characteristic Leaching Procedure, when approved.)

FORM NO. 140-8-80

BORING NO. _____

SHEET ____ OF ____

BRIDGEPORT RENTAL AND OIL SERVICES
ECOLOGY AND ENVIRONMENT
TIPPETTS-ABBETT-McCARTHY-STRATTON
FIELD LOG - SUBSURFACE EXPLORATION

JOB NO. _____ JOB TITLE _____

LOCATION _____ COORDINATES _____

DRILL _____ ANGLE _____ REFERENCE ELEV. _____ DATUM _____

DRILLING CONTRACTOR _____ DRILLER _____ INSPECTOR _____

DEPTH IN FEET (ELEVATION)	BLOWS ON SAMPLER FOR INCHES (% RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DATE AND TIME	DEPTH IN FEET		DESCRIPTION OF OPERATION AND REMARKS
								FROM	TO	

Figure 2–4 SAMPLE FIELD LOG – SUBSURFACE EXPLORATION

recycled paper

ecology and environment

1) The QC duplicate sample from the aqueous phase of tank 69 will be analyzed for priority pollutant metals and total organic carbon, and a GC/MS scan will be performed.

2) The QC field blank will be analyzed as a sludge sample for EP toxicity (or by the Toxicity Characteristic Leaching Procedure, when approved).

3) The QC duplicate sample from the non-aqueous phase of tank 30 will be analyzed for organic sulfur.

QA split samples will be taken as given in Table 2-10 and provided to the COE for their analysis.

All duplicates, splits, and blanks will be treated like other samples. Duplicates or splits and field blanks will be provided to the COE for QA purposes in precleaned sample containers furnished by MRDED-L, one QA sample for every 10 samples taken.

3. SAMPLING METHODS

3.1 GENERAL REQUIREMENTS

During sampling, each tank will be mounted using a suitable means of ascent (personnel lift). The tank will be carefully opened and its headspace checked for oxygen content, explosiveness, and toxic contaminant concentration. Many of the tanks have manways and hatches that are already opened; these tanks will be monitored before any other work is permitted on the tank. Those tanks that require opening will be opened at existing manways and hatches using non-sparking tools and allowing venting as the bolts or connections are loosened. The headspace will be checked as described above. If necessary to obtain samples from various points in a tank, holes will be cut in the roof. These holes will only be cut if the headspace explosivity (measured as % LEL) is above background. Holes will be cut using either electrically driven steel saw jaws or an air-driven saw. Drilling of small diameter holes may be necessary to start the cutting operation and will be accomplished using an electric drill. Upon completion of sampling, the holes will be covered with 6-mil plastic taped in place.

All sampling will be done in accordance with the SSSP prepared for the site. Under no circumstance will anyone enter a tank or confined space. Lamps used for looking into tanks will be explosion-proof.

3.2 PHASE DETERMINATION

The phases present and the amount of material in each phase will be determined using a Coliwasa sampler. Procedures for operating the sampler are in accordance with EPA protocols and are given below.

recycled paper

ecology and environment

The main parts of the Coliwasa consist of the sampling tube, the closure-locking mechanism, and the closure system.

The sampling tube consists of 5-foot by 1 5/8-inch I.D. translucent plastic pipe, usually polyvinyl chloride (PVC) or borosilicate glass plumbing tube. A closure-locking mechanism consists of a short-length channeled aluminum bar attached to the sampler's stopper rod by an adjustable swivel. An aluminum bar serves both as a T-handle and lock for the sampler's closure system.

Procedures for Use

- Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.

- Slowly lower the sampler into the liquid waste. (Lower the sampler at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the sampling rate is too fast, the level of the liquid in the sampler tube will be lower than the level outside the sampler, resulting in a nonrepresentative sample.)

- When the sampler stopper hits the bottom of the waste container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T handle until it is upright and one end rests tightly on the locking block.

- Slowly withdraw the sampler from the waste container.

- The phases are then measured using the graduated markings on the sampling tube and a tape measure between gradations if necessary.

- Slowly open the sampler and carefully discharge the sample back into the tank sampled. The sampler is opened by pulling the lower end of the T handle away from the locking block.

3.3 OIL/NON-AQUEOUS SAMPLING

Both the non-aqueous and aqueous phases will be sampled using the same methods. The two methods used will be either a vacuum pump and sampling bottle or a weighted bottle (Kemmer sampler).

Pump and Vacuum Bottle

The inlet tubing is dropped to the middle of the phase to be sampled. The pump is then activated (usually by hand cranking) and the liquid drawn up to a liquid trap (sample container, vacuum bottle) which is installed in the line prior to the pump. This prevents contamination of the pump. Upon completion of sampling from a specific phase, the inlet tubing is discarded, eliminating the possibility of cross contamination.

Weighted Bottle (Kemmer Sampler)

This sampler consists of a glass bottle, a weighted sinker, or bottle stopper, and a line that is used to open the bottle and lower and raise the sampler. This sampler can either be fabricated or purchased (Kemmer sampler). The bottle is gently lowered to the desired depth to avoid removing the stopper prematurely. The stopper is then pulled out with a sharp jerk of the sample line. The bottle is allowed to fill completely as evidenced by the cessation of air bubbles. The bottle is then raised, capped, and wiped clean. The bottle can be used as the sample container.

3.4 SLUDGE/SOLID/SEDIMENT SAMPLING (TANKS)

Sludge and solid layer samples will be collected using a Ponar dredge or a KB core sampler.

Ponar Dredge

A Ponar dredge consists of sampling jaws, a closure system, and a hand line. The dredge is dropped through an opening in the top of the tank and allowed to drop to tank bottom under its own weight. The closing mechanism is released on striking the bottom sediment or sludge. The dredge is then pulled up with the hand line.

recycled paper

ecology and environment

KB Core Sampler

The KB core sampler consists of a core tube, weight, valve mechanism, and messenger for closing the valve. The procedure for obtaining a core sample is as follows:

- A 3-inch PVC pipe is inserted through an opening in the tank top.
- Using a vacuum pump and tubing, the non-aqueous layer is pumped out of the PVC pipe and returned to the tank.
- The 2-inch KB core sampler is then dropped down the PVC pipe; as it descends to the tank bottom under its own weight, the remaining liquid flows through the sampler.
- After the sampler has settled into the sludge/solid layer and the operator feels that a solid sample has been obtained, the messenger-operated valve is closed.
- When the seal is closed by the messenger, the core sampler is raised with the hand line.

3.5 TANK GAUGING

On those tanks to be physically sampled, a gauge of the level of product will be taken. A weight will be attached to the end of a tape measure. The tape will then be lowered to the top of the material. The outage (height from top of material to top of tank shell) will be measured. These data and an estimate of the height of the gauging point above the top of the tank shell will be noted on the tank data sheets.

3.6 SPLIT-BARREL SAMPLING AT LEVEE

The drilling team will follow the procedures outlined below for obtaining the required split-barrel samples. The sampling portion of this procedure is in accordance with ASTM D 1586-67(1974), standard Method for Penetration Test and Split-Barrel Sampling of Soils.

- Before moving onto a location, the driller will decontaminate all equipment to be used per Section 9 of this plan and the SSSP.

- The borehole location will be determined and a magnetometer survey performed. If the magnetometer reading is unacceptable, the borehole location will be moved to one side of the original location until magnetometer readings are obtained which indicate no buried metal.

- The driller will place the auger over the specified location. Any deviation from the specified location will be recorded.

- The driller will drill the hole to the depth specified by the geologist or engineer.

- To take a sample, the auger is removed and the hole cleared of all loose material and material disturbed by drilling. The split-barrel sampler is inserted in the hole, verifying that the sampler reaches the depth drilled. The sampler dimensions are given in the ASTM procedure ASTM D 1586-67 (1974), Standard Method for Penetration Test and Split-Barrel Sampling of Soils.

- The sampler is driven into the material to be sampled using a 140-pound hammer. The driller will obtain a consistent 30-inch free fall drop of the hammer with two wraps of a rope around the cathead on the drill rig. (Cables attached to a hoisting drum should not be used because it is difficult to obtain a free fall with them.)

- The split-barrel is driven 18 inches into the material to be sampled or until normal maximum resistance (refusal) is reached, using the standard hammer and drop. (Refusal is defined as a penetration of less than 18 inches for 100 hammer blows.)

recycled paper

ecology and environment

- The number of blows required to drive each 6 inches of penetration is counted and recorded.

- The sampler is then removed from the boring and turned over to the geologist. The geologist will note soil conditions, and will prepare, seal, and label samples.

- The split-barrel samplers will be decontaminated between uses.

- Before moving to a new location, all equipment will be decontaminated per Section 9.

3.7 COMPATABILITY TESTING

Compatability testing will consist of several tests to be performed in the field. These tests are to be performed on the material from the 28 borehole locations.

Characterization of Hazardous Waste in the Field*

Sample Acquisition. No more than 5 milliliters (mL) of the waste is needed to conduct the field characterization tests. This will be collected in a vial separate from the sample which is collected for laboratory analysis.

- Air Reactivity - If the waste is air-reactive, a reaction may begin when the sample comes in contact with air during the sampling procedure. If the waste is stored moist, it will not be allowed to dry out until sufficient tests have been conducted to determine that the waste is not explosive when dry.

- Radioactivity - Testing of the individual wastes for radioactivity will be implemented if radioactivity has not been previously ruled out by on-site testing.

---

*Drum Consolidation Protocol (DRAFT) USEPA (August 1981).

- Phase Determination - Phase determination will be implemented to assess whether the waste is a liquid, solid, or heterogeneous mixture. This determination may sometimes be difficult for very viscous liquids or resins, but it is not crucial because the same characterization tests are performed on both solids and liquids.

General Liquid Characterization. The remainder of the tests will be performed a safe distance from the sampling area, away from all contamination, but within the decontamination line or hot-line. The majority of the tests will be performed on a single table or bench covered with plastic. The flame tests must be performed in a separate location to minimize the chances of an accidental fire.

- A bunsen burner fueled by a propane tank is lit and adjusted to a small blue flame. The flame height must be adjusted with the propane tank valve rather than the bunsen burner adjustment to prevent pressure buildup in the rubber connecting hose. It may be necessary to construct a wind break with coolers or other non-flammable objects. Always have a fire extinguisher handy when conducting such characterization tests.

- Flame Ignitibility Test - The first test to be conducted will be an open-flame ignitibility test. One or two drops of the waste will be placed in a porcelain spoon and held over the flame. Note the following: flammability and nature or explosiveness of the flame, color of the flame, sootyness, whether a residue remains after burning, etc. If the drops evaporate too fast or if the flame disappears too rapidly to characterize, the spoon will be allowed to cool and the process repeated using twice as many drops as before.

- Bielstien's Test - The second flame test is a Bielstien's copper wire halogen test. A small coil will be bent in the end of a length of copper wire and held over the peak of the flame until any green flame disappears. Do not allow the wire to

recycled paper

ecology and environment

melt in the flame. The wire will be allowed to cool and then dipped in a small amount of the waste and held in the edge of the flame again. A green flame indicates the presence of a halogen (chlorine, bromine, florine, iodine). If the test is to be repeated, the wire must be thoroughly cooled before dipping the coil back into the liquid.

Interferences. Very volatile liquids may have a tendency to evaporate in the flame before decomposition can occur, thus causing a negative result. Several compounds have been found to also cause a green flame, e.g., organic acids, copper cyanide, urea, and quinoline and pyridine derivatives.

- Multiple phases will be observed. If multiple phases exist, they will be separated using a transfer pipet. Further characterization may then be conducted on the individual phases.

- Determination of whether the waste is soluble, insoluble, or reactive with water will be performed by placing several drops in a 40-mL vial containing 3 to 5 mL of distilled water. Reactions of the waste with the water will be observed, i.e., gas generation, heat generation, combustion, etc. There is often some heat of solution or color change when the waste is mixed with water, but a waste which exhibits these mild reactions should not be considered a water-reactive waste.

A waste which is not readily miscible with water will be characterized further by Organic Liquid Characterization, below. Some organic solvents such as acetone and alcohols are miscible with water, but the mixing reaction is usually easily detectable.

An aqueous waste will form a single phase in the vial. Water-soluble wastes will be considered inorganic liquids and further characterized by Inorganic Liquid Characterization, below.

Inorganic Liquid Characterization

- The presence of soluble volatile organics in the waste will be checked by testing the headspace of the waste with an organic vapor analyzer (OVA), a photoionization detector, or a combustible gas meter. If vapors are detected, further organic analysis in the lab or with a portable gas chromatograph (GC) will be conducted.

- Inorganic Oxidizers and Peroxides. Inorganic oxidizers and peroxides will be tested for next. Testing for inorganic oxidizers will be implemented by placing a drop of the waste on a strip of potassium iodide (KI)/starch paper. A purple stain will indicate the presence of an oxidizer. If the waste is dark and stains the KI/starch paper dark because of its color, check closely around the edges of the spot for the purple color. Very strong acids or bases may also stain the paper brown. When this happens, moisten a strip of the KI/starch paper with buffer solution and repeat the test. (The composition of the buffer solution and all other solutions are listed at the end of these instructions). A portion of the sample will also be diluted with the buffer solution, if necessary.

- Peroxides. Peroxides in the aqueous solution are detected with EM Quant Peroxide-Test strips. The pH of 1 mL of the sample will be adjusted to between pH 2-12 with NaOH or H_2SO_4 solutions, if necessary. The reagent portion of a strip will be immersed into the sample for five seconds. A blue stain will indicate the presence of peroxides. The test is sensitive to a few parts per million, and the darkness of the blue stain indicates the concentration.

- Determination of the pH of the waste with pH paper:

  - Acidic ($pH \leq 3$); and
  - Neutral or basic ($pH > 3$).

recycled paper

ecology and environment

- The acidic wastes will be tested for nitric (HNO_3) or perchloric acid ($HClO_4$) with a sulfuric acid/diphenylamine test. Two milliliters of the sample will be pipetted into a vial and 0.5 milliliters of the diphenylamine solution will be added, followed by an equal amount of H_2SO_4 solution. A deep purple color will indicate the presence of nitrate or chlorate ions.

Sulfide and Cyanide Testing. The neutral and basic liquids will be tested for the presence of sulfide or cyanide ions. To test for sulfide, a drop of the sample will be placed on a strip of lead acetate paper which has been previously moistened with the buffer solution. A black stain will indicate the presence of sulfide. If the sulfide test is positive, the sulfide will be removed before the following cyanide test is conducted. This may be accomplished by adding cadmium nitrate to a small amount of the sample and swirling to precipitate cadmium sulfide, alternately adding small amounts of cadmium sulfide and repeating the spot test until all of the sulfide has precipitated.

High chloride ion concentrations may interfere with the cyanide ion detector tube test. Therefore, the waste is diluted by adding 8 mL of distilled water to a 0.5-mL sample. This should dilute the sample to where effects from the interfering ions are minimal and the test is still sensitive to less than 100 ppm cyanide. After diluting the sample, the tip of a Matheson-Kitigawa cyanide ion detector tube will be scored and broken and set in the sample with the red dot up. The liquid will be allowed to rise into the column by capillary action and any color change in the tube will be noted. A deep blue color will indicate the presence of the cyanide ion.

An alternative method for detecting sulfide- or cyanide-containing wastes consists of using a Drager or Matheson-Kitagawa gas detector pump and hydrogen sulfide and hydrogen cyanide detector tubes. One or two drops of sulfuric acid solution are added to an equal amount of sample in a vial and the vapor space about the mixture is immediately tested for H_2S and HCN. If both tests are negative, several more drops of sample and acid solution are added and the test is repeated. The detector tubes may be reused several times if the

tests continue negative. Due to the high toxicity of H_2S and HCN, precautions must be taken to avoid breathing any gases which may evolve from the sample.

Organic Liquid Characterization

- The headspace above the sample is tested for volatile organics with an OVA, HNu, or combustible gas meter. Further analysis with the GC mode of the OVA may be conducted if vapors are present.

- Organic oxidizers will be checked for by placing a drop of the waste on a strip of KI/starch paper. A purple stain will indicate an oxidizer. Organic peroxides are then tested with the EM Quant Peroxide Test strips.

  After immersing the reagent portion of the strip in the sample for five seconds, the strip must be moistened by breathing several times on the reagent pad. When a respirator is worn, this may be accomplished by holding the strip below the exhalation valve of the mask. Peroxides are indicated by a blue stain, as in the inorganic liquid test.

- A pH determination will be made after mixing 2 mL of the sample with 2 mL of distilled water. Determination of the pH of the water phase will be made with pH test paper.

Solids Characterization

- Color, texture, and approximate density of the waste and any other sample-specific preliminary information will be recorded.

- An open flame ignitibility test will be performed on a BB-sized portion of the waste and all observations recorded.

recycled paper

ecology and environment

Also, the Bielstien's halogen test will be conducted if the consistency of the waste is such that it adheres to the small loop or coil of wire.

- Another BB-sized portion of the sample will be added to a vial containing 10 mL of distilled water. Reactions will be observed. If no violent reaction is observed, an additional amount of sample will be added to the water equivalent to about 1 cubic centimeter. The vial will be swirled to thoroughly mix the waste with the water. After settling, solubilities will be roughly estimated.

  The pH of the mixture will be determined. The oxidizer, peroxide, sulfide, and cyanide tests may be conducted on the waste/water mixture as in Inorganic Liquid Characterization, above.

Solutions

Buffer Solution: Dissolve 24.3 g $NaC_2H_3O_2.3H_2O$ or 14.6 g anhydrous $NaC_2H_3O_2$ in 40 mL distilled water. Add 48 mL concentrated acetic acid and bring solution to 100 mL with distilled water.

Diphenylamine Solution: 1.0 g of diphenylamine in 50 mL methanol.

Sulfuric Acid: Four parts H_2SO_4 to 1 part water.

Sodium Hydroxide Solution: 0.1 sodium hydroxide solution.

3.8 COMPOSITING AQUEOUS AND NON-AQUEOUS SAMPLES

Sample compositing will be performed in a designated area at the hotline. Samples from various points within the same phase in a given tank will be combined to form a composite sample. The composite is prepared in the following manner:

- All samples to be composited will be thoroughly mixed prior to compositing to assure they are homogeneous. Sealed sample containers will be vigorously shaken for 2 minutes by hand. If after shaking the samples do not appear homogeneous, another 2-minute shaking will be employed. This will be repeated until the sample appears homogeneous.

- Equal volumes from each sample point of a particular phase of a particular tank are then poured from their containers into a new container. If three points were sampled, the composite will consist of 1/3 from sample location 1, 1/3 from sample location 2, and 1/3 from sample location 3.

- Equal volumes will be determined visually in order to minimize sample handling and the possibility of cross contamination.

- After compositing is complete, the containers will be sealed and labeled as specified in this plan.

- The volumes and containers required for each composite will be the same as for the individual samples listed in Tables 2-3 and 2-4.

3.9 COMPOSITING SLUDGE/SEDIMENT SAMPLES

Sample compositing will be performed in a designated area at the hotline. Samples from various points within the sludge/sediment will be combined to form a composite sample. A composite sample is prepared in the following manner.

- All samples to be composited will be thoroughly mixed prior to compositing to assure they are homogeneous. They will be mixed in their containers by stirring with a stainless steel tablespoon. The material will be chopped, mixed, and stirred until the material appears homogeneous, or at least 3 minutes.

recycled paper

ecology and environment

- The composite containers will then be filled with equal amounts of material from each location. A stainless steel tablespoon will be used to transfer the material. A tablespoon from each sample point of a particular phase of a particular tank will be placed in the composite container in succession until the container is filled.

- The composite container will then be sealed and labeled as specified in this plan.

- The volumes and containers required for each composite will be the same as for the individual samples listed in Table 2-5.

3.10 COMPOSITING LEVEE SOIL SAMPLES

Sample compositing will take place at the sampling location (borehole location). The first 6 inches of material from each split-spoon sample will be placed in individual 8 oz.-jars and retained at the site. The second 6 inches of the material from each split-spoon will be put into a second set of jars. The material in the second set of jars will be analyzed for moisture content and grain size. A composite sample of the levee and soil foundation will be prepared as follows:

- The third 6-inch section of sample material from each split-spoon will be placed in 8-oz. glass jars. The materials will be mixed in their containers by stirring with a stainless steel tablespoon. The material will be chopped, mixed, and stirred until the material appears homogeneous, or at least 3 minutes.

- Composite containers will then be filled with equal amounts from the levee material and the soil foundation material from each individual split-tube sample. A stainless steel tablespoon will be used to transfer the material. One tablespoon of levee material and then one tablespoon of soil foundation material will be placed in the composite container until the container is filled.

- The composite container will then be sealed and labeled as specified in this plan.

- The volumes and containers required for each composite will be the same as for the individual samples listed in Table 2-7.

recycled paper

4. SAMPLE PREPARATION

4.1 COORDINATION WITH ANALYTICAL LABORATORY

It is important that any limitation on sampling due to laboratory capacity or special sample requirements be determined prior to sampling. Based on the analyses required, it is not anticipated that any special sampling requirements will be necessary. However, the site team leader will be responsible for contacting the laboratories well in advance of sampling to determine that adequate laboratory analysis capacity is available.

At present, all analytical work will be performed by E & E's Analytical Services Center (ASC) with the exception of the corrosivity coupon test and the 2,3,7,8-TCDD analysis. However, if it is not feasible for the ASC to perform analytical work because of an emergency situation, another COE-approved laboratory will be used with prior notification and approval by the COE. The laboratories chosen will comply with all QA/QC contract requirements as well as those prescribed in the appropriate methodology.

The dioxin analysis will be performed by:

Environmental Testing and Certification Corp. (ETC)
284 Raritan Center Parkway
Edison, New Jersey

or alternately,

Envirodyne Engineers
12161 Lackland Road
St. Louis, Missouri

recycled paper

ecology and environment

Both of these laboratories have been approved by the EPA to perform dioxin analysis.

The following COE-approved laboratory will be used for the corrosivity coupon test:

Environmental Research Group
117 W. First S.E.
Ann Arbor, Michigan 48104

4.2 MAJOR SAMPLING EQUIPMENT

Equipment for sampling will be the responsibility of the equipment manager. He should assure that the items required for sampling and quantities required are packaged and shipped to the site prior to sampling. He will also be responsible for purchasing any locally available items. All equipment will be checked for serviceability and calibration (if required) prior to shipment. Similar checks are made at the sampling location. Any sampling device that is reusable will be decontaminated prior to use at the site. Sample containers will be precleaned and supplied by the E & E laboratory. Those sample containers for QA samples for the COE external QA checks will be provided by MRDED-L. The equipment required for sampling at the site includes but is not limited to items shown in Table 4-1.

Table 4-1

MAJOR SAMPLING EQUIPMENT LIST

Item
Ponar dredge
Peristaltic pump (vacuum)
KB 2-inch core sampler
Kemmer sampler (weighted bottle)
HNu analyzers
O_2 explosive meters
<u>Sample Containers</u>
8-oz. jar, glass
250 mL, poly
1-liter bottle, glass
1/2-gal bottle, glass
VOA bottle 40 mL, glass
Miscellaneous disposables (tubing, rope, bags, rods, etc.)
<u>Documents</u>
Field notebooks
Labels
Tank data sheet
Sampling plan

recycled paper

ecology and environment

5. FIELD PERSONNEL REQUIREMENTS

5.1 TANK SAMPLING

There will be no more than two sampling teams working at the site. Each sampling team will consist of four members. In addition, two personnel will be located at the hotline. The team members' duties are listed below. Duties will be rotated, so each team member may have any one of the functions during the sampling effort.

Task Team Leader will have overall responsibility for the sample teams activities. Responsibilities include relaying information to record custodian; picking sample locations; directing sample gathering methods, quantities, and locations; and assisting in actual sampling.

Record Custodian will record all information required on tank data sheets and logs and any other pertinent information as relayed from the task team leader. He will also prepare sample labels and bottles and provide any other necessary ground support for sampling effort.

Site Safety Monitor will be responsible for the team's overall safety. He will make the necessary tank measurements of explosivity, O_2, etc., and will also assure that protocols required in the SSSP are followed. In addition, the safety monitor will assist in obtaining samples.

The team will also have one additional Team Member who will provide assistance for opening the tank, sample gathering, and in

recycled paper

ecology and environment

general, assist in all phases of sampling where required by the task team leader.

5.2 LEVEE SAMPLING

The sampling team required for the subsurface investigation will consist of four members. Their duties are listed below.

Driller will be responsible for the operation of the drill rig. He will supervise location of the rig, operation of the auger, and split-spoon sampling. Either the E & E drill rig and driller or an approved drilling contractor who meets the corporate safety and health requirements will be used.

Driller's Helper will be responsible directly to the driller. He will assist in all phases of the drilling operations.

Task Team Leader/Geologist will be responsible for the overall sampling activity. Responsibilities include directing the location of the boreholes, recording information on the boring logs, placing samples in sample containers and labeling them, and compositing the samples. The geologist must have prior experience or special training in Superfund sampling procedures. Resumes of proposed geologists are included in the SSQMP.

Site Safety Monitor will be responsible for taking magnetometer readings before boring begins, checking the area for hazardous vapor concentrations, and monitoring the drilling spoils.

5.3 TANK INSPECTION

In addition to the visual inspection performed on the tanks by the sampling team, another visual inspection will be performed to determine the integrity of the tank foundations and structures. The team for this inspection will consist of four members. Their respective duties are listed below.

Task Team Leader will be responsible for the team's overall activities. These include selecting parameters to be reviewed and directing activities of other team members.

Additional Team Members - Two additional team members experienced in structural analysis and investigation will be used.

Safety Monitor will be responsible for the overall safety of the team members. He will measure ambient air quality and assure that all health and safety protocols are followed.

recycled paper

ecology and environment

6. SITE LOGISTICS

The site layout will consist of an exclusion (contamination) zone, entered through a support zone and a contamination reduction zone. The line between the exclusion zone and the support zone is called the hotline. These zones are shown in Figure 6-1.

The tank farm and levee which are to be sampled are located in the exclusion zone. No one will enter the exclusion zone without the required level of protective equipment. On the basis of air monitoring, the level of protection may be downgraded or upgraded at the discretion of the site safety coordinator. The tasks and levels of protection are summarized below:

Task	Level of Protection
Initial Site Survey	Level C
Ground Level Tank Inspection	Level C
General Ground Support for Tank Sampling	Level C
Tank Sampling	Level B
Levee Sampling	Level C

Crew members will enter the exclusion zone in pairs, employing the "buddy system," and the pair will exit the exclusion zone at the same time. While in the exclusion zone, task teams will be in constant radio contact with personnel in the contamination reduction zone and

recycled paper

ecology and environment

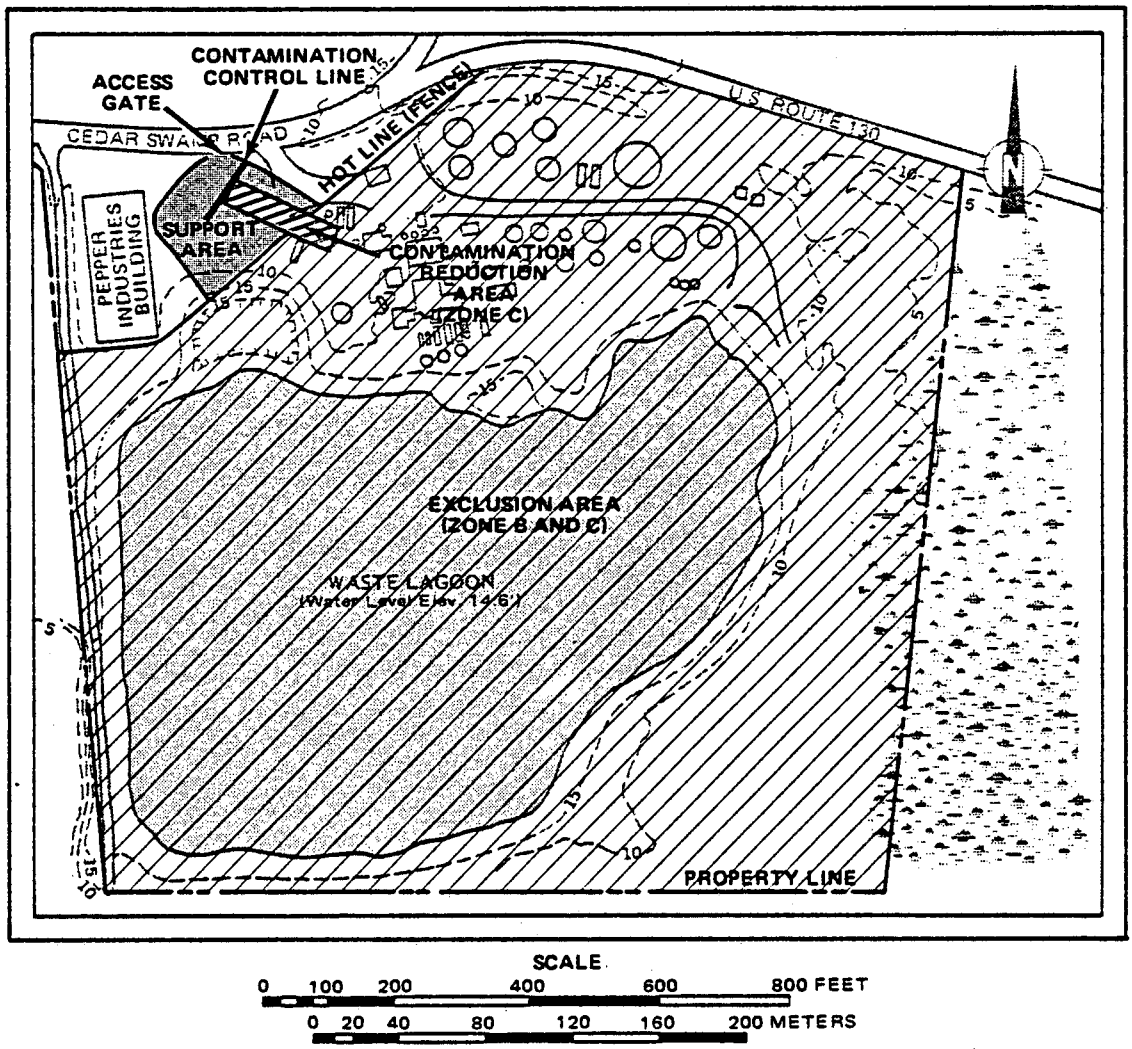


Figure 6–1 FIELD OPERATIONS WORK AREA

any other task teams in the exclusion zone, to provide for emergency notification and assistance. Upon exiting the exclusion zone, personnel and equipment will be decontaminated. All work will be limited to daylight hours only.

Some specific considerations for each task are noted below:

Tank Sampling

- Monitoring of tank environment for combustibility, oxygen content, and toxic contaminant concentrations will be performed prior to and during sampling.

- Personnel on the air platform will be secured to the cage with safety lines.

- Any sampling devices that will be reused will be decontaminated between uses.

- Tanks will be tested in one area of the tank farm and then equipment will be moved to another area to minimize equipment movement and potential for contamination.

Levee Sampling

- If drilling work is subcontracted, the driller will meet E & E health and safety requirements.

- Monitoring of the boring locations for combustibility, oxygen content, and toxic contaminant concentrations will be performed prior to and during the drilling and sampling. In addition, prior to the commencement of the drilling, magnetometer readings will be taken to determine if there is any metal below surface.

- Drill augers, split-spoon samplers, and other equipment that is to be reused will be decontaminated before reuse.

recycled paper

ecology and environment

- Augers and sampling equipment will be transported to the contamination reduction zone for decontamination. The drill rig will be moved from borehole to borehole but will not be decontaminated until drilling is complete.

- Before leaving the site, the drill rig will be thoroughly decontaminated.

7. SAMPLE HANDLING, PACKAGING, AND SHIPPING

The transportation and handling of samples must be accomplished in a manner not only to protect the integrity of the sample but also to prevent any detrimental effects due to the hazardous nature of any samples. Regulations for packaging, marking, labeling, and shipping of hazardous materials are promulgated by the United States Department of Transportation (DOT) in the Code of Federal Regulations, 49 CFR 171 through 177.

The samples obtained from the BROS site will be considered hazardous substance samples and transported as such. The DOT Hazardous Materials Classification will be either Flammable Liquid (n.o.s.) or Flammable Solid (n.o.s.). The samples will be handled as outlined below.

Packaging

- Collect sample in specified container with non-metallic, Teflon-lined screw cap. Allow sufficient ullage (approximately 10% by volume) so that the container is not liquid-full at 130°F. Secure sample bottle lids with strapping tape or evidence tape. If an air space in a container cannot be tolerated in order to maintain sample integrity, place it within a second container to provide the required ullage.

- Attach properly completed sample identification tag to sample container.

recycled paper

ecology and environment

- Mark volume level on bottle with grease pencil.

- Seal sample container and place in a 2-mil thick (or thicker) polyethylene bag, one sample per bag. The sample identification tag (label) should be positioned so that it can be read through the bag.

- Place sealed bag inside an appropriate-sized metal can with enough incombustible, absorbent, cushioning material (e.g., vermiculite or diatomaceous earth) to prevent breakage and absorb liquid, one bag per can. Pressure-close the can and use clips, tape, or other positive means to hold the lid on securely.

- Place one or more metal cans (or single 1-gallon bottle) surrounded with incombustible, absorbing packaging material for stability during transport into a strong outside container, such as a metal picnic cooler, or inside an approved fiberboard box.

- Tape cooler completely around with strapping tape at two locations. Do not cover any labels.

Marking and Labeling

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

  Laboratory name and address; "Flammable Liquid, n.o.s. UN1993" or "Flammable Solid, n.o.s. UN1325". The abbreviation "n.o.s." means "not otherwise specified."

- Place the following DOT labels on the outside of the can (or bottle):

"Flammable Liquid" or "Flammable Solid." The "Dangerous When Wet" label must be used with the "Flammable Solid" label if the material meets the definition of water-reactive. The "Cargo Aircraft Only" label must be used if the net quantity of the sample in each package is greater than one quart (for Flammable Liquid, n.o.s.) or 25 pounds (for Flammable Solid, n.o.s., 172.402, 172.101).

- If the cans are placed in an exterior container, both the exterior container and the inside can (or bottle) must have the same markings and labels as above.

  The words: "This End Up" or "This Side Up" must be clearly printed on the top of the outer package. Upward-pointing arrows should be placed on the sides of package. The words "Laboratory Samples" should also be printed on the top of the package.

- Once the cooler has been sealed, two chain-of-custody seals are placed on the container, one on the front and one on the back. The seals are protected from accidental damage by placing Mylar tape over them.

Shipping Papers

- Use abbreviations only where specified below. Complete the carrier-provided bill-of-lading and sign the certification statement (if the carrier does not provide these, use standard industry form) with 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."); net weight or net volume (standard abbreviations of weight or volume are

recycled paper

ecology and environment

acceptable). Further descriptions, such as "Laboratory Samples" or "Cargo Aircraft Only" (if applicable), are allowed if they do not contradict the required information.

The net weight or net volume must be placed just before or just after the "Flammable Liquid, n.o.s." or "Flammable Solid, n.o.s." designation.

- A chain-of-custody record, properly executed, must be included in the exterior container if samples are collected for legal evidence or if there is an expectation that at some future date they may be needed as evidence.

- One copy of the tank data sheet(s) from which the samples were collected will be included in the exterior container.

Transportation

Unknown hazardous substance samples classified as flammable liquids may be transported by rented or common carrier truck, railroad, or by Federal Express Corporation, but they should not be transported by any other common carrier air transport, even "cargo only" aircraft. (DOT regulations permit "cargo only" aircraft such as TWA, United, etc.; however, policy difficulties with airline transportation suggests avoiding these types of transportation.)

8. DOCUMENTATION

8.1 TANK SAMPLE IDENTIFICATION

All containers of samples collected from the tank farm will be identified using the following format on a label or tag fixed to the sample container (labels are to be covered with Mylar tape):

JV-TK-123-A1-XX

- JV - This specific set of initials, meaning "Joint Venture," is used to indicate the sample is from this project.

- TK - This specific set of initials is used to indicate the sample is from the tank farm.

- 123 - These three numbers are the tank identification number. If the tank number is only two digits, the first number will be 0.

- A1 - The first character will be either "A," for aqueous; "N," for non-aqueous; or "S," for sludge/sediment/solid, identifying the phase the sample represents. The second character is the sampling sequence number (i.e., 1 indicates that it is the first set of samples).

- XX - Specifies either (1) the sample location number for a given tank, 01 through 05 (maximum of five locations

recycled paper

ecology and environment

sampled in each phase); or (2) identifies the sample as an original composite sample (OC) or a duplicate composite sample (DC).

Each sample must be labeled and sealed immediately after collection. To minimize handling of sample container, labels should be filled out prior to sample collection. The sample label must be filled out using waterproof ink and firmly affixed to the sample containers and protected with Mylar tape. The labels must include:

- Name of collector (task team leader),
- Date and time of collection,
- Sample number,
- Sample volume, and
- Analysis required.

8.2 LEVEE SAMPLE IDENTIFICATION

A subsurface soil sample collected from the levee will be identified using the following format on a label or tag fixed to the sample container (labels are to be covered with Mylar tape);

JV-LV-123-L-0

- JV - This specific set of initials, meaning "Joint Venture," is used to indicate the sample is from this project.

- LV - This specific designation indicates a sample taken from the levee.

- 123 - Borehole location number. If the borehole location number has only two numbers, the first character will be 0.

- L - This letter will be either "L" for material from levee, "F" for existing soil foundation, or "C" for composite of levee and foundation materials.

- O - This letter will either be "O" for original sample, or "D" for duplicate sample.

Each sample must be labeled and sealed immediately after collection. Labels will be filled out prior to sample collection to minimize handling of sample container. The sample label must be filled out using waterproof ink and firmly affixed to the sample containers and protected with Mylar tape. The labels must include:

- Name of collector (geologist),
- Date and time of collection,
- Sample number,
- Sample volume, and
- Analysis required.

8.3 DATA SHEETS

During the tank sampling portion of the work, a tank data sheet will be filled out for each tank. Figure 2-2 is an example of a tank data sheet.

During the levee sampling portion of the work, a boring log will be filled out for each boring. Figure 2-3 is an example of the boring log.

Both the tank data sheet and the boring log will be kept in notebooks. All notebooks will be kept in a three-ring binder in a secure area in the custody of the site team leader. All entries will be made in wateproof ink, dated, and signed. No pages will be removed for any reason. Corrections will be made according to the procedures given at the end of this section. The notebooks will include: tank data sheet notebook, boring log notebook, and heat stress notebook.

8.4 CHAIN OF CUSTODY PROCEDURES

The primary objective of the chain of custody procedures is to create an accurate written record which can be used to trace the possession and handling of the sample from the moment of its collection through analysis.

A sample is in custody if it is:

recycled paper

ecology and environment

- In someone's physical possession;
- In someone's view;
- Locked up; or
- Kept in a secured area that is restricted to authorized personnel only.

Sample Collection Handling and Identification

Samples are collected from several locations within a phase. The quantities and sample numbers are recorded on a tank data sheet in custody of task team leader. The samples are then transported to the hotline area, where they are composited and labeled as required for the various analyses under the direction of the task team leader and in custody of task team leader. The sample composites are then prepared for shipment as required in Section 7. When a cooler is filled, a chain-of-custody form (see Figure 8-1) is filled out and signed as required by the task sample team leader. The original is placed in a plastic bag and taped inside the cooler lid. A copy of the chain-of-custody form is retained at the site. The cooler is then closed and two chain-of-custody seals affixed to the container. Clear Mylar tape is placed over the seals to prevent accidental damage. If a full cooler is not prepared, the sample team leader prepares a chain-of-custody form and relinquishes the samples to the site team leader. When additional samples (sufficient to fill the cooler) are prepared, a chain-of-custody form is prepared and these samples, too, are relinquished to the site team leader with another chain-of-custody form. The full cooler is then prepared for shipment and both chain-of-custody forms placed inside a plastic bag and taped inside the cooler lid and a copy of each retained at the site. The cooler is then sealed and labeled according to procedures in Section 7.

The laboratory receives the coolers and signs the chain-of-custody form or forms. Upon completion of analysis, the results and chain-of-custody forms are shipped to the site or headquarters, as required.

ecology and environment, inc.
195 SUGG ROAD, P.O. BOX D, BUFFALO, 14225, TEL. 716-632-4491, TELEX 91-9183
International Specialists in the Environment

CHAIN-OF-CUSTODY RECORD

Project No.	Project Name
Samplers: (Signature)	

STA. NO.	DATE.	TIME	SAMPLE TYPE COMP	GRAB	AIR	STATION LOCATION	NO. OF CON-TAINERS							REMARKS

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	
				Method of Shipment	

Distribution: Original Accompanies Shipment; Copy to Coodinator Field Files

Figure 8—1 SAMPLE CHAIN-OF-CUSTODY FORM

234081

9. DECONTAMINATION

Sampling methods and equipment will be chosen so as to minimize decontamination requirements and the possibility of cross contamination. Sample tubing, rope, rods, etc., will be disposed of after sampling of each phase of each tank. The material will either be left with the tank or packaged with other disposable material in empty tanks on-site. Any sampling equipment used on more than one tank will be decontaminated between tanks by following these steps in accordance with the SSSP.

- The equipment will be steam-cleaned with spray from a portable steam generator.
- The equipment will then be scrubbed with brushes and a TSP solution.
- The equipment will be rinsed with deionized water.
- The equipment will be rinsed with methanol.
- The equipment will then be rinsed with deionized water.
- The equipment will be rinsed with hexane and then let air dry.

recycled paper

ecology and environment

10. OTHER SITE-SPECIFIC ACTIVITIES

10.1 PHOTOGRAPHS

Photographs will be taken at each tank or as directed by the geologist during levee sampling. Documentation of a photograph is crucial to its validity as a representation of an existing situation. The following information will be noted in the task log concerning photographs:

- Date, time, location photograph was taken,
- Photographer (signature),
- Weather conditions,
- Description of photograph taken,
- Reasons why photograph was taken,
- Sequential number of the photograph and the film roll number, and
- Camera-lens system used.

After the photographs have been developed, the information recorded in the field notebook should be transferred to back of the photographs.

recycled paper

ecology and environment

10.2 SURVEYING

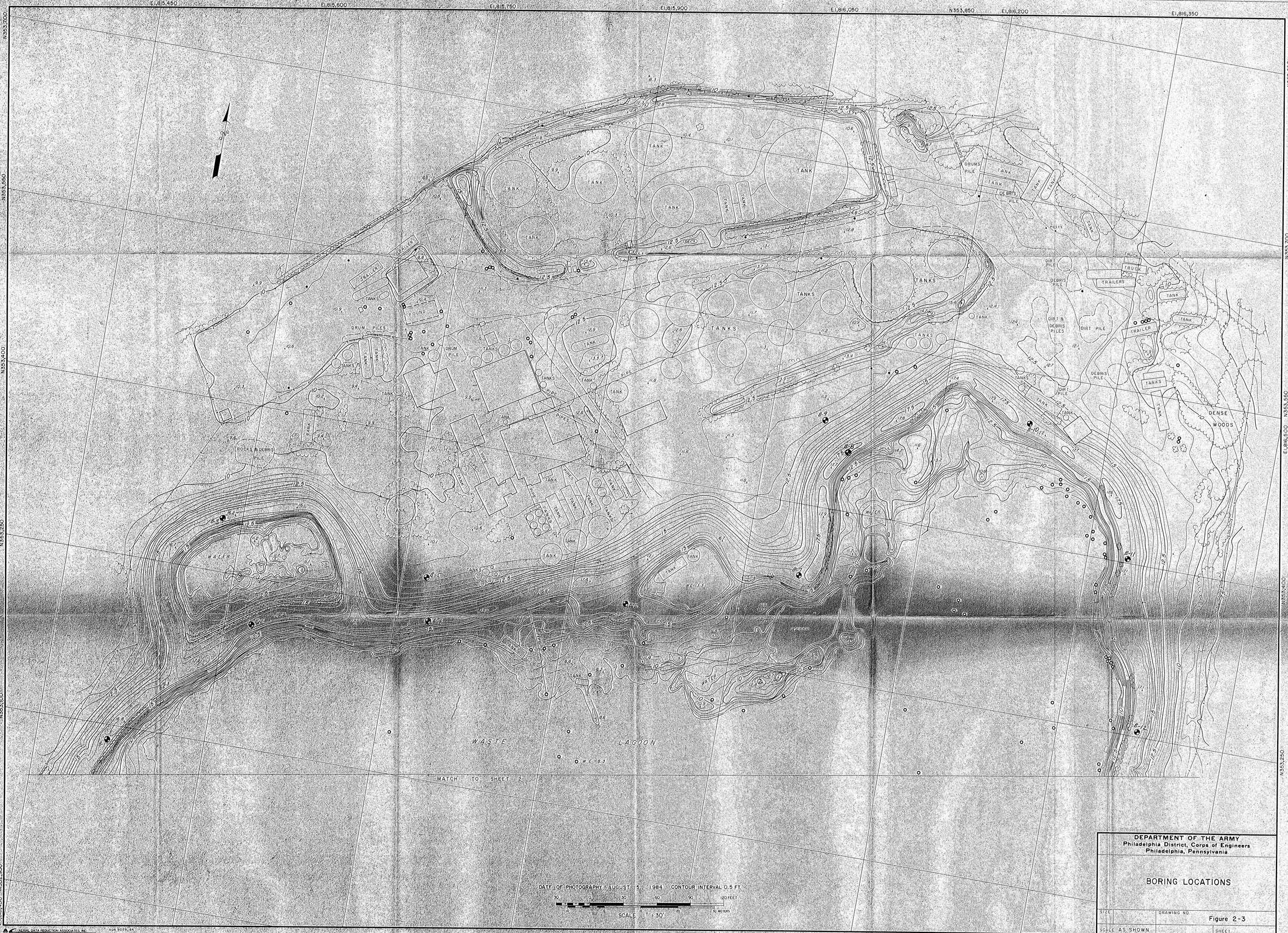
The JV will contract with a local registered surveyor to perform at least the following work at the site:

- Locate 40 borehole locations in the field as shown on Figure 2-4. The surveyor will also provide the top-of-levee elevation and the grade elevation.

- Develop cross sections of the levee at specified locations.

- Locate and mark points on two sides of the perimeter of the sampling grid at 50-foot intervals.

- Locate and mark an additional six points around the perimeter.



DEPARTMENT OF THE ARMY
Philadelphia District, Corps of Engineers
Philadelphia, Pennsylvania

BORING LOCATIONS

SIZE	DRAWING NO.	Figure 2-3
SCALE AS SHOWN	SHEET	

SHEET 1 OF 2

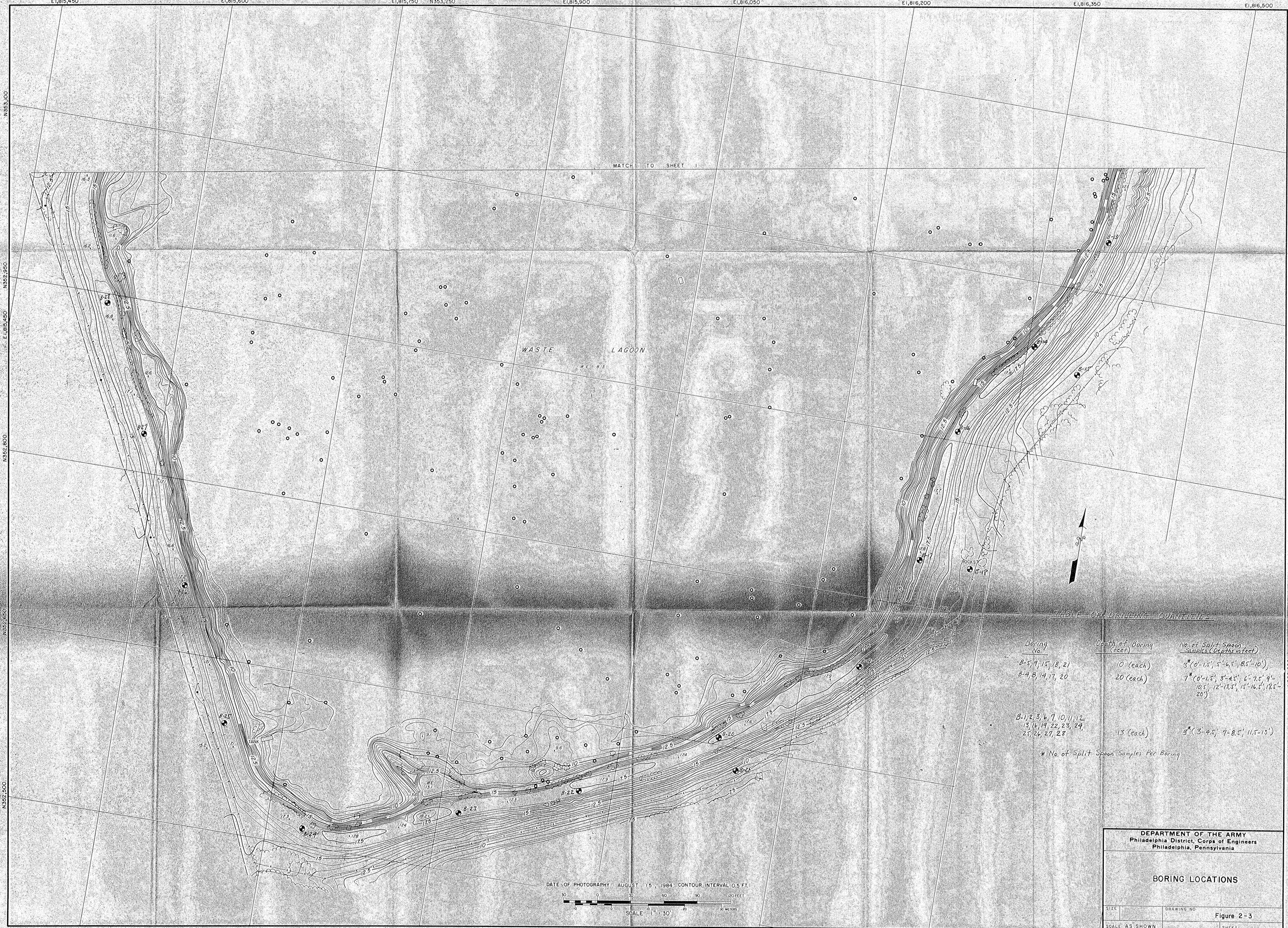


TABLE OF DRILLING QUANTITIES

Boring No.	Depth of Boring (feet)	No. of Split Spoon Samples (Depths in feet)
B-5, 9, 15, 18, 21	10 (each)	3* (0'-1.5', 5'-6.5', 8.5'-10')
B-4, 8, 14, 17, 20	20 (each)	7* (0'-1.5', 3'-4.5', 6'-7.5', 9'-10.5', 12'-13.5', 15'-16.5', 18.5'-20')
B-1, 2, 3, 6, 7, 10, 11, 12, 13, 16, 19, 22, 23, 24, 25, 26, 27, 28	13 (each)	3* (3'-4.5', 7-8.5', 11.5-13')

* No. of Split Spoon Samples Per Boring

DEPARTMENT OF THE ARMY
Philadelphia District, Corps of Engineers
Philadelphia, Pennsylvania

BORING LOCATIONS

SIZE | DRAWING NO. Figure 2-3
SCALE AS SHOWN | SHEET

AERIAL DATA REDUCTION ASSOCIATES, INC.
PENNSYLVANIA, NY · HARRISON, CT
MONMOUTH, NJ · EAST PROVIDENCE, RI
AOR9029-84

SHEET 2 OF 2