APPENDIX A

FIELD SAMPLING PLAN ADDENDUM

FORMER COMMUNICATIONS SITE DRUM AND DEBRIS INVESTIGATION

FORT WAINWRIGHT, ALASKA

FINAL
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ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
BFB	bromofluorobromide
CoC	chain-of-custody
DQO	data quality objective
DRO	diesel-range organics
FCS	Former Communications Site
FSP	Field Sampling Plan
GRO	gasoline-range organics
HCl	hydrochloric acid
Hg	mercury
HNO_3	nitric acid
Jacobs	Jacobs Engineering Group Inc.
mL	milliliter
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
PCB	polychlorinated biphenyls
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RRO	residual-range organics
SVOC	semivolatile organic compound
TAT	turnaround time
TCLP	toxicity characterization leaching procedure
TLC	Teflon®-lined cap
TLS	Teflon®-lined septum
USAED	U.S. Army Engineer District, Alaska
VOC	volatile organic compound
°C	degrees Celsius

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1.0 INTRODUCTION

This addendum to the 2007 CH2M Hill Remedial Investigation Field Sampling Plan (FSP) (U.S. Army of Engineering District, Alaska [USAED] 2007) addresses work to be conducted in support of the 2008 Former Communications Site (FCS) drum and debris investigation at Fort Wainwright, Alaska. This addendum presents sampling protocols and procedures that will be used to meet the project data quality objectives (DQO). Sample collection, preservation, packaging, and laboratory analytical methods are also presented. Laboratory data quality requirements are presented in the 2007 CH2M Hill Quality Assurance Project Plan (QAPP) (USAED 2007).

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2.0 PURPOSE

The purpose of this FSP Addendum is to provide a summary of field sampling and analytical testing methods required to meet the 2008 FCS drum and debris investigation objectives presented in Section 2.0 of the Work Plan.

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3.0 PROCEDURES AND METHODS

This section discusses the procedures that will be followed during field screening and sampling associated with the 2008 drum and debris investigation at the FCS. It describes the number and type of samples, required chemical analyses, appropriate sample containers, preservation methods, quality assurance (QA)/quality control (QC) requirements, and anticipated turnaround times (TAT). The QAPP (USAED 2007) presents DQOs and data review procedures. Attachment A-1 contains standard field forms for the field activities described in this FSP.

3.1 SOIL SAMPLE COLLECTION FOR CHEMICAL LABORATORY ANALYSIS

All analytical soil samples will be discrete samples collected at the frequencies stated in the Work Plan. Only new, pre-cleaned sample containers, certified clean, will be used for sample collection. In general, soil sampling for laboratory analysis will be performed in accordance with the following procedures:

- Prior to the collection of each sample, the sampler(s) will don new, clean nitrile gloves to avoid cross-contamination.
- Samples will be collected in order of the most volatile to least volatile analytes.
- All soil samples will be collected using clean stainless-steel spoons or other sampling equipment and placed in jars.
- Excess soil will be removed from the lip of the container, and a Teflon®-lined lid will be used to seal the container. The sample collection date, time, analyses requested, preservation, place of collection, project name, and sampler initials will be placed on the prepared label and chain-of-custody (CoC) form.
- Each sample will be assigned an identification number, as described in Section 4.2 of this FSP Addendum.
- Soil samples will be placed in a cooler immediately after sample collection. Upon return to the field office, samples will be refrigerated at 4 ± 2 degrees Celsius (°C) until packaged for shipping.
- Sample packaging and shipping procedures will be followed, as described in Section 4.0 of this FSP.
- Matrix spike (MS)/MS duplicates (MSD) will be designated on the CoC form for each sample shipment, or at least a frequency of 1 per 20 samples per matrix. Only pre- and post-construction stockpile sampling and confirmation samples will require QA sampling.

Waste characterization samples do not require QA sampling because they are not required in order to characterize, transport, or dispose of the waste.

- One duplicate (QC) sample will be collected at a minimum frequency of 10 percent, or one per sampling event, whichever is more frequent for each matrix and for each analysis. Only pre- and post-construction stockpile and confirmation sampling will require QC sampling. Waste characterization samples do not require field duplicates.
- The field sampler(s) will dispose of nitrile gloves after sample collection is completed at each sample location to minimize potential for cross-contamination.

Soil samples for gasoline-range organics (GRO) and volatile organic compound (VOC) analysis must be collected and containerized with the following additional requirements:

- Four-ounce jars with Teflon®-lined septa shall be supplied pre-tared by the laboratory.
- A label sticker must not be affixed to the jar; instead, write sample information on the preaffixed label, using a pen.
- Sharpie or similar brand markers contain VOCs and must not be used on the jar.
- Twenty-five grams of soil must first be weighed or estimated and then added to the jar.
- After the soil is added to the jar, pour a 25-milliliter (mL) vial of methanol preservative (surrogated methanol for AK101 analysis) into the jar, ensuring that the liquid completely covers the 25 grams of soil.
- If the 25 mL of methanol does not completely cover the soil, the sample should be restarted as adding another 25ml of Methanol will be above the hazardous materials excepted shipping quantities and will not be able to shipped within the regulations to the laboratory.
- Upon completion of methanol addition, place a line on the jar label, in pen, that is flush with the methanol level.
- After wrapping the jar in bubble wrap, place in a self-sealing bag and place a sticker label on the outside of the bag.

3.1.1 Stockpile Preconstruction

Preconstruction soil samples will be collected from the footprint of the stockpile location to characterize the condition of the soil prior to placement of the stockpile. Discrete samples will be collected from an appropriate number of sample locations based on the size of the stockpile. Samples will be collected from a depth of 0 to 6 inches below ground surface.

3.1.2 Stockpiles

Waste characterization samples from contaminated soil stockpiles will be collected in accordance with the Alaska Department of Environmental Conservation's (ADEC) *Guidance for Cleanup of Petroleum Contaminated Sites* (ADEC 2000). Stockpiles will be sampled at a frequency of two samples for the first 50 cubic yards and one sample for each additional 50 cubic yards. Samples will be submitted to an approved laboratory for analysis of GRO, diesel-range organics, residual-range organics (RRO), polychlorinated biphenyls, pesticides, Resource Conservation and Recovery Act (RCRA) metals, semivolatile organic compounds (SVOC), and VOC concentrations, as applicable to the specific stockpile.

3.1.3 Excavations

Collection of confirmation soil samples for laboratory analysis within excavations will be conducted in accordance with the *2007 Remedial Investigation/Feasibility Study Work Plan* (USAED 2007). Confirmation soil samples will only be collected in areas where contaminants of potential concern were noted during the excavation for example where stained soil, drums or olfactory evidence of contamination was removed. Samples will be submitted to an approved laboratory for analysis of GRO, diesel-range organics, RRO, polychlorinated biphenyls, pesticides, RCRA metals, SVOCs, and VOC concentrations, as applicable to the compounds identified in the waste removed from the excavation.

3.2 DRUM SAMPLE COLLECTION

Drum contents and waste testing will be performed onsite in accordance with EM 200-1-3 (U.S. Army Corps of Engineers 2001). Physical and chemical hazard categorization testing will be used to characterize and segregate the contents of drums and tanks into the appropriate waste stream or group. Hazard categorization will include testing for the following properties: flammability, corrosivity, oxidation, miscibility, and halogenated hydrocarbons. Testing methods are described in Attachment A-2. Initial inspection will include a physical description of the drum, tank, or container including its size, type, markings, and condition. Upon preliminary waste characterization testing, physical descriptions should be noted,

including the number and types of phases present, the physical state, color, clarity, homogeneity, and any other observations with respect to appearance.

Using a Coliwasa sampling tube, bailer, or equivalent, samples will be collected from the entirety of the drums and tanks for hazard categorization testing and will then be bulked for laboratory analysis. If multiple strata are encountered in a drum, separate samples from each stratum will be collected, and bulking will not be performed. The testing will utilize a chemical analytical test and combustion process to determine the general category of organic, inorganic, metals, reagents, and combustibility for total oil and grease and total petroleum hydrocarbons.

In single stratum liquids, after hazard categorization tests have confirmed compatibility, the remaining volume from the sampling device will be placed in a 5-gallon bucket used to combine a composite liquid from each compatible waste stream. An analytical sample will then be collected from the composite liquid and submitted to the laboratory for the tests specified in the Work Plan. The remainder of this composite liquid will be combined with a like waste stream for disposal.

Following completion of all hazard categorization screening and analytical sampling, drums will be moved to a central staging area for further waste management in accordance with the Work Plan. If temperatures drop below freezing, drums will be moved and stored in the DERA Building.

4.0 SAMPLE HANDLING

Methanol will be used as a preservative in conjunction with sampling. The use of personal protective equipment, including safety glasses, proper gloves, respirators, and appropriate clothing, is required when conducting sampling operations. Health and safety procedures are defined in the Jacobs Engineering Group Inc. (Jacobs) Site Safety and Health Plan (USAED 2008).

4.1 PRESERVATION AND CONTAINER SPECIFICATIONS

Table A-1 provides sample handling, volume, container, and preservation information, and Table A-2 describes the estimated number of laboratory samples and analyses required for each sample type. Sample containers certified as clean for the parameter(s) to be investigated will be obtained from the laboratory. Jacobs will use a certified analytical laboratory approved by USAED in the QAPP.

Table A-1
Methods, Containers, Preservation Requirements, and Hold Times for Soil and Liquid Waste Characterization Samples

Parameter	Analytical Method	Container	Preservation and Maximum Hold Times
Soil Waste and Pre- and Post-Stockpile Construction Samples			
GRO	AK101	One 4-ounce amber glass, TLS	Methanol and BFB, Cool <25 ºC, 28 days
DRO/RRO	AK102/AK103	One 4-ounce amber glass, TLC	Cool 4 ± 2 ºC 14 days to extraction, 40 days to analysis
SVOC	SW8270C	One 8-ounce amber glass, TLC	Cool 4 ± 2 ºC / 14 days to extraction, 40 days to analysis
RCRA 8 Metals	SW6020/SW7471A	One 4-ounce amber glass, TLC	Cool 4 ± 2 ºC / 180 days to analysis, 28 days to analysis (Hg)
Pesticides	SW8081A	One 8-ounce amber glass, TLC	Cool 4 ± 2 ºC / 14 days to extraction, 40 days to analysis
PCBs	SW8082	One 8-ounce amber glass, TLC	Cool 4 ± 2 ºC / 14 days to extraction, 40 days to analysis

Table A-1
Methods, Containers, Preservation Requirements, and Hold Times for Soil and Liquid Waste Characterization Samples
(continued)

Parameter	Analytical Method	Container	Preservation and Maximum Hold Times
Herbicides	SW8151A	One 8-ounce amber glass, TLC	Cool 4 ± 2 ºC / 14 days to extraction, 40 days to analysis
VOCs (mid-level)	SW8260B	One 4-ounce amber glass, TLS	Methanol, Cool 4 ± 2 ºC / 14 days to analysis
Ignitability	SW1010	One 4-ounce amber glass, TLC	Cool 4 ± 2 ºC / 14 days to analysis
Reactivity	SW 846 Chapter 7.3	One 4-ounce amber glass, TLC	Cool 4 ± 2 ºC, ASAP
TCLP	SW1311/ 260/8270/8081/ 8151/6020/7471	Three 8-ounce amber glass, TLC	Cool 4 ± 2 ºC /14 days to leaching, 7 days to extraction, 14 days to analysis
Liquid Waste Samples			
SVOCs	SW8270C	Two 1-liter amber glass, TLC	Cool 4 ± 2 ºC / 7 days to extraction, 40 days to analysis
VOCs	SW8260B	Three 40-mL VOA vials (prepreserved), TLS	HCl, Cool 4 ± 2 ºC / 14 days to analysis
Pesticides	SW8081A	Two 1-liter amber glass, TLC	Cool 4 ± 2 ºC / 7 days to extraction, 40 days to analysis
PCBs	SW8082	Two 1-liter amber glass, TLC	Cool 4 ± 2 ºC / 7 days to extraction, 40 days to analysis
RCRA Metals	SW6020/7470A	One 250-mL poly, TLC	HNO_3, Cool 4 ± 2 ºC / 180 days to analysis, 28 days to analysis (Hg)
Herbicides	SW8151A	Two 1-liter amber glass, TLC	Cool 4 ± 2 ºC / 7 days to extraction, 40 days to analysis
Ignitability	SW1010A or SW1020A	250 mL amber glass, TLC	Cool 4 ± 2 ºC / 14 days to analysis
Reactivity	SW 846 Chapter 7.3	One 4-ounce amber glass, TLC	Cool 4 ± 2 ºC, ASAP
TCLP	SW1311/8260/8270/8081/ 8151/6020/7471	Five 1-liter amber glass, TLC and Three 40-mL VOA vials, TLS	Cool 4 ± 2 ºC /14 days to leaching, 7 days to extraction, 14 days to analysis

Notes:

MS/MSD samples will be collected based on a frequency of 5% and will require additional sample or soil volume.

Duplicate and QA samples will be collected based on a frequency of 10% and will require additional sample or soil volume.

Whenever practical, multiple analyses will be performed from the same sample container to reduce the sample volume needed.

Sample containers may be substituted by the laboratory as long as all method requirements are met.

For definitions, see the Acronyms and Abbreviations section.

Table A-2
Sample Summary

Parameter	TAT (days)	Primary Samples	Field Duplicates (QC)	MS/ MSD	Total Samples
Soil Pre- and Post-Stockpile Construction					
GRO by AK 101	30	32	2	2	36
DRO/RRO by AK 102/103	30	32	2	2	36
SVOCs by SW8270C	30	32	2	2	36
VOCs by SW8260B	30	32	2	2	36
RCRA Metals by SW6020/7471A	30	32	2	2	36
Pesticides by SW8081B	30	32	2	2	36
Herbicides by SW8151A	30	32	2	2	36
PCBs by SW8082	30	32	2	2	36
Contaminated Soil Characterization					
SVOCs by SW8270C	7	10	NA	NA	10
VOCs by SW8260B	7	10	NA	NA	10
RCRA Metals by SW6020/7471A	7	10	NA	NA	10
Pesticides by SW8081B	7	10	NA	NA	10
PCBs by SW8082	7	10	NA	NA	10
Herbicides by SW8151A	7	10	NA	NA	10
Ignitability by SW1010A or SW1020A	7	10	NA	NA	10
Reactivity	7	10	NA	NA	10
TCLP	7	5	NA	NA	5
Solid and Liquid Waste Characterization					
SVOCs by SW8270C	7	15	NA	NA	15
VOCs by SW8260B	7	15	NA	NA	15
RCRA Metals by SW6020/7470A	7	15	NA	NA	15
Pesticides by SW8081B	7	15	NA	NA	15
PCBs by SW8082	7	15	NA	NA	15
Herbicides by SW8151A	7	15	NA	NA	15
Ignitability by SW1010	7	15	NA	NA	15
TCLP	7	5	NA	NA	5
Confirmation Samples					
GRO by AK 101	30	50	2	2	54
DRO/RRO by AK 102/103	30	50	2	2	54
SVOCs by SW8270C	30	50	2	2	54
VOCs by SW8260B	30	50	2	2	54
RCRA Metals by SW6020/7471A	30	50	2	2	54

Table A-1
Methods, Containers, Preservation Requirements, and Hold Times for Soil and Liquid Waste Characterization Samples
(continued)

Parameter	TAT (days)	Primary Samples	Field Duplicates (QC)	MS/ MSD	Total Samples
Pesticides by SW8081B	30	50	2	2	54
Herbicides by SW8151A	30	50	2	2	54
PCBs by SW8082	30	50	2	2	54

Notes:
MS/MSD samples will be collected based on a frequency of 5% and will require additional volumes. MS/MSD will not be collected for waste samples.
Duplicate (QC) samples will be collected based on a frequency of 10% and will require additional volumes. Duplicates will not be collected for waste samples.
One trip blank shall accompany each group of methanol-preserved samples in the shipment cooler. There will also be a minimum of one unique trip blank per every 20 or fewer methanol preserved samples.
NA = not applicable. Field duplicates and MSs are not a requirement for waste characterization samples.
TCLP includes methods 8260/8270/8081/8151/6020/7471.
For definitions, see the Acronyms and Abbreviations section.

The Field Sampler will inventory all sample containers and verify that the container type, volume, and preservation method are correct and adequate quantities are on hand to meet sample collection requirements.

4.2 SAMPLE NUMBERING SYSTEM

Each CoC submitted to the laboratory will be assigned an identification number 12 characters in length. The first four digits define the sampling year (e.g., 2008). The FCS project will be denoted on the CoC as "FCSRI". The final three characters are incremented sequentially per CoC (001, 002, etc.). An example of the CoC number is presented below:

CoC Number:

Year	Project Identifier	CoC Number
2008	FCSRI	001

Each sample is assigned a unique identification number. This identifier is a unique character sequence specified by the project, which specifies a distinct location at the project site. The first two digits define the sampling year (e.g., 08). The next five characters (FCSRI) defines the project as FCS drum and debris investigation. An example of a sample name is shown below:

Year	Site	Sample Matrix	Sample Number
08	FCSRI	SO	001

Two characters follow the site identifier to indicate the matrix, “SO” for soil and “WW” for waste liquid. The final three characters denote the sample number. Samples should be identified with an appropriate location identifier to i.e. B15 to denote the excavation or stockpile that the sample originated from.

All duplicate and MS/MSD samples will be noted in the field logbooks and the sample summary table. Duplicate samples will be given unique sample identifications to ensure blind analysis at the laboratory. MS/MSD samples will be denoted as such in the appropriate fields on the CoCs (QC column). Field duplicates and MS/MSD will not be required for waste characterization samples.

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5.0 CORRECTIVE ACTIONS

Corrective action will be initiated when potential or existing conditions are identified that may adversely impact data quantity or quality. It will be the responsibility of the individual who first recognizes an out-of-control event to initiate corrective action. Corrective action for either field or analytical operations includes notification to the Jacobs Project Chemist and Site Manager, response, reestablishment of control, and documentation. Corrective actions will be approved by the appropriate personnel (Site Manager and/or Project Chemist). The implementation of these corrective actions will be documented, and documentation will be maintained and provided with the deliverables. All variances to the Work Plan will be communicated to the Jacobs Site Manager and Project Chemist immediately upon identification.

Events that may require corrective action include the following (at a minimum):

- Violation of established field procedures including sample collection, handling, and documentation.
- Violation of established analytical methods, procedures, or controls.

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6.0 REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2000 (September). *Guidance for Cleanup of Petroleum Contaminated Sites*.

U.S. Environmental Protection Agency. 1996 (April). *Test Methods for Evaluating Solid Waste*. EPA/540/S-95/504. SW846, Third Edition, On-Line, Resource Conservation and Recovery Act Test Methods: http://www.epa.gov/epaoswer/hazwaste/test/main.htm

U.S. Army Corps of Engineers. 2001 (1 February). *Engineering and Design - Requirements for the Preparation of Sampling and Analysis Plans*. EM 200-1-3.

USAED (U.S. Army Engineer District, Alaska). 2007. *Remedial Investigation/Feasibility Study Management Plan.* Prepared by CH2M Hill.

USAED. 2008. Site Safety and Health Plan Prepared by Jacobs Engineering Group Inc

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ATTACHMENT A-1

Standard Field Forms

SAMPLING CHECKLIST

Project Name: _____ Project No: _____
Reviewer's Name: _____ Date: _____

Place initials next to activity after information has been verified.

SAMPLE LABELS COMPLETED AND CORRECT

_____ Field organization (e.g., Jacobs)
_____ Sample ID number
_____ Sampling data and time
_____ Analytical method(s)
_____ Initials of person(s) collecting the sample
_____ Preservative

CHAIN-OF-CUSTODY COMPLETED AND CORRECT FOR SAMPLES

_____ Project name and/or number
_____ CoC number and cooler ID
_____ NPDL WO# (admin number)
_____ Sample identification
_____ Date and time of collection
_____ Sampler(s) initials
_____ Number, type and volume of container(s)
_____ Preservative and matrix
_____ Analyses requested
_____ Turn-around time requested
_____ Airway bill number

COOLER PACKING COMPLETED AND CORRECT

_____ Cooler media in cooler(s)
_____ Sample(s) in bubble wrap and bag
_____ Temperature blank in cooler(s)
_____ Chain-of-custody inside cooler (relinquished)
_____ Cooler(s) sealed
_____ Shipping label on lid and custody seals in place

CoC VARIANCE REQUEST

Change Requestor: _____

Laboratory Project Manager: _____

Date/Time Requested: _____

Jacobs Project Chemist: _____

Jacobs Site Manager: _____

Jacobs Contracts Administrator: _____

Project Name/Number _____

Laboratory Sample Delivery Group Number _____

Action to be taken (add analyses, change turnaround time, delete analysis, etc.): _____

Specific Requirements

Jacobs Sample Number	Lab Sample Number	Action	Added Cost
		Total Additional Cost:	

Comments/Justification: _____

_____

_____

Authorization: To ensure proper action is authorized, transmit this form via facsimile to Jacobs Project Chemist for signature approval. Jacobs Project Chemist will sign and return this form via facsimile to the Laboratory Project Manager to initiate change implementation.

Client Approval: _____ Date: _____

This form will be used to track changes to the chain-of-custody record and will not be used to modify or increase the value of a delivery order.

Signed Copy Routing: Jacobs Project Chemist, Jacobs Site Manager, Jacobs Contracts Administrator

COOLER RECEIPT FORM

Fax this form and the CoC records to Jacobs Project Chemist within 24 hours of receiving sample.

CoC Number _____ **(One receipt form per cooler)**
Cooler Number/Name on CoC _____
Laboratory and Location _____
Lab SDG _____

1.	Were custody seals on outside of cooler?	**YES**	**NO**
	If yes, how many and where? _____		
	Were signatures and dates correct?	**YES**	**NO**
2.	Were custody papers taped to lid inside of cooler?	**YES**	**NO**
3.	Were custody papers properly filled out (ink, signed, etc.)?	**YES**	**NO**
4.	Did you sign custody papers in the appropriate place?	**YES**	**NO**
5.	Did you attach shipper's packing slip to this form?	**YES**	**NO**
6.	What kind of packing material was used? _____		
7.	Was sufficient ice used (if appropriate)?	**YES**	**NO**
8.	Were all bottles sealed in separate plastic bags?	**YES**	**NO**
9.	Did all bottles arrive in good condition?	**YES**	**NO**
10.	Were all bottle labels complete (number, date, signed, analysis, pres., etc.)?	**YES**	**NO**
11.	Did all bottle labels and tags agree with custody papers?	**YES**	**NO**
12.	Were correct bottles used for the tests?	**YES**	**NO**
13.	Were VOA vials checked for absence of air bubbles and, if present, noted?	**YES**	**NO**
14.	Was sufficient amount of sample sent in each bottle?	**YES**	**NO**
15.	Chain-of-custody identification number: _____		
	Temperature blank reading _____		
	Cooler temperature. _____		
	Identification number of thermometer _____		
16.	Is temperature within 4± 2 °C?	**YES**	**NO**
17.	Were labels correctly associated with pretared containers? (not placed directly on jars)?	**YES**	**NO**
CORRECTIVE ACTION FORM ATTACHED		***YES***	***NO***

Jacobs Project Chemist contacted? Date/Time _____

Attach associated CoC record and Conversation Confirmer forms.

Explain any discrepancies: _____

_____

_____

Chain-of-Custody Report

Collection Organization: JEGA **Chain-of-Custody:** _____ **Cooler ID:** _____ **Admin #: 06-083**

Project Number: **FCS Remedial Investigation / 05F50601** **Laboratory: TBD** **Bill To: JEGA** **Report To: JEGA**

COC Sample ID	Collection Date	Time	Sampler	Number	Containers Type	Volume	Preservative	Matrix	Analyses Requested Group	QC	TAT	Notes:

Special Instructions:

Relinquish By: _____
Signature/Printed Name Date/Time

Relinquish By: _____
Signature/Printed Name Date/Time

Received By: _____
Signature/Printed Name Date/Time

Received By: _____
Signature/Printed Name Date/Time

ATTACHMENT A-2

HAZCAT Procedures

(modified from *HazCat® Abridged Manual for Field Use* by Robert Turkington, February 1995)

FLAMMABILITY

Place an amount of unknown material the size of a dollar coin into a watch glass.

Beginning 2 inches away, carefully move a lit match towards the watch glass. Flammability distinctions are based on the table below.

Distance from Watch Glass	Reaction of Unknown	Flammability Distinction
Less than 2 inches from watch glass but not in contact with watch glass	Unknown bursts into flames	Extremely Flammable
Match is just barely touching watch glass	Unknown bursts into flames	Extremely Flammable
Match is touching unknown	Unknown ignites quickly	Flammable (fp<100°F)
Match is touching unknown	Unknown wicks into match, then flame covers the whole surface of the unknown	Flammable (fp>100°F)
Match is touching unknown	Unknown flashes on contact, wicks up match, then entire surface of unknown is slowly covered in flame	Flammable (fp>100°F)
Match is touching unknown	Unknown slowly wicks up match, but the flame does not spread over the surface of the unknown	Combustible, but for safety treat as flammable

CORROSIVITY

Insert pH paper into unknown liquid. Keep pH paper in liquid as long as is recommended on the pH paper container and then compare the color of the pH test strip with the key on the pH paper container.

If the pH of the unknown liquid is less than 2 or greater than 12.5, then the unknown liquid is considered corrosive.

OXIDATION

Use hydrochloric acid solution to acidify an Oxidizer test strip.

Use a pipette to drop some of the unknown liquid on the acidified test paper.

If the unknown liquid is an oxidizer, a blue/black or purple color will appear.

MISCIBILITY

Place 0.5 inch of water in a test tube. Then place a small amount (pea-sized) of the unknown liquid into the water. If the solution does not react (heat or effervescence), then place a stopper on the test tube and shake.

Observe the reaction for a few minutes and determine if the unknown liquid floats, sinks, or is miscible in water. If the liquid floats, then the test indicates that it is most likely a petroleum-based liquid. If the liquid sinks, then the test indicates that chlorinated compounds may be present. If the liquid is miscible in water, then the test indicates that the unknown liquid could be a ketone, alcohol, or coolant.

HALOGENATED HYDROCARBONS

Use a torch flame to heat a copper wire until the flame shows no green color.

Let the wire cool, then place the wire in a test tube of the unknown liquid.

Remove the wire from the test tube and apply the flame again.

The presence of chlorine is indicated by a green flame.