Final
Site-Specific Drum Removal and Sampling Plan, Site-Specific Safety and Health Plan, and Site-Specific Unexploded Ordnance Plan Attachments to the Remedial Investigation Field Sampling Plan, Range K, Former Agent Training Area, Parcel 203(7)

Fort McClellan
Calhoun County, Alabama

Prepared by:

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Task Order CK05
Contract No. DACA21-96-D-0018
IT Project No. 774645

June 2002

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Site-Specific Drum Removal and Sampling Plan Attachment to the Remedial Investigation Field Sampling Plan Range K, Former Agent Training Area, Parcel 203(7)

Fort McClellan
Calhoun County, Alabama

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1.0 Introduction

The U.S. Army is conducting studies of the environmental impact of suspected contaminants at Fort McClellan (FTMC) in Calhoun County, Alabama, under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE has contracted IT Corporation (IT) to provide environmental services for the remedial investigation (RI) of the Former Agent Training Area, Range K, Parcel 203(7) (Pelham Range), under Task Order CK05, Contract Number DACA21-96-D-0018 (IT, 2001). As part of the RI, the USACE has requested that IT remove a partially buried drum at the Former Agent Training Area, Range K, Parcel 203(7) (Range K). IT has developed this drum removal and sampling plan to provide technical guidance for the drum removal and sampling activities proposed at Range K.

This drum removal and sampling plan has been prepared to provide technical guidance and rationale for the collection and analysis of drum contents and soil samples at Range K. The data collected will be used to determine the removal and final disposal procedures of the drum and any contaminated soil around and beneath the drum. This drum removal and sampling plan will be used in conjunction with the site-specific safety and health plan (SSHP) and the site-specific unexploded ordnance (UXO) safety plan. In addition, this drum removal and sampling plan will be used in conjunction with the installation-wide work plan (WP) (IT, 2002a), and the installation-wide sampling and analysis plan (SAP) (IT, 2002b). The SAP includes the installation-wide safety and health plan, monitoring well installation and maintenance plan, waste management plan, ordnance and explosives management plan, and quality assurance plan (QAP). Site-specific hazard analysis is included in the SSHP and the site-specific UXO safety plan attachments.

1.1 Site Description and History

Range K, Former Agent Training Area, Parcel 203(7) (Range K) is a 2-acre former chemical agent training area located in the northwest section of Pelham Range (Environmental Science Engineering [ESE], 1998) (Figures 1-1 and 1-2). The complete time of operation and the precise nature of the activities conducted at the site have not been completely documented. A reported shell tapping area, where rounds were opened and decontaminated, was operated at Range K prior to 1961 and continued through the summer of 1963 (ESE, 1998). During training exercises, breaking open one 155-millimeter distilled mustard (HD), one 105-millimeter sarin (GB), and one 4.2-inch phosgene (CG) mortar round was standard practice. The site has been physically rearranged by bulldozing, and records indicate that the area was cleared for surface use in 1967

(ESE, 1998). Tapped shells, decontamination agent-noncorrosive (DANC) cans, decontamination solution No. 2 (DS2) cans, and bleach cans were observed by the U.S. Army Environmental Center (USAEC) beyond a tree line to the south and west in November 1992, and have been confirmed during subsequent site visits by both Science Applications International Corporation (SAIC) and the U.S. Army for Health Promotion and Prevention Medicine personnel. The Alabama National Guard presently uses Range K and the surrounding areas for military training maneuvers and bivouac activities. The site was located based on coordinates in the 1997 U.S. Army Toxic and Hazardous Materials Agency installation assessment and on the location of a downed fence line (SAIC, 1998).

Chemical agents and decontaminants reportedly used at Range K, Former Agent Training Area include:

- HD - Distilled mustard
- DANC - Decontamination agent-noncorrosive
- DS2 - Decontamination solution No. 2
- CG - Carbonyl chloride (phosgene)
- GB - Sarin.

1.2 Previous Site Investigations

Previous site investigations include a site investigation and a remedial investigation by SAIC. The details and corresponding data for the previous investigations conducted at Range K are summarized in the *Remedial Investigation, Final Site-Specific Field Sampling Plan, Site-Specific Safety and Health Plan, and Site-Specific Unexploded Ordnance Safety Plan Attachments, Range K, Former Agent Training Area, Parcel 203(7)* (IT, 2001).

1.3 Background

In 2000, IT performed a relative risk investigation as an initial step in identifying possible contamination at Former Agent Training Area, Range K, Parcel 203(7) (IT, 1999). Four groundwater monitoring wells were installed and sampled at Range K. Surface soil, subsurface soil, and groundwater samples were collected and analyzed for volatile organic compounds, semivolatile organic compounds, metals, and explosives. Based on the sample results, IT recommended that additional field work be conducted to determine the nature and extent of the contamination (IT, 2001).

Analytical results from the relative risk site evaluation indicated elevated concentrations of cis- and trans-1,2-dichloroethene in groundwater in monitoring well RNG-203-MW01 at Range K.

RNG-203-MW01 is located immediately downgradient of a partially buried drum. The partially buried drum corresponds to the location of a geophysical anomaly identified by SAIC during their remedial investigation (SAIC, 1999). Based on this information, the USACE requested IT to remove the drum and its contents. This action will serve as an interim source removal action and will assist in the characterization of the contamination present at Range K, Parcel 203(7).

In July 2000, a risk assessment report was prepared for Range K by the U.S. Army in accordance with Army Regulation (AR) 385-10, *Applicability of Biological Warfare Materiel and Non-Stockpile Chemical Warfare Materiel Response Activity Interim Guidance,* to determine the probability of encountering chemical warfare material (CWM) during RI activities at Range K. This report is included as an attachment to Attachment 2, *Evaluation of OE/UXO/CWM in Support of HTRW Activities*, of the site-specific safety and health plan for Range K. It was concluded in the risk assessment that the probability of encountering CWM at the site during field activities is deemed remote. Per AR 385-10, Category 4 (remote) sites are those which it is unlikely, but possible, to encounter CWM during proposed site activities. (U.S. Army, 2001)

As part of the RI, groundwater samples were collected from monitoring wells at Range K in September and October 2001. Preliminary results of the groundwater samples indicate that, in addition to VOCs detected in the groundwater, there were CWM breakdown products detected in two monitoring wells (MW01 and MW04). The preliminary results of the CWM breakdown product compounds detected in groundwater are presented in Table 1-1. The chemicals detected, 1,4-dithiane and 1,4-oxathiane, are breakdown products formed by the dechlorination of mustard. Final results of the groundwater samples will be provided in the RI report.

Table 1-1

CWM Breakdown Products Detected in Groundwater at Range K, Parcel 203(7) Fort McClellan, Calhoun County, Alabama

Sample Location	Number	Date Sampled	Detected Parameter	Result	Units	Qualifier
RNG-203-MW01	RG3007	26-Sep-01	1,4-Dithiane	0.014	mg/L	
			1,4-Oxathiane	0.0065	mg/L	
RNG-203-MW04	RG3011	1-Oct-01	1,4-Dithiane	0.0018	mg/L	J
			1,4-Oxathiane	0.0014	mg/L	J

CWM - chemical warfare material
mg/L - milligrams per liter
J - estimated concentration

2.0 Data Quality Objectives

2.1 Overview

The data quality objective (DQO) process is followed to establish data requirements. This process ensures that the proper quantity and quality of data are generated to support the decision-making process associated with the drum removal in support of the Range K drum sampling activities. This section incorporates the components of the DQO process described in *Guidance for the Data Quality Objectives Process* (U.S. Environmental Protection Agency [EPA], 2000).

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Chapter 3.0 in this SFSP and Chapter 5.0 of the QAP (IT, 2002b). Data will be reported in accordance with definitive data requirements of the USACE Engineer Manual, Chemical Quality Assurance for Hazardous, Toxic, and Radioactive Waste (HTRW) Projects (USACE, 1997) and evaluated by the stipulated requirements for the generation of definitive data (Section 7.2.2 of the QAP [IT, 2002b]). Chemical data will be reported via hard-copy data packages by the laboratory using Contract Laboratory Program (CLP)-like forms, along with electronic copies. The data packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

2.2 Data Users and Available Data

The data users for the data and information generated during field activities are primarily EPA, USACE, the Alabama Department of Environmental Management (ADEM), FTMC, and the USACE supporting contractors. This SFSP, along with the necessary companion documents, is intended to provide the regulatory agencies with sufficient detail to reach a determination as to the adequacy of the scope of work.

2.3 Data Types and Quality

Drum content and confirmatory soil samples will be collected and analyzed to meet the objectives of the Range K drum sampling and removal activities. Quality assurance/quality control (QA/QC) samples will be collected as described in Chapter 3.0 of this SFSP. Samples will be analyzed by EPA-approved SW-846 Methods, Update III, where available; comply with EPA definitive data requirements; and be reported using hard-copy data packages along with electronic copies. Data analyzed at this level of quality are appropriate for all phases of remedial investigation and closure assessment.

2.4 Precision, Accuracy, and Completeness

Laboratory requirements for precision, accuracy, and completeness for the Range K drum removal samples are defined in Section 3.3 and presented in Chapter 5.0 of the QAP (IT, 2002b).

3.0 Field Activities

3.1 Drum Removal and Sampling Activities

Drum removal and sampling activities at Range K will be conducted in accordance with the SSHP and site-specific UXO safety plan attachments included herein. Field activities will be conducted in the following order:

- UXO personnel will conduct surface surveys of foot paths and vehicular lanes to clear the investigation site for potential UXO. The boundaries of the access routes and investigation site will be clearly marked.

- UXO and health and safety personnel will set up the exclusion zone, contamination reduction zone, and the support zone for the drum removal and sampling activities.

- An evaluation of the drum site will be made to determine if excavation is required to further expose the partially buried drum to allow adequate access to the drum. If required, minimal excavation will be carefully conducted using hand tools (shovels, etc.) to obtain appropriate drum surface area to penetrate the drum.

- If the drum is sealed, a remote drum punch will be utilized to puncture the drum to reach the interior contents.

- After the drum is penetrated, samples of the contents will be collected following the procedures listed in the IT Drum Sampling Standard Operating Procedure provided in Attachment 2 of this sampling plan.

- After the samples have been collected, the drum will be sealed and covered with plastic until the results of the samples are received and evaluated.

- If it is determined that the drum is empty, the drum will be fully excavated, transported to a decontamination station, rinsed, crushed, and disposed of as scrap metal. If the drum contents are non-hazardous, the drum will be overpacked until disposal procedures are determined. Excavated soil will be placed into roll-off bins and disposed of as investigation-derived waste.

- All scrap metal found during the drum excavation and sampling activities will be inspected by the UXO team and will be certified as OE scrap metal or non-OE scrap metal. Certified non-OE scrap metal will be stockpiled on site. Handling and disposal of OE scrap metal will follow the procedures presented in Section 2.7.6 of the site-specific UXO safety plan attachment for the Drum Removal and Sampling Plan at Former Agent Training Area, Range K, Parcel 203(7) contained in this binder.

- After the drum sample results have been evaluated and it is determined that the drum can be removed, the drum will be further excavated using either hand tools or a backhoe, removed from the excavation, and placed on plastic sheeting. If the drum contains liquids, a temporary containment berm will be constructed to contain potential spills until the drum can be overpacked.

- Final disposition of the drum will be determined based on the sample results of the drum contents, if any. If the drum contains any material, the drum will be overpacked to avoid spillage and in preparation for disposal.

- After the drum is removed, the excavation will be surveyed by the UXO team to determine if there is the potential for more buried drums.

- Any additional drums found in the excavation will be sampled and depositioned in the manner described above.

- If it appears there are not any additional drums buried at this location, confirmatory soil samples will be collected from the excavation and analyzed.

3.1.1 Drum Sampling

After the drum has been penetrated using the remote drum punch, the drum contents samples will be collected using the procedures listed in *IT Standard Operation Procedure for Drum Sampling, FTMC – 001* provided in Attachment 2. Drum content samples will be analyzed for the parameters listed in Section 3.3 of this SFSP.

3.1.2 Confirmatory Soil Sampling

Confirmatory soil samples will be collected from the excavation after the drum is removed. If it appears there are additional drums buried beneath the excavation, confirmatory soil samples will be collected after all drums have been removed from the excavation.

3.1.2.1 Confirmatory Soil Sampling of Excavation

Following the removal of the drum(s) and contaminated soils, confirmatory soil samples will be collected from the drum excavation area. These samples will provide data to determine if contaminated soils remain at the site, and if further action is required.

Confirmatory soil samples will be collected from the sidewalls and floor of the drum excavation to determine if potential site-specific chemicals (PSSC) remain at the site. The confirmatory soil sample locations and rationale are listed in Table 3-1. Confirmatory soil sample designations and QA/QC samples are listed in Table 3-2. The actual confirmatory soil sample locations will be

Table 3-1

Sampling Locations and Rationale
Range K Drum Removal Site, Parcel 203(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
RNG-203-DR01	Drum Contents	Sample to be collected from drum contents (if any). Sample data will be use to determine appropriate disposal methods for drum and contents.
RNG-203-CS01	Confirmatory soil	Shallow soil sample to be collected from the north wall of the excavation at the lowest one-third depth of the drum diameter. Sample data will confirm that no PSSCs remain above unaceptable levels.
RNG-203-CS02	Confirmatory soil	Shallow soil sample to be collected from the east wall of the excavation at the lowest one-third depth of the drum diameter. Sample data will confirm that no PSSCs remain above unaceptable levels.
RNG-203-CS03	Confirmatory soil	Shallow soil sample to be collected from the south wall of the excavation at the lowest one-third depth of the drum diameter. Sample data will confirm that no PSSCs remain above unaceptable levels.
RNG-203-CS04	Confirmatory soil	Shallow soil sample to be collected from the west wall of the excavation at the lowest one-third depth of the drum diameter. Sample data will confirm that no PSSCs remain above unaceptable levels.
RNG-203-CS05	Confirmatory soil	Shallow soil sample to be collected from the center of the floor of the excavation. Sample data will confirm that no PSSCs remain above unaceptable levels.

Table 3-2

Sample Designations and QA/QC Sample Quantities
Range K Drum Removal Site, Parcel 203(7)
Fort McClellan, Calhoun County, Alabama

Sample Location[a]	Sample Designation	Sample Position[b]	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
RNG-203-DR01	RNG-203-DR01-DR-RG4001-REG	NA				**Analyze all samples for the following suites:**
RNG-203-CS01	RNG-203-CS01-CS-RG0030-REG	Sidewall			RNG-203-CS02-CS-RG0031-MS/MSD	VOCs, SVOCs, metals, agent breakdown products, nitroaromatic/nitramine explosives, Cl pesticides, OP pesticides, Cl herbicides, and PCBs
RNG-203-CS02	RNG-203-CS02-CS-RG0031-REG	Sidewall				
RNG-203-CS03	RNG-203-CS03-CS-RG0032-REG	Sidewall	RNG-203-CS03-CS-RG0033-FD			
RNG-203-CS04	RNG-203-CS04-CS-RG0034-REG	Sidewall				
RNG-203-CS05	RNG-203-CS05-CS-RG0035-REG	Floor				

[a] Additional drum content samples and excavation confirmation soil samples may be required depending on the number of drums removed and the size of the drum removal excavation.

[b] One excavation floor confirmation soil sample will be collected for every 100 square feet of excavation floor space. One sidewall confirmation soil sample will be collected for every 10 feet of linear length of excavation. Samples will be collected at a depth of 0-0.5 feet from the sidewalls and floor.

Cl - Chlorinated.
FD - Field duplicate.
MS/MSD - Matrix spike/matrix spike duplicate.
NA - Not applicable.
OP - Organophosphorus.
PCB - Polychlorinated biphenyls.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
VOC - Volatile organic compound.

determined in the field by the on-site geologist, based on field observations and excavation conditions.

At least one sample shall be collected from each sidewall of the excavation and from the floor of the excavation. In cases where multiple drums are located and the excavation pit is large, sidewall samples will be collected every 10 linear feet along the excavation sidewalls. Sidewall samples shall be collected from the lowest one-third of the drum diameter. Excavation floor samples will be collected from a location directly underneath the drum. One floor sample will be taken for every 100 square feet of excavation floor area. Samples from the drum excavation pit side and floor shall be representative of the area being sampled.

Confirmatory soil sampling will be performed using stainless-steel hand tools to collect samples from excavation soil and may be retrieved in an excavator bucket if the excavation is several feet deep. Sampling personnel will not enter excavations over 4 feet deep to collect samples. Soil that has come in contact with the excavator bucket sides will not be sampled. Sampling equipment will be decontaminated between locations. Confirmatory soil samples will be collected as specified in Section 6.1.1.1 of the SAP (IT, 2002b). Samples will be screened using a photoionization detector (PID) in accordance with Section 6.8.3 of the SAP and additional samples may be collected based on actual field observations and PID readings. Sample documentation and chain of custody will be recorded as specified in Chapter 6.0 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are discussed in Chapter 4.0, and listed in Table 4-1 of the QAP. The samples will be analyzed for the parameters listed in Section 3.3 of this SFSP.

3.1.2.2 Excavated Soil

Excavated soil will be handled as IDW and will be placed into roll-off bins. After the drum removal excavation is complete, samples of the excavated soil will be collected to determine proper disposal of the soil.

3.2 Surveying of Sample Locations

Confirmatory soil sample locations will be marked with pin flags, stakes, and/or flagging at the edge of the drum excavation and will be surveyed using global positioning system (GPS) or conventional civil survey techniques. Horizontal coordinates for soil locations will be recorded using a GPS to an accuracy within 1 meter. Procedures to be used for GPS surveying are

described in Section 4.4.1.1 of the SAP. Conventional land survey requirements are presented in Section 4.4.1.2 of the SAP.

Horizontal coordinates will be referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum (NAD83), 1983. Elevations will be referenced to the North American Vertical Datum of 1988.

3.3 Analytical Program

Samples collected during drum removal and excavation activities will be analyzed for various chemical constituents (including agent breakdown products) based on the PSSCs and on EPA, ADEM, FTMC, and USACE requirements. The target analyses for drum samples collected from the Range K drum site will include the following parameters:

- TCL VOCs - EPA Method 5035/8260B
- TCL SVOCs - EPA Method 8270C
- TAL metals - EPA Method 6010B/7000
- Agent breakdown products - EPA Method 8270 (modified) and Method 8321
- Nitroaromatic/Nitramine Explosives - EPA Method 8330
- Chlorinated pesticides - EPA Method 8081A
- Chlorinated herbicides - EPA Method 8151A
- Organophosphorus pesticides - EPA Method 8141A
- Polychlorinated biphenyls - EPA Method 8082.

The samples will be analyzed using EPA SW-846 Update III methods where applicable, as presented in Table 3-3 of this drum removal and sampling plan and Chapter 5.0 of the QAP (IT, 2002b). Data will be reported in accordance with definitive data requirements of the USACE Engineer Manual, *Chemical Quality Assurance for Hazardous, Toxic and Radioactive Waste (HTRW) Projects* (USACE, 1997) and the stipulated requirements for the generation of definitive data (Section 7.2.2 of the QAP). Chemical data will be reported via hard copy data packages by the laboratory using CLP-like forms. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

3.4 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping will follow the procedures specified in Sections 6.1.3 through 6.1.7 of the SAP (IT, 2002b). Completed analysis request/COC records will be secured and included with each shipment of coolers to:

Table 3-3

Analytical Samples
Drum Removal and Sampling
Range K, Former Agent Training Area, Parcel 203(7)
Fort McClellan, Calhoun County, Alabama

Parameters	Analysis Method	Sample Matrix	TAT Needed	Field Samples: No. of Sample Points	No. of Events	No. of Field Samples	QA/QC Samples[a]: Field Dups (10%)	Splits w/ QA Lab (0%)	MS/MSD (5%)	Trip Blank (1/ship)	Eq. Rinse (1/wk/matrix)	EMAX Total No. Analysis	QA Lab Total No. Analysis
Drum removal and sampling: 5 soil matrix samples and 1 drum content sample													
All samples will be analyzed for the following parameters:													
TCL VOCs	5035/8260B	soil	normal	5	1	5	1		1		1	9	
TCL SVOCs	8270C	soil	normal	5	1	5	1		1			8	
TAL Metals	6010B/7000	soil	normal	5	1	5	1		1			8	
CWM BD Products [(b)]	8270/8321	soil	normal	5	1	5	1		1			8	
Nitroaromatic/Nitramine Explosives	8330	soil	normal	5	1	5	1		1			8	
Cl Pesticides	8081A	soil	normal	5	1	5	1		1			8	
OP Pesticides	8141A	soil	normal	5	1	5	1		1			8	
Cl Herbicides	8151A	soil	normal	5	1	5	1		1			8	
PCBs	8082	soil	normal	5	1	5	1		1			8	
TCL VOCs	5035/8260B	drum content	normal	1	1	1							
TCL SVOCs	8270C	drum content	normal	1	1	1							
TAL Metals	6010B/7000	drum content	normal	1	1	1							
CWM BD Products [(b)]	8270/8321	drum content	normal	1	1	1							
Nitroaromatic/Nitramine Explosives	8330	drum content	normal	1	1	1							
Cl Pesticides	8081A	drum content	normal	1	1	1							
OP Pesticides	8141A	drum content	normal	1	1	1							
Cl Herbicides	8151A	drum content	normal	1	1	1							
PCBs	8082	drum content	normal	1	1	1							
Drum removal and sampling subtotal:						54	9	0	9	0	1	73	0

[a]Field duplicate, QA split, and MS/MSD samples were calculated as a percentage of the field samples collected per site and were rounded to the nearest whole number. Trip blank samples will be collected in association with water matrix samples for VOC analysis only. Assumed four field samples per day to estimate trip blanks. Equipment blanks will be collected once per event whenever sampling equipment is field decontaminated and re-used. They will be repeated weekly for sampling events that are anticipated to last more than 1 week. Assumed 20 field samples will be collected per week to estimate number of equipment blanks.

[b]Chemical Warfare Material Breakdown Products - include Method 8270 (Modified): 1,4-oxathiane, 1,4-dithiane, p-chlorophenylmethylsulfoxide, p-chlorophenylmethylsulfone; Method 8321: thiodiglycol, IMPA, EMPA, MPA, DIMP, and DMMP.

MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
TAL - Target analyte list.
TOC - Total organic carbon.
ASTM- American Society for Testing and Materials
PCB - Polychlorinated biphenyl

TCL - Target compound list
VOC - Volatile organic compound
SVOC - Semivolatile organic compound
Cl - Chlorinated
OP - Organophosphate

Ship samples to:

EMAX Laboratories, Inc
1835 205th Street
Torrance, CA 90501
Attn: Elizabeth McIntyre
Tel: 310-618-8889
Fax: 310-618-0818

Attn: Sample Receiving/Elizabeth McIntyre
EMAX Laboratories, Inc.
1835 205th Street
Torrance, California 90501
Telephone: (310) 618-8889.

3.5 Investigation-Derived Waste Management

Management and disposal of investigation-derived wastes (IDW) will follow procedures and requirements as described in Appendix D of the SAP (IT, 2002b). The IDW generated at the Former Agent Training Area, Range K, Parcel 203(7) is expected to include decontamination fluids, disposable personal protective equipment, and possible excavated soil. The IDW will be staged at Range K while awaiting final disposal. Sampling of IDW to obtain analytical results for characterizing the waste for disposal will follow the procedures specified in Section 6.1.1.8 of the SAP (IT, 2002b).

3.6 Safety and Health

The presence of UXO is possible at the Range K, Former Agent Training Area, Parcel 203(7). Therefore, IT will perform limited surface and subsurface UXO detection and safety support incidental to the collection of samples from a partially exposed drum and other soil samples as required for removal of the drum and investigation of the area immediately surrounding the partially exposed drum. UXO detection and safety support activities to support the sampling and drum removal activities are presented in the site-specific UXO safety plan is included herein and Appendix E of the SAP (IT, 2002b). In addition, all field activities for the work specified in this addendum will be conducted in accordance with the procedures presented in the Site-Specific Health and Safety Plan Attachment included as part of this addendum for Range K, Former Agent Training Area, Parcel 203(7).

3.7 Schedule

The project schedule for the drum removal and sampling activities will be provided by the IT Project Manager to the Base Realignment and Closure Clean-up team.

4.0 References

Environmental Science and Engineering Inc. (ESE), 1998, ***Final Environmental Baseline Survey, Fort McClellan, Alabama***, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January.

IT Corporation (IT), 2002a, ***Draft Revision 2, Final Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama***, February.

IT Corporation (IT), 2002b, ***Draft Revision 3, Final Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama***, February.

IT Corporation (IT), 2001, ***Remedial Investigation, Final Site-Specific Field Sampling Plan, Site-Specific Safety and Health Plan, and Site-Specific Unexploded Ordnance Safety Plan Attachments, Range K, Former Agent Training Area, Parcel 203(7)***, March

IT Corporation (IT), 1999, ***Final Site-Specific Field Sampling Plan Attachment, Relative Risk Screening for the Former Agent Training Area, Range K, Parcel 203(7)***, November.

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Science Application International Corporation (SAIC), 1998, ***Background Survey Report, Fort McClellan, Anniston, Alabama***, prepared for U.S. Army Corps of Engineers, Mobile, Alabama, July.

Science Application International Corporation (SAIC), 1993, ***Site Investigation Report***, prepared for the U.S. Army Environmental Center, Aberdeen Proving Grounds, Maryland, August.

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U.S. Army Corps of Engineers (USACE), 2001, Memorandum from Ronald M. Levy, BRAC Environmental Coordinator, to Ellis Pope, USACE, July 23.

U.S. Army Corps of Engineers (USACE), 1997, ***Chemical Quality Assurance for Hazardous, Toxic, and Radioactive Waste (HTRW) Projects***, USACE Engineer Manual.

U.S. Army Corps of Engineers (USACE), South Atlantic Division, 1983, ***Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations***, Division Manual, DM 1110-1-1, July.

U.S. Department of the Army and Air Force, 1963, ***Military Chemistry and Chemical Agents, U.S. Department of Commerce, National Technical Information Service***, December.

U.S. Environmental Protection Agency (EPA), 2000, ***Guidance for Data Quality Objectives Process***, EPA 600/R-96/005, August.

U.S. Army Center for Health Promotion and Preventative Medicine (CHPPM), 1999, ***Preliminary Assessment No. 38-EH-1775-99, Fort McClellan Army National Guard Training Center,*** Fort McClellan, Alabama, May 28-June 17.

ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

ATTACHMENT 2

STANDARD OPERATING PROCEDURE FOR DRUM SAMPLING

IT STANDARD OPERATING PROJECT PROCEDURE

Fort McClellan, Anniston, Alabama

Subject: DRUM SAMPLING

1.0 PURPOSE

1.1 To provide general reference information for use in planning and implementing sampling programs that involve the moving, opening and sampling of closed containers (drums) at IT Corporation (IT) project sites.

1.2 To provide guidelines for primary and secondary staging of drums.

1.3 To provide IT standard procedures for opening containers.

1.4 To provide guidelines for the sampling of containerized materials.

1.5 To discuss site organization and assigned responsibilities.

1.6 To provide information on protective clothing, worker protection and other safety related issues.

2.0 SCOPE

2.1 This guideline is applicable to opening and sampling of closed containers (120 gallon or less) on IT project 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 procedure.

3.0 RELATED DOCUMENTS

3.1 Cassis, Jo, et al., 1985. Guidance Document for Cleanup of Surface Tank and Drum Sites. Prepared for Office of Emergency and Remedial Response, USEPA, Washington, D.C. under Contract No. 68-01-6930.

3.2 IT Corporation (IT), 1988. Hazardous Waste Operations and Emergency Response, December.

3.3 IT Corporation (IT), 2000. Final Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, March.

3.4 IT Corporation (IT), 1998. Final Installation-Wide Work Plan, Fort McClellan, Calhoun County, August.

3.3 Martin, F.M., Lippitt, J.M., Prothero, T.G., 1987. Hazardous Waste Handbook for Health and Safety, Butterworth Publishers, p. 167-177.

3.4 NIOSH, OSHA, USCG, & USEPA, October 1985. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.

3.5 NUS Corporation, 1983. Operating Guidelines Manual.

3.6 IT Compatibility Testing Manual, 1993.

3.7 USEPA, 1986. Drum Handling Practices at Hazardous Waste Sites, EPA/600/2-86/013.

3.8 US Code of Federal Regulations 29 CFR 1910 and 1926 (OSHA).

3.9 US Code of Federal Regulations 49 CFR 265 (EPA).

4.0 GENERAL INFORMATION

4.1 Location of containers on a hazardous waste site.

4.1.1 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. Usually there is some type of pattern to the method that the drums were staged on site. Markings on the drums may assist in determination of these patterns. Frequently, the only indication that a group of drums is related will be the color, size, or type of drum. During the initial site inspection, one should look for distinguishing features in an attempt to define the different lots or patterns 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.).

4.1.2 At almost every site that has been receiving waste, there is an isolated group of containers. These containers were most likely segregated because of their reactive nature or containing highly hazardous materials. Approach these with care and try to determine why they were segregated.

4.1.3 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).

4.2 Strict adherence to safety precautions will occur during drum handling, opening and sampling. Site Health and Safety Plan and Site Unexploded Ordnance work plan procedures and requirements will supersede this document and will be adhered to during field activities on-site.

4.3 Risks

4.3.1 Four basic risks are involved in moving and opening closed containers:

4.3.1.1 Exposure of personnel to toxic materials

4.3.1.2 Fire

4.3.1.3 Explosion

4.3.1.4 Hazardous reactions (i.e. rapid polymerization reactions)

4.3.2 Exposure of personnel to toxic materials.

4.3.2.1 The first risk can be reasonably eliminated through the use of proper skin and respiratory protection equipment. The use of level B protection with splash guard (i.e. Tyvek and Saran suits with face shield) acceptably reduces the risk of a worker being injured by toxic vapors, mists, or splashes.

4.3.3 Fire

4.3.3.1 In the same way, standard fire prevention procedures can be used to reduce the fire hazard through the 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. Piles of sand and lime (for neutralization and suffocation) will be on hand at the site in case of a fire.

4.3.4 Explosion

4.3.4.1 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 guideline, should be used (see section 7.6.2, Drums Containing Explosive or Shock Sensitive Waste).

4.3.5 Hazardous Reactions

4.3.5.1 The risk of a hazardous reaction is another primary consideration in any container opening operation. Since a reaction can be triggered by a wide range of possibilities, it is not something that is always preventable. In order to provide the same reasonable level of protection against this risk as against toxic exposure and hazardous reactions, a very cautious approach should be used. An example of a hazardous reaction would be the self-polymerization of nylon or styrene precursors. Both can generate heat, fumes and can explosively pressurize a drum.

4.4 Scenarios involving drums encountered in the field may include drums that are:

- Unmarked
- Mislabeled
- Bulging (pressurized)
- Buried
- Deteriorated (physically unsound)
- Leaking

4.4.1 Drum condition and contents will be the factors which will determine the general drum handling and sampling procedures.

4.5 Consult OSHA regulations (29 CFR Sections 1910 and 1926) for established general requirements and standards for storing, containing, and handling chemicals and containers, and for maintaining equipment used for handling materials.

4.6 Consult EPA regulations (49 CFR 265) for requirements pertaining to the types of containers, maintenance of containers and containment structures, and design and maintenance of storage areas.

5.0 DEFINITIONS

5.1 Air Reactive Wastes - Some chemicals, such as white phosphorus and some of the metallic hydrides, react with the oxygen in the air and can start burning or at least producing considerable amounts of heat and may possibly release toxic or flammable vapors.

5.2 Compatibility Testing - A series of tests performed on individual drum samples where the object of the testing is to find those drums which have similar and potentially compatible contents. After further testing the contents of these drums would be mixed together to form a larger single waste stream for disposal purposes.

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

5.3 Dosimeter - A portable, transistorized survey meter that can be used for radiation monitoring purposes and/or contamination measurements.

5.4 Exotic Metal Drums - (i.e. aluminum, nickel, stainless steel, or other unusual metals). Very expensive drums that usually contain an extremely dangerous material.

5.5 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 up and disposed of in the drum following sampling.

5.6 LEL - (Lower explosive limit.) An air monitoring device can test the surrounding air for sufficient oxygen content for life support and/or the presence of combustible gases or vapors which may pose a potential flammability hazard. The lower explosive limit is defined as the minimum concentration of a particular combustible gas in the air that can be ignited. The upper explosive limit is defined as the maximum concentration that can be ignited.

5.7 Laboratory Packs - Such drums are commonly used for disposal of expired chemicals and process samples from laboratories, hospitals and similar institutions. Bottles in the laboratory pack may contain incompatible materials and may not be packed in absorbent material. They may contain radioisotopes, shock sensitive, highly volatile, highly corrosive, or very toxic exotic chemicals. Laboratory packs have been the primary ignition sources for fires at some hazardous waste sites.

5.8 Monitox - A portable warning device used for detecting specific toxic gases found in the surrounding air (i.e. H_2S, HCl, Cl, HCN and $COCl_2$).

5.9 PID - (photoionization detector) A portable air-monitoring instrument used to detect organic vapors. The PID does not distinguish between different types of vapors or tell if more than one vapor is present.

5.10 Polyethylene or PVC-lined Drums - Often contains strong acids or bases. If the lining is punctured, the substance usually corrodes the steel, resulting in a significant leak or spill.

5.11 Shock Sensitives - A chemical which may undergo a very rapid chemical transformation, with the simultaneous production of large quantities of heat and gases, if introduced to shock (i.e. friction).

5.12 Single-Walled Drums Used as a Pressure Vessel - These drums have fittings for both product filling and placement of an inert gas, such as nitrogen. Such drums may contain reactive, flammable, or explosive substances.

5.13 Vapor Control - The use of an LEL, PID, Monitox, or any other air monitoring device to assure the quality of air meets all safety requirements.

5.14 Waste Blending Test - A waste blending test is done on sample materials from drums that were found to be similar and potentially compatible with each other. The sample materials are proportionally and sequentially blended with each other and observations and measurements are made during and after the blending process to determine if any potentially hazardous reactions are occurring (i.e., temperature rise, outgassing occurring or other reaction).

5.14 Water Reactive Wastes - Some chemicals will react violently with water on contact or through contact with moisture in the air while others may give off toxic or flammable gasses. Sodium or potassium metal reacts violently with water while calcium carbide reacts to produce a flammable gas (acetylene).

6.0 RESPONSIBILITIES

6.1 Site Manager

6.1.1 The Site manager will:

6.1.1.1 Act as site coordinator for field technical personnel

6.1.1.2 Review and update site sampling and analytical plans as required.

6.1.1.3 Determine which procedures and methods will be utilized on- site.

6.2 Project Chemist

6.2.1 The project Chemist will:

6.2.1.1 Manage the mobile laboratory (if applicable) or the shift so that the data generated meets the required levels of certification

6.2.1.2 Implement sample acquisition numbering system.

6.3 Chemists

6.3.1 The chemists will:

6.3.1.1 Carry out compatibility tests (if applicable)

6.3.1.2 Carry out approved analytical procedures and maintain sample analysis tracking forms.

6.4 Sample Technicians

6.4.1 The sampling technicians will be responsible for:

6.4.1.1 Carrying out all drum sampling as per the Installation-Wide Sampling and Analysis Plan (IT, 2000) and SOP

6.4.1.2 Generate trip blanks, equipment blanks, and acquire replicate samples as per the Installation-Wide Sampling and Analysis Plan (IT, 2000)

6.4.1.3 Record all field data in Log Books or on drum logs forms

6.4.1.4 Fill out COC forms.

6.5 Procedure Modifications

6.5.1 The responsibility and authority for modifying this SOP (Fort McClellan Drum Sampling) lies with the Fort McClellan Project Manager and Technical Leads.

7.0 PROCEDURE

7.1 Introduction

7.1.1 The guidance presented is based on field experience in working with containers on uncontrolled hazardous substance sites and on information contained in USEPA and other government agency publications. It will be evident that in many cases hard and fast rules cannot be given, and professional judgement 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 thorough review of all available background data, such as potential sources of the wastes. The following topics will be covered in the paragraphs to follow:

7.1.1.1 Initial inspection of drums.

7.1.1.2 Handling.

7.1.1.3 Staging.

7.1.1.4 Remote opening of drums.

7.1.1.5 Second inspection of drums.

7.1.1.6 Numbering and mapping of drums.

7.1.1.7 Sampling of drums.

7.1.1.8 Characterization and test blending.

7.1.2 During many drum projects, several phases will be in progress simultaneously. Air monitoring, dust control, and organic vapor control operations should be in progress throughout the course of the project.

7.2 Initial Inspection

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

7.2.1.1 Are the drums radioactive?

7.2.1.2 Do the drums exhibit leakage or deterioration, i.e., is it unsound?

7.2.1.3 Do the drums exhibit apparent internal pressure?

7.2.1.4 Do the drums contain markings which would indicate that the contents are potentially explosive?

7.2.1.5 Are the drums of special construction (i.e., Nickel, Stainless Steel, or Corrugated drums)?

7.2.2 Drums which are determined to be possibly radioactive, shock sensitive, or reactive will be segregated to a special handling area. The results of the preliminary classification checklist will dictate what procedures are followed in the handling, opening, and sampling of a drum.

7.2.2.1 Overpacking Leakers

7.2.2.1.1 During the initial inspection, and beyond, personnel should watch for leaking drums. These must be overpacked promptly, and the spill should be cleaned up immediately.

7.2.3 Gas Cylinders

7.2.3.1 Gas cylinders, when encountered, should be stored and disposed of on a special case by case basis depending on the integrity of the cylinders and the type of substance they may contain.

7.2.4 Air Monitoring

7.2.4.1 Preliminary surveys at project sites for organic vapors, explosivity, and radiation should be completed for all drum projects. This survey will aid in identifying site specific hazards and development of work zones. In addition, this is how many of the drums that require special handling are identified.

7.2.4.2 Radiological Survey

7.2.4.2.1 The personnel conducting radiological surveys will have a basic knowledge of the radiological survey meter used and of radiation types.

7.2.4.2.2 There are three types of radiation which might be encountered in the field:

Alpha (α), which is stopped by clothing or a sheet of paper. While alpha radiation is the least penetrating type, it can be very dangerous if alpha-emitting radionuclides are ingested, inhaled, or enter the body through a puncture wound.

Beta (β), which is stopped by the steel wall of a drum.

Gamma (γ) or X-ray, which is only stopped by lead shielding, thick concrete, or steel.

7.2.4.2.3 Ionizing Radiation Survey Meters

The survey meters IT uses measure radiation in units of millirems per hour (mr/hr). The dose that one is exposed to is calculated by multiplying the hours of exposure by the average measured level of exposure as determined by a calibrated radiation meter. The specified survey meter as found in the equipment list in Section 8.0 has internally mounted twin detectors. The survey meter shall be checked for proper function by use of a low-level non-regulated source before each day's usage of the meter. Record the results of the meter check in the sampler's daily notes.

7.2.4.2.4 Background Level for Gamma Radiation

The background level for gamma radiation is between 0.008 and 0.02 mr/hr. Occasionally, the needle will briefly jump above this level, but it should not stay there.

7.2.4.2.5 Radiation Areas Defined

The Nuclear Regulatory Commission defines a radiation area to be one in which the radiation levels are at 5 mr/hr or greater or an area where one can accumulate 100 milli

rems of exposure in 5 days of normal work in the area. A high-radiation area has radiation at levels greater than 100 mr/hr.

When abnormally high readings are obtained, ranging from 0.2 to 2.0 mr/hr, one must first ascertain that this is not caused by a malfunction in the unit. If the readings are not caused by a malfunction one should follow the guidelines in Table 7.2-1 below.

Table 7.2-1
Dosimeter Readings

Reading	Action
< or = 2 mrem/hr	Radiation above background levels (0.01-0.02 mrem/hr) signifies the possible presence of radiation sources. Continue investigation with caution.
> 2 mrem/hr	Potential radiation hazard. Contact Site Health and Safety Officer and Site Supervisor immediately.

7.2.4.3 Other air monitoring includes scans with a Photoionization Detector (PID), Lower Explosion Limit (LEL) meter, and cyanide and sulfide monitoxes. Since the majority (if not all) of the drums should be unopened at the time of the initial survey, this scan is typically performed over the tops of the sealed drums. Special Handling drums are sometimes identified during this scan when PID or LEL readings are abnormally high or when cyanide and/or sulfide monitox alarms sound. Such drums will need to be segregated to a special handling area.

7.3 The handling, movements and transport of drums and other containers should be by use of mechanical equipment only; no drums should be handled manually. Remote drum handling equipment may consist of a grappler-equipped backhoe or front-end loader. Drum transportation should be with front-end loaders or forklifts 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 side splash and explosion shields. Class ABC fire extinguishers will be fitted to the body of each piece of equipment.

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

7.3.2 Whenever 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 the others.

7.3.3 Leaking or Deteriorated Drums

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

7.3.3.2 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 placed in overpack containers. Make certain that representative samples are obtained from overpacked drums. Sample the actual drum, not material that has leaked from the drum into the overpack.

7.3.4 Bulging Drums

7.3.4.1 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.

7.3.4.2 Should movement of a pressurized drum be unavoidable, handle only by 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.

7.4 Primary Staging of Drums

7.4.1 A staging configuration must allow the samplers reasonable access to each drum for inspection, sampling, and overpacking, if necessary, while economizing on space. Drums are staged in rows, two wide, with isle space between rows. According to the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, "In all staging areas, stage the drums two wide in two rows, per area, and space these rows 7 to 8 feet apart to enable movement of the drum handling equipment."

7.5 Drum Opening

7.5.1 Drum opening operations are completed by remote means prior to the collection of samples. This provides the sampler a means for collecting a sample in an otherwise sealed container.

7.5.2 Opening Area

7.5.2.1 The drum opening area should be physically separated from the drum removal and drum staging operations. However, when drums must be opened after they are already in a staging area, personnel should be a minimum of 50 feet from the drum opening area. When drum opening can be performed at an area other than the staging area, there should be adequate distance between the drum opening and the removal and staging operations to prevent a chain reaction or fire during the drum opening procedure.

7.5.3 Caterpillar 215 Grappler

7.5.3.1 Drum opening is normally accomplished with a Caterpillar 215 grappler using a brass-tipped punch. A remote drum-punching unit may also be used on smaller drum projects. At all times the staging area should be clear of personnel on the ground during punching operations. Extreme caution should always be taken when drum punching/opening is being performed. **AT NO TIME SHOULD DRUMS BE PUNCHED MANUALLY BY HAND USING HAND HELD TOOLS!** Drums that have been placed inside overpack drums upside down will need to be punched to obtain sample(s) of both liquids in them and any settled solids.

7.5.4 IT procedures prohibit the opening of drums containing unknown materials by hand. Employees found to be opening drums by hand will face disciplinary action. The drums will be opened by using a remote air operated punch or by the method described above.

7.5.5 Small containers, like drums, are not to be opened by hand at any time. IT has remote opening devices specifically designed for the opening of small containers.

7.5.6 Containers that are inside warehouses, basements, or other buildings should be moved outside before they are opened. Opening and sampling of containers inside a building should only be done when there are no areas outside of the building that could be safely or physically used for these purposes.

7.5.6.1 If it is determined that opening and sampling of containers must be done inside of a building, then the following minimum requirements must be met:

7.5.6.1.1 Adequate ventilation must be provided.

7.5.6.1.2 Containment must be in place around drum opening and sampling area.

7.5.6.1.3 A,B,C type fire extinguishers must be in place.

7.5.6.1.4 Sand and mechanized equipment for spreading the sand in case of a fire or reaction must be present when drum opening operations take place.

7.5.6.2 Consult the site-specific safety and health plan for this investigation. Additional information may be found in the Installation-Wide Sampling and Analysis Plan, Volume II – Installation-Wide Safety and Health Plan (IT, 2000).

7.6 Second Inspection

7.6.1 After the drums have been staged and opened, a second inspection of the drums is required. During the initial inspection, the drums would have been sealed and only inspection of the outside of the drums was possible. Since the drums are now open, visual observations of the drum contents will aid in locating drums that will require special handling.

7.6.2 Special handling techniques are required for containers that may expose personnel to particularly hazardous conditions. These techniques and techniques for recognition of special handling drums are described in general below, although site-specific conditions may require the development of specialized methods for handling of special handling drums. The following are considered to be problem containers:

7.6.2.1 Drums Containing Biohazards.

7.6.2.2 Drums Containing Explosive or Shock Sensitive Waste.

7.6.2.3 Drums Containing Radioactive Waste.

7.6.2.4 Packaged Laboratory Wastes (Laboratory Packs).

7.6.2.5 Air Reactive Wastes (in drums).

7.6.3 Drums Containing Biohazards.

7.6.3.1 A biohazard is defined by the Biohazards Committee of the American Industrial Hygiene Association (AIHA), as "an agent that is biological in nature, capable of self-reproduction, and has the capacity to produce deleterious effects upon other biological organisms, particularly humans." Biological agents or substances which could be biohazardous substances are but not limited to the following:

7.6.3.1.1 Infectious or parasitic agents.

7.6.3.1.2 Non-infectious microorganisms (such as some fungi, yeasts and algae).

7.6.3.1.3 Plants and plant products.

7.6.3.1.4 Animals and animal products which can cause occupational disease.

7.6.3.2 Recognition is the key to avoiding disease contaminated biological waste. Be aware that this may take the form of cultured animal cells, infected clinical specimens (tissues, fluids, etc.) or tissues from experimental animals (including animal dander). Open drums should be examined for evidence of biological material such as:

7.6.3.2.1 Gauze.

7.6.3.2.2 Hypodermic syringes.

7.6.3.2.3 Petri dishes.

7.6.3.2.4 Cultures.

7.6.3.2.5 Blood.

7.6.3.2.6 Animal tissues.

7.6.3.2.7 Waste from orthopedic casts (may be gray, crumbly solids resembling a type of insulation).

7.6.3.3 Biological waste that has been prepared for incineration or for autoclaving may be packaged in **red plastic bags** or may be contained in plastic bags that are marked with the universal biohazard symbol (one ring with three interlocking "C"-shaped rings on top). Biohazards such as research bacterial cultures may be sent through the mail if they are packaged in a mailing tube. It is conceivable that either type of packaging could be found on a hazardous waste project.

7.6.3.4 If a biohazard or possible biohazard is identified, seal the drum and immediately notify the Site Health and Safety Officer and the Site Manager.

7.6.4 Drums Containing Explosive or Shock Sensitive Waste

7.6.4.1 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 the Health and Safety Officer must be notified immediately, before the drums are handled in any way.

7.6.4.2 If the Site Manager and the Health and Safety Officer 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.

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

7.6.4.4 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 material usually may be identified by their physical characteristics such as texture, color density, etc. as well as the way they are packaged. Most explosives are solids. In some cases they are packaged in watertight containers to exclude water while in other cases they are packaged wet to preclude explosion.

7.6.4.5 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 communication base shall be maintained until handling or transporting operations are complete. An audible siren signal system shall be used to signify the commencement and completion of explosive waste handling or transporting activities.

7.6.5 Drums Containing Radioactive Waste

7.6.5.1 After the containers are opened, another radiological survey will be conducted.

7.6.5.2 Handling and Transporting Radioactive Waste Drums

7.6.5.2.1 Drums containing radioactive wastes shall not be handled until radiation levels have been determined by a 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.

7.6.5.2.2 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.

7.6.6 Packaged Laboratory Wastes (Laboratory Packs)

7.6.6.1 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.

7.6.6.2 Lab pack drums are easily identified by the presence of vermiculite or other absorbent type packaging material. If a drum contains such material, there is a good possibility that the drum is a lab pack drum. Further investigation may reveal that the drum also contains smaller containers inside such as:

7.6.6.2.1 Sample jars.

7.6.6.2.2 Metal shipping containers.

7.6.6.2.3 Specially sealed packages.

7.6.6.2.4 Sealed 5 gallon buckets.

7.6.6.3 If the Site Manager and the Health and Safety Officer approve the handling of these containers, they shall be handled with extreme caution. Until otherwise categorized, they shall be considered to be 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 a staging area where sorting, identification, repacking and/or stabilization can be done.

7.6.6.4 Prior to handling or transporting Laboratory Packs from the existing drum area, personnel working in the immediate area shall be removed to a safe distance. Continuous contact with the communication base 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 Laboratory Pack handling or transporting activities.

7.6.7 Air Reactive Wastes

7.6.7.1 If the presence of 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.

7.6.7.2 Air reactive wastes may be discovered during opening or sampling operations. Air reactive substances are routinely packaged in special containers or packages that keep the material from making contact with the air. They may be stored under kerosene or some other liquid to minimize air contact. They may also be found in sealed ampoules, corrugated drums, stainless steel canisters, sealed aluminum containers or specially lined drums.

7.7 Numbering and Mapping

7.7.1 Accurate numbering is critical. Mistakes in numbering, such as missing numbers or double numbering, are minimized by numbering after primary staging. (It is highly recommended that drums are not numbered prior to staging.) To avoid problems, empty containers (not removed from the staging area prior to sampling) should be numbered and recorded on drum inventory logs as empty. **DRUM NUMBERING SHOULD BE STRICTLY NUMERICAL.**

7.7.2 Mistakes in numbering occur in most drum sampling projects. In large part mistakes made in numbering have very little consequence until samples have been submitted to the laboratory. It is for this reason that drum numbering and drum mapping must occur before samples are collected.

7.7.3 After the drums in the staging area have been numbered, a drum map is made. The drum map is reviewed for double numbers and missing numbers. Any double numbered drums or missing numbers are corrected in the staging area and on the drum map before any sampling is to be performed in the staging area.

7.8 Sampling

7.8.1 Collection of samples should occur only after the procedures of the previous subsections have been followed. Any container not meeting these requirements will not be sampled until these procedures have been followed.

For example: If a drum is discovered to not have access into it (not remotely opened), the drum will not be sampled and the senior sampling technologist and the site supervisor will be notified. In this

example, the procedures of the previous subsections were not met. Had those procedures been met, there would be access into the drum because the drum would have been remotely opened on a previous occasion. Until access can be made into the drum by remote means, the drum will not be sampled.

7.8.2 The following subsections describe collection of samples from drums that have been inspected, handled, staged, remotely opened, and inspected a second time prior to sampling.

7.8.3 Required Equipment (See also Section 8.0 for more detailed and specific data on the equipment and supplies required).

7.8.3.1 1 12-column book.

7.8.3.2 2 IT record books.

7.8.3.3 1 knife, beryllium copper.

7.8.3.4 1 bung wrench, Ampco metal.

7.8.3.5 1 screwdriver, beryllium copper.

7.8.3.6 1 scraper, beryllium copper.

7.8.3.7 2 pair Wizard cut-resistant glove liners.

7.8.3.8 2 1/2 inch drive ratchets, BeCu alloy.

7.8.3.9 2 15/16 sockets, BeCu alloy.

7.8.3.10 2 polyethylene squirt bottles.

7.8.3.11 U.S. EPA Level B personal protective equipment.

7.8.3.12 1 radiation survey meter.

7.8.3.13 1 H_2S monitox with gas generator.

7.8.3.14 1 HCN monitox with gas generator.

7.8.4 Expendables per Hundred Drums.

7.8.4.1 120 drum log sheets.

7.8.4.2 120* 8 oz. jars with Teflon liners.

7.8.4.3 200 tongue depressors.

7.8.4.4 120 11-mm dip tubes.

7.8.4.5 400 pair sample gloves.

7.8.4.6 5 mean streaks.

7.8.4.7 4 rolls paper towels

7.8.4.8 2 trash bags.

7.8.4.9 12 chain-of-custody forms.

7.8.4.10 1 Liter of Isopropanol (Pesticide Grade).

7.8.4.11 1 Liter of Hexane (Pesticide Grade).

*Varies according to sample volume requirements.

7.8.5 Sampling Procedures

(See sections 7.8.5.3 - 7.8.5.7 for additional information on sampling solids, semisolids and liquids).

7.8.5.1 All drums not in direct contact with ground surface and mechanical equipment should be grounded prior to the commencement of sampling. The reason for grounding of drums, which are not in direct contact with ground surface, is that a simple static electricity charge transferred to a drum that is not grounded, can cause an explosion or start a fire. A grounding rod driven into the ground surface, which is attached to copper wire, which is attached to a metal or copper clip, which is clipped to the drum being sampled, is an acceptable method of grounding a drum.

7.8.5.2 Once the drum has been grounded, sampling of the drum can begin. The steps to be followed in sampling are as follows:

7.8.5.2.1 Remove the lid of the overpack container or remove the polyethylene sheeting from the top of the drum.

7.8.5.2.2 Record any markings, special drum conditions, and type of opening on the Drum Inventory Log.

7.8.5.2.3 Record the identifying number from the drum onto the Drum Inventory Log. Have a copy (reduced size if necessary) of the drum staging area map and double-check the drum number and location.

7.8.5.2.4 Use a PID (if weather permits) and an LEL meter to collect air monitoring readings from the drum. Record the results on the Drum Inventory Log.

7.8.5.2.5 Insert glass tubing almost to the bottom of the drum or until a solid layer is encountered. About one foot of tubing should extend above the drum.

7.8.5.2.6 Allow the waste in the drum to reach its natural level in the tube. Cap the top of the sampling tube using a thumb or fore-finger.

7.8.5.2.7 Carefully remove the capped tube from the drum and insert the uncapped end in the sample container. Release thumb or forefinger from tube and allow the glass thief to drain completely into the sample container.

7.8.5.2.8 Repeat steps 6 & 7 until the required sample volume has been collected.

7.8.5.2.9 Place the used sampling tube, along with paper towels or waste rags (used to wipe up any spills), into an empty metal barrel marked "sampling waste" for subsequent disposal.

7.8.5.2.10 Close the sample container cover tightly, wipe off with a paper towel and place a label on the sample container.

7.8.5.2.11 Replace the overpack lid or place a plastic cover over the drum/container.

7.8.5.2.12 Measure the sample for radioactivity and record results on the Drum Inventory Log.

7.8.5.2.13 Fill out Chain-of-Custody Record and carefully package samples (if applicable). 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 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.

7.8.5.2.14 Complete the appropriate shipping forms. Drum samples are always considered to be high-hazard samples.

7.8.5.3 Sampling Solids and Semisolids

7.8.5.3.1 Solids in drums are sampled by scooping the material up with the use of drum thief, stainless steel spoon, scoop, or tongue depressors. Sampling device must be compatible with drum contents. All reasonable efforts shall be made to obtain sample to a depth of 12 inches or refusal. It is sometimes necessary to sample the material with the use of a trier. This sampling device is often not used however, due to the substantial increase in time necessary to obtain the samples and because of the time required to decontaminate the trier. Tongue depressors will be disposed after each use. Nonexpendable sampling tools must be decontaminated between drums. Sometimes, the material must first be broken up with a non-sparking hammer or hammer and chisel (NOTE: This is the **ONLY** time in which a sampler is allowed to have a hammer and chisel in their hands), or, for rubber-like solids, a piece may need to be cut off with a knife.

7.8.5.4 Sampling Solids Underneath Liquids

7.8.5.4.1 Sludges or solids underneath a liquid may be sampled by forcing the rigid tubing into it. If the sludge does not run out into the jar, shaking the tubing or tapping it against the side of the bottle may loosen the sample. If this fails, one may break the tubing and put the pieces that have the solid in them in the bottle.

7.8.5.4.2 When glass tubing is used for sampling, samplers must wear Whizard glove liners (stainless steel mesh glove liners designed to prevent cuts which could be caused by sharp objects such as broken glass tubing).

7.8.5.5 Materials between drum and overpack

7.8.5.5.1 In many drum sampling projects where drums have been overpacked, it is typical to find liquids or solids between the drum and the overpack it is contained in. Sometimes these materials have the same appearance and matrix as the material inside of the drum itself. Sometimes this material can be quite different than the material inside the drum itself.

7.8.5.5.2 Solids

Solids may appear in an overpack, between the drum and the overpack that is different than the solids or liquids in the drum itself. If these solids appear to be soil, then a notation must be made on the Drum Inventory Log that the material exists between the drum and the overpack. This material does not need to be sampled. If these solids appear to be something other than soil, then this material must be sampled in accordance with Sampling Solids and Semisolids in section 7.8.3.1. In addition, a notation that the material exists between the drum and the overpack must be made on the Drum Inventory Log.

7.8.5.5.3 Liquids

Liquids may appear in an overpack, between the drum and the overpack, which is different than the solids or liquids in the drum itself. This material must be sampled in accordance with Sampling Procedures in section 7.8.3. In addition, a notation that the material exists between the drum and the overpack must be made on the Drum Inventory Log.

7.8.5.6 Sampling Frozen Drums

7.8.5.6.1 IT is often faced with the need to collect samples in conditions where the temperature is below 32°F (0°C) and the material inside the drum is partially or completely frozen. In situations where the material in the drum is frozen, a Milwaukee wood bit with an air driven drill or hand drill can be used. An air driven drill or hand drill is used (with the Milwaukee wood bit) to drill, or auger through the frozen material. Every few inches of augering, the bit is removed and the shavings are placed into the appropriate sample container(s). This procedure is repeated until a sufficient volume of the material has been obtained. Care must be taken to ensure that a hole is not drilled through the bottom of the drum.

7.8.6 Post Sampling Procedures

7.8.6.1 After the sample has been taken, the outside of the bottle will be wiped off and labeled with the drum number. The drum number will also be written on the lid of the bottle. All sampling data and observations will be recorded on the drum inventory log and appropriate sample collection log.

7.8.6.2 After a group of drums have been sampled, the samples will be collected. The sampling trash, sample gloves, paper towels, etc., will be collected and placed into a drum marked "sampling waste" for disposal. The sampling pipettes will also be collected and packaged in the sampling waste drum for disposal.

7.8.6.3 All openings shall be plugged except during sampling operation. The reason for this is to prevent rainwater from entering the drum before or after sampling has been performed. For drums which are in overpack containers, this is simply having the lid on the overpack container. For drums which are not in overpack containers, this can be accomplished by placing polyethylene sheeting over the top of the drum in a manner that will keep rainwater from entering the drum.

7.8.7 Drum Inventory Log

7.8.7.1 The field data gathered during the drum sampling activities will be recorded on a Drum Inventory Log sheet (See Figure 7.8-1). The following is a list of the information needed for the form.

7.8.7.1 Drum Number--Numbers only; at least 3 digits in length (001).

7.8.7.2 Project Number--Assigned by IT to each project.

7.8.7.3 Page of --If the drum log is accompanied by Material Safety Data Sheets (MSDS) or other information, then the total number of pages is required. Mostly, will be page 1 of 1.

7.8.7.4 Project Location--Name assigned by IT.

7.8.7.5 Project Contact--The IT employee responsible for over-seeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results given for review (i.e., project chemist, or site supervisor).

7.8.7.6 Phone--Site phone or number of the supporting IT office.

7.8.7.7 Logger--Name of individual responsible for filling in the sampling portion of the Drum Inventory Log.

7.8.7.8 Sampler--Name of individual(s) responsible for obtaining the sample.

7.8.7.9 Weather--Weather conditions during sampling (e.g., temperature and/or precipitation).

7.8.7.10 Date--Date when sample is collected.

7.8.7.11 Time--Time when sample is collected.

7.8.7.12 Drum Type--Place an "x" in the box or boxes which best describe the drum type and materials of construction.

7.8.7.13 Lid Type--An "x" should appear in the box that describes the type of closure on the container.

7.8.7.14 Drum Condition--Place an "x" in the box indicating the integrity of the drum. "Meets DOT specifications" means the drum can be shipped according to Department of Transportation (DOT) regulations.

7.8.7.15 Drum Size--Place an "x" in the box indicating the volume of drum when full. If the drum is overpacked, the inner drum volume should be indicated, not the size of the overpack.

7.8.7.16 Drum Contents--Place an "x" in the box indicating the volume of waste contained in the drum.

7.8.7.17 Overpacked--An "x" should appear in the "yes" box if the container was overpacked, along with an "x" in the box which states the type of overpack utilized.

7.8.7.18 Layers--This designates the layer as top, middle, or bottom for a multi-layered sample. If only one layer exists, complete only the line associated with the top layer, "T."

7.8.7.19 Physical State--Place an "x" in the box indicating the actual physical state of each layer.

7.8.7.20 Color--The standard color description for each layer of the sample should be written in. **The only acceptable color descriptions are as follows.**

blue (blu)	white (wht)	black (blk)
red (red)	cream (crm)	orange (org)

pink (pnk)	yellow (yel)	gray (gry)
colorless (cls)	purple (pup)	tan (tan)
green (grn)	brown (brn)	green-blue (gbl)

7.8.7.21 Clarity--An "x" should appear in the box indicating the clarity of each layer of the sample.

7.8.7.22 Layer Thickness--Record the thickness of each layer in inches, an estimate of how deep the layer is.

7.8.7.23 pH--Record pH measurement in standard units (SU); 0 to 14 or the designation "NA" if there was no measurement obtained.

7.8.7.24 PID--Record the results for vapor analysis by photoionization detector (PID) or the designation "NA" if there was no measurement obtained. The PID scale reads in ppm (0 to 2,000).

7.8.7.25 Dosimeter-The results of the field radiation survey is recorded in this space or the designation "NA" if there was no measurement obtained. The dosimeter's scale units are in millirems per hour (mr/hr or mrem/hr).

7.8.7.26 Other--This space is for additional analysis which may take place or the designation "NA" if there were no other measurements. The information should include the equipment used, the parameter being measured, and its concentration. Example: Drager tube - HCN - 5 ppm

7.8.7.27 DOT Haz--Hazard category from placards or stencils on drum. Example: Corrosive Liquid

7.8.7.28 UN/NA--Space for any UN or NA numbers which are stenciled or written on the drum. These numbers are always prefixed by either UN or NA.

7.8.7.29 MFG Name--Name, address, and telephone number of the company producing or distributing the chemical/product. If the space provided is inadequate, indicate that the information continues on the back of the log, and do so.

7.8.7.30 Chemical Name--Any chemical compound, key ingredient, trade name, and/or chemical name of the contents on the label or stenciled on the drum. Indicate whether the information was printed on a label or stenciled or handwritten on the drum. If the space provided is inadequate, indicate that the information continues on the back of the log, and do so.

7.8.7.31 Additional Information--This space is for additional information or comments for which no specific space is designated. It can include unusual comments or problems such as the contents are too hard to sample, drum color, or that colored crystals have formed on the drum. If the space provided is inadequate, indicate that the information continues on the back of the log.

7.8.8 Sample Preservation and Packing Procedures for Drummed Waste Samples

7.8.8.1 No preservatives shall be used.

7.8.8.2 Place sample in a zip lock plastic bag.

7.8.8.3 Sample may require special shipping requirements per DOT.

7.8.8.4 Samples that are required to be shipped in ice should be double-bagged to prevent water contamination from melting ice. Ice should be double-bagged to prevent leakage from shipping container.

7.8.8.5 Arrange for the appropriate transportation mode consistent with the type of hazardous waste involved. Depending on mode of transportation and type of material being transported, additional packaging requirements may apply (IATA, DOT, etc.).

7.8.8.6 In general, follow the procedures given in the site-specific field sampling plan and in the Installation-Wide Work Plan (IT, 1998) and Installation-Wide Sampling and Analysis Plan (IT, 2000).

7.8.9 Decontamination Procedures

7.8.9.1 All sampling equipment used in obtaining samples from containers will be either dedicated (disposable) or pre-cleaned and decontaminated by the following procedures:

7.8.9.1.1 Thoroughly scrub with a brush using a detergent (Alconox) and hot water solution to remove large particles.

7.8.9.1.2 Thoroughly rinse the detergent solution off the equipment with tap water.

7.8.9.1.3 Rinse the equipment with deionized water.

7.8.9.1.4 Solvent rinse the stainless steel equipment only with pesticide grade isopropanol.

7.8.9.1.5 Solvent rinse the glass equipment only with pesticide grade Hexane.

7.8.9.1.6 Air dry the equipment before use.

7.8.10 Resealing and Secondary Staging

7.8.10.1 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:

7.8.10.1.1 Replacing the lid and retaining ring.

7.8.10.1.2 Placing the drum in an overpack (larger drum) when it cannot be resealed by any other method.

7.8.10.1.3 Placing polyethylene sheeting over the drum in a manner that prevents rainwater from entering the drum.

7.8.10.2 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 and sealing of drums will apply.

7.8.10.3 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.

7.8.11 Sample Control

7.8.11.1 The Project Chemist or his/her representative on-site is responsible for the identification, preservation, packaging, handling, shipping, and storage of samples obtained from the site. All samples must be readily identifiable and retain the in-situ characteristics to be determined through testing. All samples collected from containers to be analyzed for compatibilities will be validated through the preparation of a drum log. At the conclusion of the daily sampling operations for containerized waste, it is the responsibility of the Technical Services Representative to review each sample with its respective drum log to assure the documentation is complete and accurate. His signature verifying the sample has been checked must appear in the "Field Reviewer" space prior to sending samples to the laboratory. In addition, these samples will be validated through the following steps:

7.8.11.1.1 Sample Containers--Samples taken from containers to be analyzed for compatibilities will be placed into a clean 8-ounce glass bottle and secured with a Teflon-lined lid.

7.8.11.1.2 Sample Number--Each sample will be labeled and uniquely identified in accordance with the numbering system used for this job.

7.8.11.1.3 Sample Label--Each sample label will be legibly completed and affixed to the sample container. The label will include the name of the sampler, date and time of collection, place of collection, unique sample ID number, analysis required, preservatives added, and type of sample (grab or composite).

7.8.11.1.4 Field Log--All sample collection data and field observations for each sample will be recorded on a drum inventory log (see section 7.9.4.1).

7.8.11.1.5 Chain-of-Custody Procedures--All samples taken on the site will be verified through chain-of-custody procedures. The procedures followed will be in accordance with USACE Sampling Handling Protocols and USEPA procedures.

7.8.11.1.6 Sample Preservation--Samples taken from containers to be analyzed for compatibility will not be preserved.

7.8.11.1.7 Sample Shipment--Samples taken from containers to be analyzed for compatibilities will be packaged in their original shipping container or the sample bottles and transported to the laboratory.

7.9 Characterization and Test Blending

7.9.1 A waste blending test is used to determine if the drums included in a wastestream are truly compatible. Whether the wastes are to be blended on site or to be sent in drums to a disposal facility, a waste blending test must be performed for waste profile purposes. Section 8.0 of the Compatibility Manual (Attachment 1) outlines waste blending procedures used by the on-site Chemist. However, situations arise when the Sample Technologist is

asked to determine which compatibility groups can be blended. Refer to Section 8.0, Waste Blending, in the Compatibility Manual (Attachment 1) prior to test blending any materials. A waste Blending Test chart is found in the Compatibility Manual.

7.9.2 When using the Waste Blending Test Chart, the first step is to locate the compatibility groups (which are to be test blended) on the chart. The next step is to move to the group that appears first on the chart and follow the row number down until the other compatibility group is reached. For example the supervisor of project (x) is planning to mix acid liquids with the water reactives on site. The supervisor wants to know if this will be a safe combination. The first step is to locate acids and water reactives on the chart. Once the two groups have been located, the next step is to determine which group is listed first on the chart. The acids group is listed first. The next step is to follow column one down to the water reactive group. The chart lists the combination to be (I,V,E). The final step is to determine what the letter combination means (this can be found on the upper right portion of the chart). The I is for Incompatible, the V is for Violent Reaction, and the E is for Explosive Mixture. Therefore, it would **not** be a good idea to blend these compatibility categories.

7.9.3 Shipment of Blended Waste

7.9.3.1 Samples of the blended waste to be sent off-site for laboratory analysis for disposal parameters will be shipped by the following procedures and by the procedures listed in the site-specific field sampling plan, the Installation-Wide Work Plan (IT, 1998), and Installation-Wide Sampling and Analysis Plan (IT, 2000).

7.9.3.1.1 The lids of the sample jars will be sealed with tape.

7.9.3.1.2 The sample container will be placed inside two 4-mil plastic, protective bags.

7.9.3.1.3 The sealed sample will be place in a metal paint can.

7.9.3.1.4 The samples will be placed into a cooler and packed with blue ice to maintain their temperature at 4 degrees Centigrade.

7.9.3.1.5 Bubble pack or other insulating packing material will be

placed into empty spaces in the cooler.

7.9.3.1.6 The cooler will be sealed, addressed, identified, and placarded according to the nature of the hazards associated with the materials being shipped.

8.0 EQUIPMENT

8.1 The equipment listed below will normally be required to accomplish drum sampling on a project site. Additional equipment or more specific equipment requirements may be found in the Installation-Wide Sampling and Analysis Plan (IT, 2000).

* Spill control kit.

* Remote controlled drum opening equipment - pneumatic, hydraulic or other.

* LEL/O_2 meter (MSA Model 260/360).

* HNU portable organic vapor analyzer (Model HW-101).

* Fire extinguisher, Class A, B and C size as per H&S Plan requirements.

* Radiation survey meter, internal GM detectors (Ludlum Model 5, P/N 48-1607).

* Personal protective equipment. This may include: Robar or Tingley boots, Tyvek and/or Saran protective suit with hood, acid jacket and pants, vinyl booties, vinyl sample gloves, nitrile outer gloves, hard hat with splash shield and SCBA or airline units.

* Rolls of plastic sheeting (Visqueen).

* Sampling equipment.

* Equipment and supplies needed for drum sampling (per 100 drums).

  - 120 drum log sheets (IT Supplied)
  - 120 8oz jars with Teflon lined lids (Qoorpak Brand)

- 200 tongue depressors (VWR P/N 62505-006)
- 120 11mm dip tubs
- 400 pair sample gloves
- 5 mean streaks
- 4 rolls of paper towels (Local Purchase)
- 2 30 gal. polyethylene trash bags (Local Purchase)
- 12 chain-of-custody forms (IT Supplied)
- 1 Liter of isopropanol (Pesticide Grade)(VWR P/N JT9334-3)
- 1 Liter of hexane (Pesticide Grade)(VWR P/N JT9126-3)

* Equipment and supplies generally needed per drum job

- 1 12-column book (Local Purchase or IT Supplied)
- 2 IT record books (IT Supplied)
- 1 knife, beryllium copper (McMaster-Carr P/N 3925A1)
- 1 bung wrench, Ampco metal (McMaster-Carr P/N 6496A1)
- 1 screwdriver, beryllium copper (McMaster-Carr P/N 6525A3)
- 1 scraper, beryllium copper (McMaster-Carr P/N 6473A1)
- 1 hammer, claw, BeCu alloy (McMaster-Carr P/N 6484A2)
- 1 chisel, Ampco metal, 1" wide (McMaster-Carr P/N 6458A94)
- 2 pairs cut-proof glove liners (Lab Safety P/N WA-15128)
- 2 15/16" sockets, BeCu alloy (McMaster-Carr P/N 6503A33)
- 2 1/2" drive ratchets, BeCu alloy (McMaster-Carr P/N 6503A3)
- 1 1 1/4" X 18"L wood boring bit (McMaster-Carr P/N 2878A25)
- 1 1/2" air powered drill, low RPM (Grainger P/N 4Z542)
- 1 tool box, polyethylene with lock for above (Local Purchase)
- 2 wash bottles, isopropanol (Lab Safety P/N WA-13831)
- 2 wash bottles, hexane (Lab Safety P/N WA-23158)
- 2 wash bottles, acetone (Lab Safety P/N WA-13828)
- 1 H_2S monitox with gas generator (IT Supplied)
- 1 HCN monitox with gas generator (IT Supplied)

* Source of pressurized air (100 psi and 8 CFM) and air hoses for air drill and remote pneumatic drum punch.

8.2 Deviations from the above list and substitutions for equipment listed above need to be approved by the Project Chemist or the Manager, Field Sampling Services.

9.0 ATTACHMENTS

Attachment 1 – Section 8.0 of the Compatibility Manual.

IT CORPORATION
A Member of The IT Group

DRUM INVENTORY LOG

DRUM _____
PROJECT NO. _____
PAGE _____ OF _____

PROJECT LOCATION _____ LOGGER _____ DATE _____
PROJECT CONTACT _____ SAMPLER _____ TIME _____
PHONE _____ WEATHER _____

DRUM TYPE: FIBER ☐ POLY-LINED ☐ STEEL ☐ POLY ☐ STAINLESS STEEL ☐ OTHER ☐
LID TYPE: RINGTOP ☐ CLOSED TOP ☐
DRUM CONDITION: MEET DOT SPEC. ☐ GOOD ☐ FAIR ☐ POOR ☐
DRUM SIZE: 110 ☐ 85 ☐ 55 ☐ 42 ☐ 30 ☐ 16 ☐ 10 ☐ 5 ☐ OTHER ____
DRUM CONTENTS: VOLUME: FULL ☐ 3/4 ☐ 1/2 ☐ 1/4 ☐ <1/4 ☐ MT ☐
OVERPACKED: NO ☐ YES ☐ Overpack Type: FIBER ☐ STEEL ☐ POLY ☐

	PHYS. STATE				COLOR	CLARITY			LAYER THICKNESS
LAYERS	LIQUID	SOLID	GEL	SLUDGE	USE STD COLORS	CLEAR	CLOUDY	OPAQUE	INCHES
T									
M									
B									

FIELD ANALYSIS

pH _____ SU PID _____ ppm
DOSIMETER _____
OTHER _____

DRUM LABELS/MARKINGS

DOT HAZ _____ UN/NA _____

MFG NAME _____

CHEMICAL NAME _____

ADDITIONAL INFORMATION _____

LABORATORY COMPATIBILITY DATA

☐ MARK IF PHYSICAL STATE AND COLOR MATCHES THE ABOVE INFORMATION. IF NOT, STOP ANALYSIS AND NOTIFY PROJECT CONTACT. FURTHER WORK WILL NOT BE PAID FOR.

COMPATIBILITY CAT: _____
ANALYSTS: _____
DATE PERFORMED: _____

RADIATION: POS ☐ NEG ☐ ____MREM/HR

	PHYS. STATE				COLOR	CLARITY			WATER SOL	REACT	pH	HEX SOL	PER	OXID	CN	SL	BIEL-STEIN	FLASH POINT	PCBs (25 PPM)	PCB TEST COMP
Layers	Liquid	Solid	Gel	Sludge	Use Std Colors	Clear	Cloudy	Opaque	Solubility SPSI Density H Or L	A=Air W=Water	Std. Unit	S Or I	+ Or -	+ Or -	+ Or -	+ OR -	+ OR -	<50°C + OR -	+ OR -	NUMBER
T																				
M																				
S																				

COMMENTS: _____

PCB CONC. _____ PPM FLASH POINT _____ °C COMPATABILITY COMP. BULK # _____
DATA REVIEWER: _____ DATA REVIEW DATE: _____
FIELD REVIEWER: _____ FIELD REVIEW DATE: _____

TRANSFER NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1				
2				
3				

Figure 7.8-1

ATTACHMENT 1

SECTION 8.0 OF THE COMPATIBILITY MANUAL May 2002

8.0 WASTE BLENDING

A waste blending test is used to determine if the drums included in a wastestream are truly compatible. Whether the wastes are to be blended on site or to be sent in drums to a disposal facility, a waste blending test must be performed for waste profile purposes.

8.1 FORMULATION OF WASTE GROUPS

After all drums have been classified into compatibility groups, waste groups can be formulated for the waste blending test. Most often it is more cost effective to blend several similar compatibility groups into one wastestream or waste group. An example of combining similar compatibility groups may be the blending of flammable organic liquids with nonflammable organic liquids. Therefore, the program is designed to allow the user to place a wastestream disposal code into the Bulk Group field. The usual codes used in identifying the wastestreams are listed below:

- A = Acid
- Aq = Aqueous
- B = Base
- Cl = Chlorinated
- CN = Cyanide
- Fl = Flammable
- I = Inorganic
- Liq = Liquids
- Org = Organic
- p = Peroxide
- PCB = PCB contaminated
- A-Rxn = Air reactive
- W-Rxn = Water reactive
- RAD = Radioactive
- Sol = Solid
- s = Sulfide
- ox = Oxidizer

Combinations of some of these codes can be used to describe discrete wastestreams. Wastestreams for individual sites and clients can differ dramatically. Therefore, it is imperative that the project chemist, transportation and disposal coordinator, project manager, and client

representative are all involved in the determination of the wastestreams prior to the onset of waste blending tests and sample compositing for disposal.

For the above listed groups some degree of caution must be utilized when blending together samples that fall into these various categories. Some, though by no means all, of the problems that can occur during blending of samples from certain groups are as follows:

- **Acid Group** - Not all acids are compatible with each other. For instance concentrated acetic acid when mixed with concentrated nitric acid can result in a potentially violent reaction. Again, concentrated nitric acid and concentrated hydrochloric acid can react when mixed together and produce a toxic gas release. Concentrated sulfuric acid when mixed with water or other acids usually releases large amounts of heat which can result in relatively violent reactions. The key to blending acidic samples is to monitor the temperature of the mix during blending operations and to carefully look for signs of a gas being released as each sample is added to the mixture.

- **Acid Oxidizer Group** - The same comments apply here as with the acid group. It is sometimes possible to combine/blend this group with the acid group or oxidizer group. A test blending would need to be done. HANDLE AND BLEND OXIDIZING ACIDS WITH CAUTION. INCORRECT/IMPROPER BLENDING CAN RESULT IN DANGEROUS AND/OR UNSTABLE MIXTURES.

- **Organic Acid Group** - This group is not generally compatible with other acid groups.

- **Base Oxidizer Group** - This group usually is incompatible with all other groups except the base groups and aqueous groups. HANDLE AND BLEND OXIDIZING BASES WITH CAUTION. INCORRECT/IMPROPER BLENDING CAN RESULT IN DANGEROUS AND/OR UNSTABLE MIXTURES.

- **Cyanide, Cyanide Base, and Flammable Cyanide Groups** - Use extreme caution when handling and blending samples in these three categories. Any gas released during blending will probably be hydrogen cyanide gas. VERIFY THAT THE LABORATORY HOOD USED FOR BLENDING OF WASTES HAS AN ADEQUATE LEVEL OF AIR FLOW THROUGH IT. THE FLAMMABLE CYANIDE GROUP MAY FIT BETTER WITH THE FLAMMABLE ORGANIC GROUP.

- **Flammable Sulfide, Sulfide, and Sulfide Base Groups** - Use caution when handling and blending samples from these categories. A hydrogen sulfide gas release can sometimes occur when blending these samples. Verify that the

laboratory hood is operating properly. The flammable sulfide group may blend safely with the flammable organic group.

- **Oxidizer Group** - This group is probably one of the most dangerous groups to conduct blending operations. The blending of this group should not be performed without the expressed written permission of a senior project chemist or the regional field analytical manager.

  USE EXTREME CAUTION WHEN BLENDING OXIDIZING SAMPLES. SOME SAMPLES MAY NOT BE COMPATIBLE WITH OTHER SAMPLES IN THIS CATEGORY. IMPROPER/INCORRECT BLENDING CAN RESULT IN DANGEROUS AND/OR UNSTABLE MIXTURES. Always use small amounts of material when doing waste blending tests on oxidizers.

If large containers of oxidizing materials are found on the site, it is recommended that they be disposed of individually and that **no waste blending tests be done on them.**

- **Peroxide Group** - This group is potentially shock sensitive. **BLENDING OF THIS GROUP IS EXTREMELY DANGEROUS AND SHOULD NOT BE PERFORMED UNDER ANY CIRCUMSTANCES. NEVER COMBINE PEROXIDES WITH OXIDIZERS. THIS WILL CREATE DANGEROUS, POTENTIALLY UNSTABLE AND/OR EXPLOSIVE MIXTURES.**

- **PCB Group** - These samples are always blended with each other. Never mix PCB-contaminated waste with non-PCB contaminated waste.

- **Air Reactive, Water Reactive, and Radioactive Groups** - Never mix samples from these groups with samples from other groups. Never field bulk materials in these waste groups with other waste groups. Air reactive wastes usually cannot be bulked with other wastes and must be disposed of on a container by container basis. The same is true for water reactive wastes. Radioactive wastes shall not be bulked with other waste. Disposal of radioactive wastes will usually be on a container by container basis. Disposal of radioactive wastes is a complex and expensive process.

The Waste Test Blending Compatibility Chart (see Figure 8.1) lists possible recommended ways of combining various wastestreams and can be used as a guide to performing waste blending tests in the field.

8.2 THE WASTE BLENDING TEST

Once the wastestreams have been determined and the bulk group codes have been entered, the dbase program can be used to generate lists of the drums in each wastestream for waste blending tests and the generation of composite samples for disposal analysis. Do not create composite samples until after waste blending tests are accomplished.

8.2.1 Method Summary

Aliquots proportional to the drum volume are blended and the sequence recorded on the Waste Blending Test Log (see Figure 8.2). If any reaction occurs during the mixing of the samples, the reaction is evaluated. A small reaction in the test bulk may indicate an uncontrolled reaction when performed full scale in the field. If the reaction exceeds the set parameters, then the waste blending test is started over and the last sample that caused the reaction is omitted. Once the Blending Test is completed for a waste group the data is transferred to the Field Waste Blending Log (see Figure 8.3). This log is used by the waste blending supervisor to conduct actual waste blending operations.

8.2.2 Safety Considerations

This procedure should be performed in a hood and should be done with the smallest sample volumes that are practical. Due to the possibility of violent reactions, a safety shield should be used. Also, since the blending of some material may cause the release of toxic fumes, hydrogen sulfide gas/hydrogen cyanide gas alarm (Monitor) units should be placed in the immediate work area.

8.2.3 Materials

- Magnetic stiffer (Coming P/N 67953 1 0 or equivalent)
- Magnetic stirring bars (Baxter Scientific Catalogue No. S8302-22)
- Digital Type K thermocouple thermometer (Cole-Panner Catalogue No. L-08528-40) (Baxter Scientific Catalogue No. T2950-51)
- Type K thermocouple probe (Cole-Parmer Catalogue No. L-08516-55) or Type K TFE-coated thermocouple probe (Cole-Parmer Catalogue No. L-08516-57)**
- Glass jars or other open containers

- Hydrogen cyanide gas/hydrogen sulfide gas alarm (Monitox) units and gas generator (MDA Model Nos. RA-530341, RA-530141, and RA-4100)
- Safety shield, Nalgene brand, P/N 63503024 (from various vendors)
- Clamps (for ring stand) (used to hold monitox units and thermocouple probes)
- Ring stand(s) (used to hold monitox units and thermocouple probes)
- Pyrex Class A graduated cylinders, 10-ml, 50-rnl, 100-ml and 500-ml (Baxter Scientific Catalogue No. C9087-x, where x = cylinder volume)
- 9 Pyrex graduated Griffin beakers, 30-ml, 50-ml, 150-ml, and 400-ml (Baxter Scientific Catalogue No. B2650-x, where x = beaker volume)
- Tongue blades (Baxter Scientific Catalogue No. S 1600- 1)
- Disposable, 10-ml serological pipets (Baxter Scientific Catalogue No. P4650-1 10)
- Pipet filler (Baxter Scientific Catalogue No. P5310)
- Glass stir rods, 10-mm diameter (Baxter Scientific Catalogue No. S8205-6)
- Teflon stir rods, 5/16-inch diameter (Baxter Scientific No. 58210-7)
- Measuring spoon, 0.5 g (Hach Company Catalogue No. 907-00) Soil scoops, 1-, 2-, 5-, and 10-g stainless steel soil scoops (Hach Company Catalogue No. 22628-00).

**NOTE: These are special rapid response probes with 1 second response rates. Do not substitute other probes for them without consulting with Midwest Technical Personnel in Findlay.

8.2.4 Method

- If you are blending liquids, place a magnetic stir bar in the glass jar and put it on the magnetic stirrer. Securely position the thermocouple probe on the inside wall of the container so that the probe tip is in contact with the liquid. Use a ring stand and clamp to accomplish this. If you are blending solids, no stirring bar is needed.
- Place the Monitox alarm units near the mouth of the container using ring stands and clamps.

- Add an aliquot of the liquid proportional to the drum volume of the first sample to the container (e.g., for a 55-gallon drum add 5.5 ml or 1 ml for every 10 gallons).

- If you are blending solids add an aliquot of the solid proportional to the drum volume. Aliquots of solids are measured using a Hach calibrated soil scoop and/or a measuring spoon (0.5, 1, 2, 5, or 10 g) (e.g., for a 55-gallon drum add one 5.0 g scoop and a one 0.5 g scoop).

- If you are blending liquids, start the magnetic stirrer and adjust the speed so that a vortex can be seen in the sample, but no splashing occurs.

- Add a proportional aliquot of liquid or solid from the second drum sample in the same wastestream. Add the liquid to the fluid in the beaker just upstream from the thermocouple probe. If you are blending solids, mix thoroughly with a glass or Teflon-coated stirring rod.

- Allow one minute of mixing and observe mixture for temperature increase, gas evolution, and physical state change. For solids, place the thermocouple probe in the mixture before and after mixing to detect any temperature rise. Leave the probe in the solids mixture in intimate contact with the materials for about 1 minute.

- Record the drum number, layer(s), sequence, date and time, and any noted reactions in the Waste Blending Test Log Book.

  NOTE: IF THE TEMPERATURE RISE IS GREATER THAN 5 DEGREES CELSIUS, IF THE EVOLUTION OF GAS IS NOTED, OR IF POLYMERIZATION OCCURS, THE SAMPLE IS INCOMPATIBLE WITH THIS WASTESTREAM AND SHOULD BE EXCLUDED. START THE WASTE BLENDING TEST PROCEDURE OVER FOR THAT WASTESTREAM.

- Continue addition of proportional aliquots of the sample and continue record keeping until all samples in that bulk group have been tested.

8.2.5 Interferences

No interferences for this procedure are known.

8.3 COMPOSITING FOR DISPOSAL ANALYSIS

The volume of the composite sample needed for disposal analysis for each wastestream should be determined by the transportation and disposal coordinator. Enough disposal composite must be generated to obtain the analytical data necessary to characterize the wastestream and to send to disposal firms for approval of the waste.

8.3.1 Method Summary

Aliquots of the liquid or solid proportional to the drum volume are blended and the sequence recorded. Samples which caused a notable reaction in the waste blending test are excluded. Sample volumes added to the disposal composite are calculated from the known total end volume.

8.3.2 Safety Considerations

This procedure should be performed in a hood, and a safety shield should be used. Also since the blending of some material may cause the release of toxic fumes, hydrogen sulfide gas/hydrogen cyanide gas alarm (Monitox) units should be placed in the immediate work area.

8.3.3 Materials

- Magnetic stirrer (Corning P/N 6795310 or equivalent)
- Magnetic stirring bars (Baxter Scientific Catalogue No. S8302-22)
- Safety shield, Nalgene brand, P/N 63503024
- Clamps (for ring stands)
- Ring stands
- Digital Type K thermocouple thermometer (Cole-Parmer Catalogue No. L-08528-40) (Baxter Scientific Catalogue No. T2950-51)
- Type K thermocouple probe (Cole-Parmer Cat. No. L-08516-55) or Type K TFE-coated thermocouple probe (Cole-Parmer Catalogue No. L-08516-57)
- Large open container, i.e., stainless-steel bucket (purchase locally or through scientific vendors)
- Hydrogen cyanide gas/hydrogen sulfide gas alarm (Monitox) units and gas generator (MDA Model Nos. RA-530341, RA-530141, and RA-4100)

- Pyrex Class A graduated cylinders, 10-ml, 50-ml, 100-ml and 500-ml (Baxter Scientific Catalogue No. C9087-x, where x = cylinder volume)

- Pyrex graduated Griffin beakers, 30-n-d, 50-n-d, 150-mi, and 400-n-d (Baxter Scientific Catalogue No. B2650-x, where x = beaker volume)

- Tongue blades (Baxter Scientific Catalogue No. S 1600- 1)

- Disposable, 10-rrd serological pipets (Baxter Scientific Catalogue No. P4650-1 10)

- Pipet filler (Baxter Scientific Catalogue No. P5310)

- Glass stir rods, 10-mm diameter (Baxter Scientific Catalogue No. S8205-6)

- Teflon stir rods (Baxter Scientific Catalogue No. S8210-7)

- Soil scoops, 1-, 2-, 5-, and 10-g stainless steel soil scoops (Hach Company Catalogue No. 22628-00).

8.3.4 Method

- If you are compositing liquids, place a magnetic stir bar in the container and put it on the magnetic stirrer. Securely position the thermocouple probe on the inside wall of the container so that the probe tip is in contact with the liquid.

- If you are compositing liquids, start the magnetic stirrer and adjust the speed so a vortex can be seen in the sample, but no splashing occurs.

- Place the Monitox alarm units near the mouth of the container.

- Add an aliquot of the liquid proportional to the percent of the drum to the wastestream volume of the first sample to the container. (e.g., for a drum that is 5.5 percent of the total composite volume of 1,000 ml, add 55 ml of that sample to the composite).

- If you are blending solids add one 5 g scoop of the solid for every 10 gallons of drum volume of the solid (e.g., if the drum contains 30 gallons of solid then add three 5 g scoops of the solid). Aliquots of solid are measured using the *5 g* Hach calibrated soil scoop.

- Add a proportional aliquot of the liquid or solid from the second drum sample in the same wastestream. If you are compositing solids, mix thoroughly with a glass stirring rod.

- Allow I minute of mixing and observe mixture for temperature increase, gas evolution, and physical state change. For solids, place the thermocouple probe in the mixture before and after mixing to detect any temperature rise. Leave the probe in the solids mixture in intimate contact with the materials for about I minute.

- Record the drum number, layer(s), sequence, date and time, and any noted reactions in the Disposal Composite Log Book.

  NOTE: IF THE TEMPERATURE RISE IS GREATER THAN 5 DEGREES CELSIUS, IF THE EVOLUTION OF GAS IS NOTED, OR IF POLYMERIZATION OCCURS, THE SAMPLE IS INCOMPATIBLE WITH THIS WASTESTREAM AND SHOULD BE EXCLUDED. START THE COMPOSITE PROCEDURE OVER FOR THAT WASTESTREAM.

- Continue addition of proportional aliquots of the sample and record keeping until all samples in that bulk group have been composited.

  NOTE: DISPOSAL COMPOSITES MAY BE GENERATED CONCURRENTLY WITH THE WASTE BLENDING TEST WITH THE PRECAUTION THAT A SAMPLE IS NOT ADDED TO THE COMPOSITE UNTIL IT IS OBSERVED TO BE COMPATIBLE WITH THE WASTESTREAM.

8.3.5 Interferences

Glassware and other sample processing hardware may yield interferences pertinent to disposal analysis. All of these materials must be thoroughly decontaminated prior to use. Interferences may also occur from cross contamination. Plastic laboratory equipment should be avoided because phthalates are commonly used as plasticizers and their esters cause interferences in some analytical methods.

FIGURE 8.1
WASTE BLENDING TEST
COMPATIBILITY CHART

	COMPATIBILITY																								
1	ACIDS	1																							
2	ACID OXIDIZERS	B HG	2																						
3	ACID, ORGANICS	I HG	I HG	3																					
4	AQUEOUS	O H	O H	I HD	4																				
5	BASE	I HV	I HV	I HV	I HV	5																			
6	BASE OXIDIZER	I HV	I HV	I HV	B H	B H	6																		
7	CHLORINATED	I D	I D	I D	I D	I D	I D	7																	
8	CYANIDES	I TG	I TG	I TG	B D	B D	I H	I D	8																
9	CYANIDE BASES	I TG	I TG	I TG	B D	B D	I H	I D	B	9															
10	FLAMMABLE ACIDS	I HG	I HG	I H	I D	I HG	I HG	I HD	I TG	I TG	10														
11	FLAMM AQUEOUS	I HG	I HG	I HG	B D	I HG	I HG	B D	I D	I H	B HG	11													
12	FLAMM BASES	I HV	I HV	I HV	I D	I HD	I HD	B D	I D	I D	I HG	B D	12												
13	FLAMM CYANIDES	I TG	I TG	I TG	I D	I D	I HD	B D	I D	I D	I TG	B D	B D	13											
14	FLAMM ORGANICS	I HG	I HG	I HG	I D	I HG	I HG	B D	I D	I D	B H	B D	B H	B D	14										
15	FLAMM SULFIDES	I TG	I TG	I TG	I D	I D	I H	I D	I D	I D	I TG	B D	B D	B D	B D	15									
16	ORGANICS	I HG	I HG	I HG	I HG	I D	I HG	B D	I D	I D	B H	B D	B H	B D	B	B D	16								
17	OXIDIZERS	I HV	I HV	I HV	I D	I D	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	17							
18	PEROXIDES	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	18						
19	PCBs	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I VE	I VE	19					
20	REACTIVE, AIR	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	20				
21	REACTIVE, WATER	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	I VE	21			
22	RADIOACTIVE	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I D	I VE	I D	I VE	I VE	22			
23	SULFIDES	I TG	I TG	I TG	B D	B D	I H	I D	B	B H	I TG	I D	I D	I D	I D	I D	I D	I VE	I VE	I VE	I VE	I VE	I D	23	
24	SULFIDE BASES	I TG	I TG	I TG	B D	B D	I H	I D	B H	B	I TG	I D	I D	I D	I D	I D	I D	I VE	I VE	I VE	I VE	I VE	I D	B	24

B = Blend Test

D = Disposal Problem

E = Explosive Mixture

G = Gas Release

H = Heat Evolution

I = Incompatable

O = Order Blended Important

P = Precipitation

TG = Toxic Gas Evolution

V = Violent Reaction

This chart indicates groups which may possibly be safely blended. Test blending must be performed in accordance to the protocols detailed in Section 8.0 of IT's Compatibility Manual combining of two separate test blending groups and calling the two groups.

Figure 8.2

WASTE BLENDING TEST LOG

PROJECT NAME: PROJECT LOCATION: PROJECT NUMBER:

PROJECT CHEMIST: PROJECT MANAGER: DATE:

BLENDING SUPERVISOR: SUPERVISED BY:

WASTE STREAM: WASTE STREAM ID #

	Drum No.	Test Blending Data							Drum No.	Test Blending Data						
		Temp Rise C	Gas Evol Y	N	Hax Rxn Y	N	Approved to Blend			Temp Rise C	Gas Evol Y	N	Hax Rxn Y	N	Approved to Blend	
1								26								
2								27								
3								28								
4								29								
5								30								
6								21								
7								32								
8								33								
9								34								
10								35								
11								36								
12								37								
13								38								
14								39								
15								40								
16								41								
17								42								
18								43								
19								44								
20								45								
21								46								
22								47								
23								48								
24								49								
25								50								

Figue 8.3

FIELD WASTE BLENDING LOG

WASTE STREAM _____.

PROJECT NAME:	PROJECT NUMBER:
PROJECT LOCATION:	PROJECT MANAGER:
PROJECT CHEMIST:	BLENDING SUPERVISOR:
DATE BLENDING TEST PERFORMED:	PERFORMED BY:
CHAMBER BLENDING PERFORMED:	SUPERVISED BY:
CAUTION ALL WASTE BLENDING MUST BE PERFORMED IN LISTED SEQUENCE!	
VARIATION FROM THE SEQUENCE ORDER MUST BE APPROVED BY THE PROJECT CHEMIST AND PROJECT SUPERVISOR OR PROJECT MANAGER	

SEQ NO D	DRUM NO.	FOU	BLENDED	COMMENTS	SEQ NO D	DRUM NO.	FOU	BLENDED	COMMENTS
1					26				
2					27				
3					28				
4					29				
5					30				
6					31				
7					32				
8					33				
9					34				
10					35				
11					36				
12					37				
13					38				
14					39				
15					40				
16					41				
17					42				
18					43				
19					44				
20					45				
21					46				
22					47				
23					48				
24					49				
25					50				

TO THE BEST OF MY KNOWLEDGE THE INFORMATION ON THIS FORM IS CORRECT AND ERROR FREE EXCEPT WHERE NOTED IN THE COMMENTS SECTION.	
SIGNATURE (BLENDING SUPERVISOR)	DATE: