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Utah Division of Solid and Hazardous Waste

TOOELE CHEMICAL AGENT DISPOSAL FACILITY (TOCDF)

MUSTARD CHARACTERIZATION PROJECT REPORT FOR DESERET CHEMICAL DEPOT MUSTARD TON CONTAINERS

Revision 0

Body – Appendix C-4

EG&G DEFENSE MATERIALS, INC.

January 14, 2004

DEPARTMENT OF THE ARMY
US ARMY CHEMICAL MATERIALS AGENCY (PROVISIONAL)
TOOELE CHEMICAL AGENT DISPOSAL FACILITY
11620 STARK ROAD
STOCKTON, UTAH 84071

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JAN 30 2004
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Utah Division of Solid and Hazardous Waste

REPLY TO
ATTENTION OF:

January 26, 2004

Tooele Chemical Agent Disposal Facility

SUBJECT: Mustard Characterization Project

Mr. Dennis Downs, Director
Utah Department of Environmental Quality
Division of Solid and Hazardous Waste
288 North 1460 West
Salt Lake City, Utah 84116-0690

Dear Mr. Downs:

Enclosed are two copies (a printed version, as well as an electronic copy on a CD) of "Mustard Characterization Project Report for Deseret Chemical Depot Mustard Ton Containers". This report is submitted to the State of Utah, Department of Environmental Quality, Division of Solid and Hazardous Waste. This report summarizes the sampling and analyses of 98 ton containers and 12 H 155mm projectiles from the Deseret Chemical Depot.

Your technical the point of contact is Ms. Elizabeth A. Lowes at (435) 833-7483 or Mr. Monte S. Caldwell at (435) 833-7428.

Sincerely,

Stephen L. Frankiewicz
EG&G Defense Materials, Inc.
*CERTIFICATION STATEMENT

Dale A. Ormond
TOCDF Site Project Manager
*CERTIFICATION STATEMENT

Harold K. Oliver
Assistant to the Installation Commander

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Joseph Stang
Snow
File

* I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS.

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TOOELE CHEMICAL AGENT DISPOSAL FACILITY (TOCDF)

MUSTARD CHARACTERIZATION PROJECT REPORT FOR DESERET CHEMICAL DEPOT MUSTARD TON CONTAINERS

Revision 0

EG&G DEFENSE MATERIALS, INC.

January 14, 2004

SUMMARY OF CHANGES

Revision	Date	Affected Page(s)	Description of Change(s)
0	1/14/2004	All	Original Document

EXECUTIVE SUMMARY

A sampling and analysis project was conducted to characterize the mustard stockpile stored at Deseret Chemical Depot (DCD) in preparation for efforts to dispose of the stockpile at the Tooele Chemical Agent Disposal Facility (TOCDF). Samples were collected from a total of 98 distilled mustard (HD) ton containers by personnel at the Oquirrh Mountain Facility, formerly Chemical Agent Munitions Disposal System, located at DCD.

The samples collected during this project were analyzed for mustard purity, organic compounds (thiodiglycol, 1,2-dichloroethane, tetrachloroethylene, 1,1,2,2-tetrachloroethane, Bis [2(2-chloroethylthio)ethyl] ether (T), 1,2-Bis (2-chloroethylthio) ethane (Q), hexachloroethane, and Lewisite) and for the metals used in the DCD Human Health Risk Assessment (HHRA). Three separate matrices were sampled and analyzed – liquid mustard, non-cohesive solids resting above the solid layer, and the solid layer on the bottom of the ton containers. The liquid samples were analyzed for purity, organic compounds, and HHRA metals, while the non-cohesive solid and solid samples were only analyzed for HHRA metals.

Organic compounds of interest identified in one or more liquid mustard samples included 1,2-dichloroethane, tetrachloroethylene, T, Q, and Lewisite. Lewisite, which may have been a previous fill before the ton containers were filled with distilled mustard, was identified in samples from eight of the 98 ton containers, at a maximum concentration of 21.8 mg/kg.

HHRA metals identified in one or more liquid mustard samples included aluminum, antimony, arsenic, barium, boron, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc. All of the HHRA metals were identified in one or more non-cohesive solid and solid samples. Notable metals identified in the liquid samples included arsenic (55 mg/kg maximum), chromium (30 mg/kg maximum), and mercury (65 mg/kg maximum). Notable metals identified in the non-cohesive solid samples included arsenic (6,350 mg/kg maximum), chromium (184 mg/kg maximum), lead (1,340 mg/kg maximum), and mercury (2910 mg/kg maximum). Notable metals identified in the solid samples included arsenic (12,900 mg/kg maximum), chromium (397 mg/kg maximum), lead (625 mg/kg maximum), and mercury (10,300 mg/kg maximum).

Three separate, but parallel, studies were conducted in conjunction with this project. First, a stability study was conducted to demonstrate that several organic and inorganic target analytes are stable in munitions-grade HD for a period of up to approximately 150 days. Second, a study was conducted to evaluate the composition of headspace gas found in HD ton containers. Finally, samples collected during an ongoing U.S. Army Program Manager for Assembled Chemical Weapons Alternatives project from twelve DCD Levinstein mustard (H) 155 mm projectiles were analyzed for mustard purity, organic compounds, and HHRA metals. The results of these studies are presented as separate reports, included as appendices to this report.

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LIST OF ACRONYMS AND ABBREVIATIONS

BS	Blank Spike
CAMDS	Chemical Agent Munitions Disposal System
CCC	Continuing Calibration Check
CMA	Chemical Materials Agency
CCV	Continuing Calibration Verification
COC	Chain-of-Custody
DCD	Deseret Chemical Depot
DSHW	Department of Environmental Quality (State of Utah), Division of Solid and Hazardous Waste
EC/B FAC	Edgewood Chemical Biological Forensic Analytical Center, Edgewood, MD
EG&G	EG&G Defense Materials, Inc.
EPA	U.S. Environmental Protection Agency
GC/MS	Gas Chromatograph/Mass Spectrometry
HHRA	Human Health Risk Assessment
ICP/MS	Inductively Coupled Plasma/Mass Spectrometry
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
OMF	Oquirrh Mountain Facility
PMACWA	U.S. Army Program Manager for Assembled Chemical Weapons Alternatives
PQL	Practical Quantitation Limit
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCC	Quality Control Criteria
RPD	Relative Percent Difference
SVOC	Semi-volatile Organic Compound
SW-846	Test Methods for Evaluating Solid Waste, 3rd Edition including Update III, EPA, SW-846, December 1996.
TCs	Ton Containers
TEU	Technical Escort Unit
TIC	Tentatively Identified Compound
TOCDF	Tooele Chemical Agent Disposal Facility
VOC	Volatile Organic Compound

LIST OF UNITS AND MEASUREMENTS

g	Gram
kg	Kilogram
L	Liter
µg	Microgram
mg	Milligram
mL	Milliliter
ng	Nanogram
Wt. %	Weight Percent

LIST OF CHEMICAL SYMBOLS AND FORMULAS

Agent GB	Sarin or O-Isopropyl Methyl Phosphonofluoridate
Agent VX	O-ethyl-S-(2-diisopropylaminoethyl) methylphosphonothiolate
BFB	4-bromofluorobenzene
1,2-DCE	1,2-dichloroethane
DFTPP	Decafluorotriphenylphosphine
Freon 114	1,1-Dichlorotetrafluoroethane
H	Levinstein mustard; sulfur mustard agent; non-distilled Bis (2-chloroethyl) sulfide
HCE	Hexachloroethane
HD	sulfur mustard agent; distilled Bis (2-chloroethyl) sulfide
L	Lewisite; Dichloro-(2-chlorovinyl)arsine
1,3-PDT	1,3-Propanedithiol
Q	1,2-Bis (2-chloroethylthio) ethane
T	Bis [2(2-chloroethylthio)ethyl] ether
TDG	Thiodiglycol

1.0 INTRODUCTION

The U.S. Army Chemical Materials Agency (CMA) is responsible for ensuring the safe and timely destruction of obsolete chemical weapons presently stored at designated chemical weapons storage sites. The demilitarization of the Deseret Chemical Depot (DCD) chemical stockpile takes place at the Tooele Chemical Agent Disposal Facility (TOCDF). This hazardous waste treatment facility was designed and built for the U.S. Army. The TOCDF is located within the boundaries of the DCD, 20 miles south of Tooele, Utah. EG&G Defense Materials, Inc. (EG&G) operates the TOCDF under contract to the Army.

This project was conducted at the request of the State of Utah, Department of Environmental Quality, Division of Solid and Hazardous Waste (DSHW) to provide characterization data for organic compounds and metals for distilled mustard (HD) stored in ton containers (TCs) located at the DCD.

Sampling was conducted by personnel at the U.S. Army Oquirrh Mountain Facility (OMF), formerly Chemical Agent Munitions Disposal System (CAMDS), located at the DCD, and analysis was conducted by Battelle Memorial Institute at the Edgewood Chemical Biological Forensic Analytical Center (EC/B FAC), Edgewood, Maryland.

Three separate matrices were sampled and analyzed during this project. Samples of the liquid HD; samples of the non-cohesive solids lying on top of the solid layer; and samples of the solids on the bottom of each TC were collected by OMF personnel for subsequent analysis.

The liquid HD samples were analyzed for purity, organic compounds [thiodiglycol (TDG), 1,2-dichloroethane (1,2-DCE), tetrachloroethylene, 1,1,2,2-tetrachloroethane, Bis [2(2-chloroethylthio)ethyl] ether (T), 1,2-Bis (2-chloroethylthio) ethane (Q), hexachloroethane (HCE), and Lewisite (L)], and for the metals used in the DCD Human Health Risk Assessment (HHRA). The non-cohesive solid and solid samples were only analyzed for the HHRA metals.

The liquid HD samples were also analyzed for the presence of other organic compounds that were identified as Tentatively Identified Compounds (TICs). The TICs were identified by their mass spectra and the TIC concentration estimated by comparison to the response factors for internal standards.

Historical data indicates that the HD TCs in the chemical stockpile at DCD may have previously contained other materials. Possible previous fills include phosgene, Lewisite, sulfur mustard (H) and non-chemical agent Freon 114. These TCs were drained, reconditioned by treatment with steam, and filled with distilled mustard (HD) from July 1945 to November 1946. The HD TCs were filled before Agent GB and Agent VX were available; therefore, the mustard samples were not analyzed for these agents.

Three separate, but parallel, studies were conducted in conjunction with this project. First, a stability study was conducted to demonstrate that several organic and inorganic target analytes are stable in munitions-grade HD for a period of up to approximately 150 days. Second, a study was conducted to evaluate the composition of headspace gas found in HD ton containers. Finally,

samples collected from DCD sulfur mustard (H) 155 mm projectiles during an ongoing U.S. Army Program Manager for Assembled Chemical Weapons Alternatives (PMACWA) project were collected and sent for analysis by Battelle Memorial Institute at the EC/B FAC. Twelve liquid H samples from DCD were analyzed for purity, organic compounds, and HHRA metals. In addition, twelve solid samples were analyzed for HHRA metals. The results for each of these studies are presented as separate reports, included as appendices to this report.

The general outline of this report is as follows: A general introduction to the project is presented in Section 1.0; A discussion of sample collection is presented in Section 2.0; A discussion of sample analyses, including descriptions of the analytical methods and a discussion of the results is presented in Section 3.0; A discussion of the quality assurance/quality control data is presented in Section 4.0; A summary of referenced documents is presented in Section 5.0. Supplemental information is presented in the appendices as follows: The OMF sampling report is provided in Appendix A; Laboratory analytical methods are provided in Appendix B; Laboratory analytical reports are provided in Appendix C; An in-depth QA/QC report is provided in Appendix D; The stability study report is provided in Appendix E; The headspace gas report is provided in Appendix F; and finally, the H 155 mm projectile analytical report is provided in Appendix G.

2.0 SAMPLE COLLECTION

The Mustard Sampling and Analysis Quality Assurance Project Plan (QAPP)[1] discussed the population of HD TCs stored at DCD and provided a justification, based on the Simple Exceedance Rule outlined in the RCRA Waste Sampling Draft Technical Guidance,[2] for the number of samples collected during this project by the OMF personnel. From the population of 6,397 Mustard TCs (211 unique lots), 62 TCs were randomly selected with limitations that 1) only one TC was selected from a given lot; and 2) TCs were selected to minimize movement within storage igloos for safety reasons. An additional 28 TCs were selected based on the solids level in the TCs, as had been previously determined by ultrasonic testing. The TCs selected by solids level were chosen to have a statistical solids distribution similar to the DCD HD TC population as a whole.

A review of the lot information after the selection of the first 90 TCs revealed two lots with non-standard numbering. It was decided to collect a sample from each of these lots to ensure there were no special problems associated with these two lots. This resulted in the number of TCs sampled to be increased to 92.

The data from the first half of the TC analytical results were reviewed and several samples were found to contain mercury. It was decided to collect a small additional number of samples to see if the mercury contamination was lot specific or random. Three lots were selected for additional testing. Two additional samples were collected from each of these lots for a total of six additional samples. This resulted in the number of TCs sampled to be increased to 98.

Table 2.1 compares the TCs originally planned for sampling and identifies those actually sampled during the project.

Sampling for this project was conducted by OMF personnel in accordance with Work Plan 21-05, HD Ton Container Sampling.[3] Technical Report 21-07, HD Ton Container Sampling[4] provides a discussion of the sampling methods and activities associated with this project (Appendix A).

Three separate matrices were sampled and analyzed during this project – liquid HD; non-cohesive solids lying on top of the solid layer; and solids from the bottom of each TC. A minimum of one analysis was conducted for each of the three matrices for each TC. An evaluation of the visual observations and photographs recorded by OMF (Appendix A, pp. A-21 to A-43) and the analytical data summarized in Section 3.2 indicates that there are only liquid HD and solids in the bottom of the TCs. The sample matrix collected as non-cohesive solids was a mixture of liquid HD and the loosely adhered solids that are not different from the solids on the bottom of the TCs.

Table 2-1. Ton Containers Sampled

	Lot Number	TC Number	Sample Date		Lot Number	TC Number	Sample Date
1	RM-113-268	D93179	2/19/2003	50	RM-113-53	D55096	2/22/2003
2	RM-113-37	D56861	5/28/2003	51	RM-113-103	D1841	5/3/2003
3	RM-113-218	D22757	2/18/2003	52	RM-113-118	D17045	4/17/2003
4	RM-113-120	D16541	4/18/2003	53	RM-113-148	D17555	4/28/2003
5	RM-113-198	D92455	5/27/2003	54	RM-113-196	D47615	4/3/2003
6	RM-113-303	D83852	2/10/2003	55	RM-113-260	D94138	5/16/2003
7	RM-113-315	D79762	2/19/2003	56	RM-113-299	D47810	5/13/2003
8	RM-113-119	D449	5/1/2003	57	RM-113-308	D19497	5/16/2003
9	RM-113-200	D85182	2/8/2003	58	RM-113-314	D6800	5/3/2003
10	RM-113-233	D15056	1/24/2003	59	RM-113-341	D27635	5/14/2003
11	RM-113-92	D41559	2/13/2003	60	RM-113-182	D8207	2/3/2003
12	RM-113-150	D50034	2/20/2003	61	RM-113-185	D14498	2/6/2003 [2]
13	RM-113-164	D48273	5/13/2003	62	RM-113-235	D17911	2/22/2003
14	RM-113-43	D56368	2/21/2003	63	RM-113-251	D41617	4/29/2003
15	RM-113-62	D54617	5/1/2003	64	RM-113-316	D79439	1/28/2003
16	RM-113-98	D15856	2/6/2003	65	RM-113-351	D85521	1/29/2003
17	RM-113-108	D14637	2/11/2003	66	RM-113-372	D43499	4/17/2003
18	RM-113-101	D14767	2/13/2003	67	RM-113-165	D42249	1/24/2003
19	RM-113-152	D1650	1/28/2003	68	RM-113-294	D19397	2/3/2003
20	RM-113-199	D43395	5/28/2003	69	RM-113-355	D28506	2/8/2003
21	RM-113-219	D47125	2/5/2003	70	RM-113-100	D20382	5/17/2003
22	RM-113-130	D14354	2/4/2003	71	RM-113-139	D610	4/18/2003
23	RM-113-170	D46491	2/7/2003	72	RM-113-188	D44007	5/16/2003
24	RM-113-176	D51059	5/14/2003	73	RM-113-278	D46992	4/14/2003
25	RM-113-205	D50373	5/12/2003	74	RM-113-285	D10679	2/12/2003
26	RM-113-249	D94550	1/22/2003	75	RM-113-311	D46673	1/23/2003
27	RM-113-345	D81547	2/12/2003	76	RM-113-337	D15007	4/15/2003
28	RM-113-352	D38422	2/14/2003	77	RM-113-353	D43072	5/16/2003
29	RM-113-378	D52603	4/19/2003	78	RM-113-136	D7814	1/30/2003
30	RM-113-114	D21934	2/12/2003	79	RM-113-146	D8685	4/16/2003
31	RM-113-143	D19116	2/18/2003	80	RM-113-22	D47472	4/28/2003
32	RM-113-157	D48980	5/17/2003 [1]	81	RM-113-354	D27815	4/16/2003
33	RM-113-191	D49168	2/21/2003	82	RM-113-180	D45179	5/15/2003
34	RM-113-234	D45274	2/22/2003	83	RM-113-319	D82164	5/3/2003
35	RM-113-320	D52785	2/20/2003	84	RM-113-144	D14856	1/31/2003
36	RM-113-366	D80775	5/12/2003	85	RM-113-329	D43529	4/5/2003
37	RM-113-63	D54643	2/8/2003	86	RM-113-318	D46680	4/1/2003
38	RM-113-145	D22213	5/15/2003	87	RM-113-55	D56259	4/2/2003
39	RM-113-154	D79558	2/14/2003	88	RM-113-142	D14409	4/4/2003
40	RM-113-183	D613	1/29/2003	89	RM-113-257	D17164	2/10/2003
41	RM-113-264	D79202	4/3/2003	90	RM-113-231	D48309	2/5/2003
42	RM-113-310	D14944	1/23/2003	91	DD-1881-1	D77859	5/27/2003 [3]
43	RM-113-326	D19186	4/19/2003	92	RM-113-MISC	D15990	5/27/2003 [3]
44	RM-113-350	D33724	4/15/2003	93	RM-113-92	D50997	5/29/2003 [4]
45	RM-113-382	D17290	1/31/2003	94	RM-113-92	D41787	5/29/2003 [4]
46	RM-113-193	D46537	2/4/2003	95	RM-113-193	D49972	5/29/2003 [4]
47	RM-113-282	D47708	4/29/2003	96	RM-113-231	D8633	5/30/2003 [4]
48	RM-113-313	D32252	5/2/2003	97	RM-113-193	D44485	5/31/2003 [4]
49	RM-113-348	D82228	4/30/2003	98	RM-113-231	D17698	5/31/2003 [4]

[1] Initially sampled on 2/11/2003, however, samples not analyzed by the laboratory.

[2] Collected solid sample 2/7/2003

[3] Additional TC selected for sampling based on subsequent review of lot information that revealed non-standard lot numbering.

[4] Additional TC selected for sampling based on mercury detection in TC from same lot earlier in the project.

3.0 SAMPLE ANALYSES

All analyses for this project were conducted by Battelle Memorial Institute at the EC/B FAC, Edgewood, Maryland. Samples were shipped to the EC/B FAC via Tech Escort Unit (TEU) in eight separate sample sets. These sample sets were received between February 5 and June 10, 2003. Upon arrival at the EC/B FAC, the samples were checked and confirmed with the packing list. Once the packing list was checked for completeness and accuracy, the samples were logged into the FAC's chain-of-custody (COC) system for identification and positive tracking and a unique identifier was assigned to each sample. The sample identification numbers, collection dates, and receipt dates for Sample Sets 1 through 8 are summarized in Tables 3-1 through 3-8. Additional samples collected during this project specifically for the other studies, e.g., stability study, headspace gas study, etc, are not included in Tables 3-1 through 3-8, but rather are identified in the respective study reports.

In parallel with the TC mustard sample analyses, a stability study was conducted by the EC/B FAC to demonstrate that several organic (HD Purity, TDG, 1,2-DCE, tetrachloroethylene, 1,1,2,2-tetrachloroethane, T, Q, Lewisite) and inorganic (with mercury as a predictor) target analytes are stable in munitions-grade HD for a period longer than 28 days. The stability study was performed on a composite sample prepared from aliquots taken from three separate liquid samples collected from a single TC. From the composite sample, three stability study samples were prepared; one for inorganic analytes (spiked with mercury); one for non-volatile and semi-volatile analytes (spiked with TDG, T, HCE, and Lewisite); and one for volatile analytes (spiked with tetrachloroethylene and 1,1,2,2-tetrachloroethane). Generally, when the individual samples making up the composite sample had native concentrations of a target analyte above the practical quantitation limit (PQL), no additional analyte was added to the composite. Native concentrations of 1,2-DCE and Q were sufficient not to require spikes of these compounds. Inorganic analytes that were not initially planned for evaluation, but were evaluated in the end since they were present at adequate native concentrations included arsenic, chromium, copper, manganese, and nickel. Aliquots from each of the three prepared samples were analyzed initially and eight additional times over the approximately five month study period. Results of the stability study demonstrated that all target compounds, with the exception of TDG, were stable for approximately 150 days. Summary results of the stability study are included in Table 3-9. In addition, a copy of the stability study report is included as Appendix E.

While every attempt was made during the mustard characterization project to meet the 28 day holding time, there were instances where circumstances (weather-related shipment delays and reanalysis requirements) drove the final analysis beyond 28 days from sample collection. Based on the results of the stability study, it was concluded that the organic and inorganic results that exceeded the 28-day holding time limit are valid and provide an accurate indication of the target analytes for the samples collected.

Prior to this project, the expectation was that TDG would be present in munitions-grade HD at moderate concentrations and would be found at concentrations greater than the established PQL. Contrary to that expectation, TDG was not identified in any sample. Analysis of the stability study sample associated with this project has shown that spiked TDG decays exponentially over the first sixty days. Between March 17, 2003 and May 7, 2003, the TDG concentration, spiked at

19,900 mg/kg, decayed to 1,210 mg/kg. A literature review for TDG identified an article that discussed the reaction of TDG with mustard[1]. The article reports that when mustard is mixed with TDG, two molecules of TDG react with one molecule of mustard to produce a crystalline sulfonium salt. Sulfonium salts are ionic and ionic compounds are not soluble in organic solvents such as mustard.

The following reaction sequence was then proposed:

> *Moisture introduced into the TCs would hydrolyze mustard to form TDG. The TDG formed would react with mustard to form the sulfonium salt. The salt would precipitate from solution and settle to the bottom of the TCs.*

The lack of TDG in the analyzed mustard TC samples is consistent with this reaction sequence. The stability study sample illustrates the proposed reaction sequence. The TDG was spiked into a mustard sample and the TDG concentration was observed to exponentially decrease with time.

[1] E. Emmet Reid, Organic Chemistry of Bivalent Sulfur, Volume II, Chemical Publishing Co, 1960, p. 255

Table 3-1. Sample Set #1 Samples

TC Number	Sample ID	Laboratory ID	Sample Date	Receipt Date	Matrix	Note
D94550	21-03-001	030004-01424	1/22/2003	2/5/2003	Liquid	
D94550	21-03-004	030004-01425	1/22/2003	2/5/2003	Liquid	Field Duplicate
D94550	21-03-002	030004-01432	1/22/2003	2/5/2003	Non-cohesive Solid	
D94550	21-03-005	030004-01434	1/22/2003	2/5/2003	Non-cohesive Solid	Field Duplicate
D94550	21-03-003	030004-01433	1/22/2003	2/5/2003	Solid	
D94550	21-03-006	030004-01435	1/22/2003	2/5/2003	Solid	Field Duplicate
D94550	21-03-007a	030004-01406	1/27/2003	2/5/2003	Liquid	DSHW Sample
D94550	21-03-007b	030004-01407	1/27/2003	2/5/2003	Liquid	DSHW Sample
D94550	21-03-007c	030004-01408	1/27/2003	2/5/2003	Liquid	DSHW Sample
D94550	21-03-007d	030004-01409	1/27/2003	2/5/2003	Liquid	DSHW Sample
D94550	21-03-009a	030004-01416	1/27/2003	2/5/2003	Solid	DSHW Sample
D94550	21-03-009b	030004-01417	1/27/2003	2/5/2003	Solid	DSHW Sample
D94550	21-03-009c	030004-01418	1/27/2003	2/5/2003	Solid	DSHW Sample
D46673	21-03-011	030004-01427	1/23/2003	2/5/2003	Liquid	
D46673	21-03-012	030004-01436	1/23/2003	2/5/2003	Non-cohesive Solid	
D46673	21-03-013	030004-01437	1/23/2003	2/5/2003	Solid	
D46673	21-03-014a	030004-01428	1/23/2003	2/5/2003	Non-cohesive Solid	DSHW Sample
D46673	21-03-014b	030004-01429	1/23/2003	2/5/2003	Non-cohesive Solid	DSHW Sample
D46673	21-03-014c	030004-01430	1/23/2003	2/5/2003	Non-cohesive Solid	DSHW Sample
D14944	21-03-015	030004-01410	1/23/2003	2/5/2003	Liquid	
D14944	21-03-016	030004-01438	1/23/2003	2/5/2003	Non-cohesive Solid	
D14944	21-03-017	030004-01439	1/23/2003	2/5/2003	Solid	
D15056	21-03-018	030004-01411	1/24/2003	2/5/2003	Liquid	
D15056	21-03-019	030004-01419	1/24/2003	2/5/2003	Non-cohesive Solid	
D15056	21-03-020	030004-01420	1/24/2003	2/5/2003	Solid	
D42249	21-03-021	030004-01412	1/24/2003	2/5/2003	Liquid	
D42249	21-03-022	030004-01431	1/24/2003	2/5/2003	Non-cohesive Solid	
D42249	21-03-023	030004-01421	1/24/2003	2/5/2003	Solid	
D1650	21-03-024	030004-01413	1/28/2003	2/5/2003	Liquid	
D1650	21-03-025	030004-01422	1/28/2003	2/5/2003	Non-cohesive Solid	
D1650	21-03-026	030004-01423	1/28/2003	2/5/2003	Solid	
D79439	21-03-027	030004-01414	1/28/2003	2/5/2003	Liquid	
D79439	21-03-028	030004-01401	1/28/2003	2/5/2003	Non-cohesive Solid	
D79439	21-03-029	030004-01402	1/28/2003	2/5/2003	Solid	
D613	21-03-030	030004-01403	1/29/2003	2/5/2003	Liquid	
D613	21-03-031	030004-01404	1/29/2003	2/5/2003	Non-cohesive Solid	
D613	21-03-032	030004-01405	1/29/2003	2/5/2003	Solid	

Table 3-2. Sample Set #2 Samples

TC Number	Sample ID	Laboratory ID	Sample Date	Receipt Date	Matrix	Note
D85521	21-03-033	030004-01602	1/29/2003	2/20/2003	Liquid	
D85521	21-03-034	030004-01621	1/29/2003	2/20/2003	Non-cohesive Solid	
D85521	21-03-035	030004-01714	1/29/2003	2/20/2003	Solid	
D7814	21-03-036	030004-01603	1/30/2003	2/20/2003	Liquid	
D7814	21-03-037	030004-01622	1/30/2003	2/20/2003	Non-cohesive Solid	
D7814	21-03-038	030004-01715	1/30/2003	2/20/2003	Solid	
D17290	21-03-039	030004-01604	1/31/2003	2/20/2003	Liquid	
D17290	21-03-040	030004-01623	1/31/2003	2/20/2003	Non-cohesive Solid	
D17290	21-03-041	030004-01716	1/31/2003	2/20/2003	Solid	
D14856	21-03-042	030004-01605	1/31/2003	2/20/2003	Liquid	
D14856	21-03-043	030004-01624	1/31/2003	2/20/2003	Non-cohesive Solid	
D14856	21-03-044	030004-01717	1/31/2003	2/20/2003	Solid	
D8207	21-03-045	030004-01606	2/3/2003	2/20/2003	Liquid	
D8207	21-03-046	030004-01625	2/3/2003	2/20/2003	Non-cohesive Solid	
D8207	21-03-047	030004-01718	2/3/2003	2/20/2003	Solid	
D19397	21-03-048	030004-01607	2/3/2003	2/20/2003	Liquid	
D19397	21-03-049	030004-01626	2/3/2003	2/20/2003	Non-cohesive Solid	
D19397	21-03-050	030004-01719	2/3/2003	2/20/2003	Solid	
D46537	21-03-051	030004-01608	2/4/2003	2/20/2003	Liquid	
D46537	21-03-052	030004-01701	2/4/2003	2/20/2003	Non-cohesive Solid	
D46537	21-03-053	030004-01720	2/4/2003	2/20/2003	Solid	
D14354	21-03-054	030004-01609	2/4/2003	2/20/2003	Liquid	
D14354	21-03-055	030004-01702	2/4/2003	2/20/2003	Non-cohesive Solid	
D14354	21-03-056	030004-01721	2/4/2003	2/20/2003	Solid	
D48309	21-03-057	030004-01610	2/5/2003	2/20/2003	Liquid	
D48309	21-03-058	030004-01703	2/5/2003	2/20/2003	Non-cohesive Solid	
D48309	21-03-059	030004-01722	2/5/2003	2/20/2003	Solid	
D47125	21-03-060	030004-01611	2/5/2003	2/20/2003	Liquid	
D47125	21-03-061	030004-01704	2/5/2003	2/20/2003	Non-cohesive Solid	
D47125	21-03-062	030004-01723	2/5/2003	2/20/2003	Solid	
D15856	21-03-063	030004-01612	2/6/2003	2/20/2003	Liquid	
D15856	21-03-064	030004-01705	2/6/2003	2/20/2003	Non-cohesive Solid	
D15856	21-03-065	030004-01724	2/6/2003	2/20/2003	Solid	
D14498	21-03-066	030004-01613	2/6/2003	2/20/2003	Liquid	
D14498	21-03-069D	030004-01614	2/6/2003	2/20/2003	Liquid	Field Duplicate
D14498	21-03-067	030004-01706	2/6/2003	2/20/2003	Non-cohesive Solid	
D14498	21-03-070D	030004-01707	2/6/2003	2/20/2003	Non-cohesive Solid	Field Duplicate
D14498	21-03-068	030004-01725	2/7/2003	2/20/2003	Solid	
D14498	21-03-071D	030004-01801	2/7/2003	2/20/2003	Solid	Field Duplicate
D46491	21-03-072	030004-01615	2/7/2003	2/20/2003	Liquid	
D46491	21-03-073	030004-01708	2/7/2003	2/20/2003	Non-cohesive Solid	
D46491	21-03-074	030004-01802	2/7/2003	2/20/2003	Solid	
D54643	21-03-075	030004-01616	2/8/2003	2/20/2003	Liquid	
D54643	21-03-076	030004-01709	2/8/2003	2/20/2003	Non-cohesive Solid	
D54643	21-03-077	030004-01803	2/8/2003	2/20/2003	Solid	
D85182	21-03-078	030004-01617	2/8/2003	2/20/2003	Liquid	
D85182	21-03-079	030004-01710	2/8/2003	2/20/2003	Non-cohesive Solid	
D85182	21-03-080	030004-01804	2/8/2003	2/20/2003	Solid	
D28506	21-03-081	030004-01618	2/8/2003	2/20/2003	Liquid	
D28506	21-03-082	030004-01711	2/8/2003	2/20/2003	Non-cohesive Solid	
D28506	21-03-083	030004-01805	2/8/2003	2/20/2003	Solid	
D83852	21-03-084	030004-01619	2/10/2003	2/20/2003	Liquid	
D83852	21-03-085	030004-01712	2/10/2003	2/20/2003	Non-cohesive Solid	
D83852	21-03-086	030004-01806	2/10/2003	2/20/2003	Solid	
D17164	21-03-087	030004-01620	2/10/2003	2/20/2003	Liquid	
D17164	21-03-088	030004-01713	2/10/2003	2/20/2003	Non-cohesive Solid	
D17164	21-03-089	030004-01807	2/10/2003	2/20/2003	Solid	

Table 3-3. Sample Set #3 Samples

TC Number	Sample ID	Laboratory ID	Sample Date	Receipt Date	Matrix	Note
D14637	21-03-090	030004-020-01	2/11/2003	3/3/2003	Liquid	
D14637	21-03-091	030004-021-01	2/11/2003	3/3/2003	Non-cohesive Solid	
D14637	21-03-092	030004-022-01	2/11/2003	3/3/2003	Solid	
D21934	21-03-096	030004-020-03	2/12/2003	3/3/2003	Liquid	
D21934	21-03-097	030004-021-03	2/12/2003	3/3/2003	Non-cohesive Solid	
D21934	21-03-098	030004-022-03	2/12/2003	3/3/2003	Solid	
D10679	21-03-099	030004-020-04	2/12/2003	3/3/2003	Liquid	
D10679	21-03-100	030004-021-04	2/12/2003	3/3/2003	Non-cohesive Solid	
D10679	21-03-101	030004-022-04	2/12/2003	3/3/2003	Solid	
D81547	21-03-102	030004-020-05	2/12/2003	3/3/2003	Liquid	
D81547	21-03-103	030004-021-05	2/12/2003	3/3/2003	Non-cohesive Solid	
D81547	21-03-104	030004-022-05	2/12/2003	3/3/2003	Solid	
D41559	21-03-105	030004-020-06	2/13/2003	3/3/2003	Liquid	
D41559	21-03-106	030004-021-06	2/13/2003	3/3/2003	Non-cohesive Solid	
D41559	21-03-107	030004-022-06	2/13/2003	3/3/2003	Solid	
D14767	21-03-108	030004-020-07	2/13/2003	3/3/2003	Liquid	
D14767	21-03-109	030004-021-07	2/13/2003	3/3/2003	Non-cohesive Solid	
D14767	21-03-110	030004-022-07	2/13/2003	3/3/2003	Solid	
D38422	21-03-111	030004-020-08	2/14/2003	3/3/2003	Liquid	
D38422	21-03-112	030004-021-08	2/14/2003	3/3/2003	Non-cohesive Solid	
D38422	21-03-113	030004-022-08	2/14/2003	3/3/2003	Solid	
D79558	21-03-114	030004-020-09	2/14/2003	3/3/2003	Liquid	
D79558	21-03-115	030004-021-09	2/14/2003	3/3/2003	Non-cohesive Solid	
D79558	21-03-116	030004-022-09	2/14/2003	3/3/2003	Solid	
D19116	21-03-117	030004-020-10	2/18/2003	3/3/2003	Liquid	
D19116	21-03-118	030004-021-10	2/18/2003	3/3/2003	Non-cohesive Solid	
D19116	21-03-119	030004-022-10	2/18/2003	3/3/2003	Solid	
D22757	21-03-120	030004-020-11	2/18/2003	3/3/2003	Liquid	
D22757	21-03-121	030004-021-11	2/18/2003	3/3/2003	Non-cohesive Solid	
D22757	21-03-122	030004-022-11	2/18/2003	3/3/2003	Solid	
D93179	21-03-123	030004-020-12	2/19/2003	3/3/2003	Liquid	
D93179	21-03-124	030004-021-12	2/19/2003	3/3/2003	Non-cohesive Solid	
D93179	21-03-125	030004-022-12	2/19/2003	3/3/2003	Solid	
D79762	21-03-126	030004-020-13	2/19/2003	3/3/2003	Liquid	
D79762	21-03-127	030004-021-13	2/19/2003	3/3/2003	Non-cohesive Solid	
D79762	21-03-128	030004-022-13	2/19/2003	3/3/2003	Solid	
D52785	21-03-129	030004-020-14	2/20/2003	3/3/2003	Liquid	
D52785	21-03-132	030004-020-15	2/20/2003	3/3/2003	Liquid	Field Duplicate
D52785	21-03-130	030004-021-14	2/20/2003	3/3/2003	Non-cohesive Solid	
D52785	21-03-133	030004-021-15	2/20/2003	3/3/2003	Non-cohesive Solid	Field Duplicate
D52785	21-03-131	030004-022-14	2/20/2003	3/3/2003	Solid	
D52785	21-03-134	030004-022-15	2/20/2003	3/3/2003	Solid	Field Duplicate
D50034	21-03-135	030004-020-16	2/20/2003	3/3/2003	Liquid	
D50034	21-03-136	030004-021-16	2/20/2003	3/3/2003	Non-cohesive Solid	
D50034	21-03-137	030004-022-16	2/20/2003	3/3/2003	Solid	
D56368	21-03-138	030004-020-17	2/21/2003	3/3/2003	Liquid	
D56368	21-03-139	030004-021-17	2/21/2003	3/3/2003	Non-cohesive Solid	
D56368	21-03-140	030004-022-17	2/21/2003	3/3/2003	Solid	
D49168	21-03-141	030004-020-18	2/21/2003	3/3/2003	Liquid	
D49168	21-03-142	030004-021-18	2/21/2003	3/3/2003	Non-cohesive Solid	
D49168	21-03-143	030004-022-18	2/21/2003	3/3/2003	Solid	
D17911	21-03-144	030004-020-19	2/22/2003	3/3/2003	Liquid	
D17911	21-03-145	030004-021-19	2/22/2003	3/3/2003	Non-cohesive Solid	
D17911	21-03-146	030004-022-19	2/22/2003	3/3/2003	Solid	
D55096	21-03-147	030004-020-20	2/22/2003	3/3/2003	Liquid	
D55096	21-03-148	030004-021-20	2/22/2003	3/3/2003	Non-cohesive Solid	
D55096	21-03-149	030004-022-20	2/22/2003	3/3/2003	Solid	
D45274	21-03-150	030004-020-21	2/22/2003	3/3/2003	Liquid	
D45274	21-03-151	030004-021-21	2/22/2003	3/3/2003	Non-cohesive Solid	
D45274	21-03-152	030004-022-21	2/22/2003	3/3/2003	Solid	

Table 3-4. Sample Set #4 Samples

TC Number	Sample ID	Laboratory ID	Sample Date	Receipt Date	Matrix	Note
D46680	21-03-154	030004-034-01	4/1/2003	4/14/2003	Liquid	
D46680	21-03-155	030004-034-02	4/1/2003	4/14/2003	Liquid	Field Duplicate
D46680	21-03-156	030004-035-01	4/1/2003	4/14/2003	Non-cohesive Solid	
D46680	21-03-157	030004-035-02	4/1/2003	4/14/2003	Non-cohesive Solid	Field Duplicate
D46680	21-03-158	030004-037-01	4/1/2003	4/14/2003	Solid	
D46680	21-03-159	030004-037-02	4/1/2003	4/14/2003	Solid	Field Duplicate
D56259	21-03-160	030004-034-03	4/2/2003	4/14/2003	Liquid	
D56259	21-03-161	030004-035-03	4/2/2003	4/14/2003	Non-cohesive Solid	
D56259	21-03-162	030004-037-03	4/2/2003	4/14/2003	Solid	
D47615	21-03-163	030004-034-04	4/3/2003	4/14/2003	Liquid	
D47615	21-03-164	030004-035-04	4/3/2003	4/14/2003	Non-cohesive Solid	
D47615	21-03-165	030004-037-04	4/3/2003	4/14/2003	Solid	
D79202	21-03-166	030004-034-05	4/3/2003	4/14/2003	Liquid	
D79202	21-03-167	030004-035-05	4/3/2003	4/14/2003	Non-cohesive Solid	
D79202	21-03-168	030004-037-05	4/3/2003	4/14/2003	Solid	
D14409	21-03-169	030004-034-06	4/4/2003	4/14/2003	Liquid	
D14409	21-03-170	030004-035-06	4/4/2003	4/14/2003	Non-cohesive Solid	
D14409	21-03-171	030004-037-06	4/4/2003	4/14/2003	Solid	
D43529	21-03-173	030004-034-07	4/5/2003	4/14/2003	Liquid	
D43529	21-03-174	030004-035-07	4/5/2003	4/14/2003	Non-cohesive Solid	
D43529	21-03-175	030004-037-07	4/5/2003	4/14/2003	Solid	

Table 3-5. Sample Set #5 Samples

TC Number	Sample ID	Laboratory ID	Sample Date	Receipt Date	Matrix	Note
D46992	21-03-177	030004-041-01	4/14/2003	4/28/2003	Liquid	
D46992	21-03-178	030004-041-02	4/14/2003	4/28/2003	Liquid	Field Duplicate
D46992	21-03-179	030004-042-01	4/14/2003	4/28/2003	Non-cohesive Solid	
D46992	21-03-180	030004-042-02	4/14/2003	4/28/2003	Non-cohesive Solid	Field Duplicate
D46992	21-03-181	030004-043-01	4/14/2003	4/28/2003	Solid	
D46992	21-03-182	030004-043-02	4/14/2003	4/28/2003	Solid	Field Duplicate
D15007	21-03-183	030004-041-03	4/15/2003	4/28/2003	Liquid	
D15007	21-03-184	030004-042-03	4/15/2003	4/28/2003	Non-cohesive Solid	
D15007	21-03-185	030004-043-03	4/15/2003	4/28/2003	Solid	
D33724	21-03-186	030004-041-04	4/15/2003	4/28/2003	Liquid	
D33724	21-03-187	030004-042-04	4/15/2003	4/28/2003	Non-cohesive Solid	
D33724	21-03-188	030004-043-04	4/15/2003	4/28/2003	Solid	
D27815	21-03-189	030004-041-05	4/16/2003	4/28/2003	Liquid	
D27815	21-03-190	030004-042-05	4/16/2003	4/28/2003	Non-cohesive Solid	
D27815	21-03-191	030004-043-05	4/16/2003	4/28/2003	Solid	
D8685	21-03-192	030004-041-06	4/16/2003	4/28/2003	Liquid	
D8685	21-03-193	030004-042-06	4/16/2003	4/28/2003	Non-cohesive Solid	
D8685	21-03-194	030004-043-06	4/16/2003	4/28/2003	Solid	
D43499	21-03-195	030004-041-07	4/17/2003	4/28/2003	Liquid	
D43499	21-03-196	030004-042-07	4/17/2003	4/28/2003	Non-cohesive Solid	
D43499	21-03-197	030004-043-07	4/17/2003	4/28/2003	Solid	
D17045	21-03-198	030004-041-08	4/17/2003	4/28/2003	Liquid	
D17045	21-03-199	030004-042-08	4/17/2003	4/28/2003	Non-cohesive Solid	
D17045	21-03-200	030004-043-08	4/17/2003	4/28/2003	Solid	
D610	21-03-201	030004-041-09	4/18/2003	4/28/2003	Liquid	
D610	21-03-202	030004-042-09	4/18/2003	4/28/2003	Non-cohesive Solid	
D610	21-03-203	030004-043-09	4/18/2003	4/28/2003	Solid	
D16541	21-03-204	030004-041-10	4/18/2003	4/28/2003	Liquid	
D16541	21-03-205	030004-042-10	4/18/2003	4/28/2003	Non-cohesive Solid	
D16541	21-03-206	030004-043-10	4/18/2003	4/28/2003	Solid	
D19186	21-03-207	030004-041-11	4/19/2003	4/28/2003	Liquid	
D19186	21-03-208	030004-042-11	4/19/2003	4/28/2003	Non-cohesive Solid	
D19186	21-03-209	030004-043-11	4/19/2003	4/28/2003	Solid	
D52603	21-03-210	030004-041-12	4/19/2003	4/28/2003	Liquid	
D52603	21-03-211	030004-042-12	4/19/2003	4/28/2003	Non-cohesive Solid	
D52603	21-03-212	030004-043-12	4/19/2003	4/28/2003	Solid	

Table 3-6. Sample Set #6 Samples

TC Number	Sample ID	Laboratory ID	Sample Date	Receipt Date	Matrix	Note
D47472	21-03-213	03-0004-050-01	4/28/2003	5/12/2003	Liquid	
D47472	21-03-214	03-0004-050-02	4/28/2003	5/12/2003	Liquid	Field Duplicate
D47472	21-03-215	03-0004-051-01	4/28/2003	5/12/2003	Non-cohesive Solid	
D47472	21-03-216	03-0004-051-02	4/28/2003	5/12/2003	Non-cohesive Solid	Field Duplicate
D47472	21-03-217	03-0004-052-01	4/28/2003	5/12/2003	Solid	
D47472	21-03-218	03-0004-052-02	4/28/2003	5/12/2003	Solid	Field Duplicate
D17555	21-03-219	03-0004-050-03	4/28/2003	5/12/2003	Liquid	
D17555	21-03-220	03-0004-051-03	4/28/2003	5/12/2003	Non-cohesive Solid	
D17555	21-03-221	03-0004-052-03	4/28/2003	5/12/2003	Solid	
D41617	21-03-222	03-0004-050-04	4/29/2003	5/12/2003	Liquid	
D41617	21-03-223	03-0004-051-04	4/29/2003	5/12/2003	Non-cohesive Solid	
D41617	21-03-224	03-0004-052-04	4/29/2003	5/12/2003	Solid	
D47708	21-03-225	03-0004-050-05	4/29/2003	5/12/2003	Liquid	
D47708	21-03-226	03-0004-051-05	4/29/2003	5/12/2003	Non-cohesive Solid	
D47708	21-03-227	03-0004-052-05	4/29/2003	5/12/2003	Solid	
D82228	21-03-228	03-0004-050-06	4/30/2003	5/12/2003	Liquid	
D82228	21-03-229	03-0004-051-06	4/30/2003	5/12/2003	Non-cohesive Solid	
D82228	21-03-230	03-0004-052-06	4/30/2003	5/12/2003	Solid	
D54617	21-03-231	03-0004-050-07	5/1/2003	5/12/2003	Liquid	
D54617	21-03-232	03-0004-051-07	5/1/2003	5/12/2003	Non-cohesive Solid	
D54617	21-03-233	03-0004-052-07	5/1/2003	5/12/2003	Solid	
D449	21-03-234	03-0004-050-08	5/1/2003	5/12/2003	Liquid	
D449	21-03-235	03-0004-051-08	5/1/2003	5/12/2003	Non-cohesive Solid	
D449	21-03-236	03-0004-052-08	5/1/2003	5/12/2003	Solid	
D32252	21-03-238	03-0004-050-09	5/2/2003	5/12/2003	Liquid	
D32252	21-03-239	03-0004-051-09	5/2/2003	5/12/2003	Non-cohesive Solid	
D32252	21-03-240	03-0004-052-09	5/2/2003	5/12/2003	Solid	
D6800	21-03-241	03-0004-050-10	5/3/2003	5/12/2003	Liquid	
D6800	21-03-242	03-0004-051-10	5/3/2003	5/12/2003	Non-cohesive Solid	
D6800	21-03-243	03-0004-052-10	5/3/2003	5/12/2003	Solid	
D82164	21-03-244	03-0004-050-11	5/3/2003	5/12/2003	Liquid	
D82164	21-03-245	03-0004-051-11	5/3/2003	5/12/2003	Non-cohesive Solid	
D82164	21-03-246	03-0004-052-11	5/3/2003	5/12/2003	Solid	
D1841	21-03-247	03-0004-050-12	5/3/2003	5/12/2003	Liquid	
D1841	21-03-248	03-0004-051-12	5/3/2003	5/12/2003	Non-cohesive Solid	
D1841	21-03-249	03-0004-052-12	5/3/2003	5/12/2003	Solid	

Table 3-7. Sample Set #7 Samples

TC Number	Sample ID	Laboratory ID	Sample Date	Receipt Date	Matrix	Note
D50373	21-03-251A	030004-58-01	5/12/2003	5/27/2003	Liquid	DSHW Sample
D50373	21-03-251B	030004-58-02	5/12/2003	5/27/2003	Liquid	DSHW Sample
D50373	21-03-251C	030004-58-03	5/12/2003	5/27/2003	Liquid	DSHW Sample
D50373	21-03-251D	030004-58-04	5/12/2003	5/27/2003	Liquid	DSHW Sample
D50373	21-03-251E	030004-58-05	5/12/2003	5/27/2003	Liquid	DSHW Sample
D50373	21-03-252A	030004-59-01	5/12/2003	5/27/2003	Non-cohesive Solid	DSHW Sample
D50373	21-03-252B	030004-59-02	5/12/2003	5/27/2003	Non-cohesive Solid	DSHW Sample
D50373	21-03-252C	030004-59-03	5/12/2003	5/27/2003	Non-cohesive Solid	DSHW Sample
D50373	21-03-252D	030004-59-04	5/12/2003	5/27/2003	Non-cohesive Solid	DSHW Sample
D50373	21-03-253A	030004-60-01	5/12/2003	5/27/2003	Solid	DSHW Sample
D50373	21-03-253B	030004-60-02	5/12/2003	5/27/2003	Solid	DSHW Sample
D50373	21-03-253C	030004-60-03	5/12/2003	5/27/2003	Solid	DSHW Sample
D50373	21-03-253D	030004-60-04	5/12/2003	5/27/2003	Solid	DSHW Sample
D50373	21-03-254	030004-58-06	5/12/2003	5/27/2003	Liquid	
D50373	21-03-255	030004-58-07	5/12/2003	5/27/2003	Liquid	Field Duplicate
D50373	21-03-256	030004-59-05	5/12/2003	5/27/2003	Non-cohesive Solid	
D50373	21-03-257	030004-59-06	5/12/2003	5/27/2003	Non-cohesive Solid	Field Duplicate
D50373	21-03-258	030004-60-05	5/12/2003	5/27/2003	Solid	
D50373	21-03-259	030004-60-06	5/12/2003	5/27/2003	Solid	Field Duplicate
D80775	21-03-262	030004-58-08	5/12/2003	5/27/2003	Liquid	
D80775	21-03-263	030004-59-07	5/12/2003	5/27/2003	Non-cohesive Solid	
D80775	21-03-264	030004-60-07	5/12/2003	5/27/2003	Solid	
D47810	21-03-265	030004-58-09	5/13/2003	5/27/2003	Liquid	
D47810	21-03-266	030004-59-08	5/13/2003	5/27/2003	Non-cohesive Solid	
D47810	21-03-267	030004-60-08	5/13/2003	5/27/2003	Solid	
D48273	21-03-269	030004-58-10	5/13/2003	5/27/2003	Liquid	
D48273	21-03-270	030004-59-09	5/13/2003	5/27/2003	Non-cohesive Solid	
D48273	21-03-271	030004-60-09	5/13/2003	5/27/2003	Solid	
D51059	21-03-273	030004-58-11	5/14/2003	5/27/2003	Liquid	
D51059	21-03-274	030004-59-10	5/14/2003	5/27/2003	Non-cohesive Solid	
D51059	21-03-275	030004-60-10	5/14/2003	5/27/2003	Solid	
D27635	21-03-276	030004-58-12	5/14/2003	5/27/2003	Liquid	
D27635	21-03-277	030004-59-11	5/14/2003	5/27/2003	Non-cohesive Solid	
D27635	21-03-278	030004-60-11	5/14/2003	5/27/2003	Solid	
D22213	21-03-279	030004-58-13	5/15/2003	5/27/2003	Liquid	
D22213	21-03-280	030004-59-12	5/15/2003	5/27/2003	Non-cohesive Solid	
D22213	21-03-281	030004-60-12	5/15/2003	5/27/2003	Solid	
D45179	21-03-282	030004-58-14	5/15/2003	5/27/2003	Liquid	
D45179	21-03-283	030004-59-13	5/15/2003	5/27/2003	Non-cohesive Solid	
D45179	21-03-284	030004-60-13	5/15/2003	5/27/2003	Solid	
D19497	21-03-286	030004-58-15	5/16/2003	5/27/2003	Liquid	
D19497	21-03-287	030004-59-14	5/16/2003	5/27/2003	Non-cohesive Solid	
D19497	21-03-288	030004-60-14	5/16/2003	5/27/2003	Solid	
D43072	21-03-290	030004-58-16	5/16/2003	5/27/2003	Liquid	
D43072	21-03-291	030004-59-15	5/16/2003	5/27/2003	Non-cohesive Solid	
D43072	21-03-292	030004-60-15	5/16/2003	5/27/2003	Solid	
D44007	21-03-294	030004-58-17	5/16/2003	5/27/2003	Liquid	
D44007	21-03-295	030004-59-16	5/16/2003	5/27/2003	Non-cohesive Solid	
D44007	21-03-296	030004-60-16	5/16/2003	5/27/2003	Solid	
D94138	21-03-298	030004-58-18	5/16/2003	5/27/2003	Liquid	
D94138	21-03-299	030004-59-17	5/16/2003	5/27/2003	Non-cohesive Solid	
D94138	21-03-300	030004-60-17	5/16/2003	5/27/2003	Solid	
D48980	21-03-301	030004-58-19	5/17/2003	5/27/2003	Liquid	
D48980	21-03-302	030004-59-18	5/17/2003	5/27/2003	Non-cohesive Solid	
D48980	21-03-303	030004-60-18	5/17/2003	5/27/2003	Solid	
D20382	21-03-304	030004-58-20	5/17/2003	5/27/2003	Liquid	
D20382	21-03-305	030004-59-19	5/17/2003	5/27/2003	Non-cohesive Solid	
D20382	21-03-306	030004-60-19	5/17/2003	5/27/2003	Solid	

Table 3-8. Sample Set #8 Samples

TC Number	Sample ID	Laboratory ID	Sample Date	Receipt Date	Matrix	Note
D77859	21-03-307	03-0004-068-01	5/27/2003	6/10/2003	Liquid	
D77859	21-03-308	03-0004-068-02	5/27/2003	6/10/2003	Liquid	Field Duplicate
D77859	21-03-309	03-0004-069-01	5/27/2003	6/10/2003	Non-cohesive Solid	
D77859	21-03-310	03-0004-069-02	5/27/2003	6/10/2003	Non-cohesive Solid	Field Duplicate
D77859	21-03-311	03-0004-070-01	5/27/2003	6/10/2003	Solid	
D77859	21-03-312	03-0004-070-02	5/27/2003	6/10/2003	Solid	Field Duplicate
D15990	21-03-313	03-0004-068-03	5/27/2003	6/10/2003	Liquid	
D15990	21-03-314	03-0004-069-03	5/27/2003	6/10/2003	Non-cohesive Solid	
D15990	21-03-315	03-0004-070-03	5/27/2003	6/10/2003	Solid	
D92455	21-03-316	03-0004-068-04	5/27/2003	6/10/2003	Liquid	
D92455	21-03-317	03-0004-069-04	5/27/2003	6/10/2003	Non-cohesive Solid	
D92455	21-03-318	03-0004-070-04	5/27/2003	6/10/2003	Solid	
D56861	21-03-319	03-0004-068-05	5/28/2003	6/10/2003	Liquid	
D56861	21-03-320	03-0004-069-05	5/28/2003	6/10/2003	Non-cohesive Solid	
D56861	21-03-321	03-0004-070-05	5/28/2003	6/10/2003	Solid	
D43395	21-03-322	03-0004-068-06	5/28/2003	6/10/2003	Liquid	
D43395	21-03-323	03-0004-069-06	5/28/2003	6/10/2003	Non-cohesive Solid	
D43395	21-03-324	03-0004-070-06	5/28/2003	6/10/2003	Solid	
D49972	21-03-325	03-0004-068-07	5/29/2003	6/10/2003	Liquid	
D49972	21-03-326	03-0004-069-07	5/29/2003	6/10/2003	Non-cohesive Solid	
D49972	21-03-327	03-0004-070-07	5/29/2003	6/10/2003	Solid	
D41787	21-03-329	03-0004-068-08	5/29/2003	6/10/2003	Liquid	
D41787	21-03-330	03-0004-069-08	5/29/2003	6/10/2003	Non-cohesive Solid	
D41787	21-03-331	03-0004-070-08	5/29/2003	6/10/2003	Solid	
D50997	21-03-333	03-0004-068-09	5/29/2003	6/10/2003	Liquid	
D50997	21-03-334	03-0004-069-09	5/29/2003	6/10/2003	Non-cohesive Solid	
D50997	21-03-335	03-0004-070-09	5/29/2003	6/10/2003	Solid	
D8633	21-03-337	03-0004-068-10	5/30/2003	6/10/2003	Liquid	
D8633	21-03-338	03-0004-069-10	5/30/2003	6/10/2003	Non-cohesive Solid	
D8633	21-03-339	03-0004-070-10	5/30/2003	6/10/2003	Solid	
D44485	21-03-341	03-0004-068-11	5/31/2003	6/10/2003	Liquid	
D44485	21-03-342	03-0004-069-11	5/31/2003	6/10/2003	Non-cohesive Solid	
D44485	21-03-343	03-0004-070-11	5/31/2003	6/10/2003	Solid	
D17698	21-03-345	03-0004-068-12	5/31/2003	6/10/2003	Liquid	
D17698	21-03-346	03-0004-069-12	5/31/2003	6/10/2003	Non-cohesive Solid	
D17698	21-03-347	03-0004-070-12	5/31/2003	6/10/2003	Solid	

Table 3-9. Stability Study Results

Target	Spiked or Native Concentration	Initial Concentration	Standard Deviation	Study Period (days)
Bis (2-chloroethyl) sulfide	Native Concentration	86.8 Wt. %	5.1 Wt. %	146
Thiodiglycol	Spiked	0.669 Wt. %	Not Stable	145
1,2-Dichloroethane	Native Concentration	0.573 Wt. %	0.055 Wt. %	149
Tetrachloroethylene	Spiked	1.06 Wt. %	0.077 Wt. %	149
1,1,2,2-Tetrachloroethane	Spiked	1.54 Wt. %	0.095 Wt. %	149
T	Spiked	1.04 Wt. %	0.15 Wt. %	151
Q	Native Concentration	5.47 Wt. %	0.54 Wt. %	151
Hexachloroethane	Spiked	1.05 Wt. %	0.12 Wt. %	151
Lewisite	Spiked	232 mg/kg	47 mg/kg	151
Arsenic	Native Concentration	4.3 J mg/kg	0.9 mg/kg	152
Chromium	Native Concentration	8.22 mg/kg	4.6 mg/kg	152
Copper	Native Concentration	89.7 mg/kg	4.8 mg/kg	152
Manganese	Native Concentration	1.78 mg/kg	0.48 mg/kg	152
Mercury	Spiked	4.41 mg/kg	0.28 mg/kg	152
Nickel	Native Concentration	5.52 mg/kg	1.9 mg/kg	152

3.1 ANALYTICAL METHODS

The EC/B FAC developed and validated six analytical methods (Appendix B) to characterize the mustard samples for this project. These methods were used to determine HHRA total metals, agent purity, Lewisite, and volatile, semi-volatile, and nonvolatile organic compounds (TDG, 1,2-DCE, tetrachloroethylene, 1,1,2,2-tetrachloroethane, T, Q, and HCE) present in the liquid HD samples. The metals method was also used to determine the total HHRA metals present in the non-cohesive solid and solid HD samples.

3.1.1 Inorganic Analytical Method

Liquid HD, non-cohesive solid, and solid samples were analyzed for total HHRA metals by Inductively Coupled Plasma/Mass Spectrometry (ICP/MS) using EC/B FAC Method AM-118, Rev. 2, *Determination of Metals in Chemical Agent/Chemical Agent Sludge by Microwave Digestion Inductively Coupled Plasma/Mass Spectrometry (ICP/MS)*. This method includes preparation of samples using microwave digestion. A copy of this method is included as Appendix B-1.

3.1.2 Organic Analytical Methods

Samples of liquid HD were analyzed for organic compounds using five different gas chromatograph/mass spectrometry (GC/MS) analysis methods. Target compounds for these methods were HD purity, TDG, 1,2-DCE, tetrachloroethylene, 1,1,2,2-tetrachloroethane, T, Q, HCE, and Lewisite. The methods used for this project include:

EC/B FAC Method AM-098, Rev. 1, *Determination of Bis(2-chloroethyl) sulfide (HD) Purity by Gas Chromatography Mass Spectrometry*. This GC/MS method, based on SW-846, Methods 3585 and 8270C, was used to determine the purity of the liquid HD samples by diluting each sample and injecting an aliquot into a GC/MS for quantitation. A copy of this method is included as Appendix B-2.

EC/B FAC Method AM-100, Rev. 1, *Determination of Selected Non-Volatile Contaminants in HD by Gas Chromatography Mass Spectrometry*. This GC/MS method, based on SW-846, Method 8270C, was used to determine the TDG concentration in the liquid HD samples. The samples were derivatized and then analyzed by GC/MS. This method was also used to determine non-volatile TICs. A copy of this method is included as Appendix B-3.

EC/B FAC Method AM-101, Rev. 2, *Determination of Selected Volatile Contaminants in HD by Gas Chromatography Mass Spectrometry*. This GC/MS method, based on SW-846, Methods 3585 and 8260B, was used to identify volatile organic compounds (VOCs) in the liquid HD samples by dilution of each sample in hexadecane followed by direct injection into a GC/MS. The target compounds for this method were 1,2-DCE, tetrachloroethylene and 1,1,2,2-tetrachloroethane. This method was also used to determine volatile TICs. A copy of this method is included as Appendix B-4.

EC/B FAC Method AM-117, Rev. 1, *Determination of Selected Semi-Volatile Contaminants in HD by Gas Chromatography Mass Spectrometry*. This GC/MS method, based on SW-846, Methods 3585 and 8270C, was used to identify semi-volatile organic compounds (SVOCs) in the liquid HD samples. An internal standard mixture (d_4-1,4-dichlorobenzene, d_{10}-acenaphthene and d_{10}-phenanthrene) was used to calculate concentrations of the target compounds. The target compounds for this method were T, Q, and HCE. This method was also used to determine semi-volatile TICs. A copy of this method is included as Appendix B-5.

EC/B FAC Method AM-126, Rev. 3, *Determination of Chemical Agent Lewisite (L) in Neat Chemical Agent Mustard (HD) Matrix by Gas Chromatography Mass Spectrometry*. This GC/MS method, based on SW-846, Method 8270C, was used to analyze the liquid HD samples for Lewisite. Each sample was diluted in methylene chloride and derivatized prior to subsequent dilution and analysis. An internal standard mixture (d_4-1,4-dichlorobenzene, d_{10}-acenaphthene and d_{10}-phenanthrene) was used to calculate the Lewisite concentration. A copy of this method is included as Appendix B-6.

3.1.3 Changes to Analytical Methods

Several changes were made to the analytical methods during this project. These changes were driven primarily by the difference in target compound concentrations in munitions-grade HD as opposed to CASARM-grade HD, which was used to develop the methods. This section summarizes the changes made to the affected methods.

Method AM-118 (Metals)

1. The upper calibration range for most metals were increased from 100 to 500 ng/mL to bracket native sample concentrations. Aluminum was increased to 5000 ng/mL. The concentrations in the continuing calibration verification (CCV) standard were increased for most elements to be more representative of a mid-point level for the new calibration range.

2. Added PQL values for all elements. Some method detection limit (MDL) and instrument detection limit (IDL) values were updated based on more recent performance studies.

3. The total acquisition time was decreased from 223 seconds to 90 seconds to maintain instrument cleanliness. This was primarily achieved by reducing the number of sample repetitions from 5 to 3. The rinse time between samples was increased from 30 seconds to approximately 90 seconds to maintain instrument cleanliness.

Method AM-101 (Volatiles)

1. Concentrations of 1,2-DCE were expected to exceed the standard curve originally validated by Method AM-101 (0.5 – 50 µg/mL). A curve containing five points but at higher levels was analyzed. The higher curve (5 – 500 µg/mL) was linear. The highest MDL value for the method was 1,2-DCE at 2.6 µg/mL, therefore the PQL was set at 5.0 µg/mL.

Method AM-117 (Semi-Volatiles)

1. Due to the non-linearity of T at low levels, the original PQL value of 2.5 μg/mL was revised to 25 μg/mL. The method was revised to analyze T with a quadratic 6-point curve (not passing through zero). The original matrix spike (MS) and matrix spike duplicate (MSD) spike concentrations were below the revised linear range at 10 μg/mL. The spike concentrations were increased to 100 μg/mL.

2. Concentrations of Q were expected to exceed the standard curve originally validated by Method AM-117 (0.5 – 100 μg/mL). The new five-point calibration curve for Q ranged from 25 μg/mL to 500 μg/mL. The PQL was revised to 25.0 μg/mL. Also, due to the high native concentration of Q in the samples, the MS and MSD spiking concentration was increased from 100 μg/mL to 500 μg/mL.

Method AM-126 (Lewisite)

1. It was determined that an insufficient amount of derivatization agent [1,3-Propanedithiol (1,3-PDT)] was being added. The procedure was modified to add 10 μL of neat 1,3-PDT to each sample just prior to GC/MS analysis.

2. The calibration curve for Lewisite was revised to a quadratic (not passing through zero) curve fit. After investigation, it was decided that a quadratic curve best represented the existing data. Six concentration levels were used in the calibration curve. This meets the minimal requirements specified in SW-846, Method 8000B.

3.2 SUMMARY AND DISCUSSION OF RESULTS

The organic and inorganic analytical results for the samples are summarized in Tables 3-10 through 3-20. Table 3-10 provides an overall summary of results, including the average, maximum, and minimum values for each target analyte for each of the three matrices, excluding field duplicate samples and samples containing blind spikes prepared by the Utah DSHW. Table 3-11 provides a summary of the TIC results, including the eight compounds identified on a recurring basis during the TIC identification process, their frequency of occurrence within the population of samples, and their average, maximum, and minimum values. Table 3-12 provides a summary and explanation of data flags used to qualify data in Tables 3-13 through 3-20. Tables 3-13 through 3-20 provide the specific analytical results for each individual sample, excluding the DSHW-spiked samples. Results for the DSHW-spiked samples are provided in Section 4.0 (Quality Assurance/Quality Control Data Evaluation).

As described in the QAPP,[1] the TCs used for this project were selected to have a distribution of heel depths similar to the general population of DCD HD TCs. Figure 3-1 provides a comparison of organic results for the liquid HD samples analyzed during this project, sorted by solids depth in the TCs. Figures 3-2 through 3-21 provide a comparison of inorganic results for the liquid, non-cohesive solid, and solid samples analyzed during this project, sorted by solids depth in the TCs. Copies of the EC/B FAC analytical reports are included as Appendix C.

3.2.1 Inorganic Analyses

All samples – liquid, non-cohesive solid, and solid – were analyzed for total HHRA metals. The inorganic target analytes were aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, tin, vanadium, and zinc. The samples were analyzed in accordance with the ICP/MS method described in Section 3.1.1.

No single inorganic target analyte was detected in all liquid samples. Inorganic target analytes with detectable concentrations in one or more liquid samples include aluminum, antimony, arsenic, barium, boron, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc.

Inorganic target analytes with detectable concentrations in all non-cohesive solid samples include cadmium, 0.262 mg/kg average; and chromium, 28.1 mg/kg average. Inorganic target analytes with detectable concentrations in at least one non-cohesive solid sample included all HHRA metals.

Inorganic target analytes with detectable concentrations in all solid samples include chromium, 47.1 mg/kg average; cobalt, 7.12 mg/kg average; copper, 159 mg/kg average; lead, 64.2 mg/kg average; manganese, 411 mg/kg average; nickel, 84.4 mg/kg average; tin, 9.58 mg/kg average; and zinc, 233 mg/kg average. Inorganic target analytes with detectable concentrations in at least one solid sample included all HHRA metals.

Based on the identification of mercury in samples from the first half of the ton containers analyzed, it was decided that a small number of additional samples would be collected to see if the mercury contamination was lot specific or random. Three lots were selected for additional testing. Two additional samples were collected from each of these lots for a total of six additional samples. Table 3-21 provides the results for all of the samples containing mercury above the PQL. It appears that mercury contamination may be lot specific. Two of the lots selected for additional sampling had mercury in the additional samples collected. The third lot did not have mercury in the additional samples.

3.2.2 Organic Analyses

All liquid samples were analyzed for the organic target analytes. The organic target analytes were HD purity, TDG, 1,2-DCE, tetrachloroethylene, 1,1,2,2-tetrachloroethane, T, Q, HCE, and Lewisite. The samples were analyzed in accordance with the GC/MS methods described in Section 3.1.2.

Organic target analytes with detectable concentrations in all liquid samples include 1,2-DCE, 0.649 Wt. % average; and Q, 3.20 Wt. % average. Organic target analytes with detectable concentrations in at least one sample include 1,2-DCE, tetrachloroethylene, T, Q, and Lewisite. The average HD purity for all liquid samples, excluding field duplicates and DSHW-spiked samples, was 89.0 Wt. %.

In addition to the organic target analytes, TICs were identified using the non-volatile, semi-volatile, and volatile compound GC/MS methods. Identification was made for those compounds that met the criteria outlined in the QAPP.[1] Peaks were identified in the GC/MS chromatograms that were at least 10% of the area of the nearest internal standard. An agreement with known spectra of at least 80% was used as positive identification as a TIC. The updated Treaty mass spectral library, which contains over 300 chemical agent and related compounds, was used to identify the TICs.

Lewisite was first identified in liquid samples during analyses for Sample Set #1 (sample 21-03-021) and Sample Set #2 (sample 21-03-051). Based on a Utah DSHW request, the non-cohesive solid and solid samples collected from the same ton containers as the liquid samples were also analyzed for Lewisite. The results of these analyses are provided in Table 3-22. Lewisite was detected in these samples at a level above the MDL, but below the PQL.

Table 3-10. Mustard Composition Summary

	Liquid Sample Statistics [a]			Non-Cohesive Soil Statistics [a]			Solid Sample Statistics [a]		
	Average [b]	Maximum [c]	Minimum [c]	Average [b]	Maximum [c]	Minimum [c]	Average [b]	Maximum [c]	Minimum [c]
Organic Compounds									
Bis(2-chloroethyl)sulfide (HD), Wt.%	89.0	101	78.7						
Thiodiglycol, Wt.%	< 0.026	< 0.029 U	< 0.022 U						
1,2-dichloroethane (DCE), Wt.%	0.649	1.06	0.197						
Tetrachloroethylene, Wt.%	< 0.050	0.0734	0.013 J						
1,1,2,2-tetrachloroethane, Wt.%	< 0.052	< 0.059 U	< 0.047 U						
T, Wt.%	< 0.17	0.355	0.041 J						
Q, Wt.%	3.20	5.66	0.467						
Hexachloroethane (HCE), Wt.%	< 0.20	< 0.29 U	< 0.025 U						
Lewisite (L), mg/kg	< 5.7	21.8	2.8 J						
Metals									
Aluminum, mg/kg	< 38	< 56 U	12 J	< 36	183	9.9 J	< 65	2930	10 J
Antimony, mg/kg	< 5.1	< 5.6 U	1.2 J	< 1.9	< 5.6 U	0.14 J	< 2.7	64.6	0.18 J
Arsenic, mg/kg	< 7.6	54.7	1.3 J	< 243	6350	0.65 J	< 535	12900	0.94 J
Barium, mg/kg	< 5.1	< 5.6 U	0.44 J	< 1.5	47.1	0.038 J	< 1.3	14.2	0.047 J
Beryllium, mg/kg	< 5.2	< 5.6 U	< 4.6 U	< 4.7	< 5.6 U	0.051 J	< 4.9	< 5.6 U	0.057 J
Boron, mg/kg	< 9.4	< 11 U	4.0 J	< 10	< 11 U	4.2 J	< 9.6	< 11 U	4.0 J
Cadmium, mg/kg	< 5.2	< 5.6 U	< 4.6 U	0.262	0.96 J	0.13 J	< 0.93	< 5.3 U	0.049 J
Chromium, mg/kg	< 4.7	29.9	1.4 J	28.1	184	1.1 J	47.1	397	9.28
Cobalt, mg/kg	< 1.0	< 1.1 U	0.33 J	< 4.0	18.0	0.16 J	7.12	27.1	2.13
Copper, mg/kg	< 37	84.3	4.5 J	< 46	195	5.6 J	159	2350	4.1 J
Lead, mg/kg	< 4.7	< 5.6 U	0.47 J	< 37	1340	1.9 J	64.2	625	8.1 J
Manganese, mg/kg	< 1.8	6.49	0.33 J	< 213	777	3.5 J	411	1960	71.5
Mercury, mg/kg	< 4.6	65.0	0.055 J	< 213	2910	0.077 J	< 449	10300	0.081 J
Nickel, mg/kg	< 3.3	15.7	0.36 J	< 46	591	1.2 J	84.4	1230	8.99
Selenium, mg/kg	< 10	< 11 U	1.2 J	< 25	< 28 U	1.1 J	< 25	< 28 U	1.0 J
Silver, mg/kg	< 5.1	< 5.6 U	1.7 J	< 4.8	< 5.6 U	0.060 J	< 4.4	< 5.6 U	0.062 J
Thallium, mg/kg	< 5.2	< 5.6 U	< 4.6 U	< 5.0	< 5.6 U	0.34 J	< 5.1	< 5.6 U	0.41 J
Tin, mg/kg	< 10	< 11 U	< 9.3 U	< 5.6	26.3	0.49 J	9.58	88.8	1.0 J
Vanadium, mg/kg	< 3.1	< 5.5 U	0.94 J	< 3.3	< 5.6 U	0.98 J	< 3.6	< 5.6 U	0.98 J
Zinc, mg/kg	< 9.8	29.4	3.2 J	< 67	1430	2.2 J	233	4950	2.6 J

Notes: J - Result estimated since value was between the MDL and PQL.
U - Analyte not detected above the MDL, results reported as less than the PQL.

[a] Statistics do not include results from field duplicate samples or DSHW-spiked samples.

[b] The average value includes not-detected results at the <PQL value. Results with J-qualifiers were included.

[c] The <PQL value was used for all not-detected results. Results with J-qualifiers were included.

Table 3-11. Mustard TIC Summary

Compound	Liquid Sample Statistics [a]			
	Frequency of Identification	Maximum	Minimum	Average
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	98%	3.0	0.079	0.51
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	98%	1.6	0.080	0.26
Bis (3-chloropropyl) sulfide, Wt.%	82%	1.0	0.043	0.19
1,4-Dithiane, Wt.%	80%	5.6	0.028	1.1
1,4-Thioxane, Wt.%	52%	0.97	0.083	0.26
1,2,5-Trithiepane, Wt.%	28%	0.59	0.081	0.21
Bis (2-chloroethyl) trisulfide, Wt.%	17%	0.37	0.050	0.20
Bis (2-chloroethyl) disulfide, Wt.%	5%	0.86	0.090	0.32

Note: [a] Statistics do not include results from field duplicate samples.

Table 3-12. Explanation of Data Flags

Flag	Explanation
J	Result estimated since value was between the MDL and the PQL.
U	Analyte not detected above the MDL, results reported as less than the PQL.
H	Analysis conducted past 28-day holding time; result considered valid based on Stability Study results.
NR	Not reported since the compound did not meet the criteria for reporting. (Flag for TICs only)
1	May be biased high based on ICV results.
2	May be biased low based on CCV results.
3	May be biased high based on CCV results.
4	May be biased low based on MS/MSD results.
5	May be biased high based on MS/MSD results.
6	May be biased low based on CRM/CRMD results.
7	May be biased high based on CRM/CRMD results.
8	May be biased low based on LCS results.
9	May be biased high based on LCS results.
10	Result estimated based on RPD.

Table 3-13. Mustard Composition of Individual Samples – Sample Set #1

Test Container Number	D94550			D94550 Field Duplicate			D46673		
Sample Identification	21-03-001	21-03-002	21-03-003	21-03-004	21-03-005	[redacted]	21-03-011	21-03-012	21-03-013
Sample Matrix	Liquid	NC Solid	Solid	Liquid	NC Solid	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	80.1			79.7			87.9 H		
Thiodiglycol, Wt.%	< 0.026 U			< 0.028 U			< 0.027 U		
1,2-dichloroethane (DCE), Wt.%	0.606 [10]			0.564 [10]			0.527 [10]		
Tetrachloroethylene, Wt.%	< 0.056 U			< 0.054 U			0.013 J		
1,1,2,2-tetrachloroethane, Wt.%	< 0.056 U			< 0.054 U			< 0.057 U		
T, Wt.%	0.070 J [4,10]			0.073 J [4,10]			0.051 J [4,10]		
Q, Wt.%	4.41 [10]			4.44 [10]			3.94 [10]		
Hexachloroethane (HCE), Wt.%	< 0.27 U			< 0.26 U			< 0.24 U		
Lewisite (L), mg/kg	< 5.0 UH			< 5.0 UH			< 4.9 UH		
Organic Compounds - TICs [a]									
1,4-Thioxane, Wt.%	NR			0.086			NR		
1,4-Dithiane, Wt.%	0.16			0.90			NR		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.21			0.26			0.21		
Bis (3-chloropropyl) sulfide, Wt.%	0.098			0.096			0.079		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.27			0.27			0.15		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	85.9			86.4			92.9		
Metals									
Aluminum, mg/kg	23 J [2]	28 J	21 JH [6]	< 53 U	< 55 U	86.0 H [6]	< 52 U	< 55 U	19 J [6]
Antimony, mg/kg	< 5.2 U	0.20 J	1.9 JH	< 5.3 U	< 5.5 U	1.8 JH	< 5.2 U	< 5.5 U	0.50 J
Arsenic, mg/kg	4.3 J	128	338 H [5]	3.8 J	131	413 H [5]	< 5.2 U	59.3	38.9 [5]
Barium, mg/kg	< 5.2 U	0.39 J	0.79 JH	< 5.3 U	0.12 J	0.68 JH	< 5.2 U	0.097 J	0.51 J
Beryllium, mg/kg	< 5.2 U	< 5.3 U	< 5.1 UH	< 5.3 U	< 5.5 U	< 4.7 UH	< 5.2 U	< 5.5 U	< 5.0 U
Boron, mg/kg	< 10 U	< 11 U	4.6 JH	< 11 U	< 11 U	< 9.4 UH	< 10 U	< 11 U	< 10 U
Cadmium, mg/kg	< 5.2 U	0.27 J	1.3 JH [10]	< 5.3 U	0.30 J	0.66 JH [10]	< 5.2 U	0.29 J	0.27 J [10]
Chromium, mg/kg	< 5.2 U	17.1	26.3 H [10]	1.7 J	8.61	27.2 H [10]	1.4 J	11.3	11.7 [10]
Cobalt, mg/kg	< 1.0 U	2.16	9.65 H [10]	< 1.1 U	2.39	9.49 H [10]	< 1.0 U	2.37	3.32 [10]
Copper, mg/kg	84.3	105	1310 H [10]	84.8	58.1	568 H [10]	53.9	61.0	190 [10]
Lead, mg/kg	< 5.2 U	7.6 J	127 H [5]	< 5.3 U	8.2 J	75.8 H [5]	< 5.2 U	7.9 J	10.1 [5]
Manganese, mg/kg	1.37	88.2	355 H	1.50	83.5	323 H	< 1.0 U	157	260
Mercury, mg/kg	< 0.52 U	0.12 J	0.759 H [5]	0.054 J	< 0.55 U	0.26 JH [5]	< 0.52 U	0.29 J	0.33 J [5]
Nickel, mg/kg	2.6 J	75.7	49.8 H [10]	2.5 J	32.4	43.0 H [10]	0.54 J	14.4	22.1 [10]
Selenium, mg/kg	< 10 U	< 26 U	1.0 JH [1,10]	< 11 U	< 27 U	1.3 JH [1,10]	< 10 U	< 28 U	1.1 J [1,10]
Silver, mg/kg	< 5.2 U	< 5.3 U	0.21 JH [1,10]	< 5.3 U	< 5.5 U	0.13 JH [1,10]	< 5.2 U	< 5.5 U	< 5.0 U
Thallium, mg/kg	< 5.2 U	< 5.3 U	< 5.1 UH [10]	< 5.3 U	< 5.5 U	< 4.7 UH	< 5.2 U	< 5.5 U	< 5.0 U
Tin, mg/kg	< 10 U	1.7 J	10.4 H [5]	< 11 U	1.6 J	13.6 H [5]	< 10 U	2.2 J	6.3 J [5]
Vanadium, mg/kg	< 5.2 U	< 5.3 U	< 5.1 UH	< 5.3 U	< 5.5 U	< 4.7 UH	< 5.2 U	< 5.5 U	< 5.0 U
Zinc, mg/kg	< 10 U	41.7	2110 H [5]	< 11 U	55.1	1190 H [5]	< 10 U	52.1	82.4 [5]

Notes: See Table 3-12 for explanation of data flags.

[a] - TIC results for samples 21-03-001 and 21-03-004 are from the original Set 1 analyses (2/7/2003).

Table 3-13. Mustard Composition of Individual Samples – Sample Set #1 (Continued)

Ton Container Number	D14944			D15054			D42249		
Sample Identification	21-03-015	21-03-016	21-03-017	21-03-018	21-03-019	[redacted]	21-03-021	21-03-022	21-03-023
Sample Matrix	Liquid	NC Solid	Solid	Liquid	NC Solid		Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	91.3 H			92.1 H			86.9 H		
Thiodiglycol, Wt.%	< 0.026 U			< 0.029 U			< 0.028 U		
1,2-dichloroethane (DCE), Wt.%	0.448 [10]			0.646 [10]			0.801 [10]		
Tetrachloroethylene, Wt.%	< 0.058 U			< 0.059 U			< 0.049 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.058 U			< 0.059 U			< 0.049 U		
T, Wt.%	< 0.27 U			0.073 J [4,10]			0.14 J [4,10]		
Q, Wt.%	1.58 [10]			4.67 [10]			3.37 [10]		
Hexachloroethane (HCE), Wt.%	< 0.27 U			< 0.26 U			< 0.26 U		
Lewisite (L), mg/kg	< 6.1 UH			< 5.1 UH			5.44 H		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			NR			0.22		
1,4-Dithiane, Wt.%	NR			NR			1.50		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.10			0.23			0.19		
Bis (3-chloropropyl) sulfide, Wt.%	NR			0.12			0.089		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.11			0.32			0.26		
1,2,5-Trithiepane, Wt.%	NR			NR			0.094		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	93.5			98.2			93.6		
Metals									
Aluminum, mg/kg	< 55 U	< 47 U	< 48 U	14 J [2]	< 51 U	17 J [6]	< 53 U	< 50 U	27 J [6]
Antimony, mg/kg	< 5.5 U	< 4.7 U	< 4.8 U	< 5.1 U	< 5.1 U	0.58 J	< 5.3 U	3.8 J	64.6
Arsenic, mg/kg	< 5.5 U	289	43.4 [5]	< 5.1 U	15.4	13.2 [5]	38.9	3330	3540 [5]
Barium, mg/kg	< 5.5 U	0.038 J	0.067 J	< 5.1 U	0.051 J	0.22 J	< 5.3 U	0.11 J	0.63 J
Beryllium, mg/kg	< 5.5 U	< 4.7 U	< 4.8 U	< 5.1 U	< 5.1 U	< 5.5 U	< 5.3 U	< 5.0 U	< 5.0 U
Boron, mg/kg	< 11 U	< 9.3 U	< 9.5 U	< 10 U	< 10 U	< 11 U	< 11 U	< 10 U	5.7 J
Cadmium, mg/kg	< 5.5 U	0.27 J	0.25 J [10]	< 5.1 U	0.25 J	0.45 J [10]	< 5.3 U	0.25 J	0.99 J [10]
Chromium, mg/kg	1.8 J	19.5	29.8 [10]	1.5 J	12.3	16.2 [10]	2.7 J	47.3	97.1 [10]
Cobalt, mg/kg	< 1.1 U	3.67	3.96 [10]	< 1.0 U	2.05	6.12 [10]	< 1.1 U	4.87	11.2 [10]
Copper, mg/kg	55.1	82.8	231 [10]	40.8	63.2	280 [10]	32.2	31.9	771 [10]
Lead, mg/kg	< 5.5 U	12.4	40.0 [5]	< 5.1 U	7.5 J	29.6 [5]	< 5.3 U	27.0	219 [5]
Manganese, mg/kg	< 1.1 U	206	258	< 1.0 U	136	500	3.47	320	555
Mercury, mg/kg	< 0.55 U	< 0.47 U	< 0.48 U	< 0.51 U	0.592	0.14 J [5]	24.5	2830	1680 [5]
Nickel, mg/kg	< 5.5 U	8.70	17.3 [10]	< 5.1 U	32.5	39.0 [10]	0.91 J	33.5	158 [10]
Selenium, mg/kg	< 11 U	< 23 U	1.1 J [1,10]	< 10 U	< 26 U	< 28 U	< 11 U	< 25 U	1.5 J [1,10]
Silver, mg/kg	< 5.5 U	< 4.7 U	< 4.8 U	< 5.1 U	< 5.1 U	< 5.5 U	< 5.3 U	< 5.0 U	0.15 J [1,10]
Thallium, mg/kg	< 5.5 U	< 4.7 U	< 4.8 U	< 5.1 U	< 5.1 U	< 5.5 U	< 5.3 U	< 5.0 U	< 5.0 U
Tin, mg/kg	< 11 U	1.1 J	2.2 J [5]	< 10 U	2.1 J	3.0 J [5]	< 11 U	11.7	88.8 [5]
Vanadium, mg/kg	< 5.5 U	< 4.7 U	< 4.8 U	< 5.1 U	< 5.1 U	< 5.5 U	< 5.3 U	< 5.0 U	< 5.0 U
Zinc, mg/kg	< 11 U	122	97.1 [5]	< 10 U	55.8	251 [5]	< 11 U	43.9	1280 [5]

Note: See Table 3-12 for explanation of data flags.

Table 3-13. Mustard Composition of Individual Samples – Sample Set #1 (Continued)

Ton Container Number	D1650			D79439			D613		
Sample Identification	21-03-024	21-03-025	21-03-026	21-03-027	21-03-028	[illegible]	21-03-030	21-03-031	21-03-032
Sample Matrix	Liquid	NC Solid	Solid	Liquid	NC Solid	[illegible]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	83.9 H			92.7 H			84.1 H		
Thiodiglycol, Wt.%	< 0.024 U			< 0.024 U			< 0.022 U		
1,2-dichloroethane (DCE), Wt.%	0.541 [10]			0.532 [10]			0.418 [10]		
Tetrachloroethylene, Wt.%	< 0.053 U			0.036 J			< 0.047 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.053 U			< 0.059 U			< 0.047 U		
T, Wt.%	0.079 J [4,10]			0.070 J [4,10]			0.056 J [4,10]		
Q, Wt.%	2.83 [10]			3.95 [10]			2.64 [10]		
Hexachloroethane (HCE), Wt.%	< 0.25 U			< 0.25 U			< 0.27 U		
Lewisite (L), mg/kg	< 5.1 UH			< 5.1 UH			< 4.6 UH		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.15			NR			NR		
1,4-Dithiane, Wt.%	1.20			NR			0.93		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.24			0.16			0.16		
Bis (3-chloropropyl) sulfide, Wt.%	0.087			0.088			NR		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.24			0.19			0.22		
1,2,5-Trithiepane, Wt.%	0.11			NR			0.11		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	89.4			97.7			88.6		
Metals									
Aluminum, mg/kg	< 52 U	< 47 U	90.9 [6]	< 53 U	< 50 U	< 50 U	< 51 U	14 J	29 J [6]
Antimony, mg/kg	< 5.2 U	1.4 J	2.0 J	< 5.3 U	0.28 J	0.86 J	< 5.1 U	1.3 J	2.5 J
Arsenic, mg/kg	< 5.2 U	11.4	10.2 [5]	< 5.3 U	33.0	62.1 [5]	< 5.1 U	13.5	12.6 [5]
Barium, mg/kg	< 5.2 U	0.050 J	2.7 J	< 5.3 U	0.81 J	0.11 J	< 5.1 U	0.45 J	0.21 J
Beryllium, mg/kg	< 5.2 U	< 4.7 U	< 4.7 U	< 5.3 U	0.63 J	< 5.0 U	< 5.1 U	0.20 J	< 5.3 U
Boron, mg/kg	< 10 U	< 9.5 U	< 9.4 U	< 11 U	5.3 J [2,8]	< 10 U	5.4 J [2,4]	< 9.7 U	< 11 U
Cadmium, mg/kg	< 5.2 U	0.21 J	0.21 J [10]	< 5.3 U	0.96 J	0.35 J [10]	< 5.1 U	0.43 J	0.26 J [10]
Chromium, mg/kg	1.4 J	56.5	74.2 [10]	1.4 J	5.91	20.3 [10]	< 5.1 U	34.2	60.8 [10]
Cobalt, mg/kg	< 1.0 U	11.3	10.0 [10]	< 1.1 U	1.63	3.84 [10]	< 1.0 U	7.97	8.82 [10]
Copper, mg/kg	9.56	12.8	17.8 [10]	43.9	39.8	328 [10]	9.43	12.7	15.4 [10]
Lead, mg/kg	< 5.2 U	46.7	69.8 [5]	< 5.3 U	4.9 J	42.2 [5]	< 5.1 U	30.1	56.9 [5]
Manganese, mg/kg	2.89	766	433	< 1.1 U	56.1	261	3.76	502	661
Mercury, mg/kg	0.18 J	0.911	0.481 [5]	0.086 J	0.965	0.18 J [5]	< 0.51 U	0.834	0.32 J [5]
Nickel, mg/kg	2.0 J	152	162 [10]	< 5.3 U	6.47	32.0 [10]	1.6 J	35.7	36.2 [10]
Selenium, mg/kg	< 10 U	< 24 U	< 23 U	< 11 U	< 25 U	< 25 U	< 10 U	< 24 U	< 27 U
Silver, mg/kg	< 5.2 U	< 4.7 U	< 4.7 U	< 5.3 U	0.73 J	< 5.0 U	< 5.1 U	0.22 J	< 5.3 U
Thallium, mg/kg	< 5.2 U	< 4.7 U	< 4.7 U	< 5.3 U	0.98 J	< 5.0 U	< 5.1 U	0.34 J	< 5.3 U
Tin, mg/kg	< 10 U	15.4	15.4 [5]	< 11 U	1.1 J	1.5 J [5]	< 10 U	6.3 J	7.8 J [5]
Vanadium, mg/kg	< 5.2 U	1.3 J	< 4.7 U	< 5.3 U	1.5 J	< 5.0 U	< 5.1 U	1.4 J	< 5.3 U
Zinc, mg/kg	4.4 J	2.5 J	3.4 J [5]	< 11 U	29.0	148 [5]	< 10 U	5.2 J	3.6 J [5]

Note: See Table 3-12 for explanation of data flags

Table 3-14. Mustard Composition of Individual Samples – Sample Set #2

Ton Container Number	D85521			D7014			D17290		
Sample Identification	21-03-033	21-03-034	21-03-035	21-03-036	[illegible]	[illegible]	21-03-039	21-03-040	21-03-041
Sample Matrix	Liquid	NC Solid	Solid	Liquid	NC Solid	[illegible]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis(2-chloroethyl)sulfide (HD), Wt.%	88.2 H			91.5 H			84.8 H		
Thiodiglycol, Wt.%	< 0.025 U			< 0.025 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.465 H			0.532 H			0.404		
Tetrachloroethylene, Wt.%	< 0.050 UH			< 0.050 UH			< 0.053 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.050 UH			< 0.050 UH			< 0.053 U		
T, Wt.%	0.22 JH [4,9]			0.20 JH [4,9]			0.20 JH [4,9]		
Q, Wt.%	2.92 H			4.37 H			3.33 H		
Hexachloroethane (HCE), Wt.%	< 0.24 UH			< 0.26 UH			< 0.27 UH		
Lewisite (L), mg/kg	< 5.1 UH			< 5.1 UH			< 5.4 UH		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.17			NR			NR		
1,4-Dithiane, Wt.%	0.58			0.19			0.82		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.14			0.19			0.22		
Bis (3-chloropropyl) sulfide, Wt.%	0.098			0.10			0.085		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.22			0.25			0.28		
1,2,5-Trithiepane, Wt.%	0.083			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	0.30			NR			0.14		
Mass Balance, Wt. %	93.4			97.3			90.3		
Metals									
Aluminum, mg/kg	< 52 U	< 47 U	11 J	< 53 U	14 J	21 J	13 J	< 54 U	< 50 U
Antimony, mg/kg	1.2 J	0.75 J	1.1 JH [7]	< 5.3 U	1.7 J	0.18 JH [7]	< 5.4 U	3.6 J	1.7 JH [7]
Arsenic, mg/kg	< 5.2 U	381 H	1520 H	3.1 J	5.50	4.0 J	22.8	583 H	252
Barium, mg/kg	< 5.2 U	0.099 J	0.37 J	< 5.3 U	1.7 J	4.6 J	< 5.4 U	0.066 J	0.16 J
Beryllium, mg/kg	< 5.2 U	< 4.7 U	< 4.9 U	< 5.3 U	< 5.0 U	< 5.3 U	< 5.4 U	< 5.4 U	< 5.0 U
Boron, mg/kg	5.2 J	4.9 J [2]	4.0 J	4.4 J	4.2 J [2]	4.3 J	5.0 J	< 11 U	< 10 U
Cadmium, mg/kg	< 5.2 U	0.66 J	1.5 JH	< 5.3 U	0.39 J	0.46 J	< 5.4 U	0.40 J	0.43 J
Chromium, mg/kg	10.9	14.1	23.0 H	5.3 J	47.8	16.1 H	4.3 J	30.4	24.9 H
Cobalt, mg/kg	< 1.0 U	2.36	4.29 H	< 1.1 U	10.2	4.04 H	< 1.1 U	6.21	5.55 H
Copper, mg/kg	20.4	49.6	129 H	47.5	29.5	33.4 H	5.60	16.9	39.2 H
Lead, mg/kg	< 5.2 U	6.3 J	35.5	< 5.3 U	15.7	16.6	< 5.4 U	23.6	37.0
Manganese, mg/kg	< 1.0 U	163 H [5]	319 H	0.73 J	248 [5]	108 H	0.74 J	369 [5]	370 H
Mercury, mg/kg	0.37 J	0.29 JH	0.39 JH	0.32 J	0.13 J	< 0.53 UH	0.27 J	3.56	1.62 H
Nickel, mg/kg	1.5 J	12.6	29.7 H	0.73 J	52.6	20.8 H	1.1 J	32.0	18.0 H
Selenium, mg/kg	< 10 U	< 24 U	< 25 U	< 11 U	< 25 U	< 26 U	< 11 U	< 27 U	< 25 U
Silver, mg/kg	< 5.2 U	0.33 J	0.93 JH	< 5.3 U	< 5.0 U	< 5.3 UH	< 5.4 U	0.087 J	< 5.0 UH
Thallium, mg/kg	< 5.2 U	< 4.7 U	< 4.9 U	< 5.3 U	< 5.0 U	< 5.3 U	< 5.4 U	< 5.4 U	< 5.0 U
Tin, mg/kg	< 10 U	11.9	29.1	< 11 U	6.0 J	2.7 J	< 11 U	5.0 J	3.4 J
Vanadium, mg/kg	< 5.2 U	0.98 J	< 4.9 UH	1.3 J	1.3 J	< 5.3 UH	1.1 J	1.5 J	< 5.0 UH
Zinc, mg/kg	< 10 U	46.1	118 H	< 11 U	83.2	47.2	< 11 U	43.6	51.3

Note: See Table 3-12 for explanation of data flags.

Table 3-14. Mustard Composition of Individual Samples – Sample Set #2 (Continued)

Ton Container Number	D14856			D19397			D19397		
Sample Identification	21-03-042	21-03-043	21-03-044	21-03-045	[redacted]	[redacted]	21-03-048	21-03-049	21-03-050
Sample Matrix	Liquid	NC Solid	Solid	Liquid	NC [redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	87.6 H			84.6 H			88 6 H		
Thiodiglycol, Wt.%	< 0.025 U			< 0.024 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.596			0.558			0.590		
Tetrachloroethylene, Wt.%	< 0.050 U			< 0.050 U			0.0595		
1,1,2,2-tetrachloroethane, Wt.%	< 0.050 U			< 0.050 U			< 0.053 U		
T, Wt.%	0.22 JH [4,9]			0.21 JH [4,9]			0 22 JH [4,9]		
Q, Wt.%	2.91 H			2.88 H			4.91 H		
Hexachloroethane (HCE), Wt.%	< 0.27 UH			< 0.27 UH			< 0.29 UH		
Lewisite (L), mg/kg	< 5.1 UH			< 5.0 UH			< 5.1 UH		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.18			0.18			NR		
1,4-Dithiane, Wt.%	0.70			0.59			0.33		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.15			0 14			0.20		
Bis (3-chloropropyl) sulfide, Wt.%	0.10			0.097			0.12		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.23			0.23			0.30		
1,2,5-Trithiepane, Wt.%	0.11			0.11			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	0.32			0.20			NR		
Mass Balance, Wt. %	93.1			89.8			95.3		
Metals									
Aluminum, mg/kg	< 53 U	28 J	16 J	< 49 U	14 J	28 J	< 51 U	< 47 U	13 J
Antimony, mg/kg	< 5.3 U	0.78 J	0.55 JH [7]	< 4.9 U	0.90 J	2.6 JH [7]	< 5.1 U	0 69 J	4.91 H [7]
Arsenic, mg/kg	< 5.3 U	5.52	8.32	< 4 9 U	4.1 J	5.82	< 5.1 U	16.5	79.6
Barium, mg/kg	< 5.3 U	0 55 J	2.7 J	< 4.9 U	0.30 J	1.7 J	< 5.1 U	< 4.7 U	0.27 J
Beryllium, mg/kg	< 5.3 U	< 5.5 U	< 5.3 U	< 4.9 U	< 5.3 U	< 5.3 U	< 5.1 U	< 4 7 U	< 4.8 U
Boron, mg/kg	< 11 U	< 11 U	< 11 U	< 9.9 U	< 11 U	< 11 U	< 10 U	< 9 5 U	< 9.6 U
Cadmium, mg/kg	< 5.3 U	0.40 J	0.50 J	< 4.9 U	0.35 J	0.48 J	< 5.1 U	0.34 J	0.52 J
Chromium, mg/kg	4.8 J	29.0	29.6 H	3.7 J	106	189 H	4.2 J	14.6	37.1 H
Cobalt, mg/kg	< 1.1 U	5.96	7.72 H	< 0.99 U	6.07	10.5 H	< 1.0 U	2.84	9.59 H
Copper, mg/kg	25.6	27.5	43.0 H	29.1	24.9	38.9 H	63.6	63.6	155 H
Lead, mg/kg	< 5.3 U	16.3	22.5	< 4.9 U	7.8 J	14.5	< 5.1 U	7 0 J	31.6
Manganese, mg/kg	3.90	365 [5]	428 H	2.38	220 [5]	359 H	< 1.0 U	165 [5]	516 H
Mercury, mg/kg	0.25 J	0 40 J	0.30 JH	0 25 J	0.32 J	0.41 JH	0.16 J	0.23 J	0.32 JH
Nickel, mg/kg	0.67 J	19.9	25.4 H	< 4.9 U	46.1	20.7 H	< 5.1 U	15 1	36.1 H
Selenium, mg/kg	< 11 U	< 28 U	< 27 U	< 9 9 U	< 27 U	< 27 U	< 10 U	< 24 U	< 24 U
Silver, mg/kg	< 5.3 U	< 5.5 U	< 5 3 UH	< 4 9 U	< 5.3 U	< 5.3 UH	< 5.1 U	< 4.7 U	0.066 JH
Thallium, mg/kg	< 5.3 U	< 5.5 U	< 5.3 U	< 4.9 U	< 5.3 U	< 5.3 U	< 5.1 U	< 4.7 U	< 4.8 U
Tin, mg/kg	< 11 U	2.4 J	3 2 J	< 9.9 U	6.4 J	15.3	< 10.2 U	3.7 J	30.3
Vanadium, mg/kg	< 5.3 U	1 6 J	1.1 JH	< 4.9 U	1.1 J	2.7 JH	< 5.1 U	1.0 J	1.0 JH
Zinc, mg/kg	< 11 U	83 3	120	< 9.9 U	53.1	84.4	11.4	73 0	306

Note: See Table 3-12 for explanation of data flags.

Table 3-14. Mustard Composition of Individual Samples – Sample Set #2 (Continued)

Ton Container Number	D46537			D14354			D48309		
Sample Identification	21-03-851	21-03-852	21-03-853	21-03-854	21-03-855		21-03-857	21-03-858	21-03-859
Sample Matrix	Liquid	NC Solid	Solid	Liquid	NC Solid		Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	86.3 H			83.9 H			87.8 H		
Thiodiglycol, Wt.%	< 0.027 U			< 0.024 U			< 0.025 U		
1,2-dichloroethane (DCE), Wt.%	0.902			0.468			0.869		
Tetrachloroethylene, Wt.%	< 0.053 U			< 0.050 U			< 0.051 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.053 U			< 0.050 U			< 0.051 U		
T, Wt.%	0.23 JH [4,9]			0.22 JH [4,9]			0.21 JH [4,9]		
Q, Wt.%	2.68 H			2.82 H			3.32 H		
Hexachloroethane (HCE), Wt.%	< 0.25 UH			< 0.28 UH			< 0.27 UH		
Lewisite (L), mg/kg	3.6 JH			< 5.0 UH			< 5.0 UH		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.23			0.14			0.087		
1,4-Dithiane, Wt.%	0.48			0.37			0.20		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.14			0.14			0.15		
Bis (3-chloropropyl) sulfide, Wt.%	0.082			0.090			0.099		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.22			0.22			0.26		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			0.34			NR		
Mass Balance, Wt. %	91.3			88.7			93.0		
Metals									
Aluminum, mg/kg	< 46 U	< 51 U	14 J	< 49 U	16 J	< 48 U	< 56 U	14 J	11 J
Antimony, mg/kg	< 4.6 U	0.88 J	0.51 JH [7]	< 4.9 U	1.3 J	0.77 JH [7]	< 5.6 U	0.16 J	1.9 JH [7]
Arsenic, mg/kg	16.0	670	882 H	< 4.9 U	10.2	8.80	7.68	133	3270 H
Barium, mg/kg	< 4.6 U	0.14 J	0.17 J	< 4.9 U	0.18 J	0.17 J	< 5.6 U	0.13 J	0.42 J
Beryllium, mg/kg	< 4.6 U	< 5.1 U	< 5.1 U	< 4.9 U	< 5.0 U	< 4.8 U	< 5.6 U	< 5.2 U	< 4.8 U
Boron, mg/kg	< 9.3 U	< 10 U	< 10 U	< 9.7 U	< 9.9 U	< 9.6 U	< 11 U	< 10 U	< 9.5 U
Cadmium, mg/kg	< 4.6 U	0.35 J	0.45 J	< 4.9 U	0.64 J	0.41 J	< 5.6 U	0.34 J	0.58 J
Chromium, mg/kg	4.3 J	23.0	18.5 H	4.5 J	65.2	29.9 H	5.3 J	12.2	47.8 H
Cobalt, mg/kg	< 0.93 U	3.18	3.47 H	< 0.97 U	8.92	7.13 H	< 1.1 U	1.37	9.43 H
Copper, mg/kg	33.8	27.9	62.7 H	6.09	7.8 J	4.1 JH	39.5	57.0	154 H
Lead, mg/kg	< 4.6 U	11.0	9.1 J	0.56 J	111	38.6	< 5.6 U	5.4 J	37.2
Manganese, mg/kg	3.33	234 [5]	277 H	5.54	490 H [5]	438 H	0.40 J	80.9 [5]	539 H
Mercury, mg/kg	41.1	1450	2440 H	0.47 J	2.54	1.55 H	17.8	861	10300 H
Nickel, mg/kg	0.69 J	21.0	21.0 H	< 4.9 U	49.1	22.9 H	0.43 J	16.3	23.7 H
Selenium, mg/kg	< 9.3 U	< 26 U	< 25 U	< 9.7 U	< 25 U	< 24 U	< 11 U	< 26 U	< 24 U
Silver, mg/kg	< 4.6 U	< 5.1 U	< 5.1 UH	< 4.9 U	< 5.0 U	< 4.8 UH	< 5.6 U	< 5.2 U	< 4.8 UH
Thallium, mg/kg	< 4.6 U	< 5.1 U	< 5.1 U	< 4.9 U	< 5.0 U	< 4.8 U	< 5.6 U	< 5.2 U	< 4.8 U
Tin, mg/kg	< 9.3 U	3.2 J	2.9 J	< 9.7 U	3.8 J	5.0 J	< 11 U	0.86 J	11.5
Vanadium, mg/kg	0.94 J	< 5.1 U	< 5.1 UH	1.1 J	1.1 J	< 4.8 UH	1.3 J	< 5.2 U	< 4.8 UH
Zinc, mg/kg	< 9.3 U	36.5	56.8	< 9.7 U	7.4 J	5.8 J	< 11 U	22.3	450

Note: See Table 3-12 for explanation of data flags

Table 3-14. Mustard Composition of Individual Samples – Sample Set #2 (Continued)

Ton Container Number	D47125			D15[illegible]			D14490		
Sample Identification	21-03-060	21-03-061	21-03-062	21-03-063	[illegible]	[illegible]	21-03-066	21-03-067	21-03-068
Sample Matrix	Liquid	NC Solid	Solid	Liquid	NC Solid	[illegible]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	86.2 H			88.6 H			89.3 H		
Thiodiglycol, Wt.%	< 0.028 U			< 0.025 U			< 0.025 U		
1,2-dichloroethane (DCE), Wt.%	0.663			0.475			0.446		
Tetrachloroethylene, Wt.%	< 0.054 U			< 0.054 U			< 0.051 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.054 U			< 0.054 U			< 0.051 U		
T, Wt.%	0.20 JH [4,9]			0.23 JH [4,9]			0.273 H [4,9]		
Q, Wt.%	3.50 H			2.82 H			2.66 H		
Hexachloroethane (HCE), Wt.%	< 0.26 UH			< 0.27 UH			< 0.26 UH		
Lewisite (L), mg/kg	< 5.1 UH			< 5.2 UH			< 5.2 UH		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.13			0.17			0.22		
1,4-Dithiane, Wt.%	0.34			0.26			0.34		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.14			0.17			0.13		
Bis (3-chloropropyl) sulfide, Wt.%	0.086			NR			NR		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.23			0.26			0.20		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			0.86		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			0.19			0.37		
Mass Balance, Wt. %	91.5			93.2			94.8		
Metals									
Aluminum, mg/kg	15 J	12 J	31 J	18 J	30 J	160	19 J	< 51 U	18 J
Antimony, mg/kg	< 5.0 U	< 5.6 U	0.70 JH [7]	< 4.8 U	2.1 J	1.1 JH [7]	< 4.8 U	< 5.1 U	1.4 JH [7]
Arsenic, mg/kg	< 5.0 U	3.6 J	6.34	< 4.8 U	10.9	6.26	< 4.8 U	< 5.1 U	3.1 J
Barium, mg/kg	< 5.0 U	0.14 J	0.85 J	< 4.8 U	3.8 J	0.41 J	0.44 J	0.099 J	2.7 J
Beryllium, mg/kg	< 5.0 U	< 5.6 U	< 5.0 U	< 4.8 U	< 5.3 U	< 5.0 U	< 4.8 U	< 5.1 U	< 5.0 U
Boron, mg/kg	4.0 J	< 11 U	< 10 U	7.2 J	7.6 J [3]	5.8 J	5.1 J	< 10 U	< 10 U
Cadmium, mg/kg	< 5.0 U	0.40 J	0.46 J	< 4.8 U	0.72 J	0.52 JH	< 4.8 U	0.34 J	0.34 JH
Chromium, mg/kg	12.1	8.36	23.3 H	4.4 J	53.3	30.2 H	5.30	1.1 J	188 H
Cobalt, mg/kg	< 1.0 U	1.24	3.50 H	< 0.97 U	9.46	4.30 H	< 0.95 U	< 1.0 U	19.1 H
Copper, mg/kg	39.3	54.0	95.7 H	17.9	22.8	25.6 H	4.5 J	< 10 U	29.4 H
Lead, mg/kg	< 5.0 U	5.9 J	12.6	< 4.8 U	85.7	22.6	< 4.8 U	< 10 U	122
Manganese, mg/kg	1.72	74.0 [5]	207 H	2.11	545 H [5]	308 H	0.57 J	< 10 U	790 H
Mercury, mg/kg	0.28 J	0.25 J	0.22 JH	0.19 J	1.66	0.860 H	0.15 J	0.20 J	3.37 H
Nickel, mg/kg	2.5 J	7.57	24.5 H	< 4.8 U	216	124 H	0.36 J	< 5.1 U	685 H
Selenium, mg/kg	< 10 U	< 28 U	< 25 U	< 9.7 U	< 26 U	< 25 U	1.2 J	< 26 U	< 25 U
Silver, mg/kg	< 5.0 U	< 5.6 U	< 5.0 UH	< 4.8 U	< 5.3 U	< 5.0 UH	< 4.8 U	< 5.1 U	< 5.0 UH
Thallium, mg/kg	< 5.0 U	< 5.6 U	< 5.0 U	< 4.8 U	< 5.3 U	< 5.0 U	< 4.8 U	< 5.1 U	< 5.0 U
Tin, mg/kg	< 10 U	0.95 J	4.3 J	< 9.7 U	26.3	13.0	< 9.5 U	< 10 U	9.8 J
Vanadium, mg/kg	1.3 J	< 5.6 U	< 5.0 UH	1.2 J	< 5.3 U	< 5.0 UH	1.3 J	< 5.1 U	< 5.0 UH
Zinc, mg/kg	< 10 U	46.0	80.5	< 9.7 U	110	58.8 H	< 9.5 U	< 10 U	29.7 H

Note: See Table 3-12 for explanation of data flags.

Table 3-14. Mustard Composition of Individual Samples – Sample Set #2 (Continued)

Ton Container Number	D14498 Field Duplicate			[redacted]			D54643		
Sample Identification	21-03-069D	21-03-070D	21-03-071D	21-03-075	[redacted]	[redacted]	21-03-075	21-03-076	21-03-077
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	90.3 H			86.5 H			88.4 H		
Thiodiglycol, Wt.%	< 0.025 U			< 0.026 U			< 0.025 U		
1,2-dichloroethane (DCE), Wt.%	0.423			0.786			0.708		
Tetrachloroethylene, Wt.%	< 0.050 U			< 0.050 U			< 0.053 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.050 U			< 0.050 U			< 0.053 U		
T, Wt.%	0.279 H [4,9]			0.23 J [4,9]			0.21 J [4,9]		
Q, Wt.%	2.74 H			2.47			4.50		
Hexachloroethane (HCE), Wt.%	< 0.27 UH			< 0.27 U			< 0.27 U		
Lewisite (L), mg/kg	< 5.1 UH			< 4.9 UH			< 5.1 UH		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.23			0.25			NR		
1,4-Dithiane, Wt.%	0.35			1.50			0.22		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.13			0.18			0.15		
Bis (3-chloropropyl) sulfide, Wt.%	NR			NR			0.087		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.21			0.22			0.26		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	0.37			0.18			NR		
Mass Balance, Wt. %	95.0			92.3			94.5		
Metals									
Aluminum, mg/kg	< 52 U	36 J	15 J	< 47 U	18 J	13 J	14 J	17 J	< 53 U
Antimony, mg/kg	< 5.2 U	2.0 J	1.6 JH [7]	< 4.7 U	2.9 J	2.2 JH [7]	< 5.0 U	0.40 J	0.91 JH [7]
Arsenic, mg/kg	1.5 J	4.2 J	3.4 J	6.33	499	394	< 5.0 U	6.30	5.3 J
Barium, mg/kg	< 5.2 U	1.1 J	2.9 J	< 4.7 U	0.26 J	0.15 J	< 5.0 U	6.82	2.5 J
Beryllium, mg/kg	< 5.2 U	< 5.1 U	< 4.9 U	< 4.7 U	< 5.1 U	< 5.3 U	< 5.0 U	< 5.2 U	< 5.3 U
Boron, mg/kg	< 11 U	< 10 U	< 9.7 U	< 9.4 U	< 10 U	< 11 U	4.0 J	< 10 U	< 11 U
Cadmium, mg/kg	< 5.2 U	0.40 J	0.20 JH	< 4.7 U	0.38 J	0.33 JH	< 5.0 U	0.37 J	0.41 JH
Chromium, mg/kg	5.0 J	432	216 H	5.83	39.5	49.7 H	5.15	23.3	27.5 H
Cobalt, mg/kg	< 1.1 U	25.1	20.5 H	< 0.94 U	7.44	5.60 H	< 0.99 U	3.84	5.38 H
Copper, mg/kg	4.8 J	39.2	34.3 H	40.9	50.1	76.5 H	48.2	46.7	199 H
Lead, mg/kg	< 5.2 U	144	146	< 4.7 U	18.0	17.2	< 5.0 U	25.4	18.6
Manganese, mg/kg	0.36 J	835 [9]	815 H	4.01	466 [9]	370 H	0.59 J	288 [9]	460 H
Mercury, mg/kg	0.11 J	4.53	3.65 H	26.3	2120	2140 H	0.25 J	1.52	1.62 H
Nickel, mg/kg	0.50 J	453	626 H	1.5 J	83.9	96.6 H	0.67 J	18.5	21.4 H
Selenium, mg/kg	< 11 U	< 25 U	< 24 U	< 9.4 U	< 26 U	< 27 U	< 9.9 U	< 26 U	< 27 U
Silver, mg/kg	< 5.2 U	< 5.1 U	< 4.9 UH	< 4.7 U	< 5.1 U	< 5.3 UH	< 5.0 U	< 5.2 U	< 5.3 UH
Thallium, mg/kg	< 5.2 U	< 5.1 U	< 4.9 U	< 4.7 U	< 5.1 U	< 5.3 U	< 5.0 U	< 5.2 U	< 5.3 U
Tin, mg/kg	< 11 U	15.3	10.8	< 9.4 U	10.5	9.3 J	< 9.9 U	1.2 J	2.0 J
Vanadium, mg/kg	1.2 J	< 5.1 U	< 4.9 UH	1.2 J	< 5.1 U	< 5.3 UH	1.2 J	< 5.2 U	< 5.3 UH
Zinc, mg/kg	< 11 U	32.0	38.9 H	< 9.4 U	56.3	49.5 H	< 9.9 U	111	219 H

Note: See Table 3-12 for explanation of data flags.

Table 3-14. Mustard Composition of Individual Samples – Sample Set #2 (Continued)

Ton Container Number	DE5182			[redacted]			DE5852		
Sample Identification	21-03-078	21-03-079	21-03-080	21-03-081	[redacted]	[redacted]	21-03-084	21-03-085	21-03-086
Sample Matrix	Liquid	NC Solid	Solid	Liquid	NC Solid	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	85.3 H			86.6 H			89.2 H		
Thiodiglycol, Wt.%	< 0.025 U			< 0.025 U			< 0.028 U		
1,2-dichloroethane (DCE), Wt.%	0.611			0.718			0.655		
Tetrachloroethylene, Wt.%	< 0.052 U			< 0.052 U			< 0.054 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.052 U			< 0.052 U			< 0.054 U		
T, Wt.%	0.23 J [4,9]			0.21 J [4,9]			0.22 J [4,9]		
Q, Wt.%	2.82			3.96			3.68		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.27 U			< 0.27 U		
Lewisite (L), mg/kg	< 5.1 UH			< 5.2 UH			< 5.3 UH		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.20			NR			NR		
1,4-Dithiane, Wt.%	1.30			0.17			0.14		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.14			0.15			0.15		
Bis (3-chloropropyl) sulfide, Wt.%	0.090			0.090			0.096		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.21			0.24			0.26		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	0.17			NR			NR		
Mass Balance, Wt. %	91.1			92.1			94.4		
Metals									
Aluminum, mg/kg	32 J	21 J	< 50 U	< 51 U	19 J	28 J	< 51 U	15 J	< 49 U
Antimony, mg/kg	< 4.9 U	0.94 J	1.5 JH [7]	< 5.1 U	0.46 J	1.7 JH [7]	< 5.1 U	0.80 J	2.4 JH [7]
Arsenic, mg/kg	< 4.9 U	8.30	12.7	< 5.1 U	78.0	384	1.5 J	156	42.0
Barium, mg/kg	< 4.9 U	0.19 J	0.15 J	< 5.1 U	0.11 J	0.78 J	< 5.1 U	0.22 J	0.075 J
Beryllium, mg/kg	< 4.9 U	< 5.1 U	< 5.0 U	< 5.1 U	< 4.9 U	< 5.5 U	< 5.1 U	< 5.0 U	< 4.9 U
Boron, mg/kg	7.1 J	< 10 U	< 10 U	< 10 U	< 9.7 U	< 11 U	< 10 U	< 9.9 U	< 9.7 U
Cadmium, mg/kg	< 4.9 U	0.36 J	0.34 JH	< 5.1 U	0.37 J	0.39 JH	< 5.1 U	0.36 J	0.38 JH
Chromium, mg/kg	9.19	17.4	19.1 H	5.94	11.1	38.6 H	5.36	10.5	9.50 H
Cobalt, mg/kg	< 0.99 U	5.60	6.36 H	< 1.0 U	1.87	5.66 H	< 1.0 U	2.46	4.93 H
Copper, mg/kg	25.9	27.7	40.4 H	70.3	65.9	114 H	48.3	45.6	218 H
Lead, mg/kg	0.89 J	12.0	21.3	< 5.1 U	3.7 J	19.0	< 5.1 U	7.1 J	86.0
Manganese, mg/kg	1.15	313 [5]	434 H	0.35 J	119 [5]	370 H	0.58 J	139 [5]	349 H
Mercury, mg/kg	0.32 J	0.47 J	0.34 JH	0.091 J	0.23 J	0.49 JH	0.058 J	0.582	2.23 H
Nickel, mg/kg	1.6 J	37.1	44.2 H	0.84 J	9.66	16.9 H	5.56	18.6	56.2 H
Selenium, mg/kg	< 9.9 U	< 25 U	< 25 U	< 10 U	< 24 U	< 27 U	< 10 U	< 25 U	< 24 U
Silver, mg/kg	< 4.9 U	< 5.1 U	< 5.0 UH	< 5.1 U	< 4.9 U	< 5.5 UH	< 5.1 U	< 5.0 U	0.063 JH
Thallium, mg/kg	< 4.9 U	< 5.1 U	< 5.0 U	< 5.1 U	< 4.9 U	< 5.5 U	< 5.1 U	< 5.0 U	< 4.9 U
Tin, mg/kg	< 9.9 U	9.4 J	11.2	< 10 U	6.6 J	52.2	< 10 U	3.3 J	3.1 J
Vanadium, mg/kg	1.5 J	< 5.1 U	< 5.0 UH	1.3 J	< 4.9 U	1.4 JH	1.2 J	< 5.0 U	< 4.9 UH
Zinc, mg/kg	< 9.9 U	71.9	96.8 H	< 10 U	44.6	147 H	< 10 U	36.3	115 H

Note: See Table 3-12 for explanation of data flags.

Table 3-14. Mustard Composition of Individual Samples – Sample Set #2 (Continued)

Ton Container Number	D17164		
Sample Identification	21-03-087	21-03-088	21-03-089
Sample Matrix	Liquid	NC Solid	Solid
Organic Compounds - Targets			
Bis (2-chloroethyl)sulfide (HD), Wt.%	89.5 H		
Thiodiglycol, Wt.%	< 0.025 U		
1,2-dichloroethane (DCE), Wt.%	0.581		
Tetrachloroethylene, Wt.%	< 0.051 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U		
T, Wt.%	0.17 J [4,5]		
Q, Wt.%	3.11		
Hexachloroethane (HCE), Wt.%	< 0.25 U		
Lewisite (L), mg/kg	< 5.2 UH		
Organic Compounds - TICs			
1,4-Thioxane, Wt.%	NR		
1,4-Dithiane, Wt.%	0.10		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.14		
Bis (3-chloropropyl) sulfide, Wt.%	0.071		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.21		
1,2,5-Trithiepane, Wt.%	NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR		
Mass Balance, Wt. %	93.9		
Metals			
Aluminum, mg/kg	< 52 U	15 J	14 J
Antimony, mg/kg	< 5.2 U	0.17 J	< 4.8 UH
Arsenic, mg/kg	12.1	307	39.7
Barium, mg/kg	< 5.2 U	0.65 J	0.32 J
Beryllium, mg/kg	< 5.2 U	< 5.1 U	< 4.8 U
Boron, mg/kg	< 10 U	< 10 U	< 9.7 U
Cadmium, mg/kg	< 5.2 U	0.37 J	0.37 JH
Chromium, mg/kg	4.2 J	14.1	16.1 H
Cobalt, mg/kg	< 1.0 U	2.58	3.69 H
Copper, mg/kg	70.5	79.6	290 H
Lead, mg/kg	< 5.2 U	9.7 J	35.4
Manganese, mg/kg	0.57 J	146 [5]	290 H
Mercury, mg/kg	< 0.52 U	0.26 J	0.14 JH
Nickel, mg/kg	1.6 J	22.5	32.9 H
Selenium, mg/kg	< 10 U	< .25 U	< 24 U
Silver, mg/kg	< 5.2 U	< 5.1 U	< 4.8 UH
Thallium, mg/kg	< 5.2 U	< 5.1 U	< 4.8 U
Tin, mg/kg	< 10 U	1.8 J	1.1 J
Vanadium, mg/kg	< 5.2 U	< 5.1 U	1.1 JH
Zinc, mg/kg	< 10 U	73.4	220 H

Note: See Table 3-12 for explanation of data flags.

Table 3-15. Mustard Composition of Individual Samples – Sample Set #3

Ton Container Number	D14637			D21834			D10679		
Sample Identification	21-03-090	21-03-091	21-03-092	21-03-096	[illegible]	[illegible]	21-03-099	21-03-100	21-03-101
Sample Matrix	Liquid	NC Solid	Solid	Liquid	NC Solid	[illegible]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	87.1 H			90.8 H			87.4 H		
Thiodiglycol, Wt.%	< 0.025 UH			< 0.025 UH			< 0.026 UH		
1,2-dichloroethane (DCE), Wt.%	0.714 [10]			0.611 [10]			0.651 [10]		
Tetrachloroethylene, Wt.%	< 0.049 U			< 0.052 U			< 0.054 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.049 U			< 0.052 U			< 0.054 U		
T, Wt.%	0.290 [4,9]			0.272 [4,9]			0.23 J [4,9]		
Q, Wt.%	3.02 [4]			3.02 [4]			3.29 [4]		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.26 U			< 0.25 U		
Lewisite (L), mg/kg	< 5.1 U			< 5.4 U			< 5.1 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.64			0.55			0.22		
1,4-Dithiane, Wt.%	4.50			4.20			NR		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.60			0.64			1.40		
Bis (3-chloropropyl) sulfide, Wt.%	0.40			0.44			0.98		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	1.40			1.40			2.60		
1,2,5-Trithiepane, Wt.%	0.38			0.41			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	99.0			102			96.8		
Metals									
Aluminum, mg/kg	17 JH	< 50 UH	< 49 UH	21 JH	< 50 UH	< 51 UH	37 JH	< 51 UH	< 52 UH
Antimony, mg/kg	< 5.2 U	< 5.0 U	< 4.9 U	< 5.0 U	0.71 J	2.5 J	< 5.1 U	0.42 J	0.74 J
Arsenic, mg/kg	< 5.2 U	1.9 J	1.8 J	< 5.0 U	3.9 J	5.07	2.6 J	13.5	33.4
Barium, mg/kg	< 5.2 U	0.090 J	0.072 J	< 5.0 U	0.20 J	1.3 J	< 5.1 U	0.11 J	0.13 J
Beryllium, mg/kg	< 5.2 UH	< 5.0 UH	< 4.9 UH	< 5.0 UH	< 5.0 UH	< 5.1 UH	< 5.1 UH	< 5.1 UH	< 5.2 UH
Boron, mg/kg	< 10 UH	< 9.9 UH	< 9.9 UH	< 9.9 UH	< 10 UH	< 10 UH	6.2 JH	< 10 UH	< 10 UH
Cadmium, mg/kg	< 5.2 U	0.14 J	< 4.9 U	< 5.0 U	0.16 J	< 5.1 U	< 5.1 U	0.21 J	0.20 J
Chromium, mg/kg	3.4 J	16.4	19.1 H	6.22	31.7	71.2	6.94	31.2	42.1
Cobalt, mg/kg	< 1.0 U	1.53	2.94	< 0.99 U	6.56	10.4	< 1.0 U	5.11	7.46
Copper, mg/kg	5.79	5.6 J	18.3 H	32.0	18.1	60.1	63.7	74.6	198
Lead, mg/kg	< 5.2 U	4.5 J	8.1 J	< 5.0 U	7.1 J	14.0	< 5.1 U	9.4 J	41.2
Manganese, mg/kg	1.52	95.4 [5]	188 [10]	2.78	178 [5]	317 [10]	0.87 J	240 [5]	366 [10]
Mercury, mg/kg	0.091 J	0.13 J	0.12 JH	0.17 J	0.32 J	0.530	0.15 J	0.12 J	0.091 J
Nickel, mg/kg	< 5.2 U	11.3	21.7 H	0.41 J	10.4	40.0	2.1 J	14.2	17.1
Selenium, mg/kg	< 10 U	< 25 U	< 25 U	< 9.9 U	< 25 U	< 25 U	< 10 U	< 25 U	< 26 U
Silver, mg/kg	< 5.2 U	< 5.0 U	< 4.9 U	1.7 J	< 5.0 U	< 5.1 U	< 5.1 U	< 5.1 U	0.065 J
Thallium, mg/kg	< 5.2 U	< 5.0 U	< 4.9 UH	< 5.0 U	< 5.0 U	< 5.1 UH	< 5.1 U	< 5.1 U	< 5.2 UH
Tin, mg/kg	< 10 U	0.50 J	2.0 J	< 9.9 U	2.8 J	5.5 J	< 10 U	2.5 J	4.2 J
Vanadium, mg/kg	< 5.2 U	2.1 J	1.3 J	1.7 J	1.8 J	3.8 J	1.8 J	2.1 J	1.8 J
Zinc, mg/kg	< 10 U	3.1 J	2.6 J	< 9.9 U	47.2	62.9	< 10 U	120	431

Note: See Table 3-12 for explanation of data flags.

Table 3-15. Mustard Composition of Individual Samples – Sample Set #3 (Continued)

Ton Container Number	D81547			[redacted]			D14767		
Sample Identification	21-03-102	21-03-103	21-03-104	21-03-105	[redacted]	[redacted]	21-03-108	21-03-109	21-03-110
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	92.5 H			88.3 H			87.0 H		
Thiodiglycol, Wt.%	< 0.025 UH			< 0.026 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.619 [10]			0.795 [10]			0.594 [10]		
Tetrachloroethylene, Wt.%	< 0.052 U			< 0.050 U			< 0.050 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.052 U			< 0.050 U			< 0.050 U		
T, Wt.%	0.25 J [4,9]			0.320 [4,9]			0.275 [4,9]		
Q, Wt.%	2.99 [4]			2.96 [4]			2.90 [4]		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.26 U			< 0.26 U		
Lewisite (L), mg/kg	< 5.2 U			< 5.4 U			< 5.4 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			NR			NR		
1,4-Dithiane, Wt.%	3.20			5.60			4.80		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	1.20			0.59			0.61		
Bis (3-chloropropyl) sulfide, Wt.%	0.88			0.40			0.41		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	2.40			1.30			1.30		
1,2,5-Trithiepane, Wt.%	NR			0.32			0.42		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	104			101			98.3		
Metals									
Aluminum, mg/kg	17 JH	< 49 UH	15 JH	19 JH	< 49 UH	18 JH	16 JH	21 JH [2]	19 JH
Antimony, mg/kg	< 5.2 U	0.40 J	0.40 J	< 5.1 U	0.42 J	2.3 J	< 5.1 U	0.61 J	0.92 J
Arsenic, mg/kg	5.32	587	254	1.9 J	25.9	62.8	< 5.1 U	6.09	9.01
Barium, mg/kg	< 5.2 U	0.083 J	0.18 J	< 5.1 U	0.078 J	0.45 J	< 5.1 U	0.22 J	0.14 J
Beryllium, mg/kg	< 5.2 UH	< 4.9 UH	< 5.0 UH	< 5.1 UH	< 4.9 UH	< 5.4 UH	< 5.1 UH	< 5.3 UH	< 5.3 UH
Boron, mg/kg	< 10 UH	< 9.8 UH	< 10 UH	< 10 UH	< 9.8 UH	< 11 UH	< 10 UH	< 11 UH	< 11 UH
Cadmium, mg/kg	< 5.2 U	0.16 J	< 5.0 U	< 5.1 U	0.19 J	0.071 J	< 5.1 U	0.18 J	< 5.3 U
Chromium, mg/kg	5.72	21.9	13.6	4.9 J	13.5	38.8	3.9 J	27.6	37.8
Cobalt, mg/kg	< 1.0 U	2.33	3.33	< 1.0 U	2.58	5.13	< 1.0 U	3.49	7.46
Copper, mg/kg	45.2	58.4	116	25.9	21.2	75.5	8.59	10 J	29.4
Lead, mg/kg	< 5.2 U	17.9	97.7	< 5.1 U	10.3	103	< 5.1 U	8.0 J	26.8
Manganese, mg/kg	< 1.0 U	163 [5]	329 [10]	3.38	171 [5]	391 [10]	2.38	155 [5]	369 [10]
Mercury, mg/kg	0.12 J	0.12 J	0.11 J	46.8	1560	2010 H	0.22 J	2.59 H	0.51 JH
Nickel, mg/kg	< 5.2 U	29.8	14.7	< 5.1 U	29.0	137	< 5.1 U	27.6	50.3
Selenium, mg/kg	< 10 U	< 25 U	< 25 U	< 10 U	< 24 U	< 27 U	< 10 U	< 26 U	< 27 U
Silver, mg/kg	< 5.2 U	< 4.9 U	< 5.0 U	< 5.1 U	< 4.9 U	0.078 J	< 5.1 U	< 5.3 U	< 5.3 U
Thallium, mg/kg	< 5.2 U	< 4.9 U	< 5.0 UH	< 5.1 U	< 4.9 U	< 5.4 UH	< 5.1 U	< 5.3 U	< 5.3 UH
Tin, mg/kg	< 10 U	2.5 J	2.9 J	< 10 U	2.1 J	4.9 J	< 10 U	3.4 J	6.6 J
Vanadium, mg/kg	1.5 J	1.9 J	1.2 J	1.3 J	2.0 J	1.6 J	1.1 J	2.1 J	2.1 J
Zinc, mg/kg	< 10 U	51.4	111	< 10 U	44.2	103	< 10 U	3.1 J	4.4 J

Note: See Table 3-12 for explanation of data flags.

Table 3-15. Mustard Composition of Individual Samples – Sample Set #3 (Continued)

Tote Container Number	D18422						D19116		
Sample Identification	21-03-111	21-03-112	21-03-113	21-03-114			21-03-117	21-03-118	21-03-119
Sample Matrix	Liquid	NC Solid	Solid	Liquid			Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	90.1 H			84.5 H			86.6		
Thiodiglycol, Wt.%	< 0.025 U			< 0.026 U			< 0.025 U		
1,2-dichloroethane (DCE), Wt.%	0.541 [10]			0.674 [10]			0.538 [10]		
Tetrachloroethylene, Wt.%	< 0.051 U			< 0.053 U			< 0.054 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U			< 0.053 U			< 0.054 U		
T, Wt.%	0.26 J [4,9]			0.307 [4,9]			0.301 [4,9]		
Q, Wt.%	4.43 [4]			3.05 [4]			3.02 [4]		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.25 U			< 0.26 U		
Lewisite (L), mg/kg	< 5.3 U			< 5.4 U			< 5.2 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.39			0.69			NR		
1,4-Dithiane, Wt.%	0.028			0.32			3.70		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	1.10			0.39			0.49		
Bis (3-chloropropyl) sulfide, Wt.%	0.72			0.29			0.34		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	2.10			0.78			0.97		
1,2,5-Trithiepane, Wt.%	0.12			0.36			0.29		
Bis (2-chloroethyl) disulfide, Wt.%	NR			0.20			0.21		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	99.8			91.6			96.5		
Metals									
Aluminum, mg/kg	17 JH	< 52 UH	< 50 UH	19 JH	45 JH [2]	40 JH	19 J	9.9 JH [2]	20 JH
Antimony, mg/kg	< 5.3 U	0.33 J	1.1 J	< 5.2 U	< 4.9 U	2.5 J	< 5.1 U	2.1 J	1.8 J
Arsenic, mg/kg	16.4	433	1370 H	< 5.2 U	10.5	71.3	< 5.1 U	15.7	19.6
Barium, mg/kg	< 5.3 U	0.16 J	0.048 J	< 5.2 U	0.34 J	1.3 J	< 5.1 U	0.53 J	1.3 J
Beryllium, mg/kg	< 5.3 UH	0.066 JH	< 5.0 UH	< 5.2 UH	< 4.9 UH	< 4.9 UH	< 5.1 U	< 4.8 UH	< 5.1 UH
Boron, mg/kg	< 11 UH	< 10 UH	< 9.9 UH	< 10 UH	9.0 JH	< 9.7 UH	< 10 U	< 9.5 UH	< 10 UH
Cadmium, mg/kg	< 5.3 U	0.24 J	0.098 J	< 5.2 U	0.16 J	< 4.9 U	< 5.1 U	0.20 J	< 5.1 U
Chromium, mg/kg	6.38	16.6	31.3	6.20	37.4	91.4	4.9 J	63.3	92.5
Cobalt, mg/kg	< 1.1 U	3.47	8.73	< 1.0 U	0.94 J	9.12	< 1.0 U	12.8	13.5
Copper, mg/kg	55.8	56.3	135	28.3	26.9	43.5	21.3	25.7	25.6
Lead, mg/kg	< 5.3 U	126	60.5	0.58 J	2.6 J	24.9	0.47 J	48.8	61.7
Manganese, mg/kg	0.58 J	119 [5]	289 [10]	3.74	50.9 [5]	591 H [10]	4.25	615 [5]	536 H [10]
Mercury, mg/kg	0.20 J	0.12 JH	0.37 JH	0.49 J	1.63	14.5 H	0.19 J	2.04	1.60 H
Nickel, mg/kg	2.9 J	13.1	13.0	< 5.2 U	102	337	0.57 J	74.3	154
Selenium, mg/kg	< 11 U	< 26 U	< 25 U	< 10 U	< 25 U	< 24 U	< 10 U	< 24 U	< 26 U
Silver, mg/kg	< 5.3 U	< 5.2 U	< 5.0 U	< 5.2 U	< 4.9 U	< 4.9 U	< 5.1 U	< 4.8 U	< 5.1 U
Thallium, mg/kg	< 5.3 U	< 5.2 U	< 5.0 UH	< 5.2 U	< 4.9 U	< 4.9 UH	< 5.1 U	< 4.8 U	< 5.1 UH
Tin, mg/kg	< 11 U	2.4 J	7.1 J	< 10 U	1.2 J	14.8	< 10 U	13.2	11.1
Vanadium, mg/kg	1.6 J	1.8 J	1.1 J	1.6 J	1.6 J	1.9 J	1.3 J	2.2 J	2.8 J
Zinc, mg/kg	< 11 U	75.4	415	< 10 U	12.8	119	4.6 J	135	120

Note: See Table 3-12 for explanation of data flags.

Table 3-15. Mustard Composition of Individual Samples – Sample Set #3 (Continued)

Test Container Number	D22757			[illegible]			D79763		
Sample Identification	21-03-120	21-03-121	21-03-122	21-03-123	[illegible]	[illegible]	21-03-126	21-03-127	21-03-128
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[illegible]	[illegible]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	90.5			90.7			89.6		
Thiodiglycol, Wt.%	< 0.026 U			< 0.026 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.844 [10]			0.752 [10]			0.690 [10]		
Tetrachloroethylene, Wt.%	< 0.055 U			< 0.053 U			0.030 J [10]		
1,1,2,2-tetrachloroethane, Wt.%	< 0.055 U			< 0.053 U			< 0.056 U		
T, Wt.%	0.329 [4,9]			0.26 J [4,9]			0.261 [4,9]		
Q, Wt.%	3.31 [4]			3.77 [4]			4.16 [4]		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.27 U			< 0.26 U		
Lewisite (L), mg/kg	< 5.6 U			< 5.4 U			< 5.5 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			0.35			0.47		
1,4-Dithiane, Wt.%	4.60			NR			0.15		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.69			1.00			1.60		
Bis (3-chloropropyl) sulfide, Wt.%	0.52			0.74			1.00		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	1.50			2.20			2.00		
1,2,5-Trithiepane, Wt.%	0.29			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	103			99.8			100		
Metals									
Aluminum, mg/kg	17 J	< 49 UH	< 48 UH	21 J	16 JH [2]	< 50 UH	19 J	11 JH [2]	28 JH
Antimony, mg/kg	< 5.4 U	< 4.9 U	0.74 J	< 5.2 U	0.21 J	0.25 J	< 5.1 U	< 5.2 U	9.84
Arsenic, mg/kg	< 5.4 U	1.9 J	4.0 J	1.9 J	86.1	9.49	< 5.1 U	42.2	341
Barium, mg/kg	< 5.4 U	0.089 J	0.12 J	< 5.2 U	0.50 J	0.12 J	< 5.1 U	0.85 J	0.32 J
Beryllium, mg/kg	< 5.4 U	< 4.9 UH	< 4.8 UH	< 5.2 U	< 4.9 UH	< 5.0 UH	< 5.1 U	0.066 JH	< 4.9 UH
Boron, mg/kg	< 11 U	< 9.8 UH	< 9.5 UH	< 11 U	< 9.8 UH	< 10 UH	< 10 U	< 10 UH	< 9.8 UH
Cadmium, mg/kg	< 5.4 U	0.13 J	< 4.8 U	< 5.2 U	0.15 J	0.26 J	< 5.1 U	0.17 J	0.088 J
Chromium, mg/kg	4.3 J	5.36	53.4	11.8	16.1	16.4	5.95	6.65	44.2
Cobalt, mg/kg	< 1.1 U	< 0.98 U	14.2	< 1.1 U	2.56	5.48	< 1.0 U	1.39	18.7
Copper, mg/kg	23.9	23.4	109	70.7	68.3	498 H	30.7	10.7	163 H
Lead, mg/kg	< 5.4 U	< 9.8 U	14.8	< 5.2 U	3.4 J	70.6	< 5.1 U	20.8	177
Manganese, mg/kg	1.28	< 9.8 U	357 [10]	0.34 J	86.2 [5]	227 [10]	< 1.0 U	91.3 [5]	1030 H [10]
Mercury, mg/kg	0.12 J	0.46 J	0.502 H	0.068 J	0.34 J	< 0.50 UH	0.099 J	0.20 J	0.30 JH
Nickel, mg/kg	0.85 J	1.4 J	12.2	0.38 J	23.3	40.1	0.63 J	7.03	171
Selenium, mg/kg	< 11 U	< 25 U	< 24 U	< 11 U	< 25 U	< 25 U	< 10 U	< 26 U	< 24 U
Silver, mg/kg	< 5.4 U	< 4.9 U	< 4.8 U	< 5.2 U	< 4.9 U	0.10 J	< 5.1 U	< 5.2 U	< 4.9 U
Thallium, mg/kg	< 5.4 U	< 4.9 U	< 4.8 UH	< 5.2 U	< 4.9 U	< 5.0 UH	< 5.1 U	< 5.2 U	< 4.9 UH
Tin, mg/kg	< 11 U	< 9.8 U	5.4 J	< 11 U	1.4 J	3.3 J	< 10 U	0.99 J	52.6
Vanadium, mg/kg	< 5.4 U	1.5 J	2.5 J	< 5.2 U	1.3 J	< 5.0 U	1.4 J	< 5.2 U	2.1 J
Zinc, mg/kg	< 11 U	< 9.8 U	118	< 11 U	42.1	1640 H	< 10 U	31.7	336

Note: See Table 3-12 for explanation of data flags.

Table 3-15. Mustard Composition of Individual Samples – Sample Set #3 (Continued)

Test Container Number	D52785			[redacted]			D50034		
Sample Identification	21-03-129	21-03-130	21-03-131	21-03-132	[redacted]	[redacted]	21-03-135	21-03-136	21-03-137
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	89.4			90.5			91.1		
Thiodiglycol, Wt.%	< 0.026 U			< 0.026 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.593 [10]			0.660 [10]			0.712 [10]		
Tetrachloroethylene, Wt.%	0.066 [10]			0.0684 [10]			< 0.051 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U			< 0.051 U			< 0.051 U		
T, Wt.%	0.25 J [4,9]			0.22 J [4,9]			0.304 [4,9]		
Q, Wt.%	3.90 [4]			3.86 [4]			2.62 [4]		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.26 U			< 0.27 U		
Lewisite (L), mg/kg	< 5.6 U			< 5.7 U			< 5.2 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.33			NR			0.90		
1,4-Dithiane, Wt.%	NR			NR			5.40		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	NR			1.60			0.53		
Bis (3-chloropropyl) sulfide, Wt.%	0.090			1.20			0.35		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	3.00			3.30			0.99		
1,2,5-Trithiepane, Wt.%	0.10			0.11			0.31		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	97.7			102			103		
Metals									
Aluminum, mg/kg	21 J	< 52 U	20 JH	25 J	< 55 U	24 JH	21 J	33 J [3]	19 JH
Antimony, mg/kg	< 5.2 U	0.18 J	4.2 J	< 5.2 U	< 5.5 U	7.20	< 5.1 U	2.2 J	2.7 J
Arsenic, mg/kg	4.0 J	55.7	660 H	3.1 J	71.4	882 H	3.5 J	71.6	116
Barium, mg/kg	< 5.2 U	0.087 J	0.14 J	< 5.2 U	0.14 J	0.16 J	< 5.1 U	0.70 J	0.20 J
Beryllium, mg/kg	< 5.2 U	< 5.2 U	< 5.1 UH	< 5.2 U	< 5.5 U	< 5.0 UH	< 5.1 U	< 5.6 U	< 5.1 UH
Boron, mg/kg	< 10 U	< 10 U	< 10 UH	< 10 U	< 11 U	< 10 UH	< 10 U	< 11 U	< 10 UH
Cadmium, mg/kg	< 5.2 U	0.19 J	0.049 J	< 5.2 U	0.16 J	0.098 J	< 5.1 U	0.28 J	< 5.1 U
Chromium, mg/kg	6.05	12.0	56.3	4.1 J	19.1	64.3	4.5 J	40.7	42.5
Cobalt, mg/kg	< 1.0 U	3.26	17.6	< 1.0 U	2.06	23.1	< 1.0 U	4.44	6.29
Copper, mg/kg	62.1	59.2	319 H	65.0	93.6	185 H	28.6	22.8	43.8 H
Lead, mg/kg	< 5.2 U	3.6 J	80.1	< 5.2 U	3.2 J	74.6	< 5.1 U	21.7	39.5
Manganese, mg/kg	0.63 J	116 [5]	496 H [10]	0.61 J	68.0 [5]	647 H [10]	2.65	266 [5]	386 [10]
Mercury, mg/kg	0.13 J	0.25 J	0.552 H	0.10 J	0.20 J	0.742 H	57.2	2580	2000
Nickel, mg/kg	3.0 J	15.6	34.4	1.7 J	45.3	33.6	< 5.1 U	65.1	104
Selenium, mg/kg	< 10 U	< 26 U	< 26 U	< 10 U	< 27 U	< 25 U	< 10 U	< 28 U	< 26 U
Silver, mg/kg	< 5.2 U	< 5.2 U	< 5.1 U	< 5.2 U	< 5.5 U	< 5.0 U	< 5.1 U	< 5.6 U	< 5.1 U
Thallium, mg/kg	< 5.2 U	< 5.2 U	< 5.1 UH	< 5.2 U	< 5.5 U	< 5.0 UH	< 5.1 U	< 5.6 U	< 5.1 UH
Tin, mg/kg	< 10 U	1.7 J	19.8	< 10 U	1.1 J	29.8	< 10 U	6.1 J	5.2 J
Vanadium, mg/kg	1.5 J	1.6 J	1.1 J	< 5.2 U	1.5 J	1.8 J	1.1 J	2.1 J	1.5 J
Zinc, mg/kg	< 10 U	51.9	323	< 10 U	33.6	331	< 10 U	50.9	108

Note: See Table 3-12 for explanation of data flags.

Table 3-15. Mustard Composition of Individual Samples – Sample Set #3 (Continued)

Ton Container Number	D56368			[illegible]			D17911		
Sample Identification	21-03-138	21-03-139	21-03-140	21-03-141	[illegible]	[illegible]	21-03-144	21-03-145	21-03-146
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[illegible]	[illegible]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	82.7			87.9			88.6		
Thiodiglycol, Wt.%	< 0.028 U			< 0.027 U			< 0.025 U		
1,2-dichloroethane (DCE), Wt.%	0.694 [10]			0.726 [10]			0.773 [10]		
Tetrachloroethylene, Wt.%	< 0.051 U			< 0.050 U			0.0734 [10]		
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U			< 0.050 U			< 0.052 U		
T, Wt.%	0.280 [4,9]			0.345 [4,9]			0.25 J [4,9]		
Q, Wt.%	2.84 [4]			2.92 [4]			3.45 [4]		
Hexachloroethane (HCE), Wt.%	< 0.25 U			< 0.27 U			< 0.27 U		
Lewisite (L), mg/kg	< 5.5 U			< 5.1 U			14.5		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			0.97			0.40		
1,4-Dithiane, Wt.%	0.22			5.40			3.40		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.47			0.59			1.20		
Bis (3-chloropropyl) sulfide, Wt.%	0.32			0.37			0.99		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	1.10			1.30			2.70		
1,2,5-Trithiepane, Wt.%	0.32			0.21			0.091		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	88.9			101			102		
Metals									
Aluminum, mg/kg	24 J	23 J [2]	28 JH	19 J	< 51 U	18 JH	21 J	< 51 U	26 JH
Antimony, mg/kg	< 5.2 U	1.3 J	3.1 J	< 5.2 U	0.39 J	3.5 J	< 5.2 U	< 5.1 U	0.60 J
Arsenic, mg/kg	< 5.2 U	14.7	13.5	5.38	113	1250 H	51.6	451	185
Barium, mg/kg	< 5.2 U	1.6 J	4.0 J	< 5.2 U	0.19 J	0.35 J	< 5.2 U	0.63 J	0.27 J
Beryllium, mg/kg	< 5.2 U	< 4.8 U	< 5.2 UH	< 5.2 U	< 5.1 U	< 5.0 UH	< 5.2 U	< 5.1 U	< 5.1 UH
Boron, mg/kg	< 10 U	< 9.5 U	< 10 UH	< 10 U	< 10 U	< 10 UH	< 10 U	< 10 U	< 10 UH
Cadmium, mg/kg	< 5.2 U	0.19 J	< 5.2 U	< 5.2 U	0.18 J	< 5.0 U	< 5.2 U	0.17 J	< 5.1 U
Chromium, mg/kg	3.5 J	41.6	74.9	6.23	18.3	70.4	4.2 J	17.2	18.2
Cobalt, mg/kg	< 1.0 U	6.08	6.84	< 1.0 U	2.47	10.3	< 1.0 U	2.27	5.93
Copper, mg/kg	19.9	93.8	31.0 H	24.2	33.3	87.6 H	50.5	46.9	91.9 H
Lead, mg/kg	1.6 J	273	281	< 5.2 U	6.9 J	28.5	< 5.2 U	7.2 J	10.6
Manganese, mg/kg	0.65 J	435 [5]	435 [10]	1.67	182 [5]	483 H [10]	0.57 J	138 [5]	434 [10]
Mercury, mg/kg	0.27 J	4.04	3.44 H	5.20	238 H	442	0.13 J	96.7 H	1.76 H
Nickel, mg/kg	< 5.2 U	69.3	126	< 5.2 U	24.7	66.7	4.2 J	6.93	9.61
Selenium, mg/kg	< 10 U	< 24 U	< 26 U	< 10 U	< 26 U	< 25 U	< 10 U	< 25 U	< 26 U
Silver, mg/kg	< 5.2 U	< 4.8 U	< 5.2 U	< 5.2 U	< 5.1 U	< 5.0 U	< 5.2 U	< 5.1 U	< 5.1 U
Thallium, mg/kg	< 5.2 U	< 4.8 U	< 5.2 UH	< 5.2 U	< 5.1 U	< 5.0 UH	< 5.2 U	< 5.1 U	< 5.1 UH
Tin, mg/kg	< 10 U	21.7	43.3	< 10 U	4.4 J	13.8	< 10 U	1.2 J	2.3 J
Vanadium, mg/kg	< 5.2 U	1.6 J	2.5 J	1.7 J	1.6 J	2.5 J	1.1 J	2.3 J	2.0 J
Zinc, mg/kg	< 10 U	86.4	91.4	< 10 U	24.7	68.0	< 10 U	71.4	99.5

Note: See Table 3-12 for explanation of data flags.

Table 3-15. Mustard Composition of Individual Samples – Sample Set #3 (Continued)

Test Container Number	D55096					
Sample Identification	21-03-147	21-03-148	21-03-149	21-03-150		
Sample Matrix	Liquid	NC Solid	Solid	Liquid		
Organic Compounds - Targets						
Bis (2-chloroethyl)sulfide (HD), Wt.%	81.3			85.3		
Thiodiglycol, Wt.%	< 0.026 U			< 0.025 U		
1,2-dichloroethane (DCE), Wt.%	0.708 [10]			0.735 [10]		
Tetrachloroethylene, Wt.%	< 0.051 U			0.019 J [10]		
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U			< 0.050 U		
T, Wt.%	0.298 [4,9]			0.269 [4,9]		
Q, Wt.%	2.80 [4]			3.01 [4]		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.26 U		
Lewisite (L), mg/kg	< 5.5 U			< 5.1 U		
Organic Compounds - TICs						
1,4-Thioxane, Wt.%	0.68			0.62		
1,4-Dithiane, Wt.%	4.20			5.00		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.44			0.57		
Bis (3-chloropropyl) sulfide, Wt.%	0.28			0.39		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	1.00			1.20		
1,2,5-Trithiepane, Wt.%	0.32			0.59		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR		
Mass Balance, Wt. %	92.0			97.7		
Metals						
Aluminum, mg/kg	23 J	< 50 U	67.0 H	22 J	11 J [2]	41 JH
Antimony, mg/kg	< 5.5 U	< 5.0 U	30.3	< 5.1 U	2.0 J	2.0 J
Arsenic, mg/kg	< 5.5 U	2.0 J	11.0	1.6 J	318	1260 H
Barium, mg/kg	0.54 J	0.17 J	1.2 J	< 5.1 U	4.4 J	14.2
Beryllium, mg/kg	< 5.5 U	< 5.0 U	< 5.3 UH	< 5.1 U	< 4.8 U	< 5.0 UH
Boron, mg/kg	< 11 U	< 9.9 U	< 11 UH	< 10 U	< 9.6 U	< 10 UH
Cadmium, mg/kg	< 5.5 U	0.13 J	< 5.3 U	< 5.1 U	0.18 J	0.21 J
Chromium, mg/kg	9.19	6.09	213	3.6 J	49.0	67.2
Cobalt, mg/kg	0.33 J	< 0.99 U	12.2	< 1.0 U	7.12	27.1
Copper, mg/kg	22.2	19.7	18.7 H	33.2	33.7	178 H
Lead, mg/kg	0.85 J	< 9.9 U	625 H	< 5.1 U	77.0	161
Manganese, mg/kg	4.98	5.5 J [5]	1960 H [10]	3.12	413 [5]	969 H [10]
Mercury, mg/kg	0.19 J	0.960	2.20 H	0.089 J	1.56	2.62 H
Nickel, mg/kg	2.5 J	2.3 J	965 H	< 5.1 U	25.3	26.1
Selenium, mg/kg	< 11 U	< 25 U	< 26 U	< 10 U	< 24 U	< 25 U
Silver, mg/kg	< 5.5 U	< 5.0 U	< 5.3 U	< 5.1 U	< 4.8 U	< 5.0 U
Thallium, mg/kg	< 5.5 U	< 5.0 U	< 5.3 UH	< 5.1 U	< 4.8 U	< 5.0 UH
Tin, mg/kg	< 11 U	< 9.9 U	44.4	< 10 U	5.8 J	19.4
Vanadium, mg/kg	1.7 J	1.7 J	2.3 J	< 5.1 U	1.5 J	< 5.0 U
Zinc, mg/kg	< 11 U	2.6 J	93.3	< 10 U	149	1240 H

Note: See Table 3-12 for explanation of data flags

Table 3-16. Mustard Composition of Individual Samples – Sample Set #4

Ton Container Number	D46680			[redacted]			D56259		
Sample Identification	21-03-154	21-03-156	21-03-158	21-03-155	[redacted]	[redacted]	21-03-160	21-03-161	21-03-162
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	101			92.4			84.1		
Thiodiglycol, Wt.%	< 0.026 UH			< 0.025 UH			< 0.025 U		
1,2-dichloroethane (DCE), Wt.%	0.695			0.637			0.512		
Tetrachloroethylene, Wt.%	0.049 J			0.049 J			< 0.051 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U			< 0.051 U			< 0.051 U		
T, Wt.%	0.079 J			0.076 J			0.17 J		
Q, Wt.%	2.97			2.94			2.89		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.26 U			< 0.25 U		
Lewisite (L), mg/kg	< 5.1 U			< 5.0 U			< 5.1 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			NR			0.18		
1,4-Dithiane, Wt.%	NR			NR			0.32		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.21			0.21			0.15		
Bis (3-chloropropyl) sulfide, Wt.%	0.13			0.14			0.080		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.27			0.26			0.24		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	105			96.7			88.6		
Metals									
Aluminum, mg/kg	20 J	< 50 U	< 51 U	< 52 U	< 48 U	21 J	< 55 U	13 J	15 J
Antimony, mg/kg	< 5.1 U	0.33 J	0.34 J [7]	< 5.2 U	0.43 J	0.37 J [7]	< 5.5 U	0.23 J	0.57 J [7]
Arsenic, mg/kg	7.51	18.5	27.0	3.8 J	33.7	22.9	< 5.5 U	1.8 J	24.4
Barium, mg/kg	< 5.1 U	0.12 J	0.062 J	< 5.2 U	< 4.8 U	1.9 J	< 5.5 U	0.37 J	1.1 J
Beryllium, mg/kg	< 5.1 U	< 5.0 U	< 5.1 U	< 5.2 U	< 4.8 U	0.082 J	< 5.5 U	0.064 J	< 4.9 U
Boron, mg/kg	6.7 J	< 9.9 U	< 10 U	4.3 J	< 9.5 U	< 11 U	< 11 U	< 11 U	< 9.8 U
Cadmium, mg/kg	< 5.1 U	0.25 J	0.28 J	< 5.2 U	0.24 J	0.32 J	< 5.5 U	0.37 J	0.30 J
Chromium, mg/kg	2.8 J	5.86	16.0	5.24	13.7	15.4	2.1 J	9.35	25.0
Cobalt, mg/kg	< 1.0 U	0.32 J	2.51	< 1.0 U	2.09	3.33	< 1.1 U	0.48 J	5.05
Copper, mg/kg	39.3	64.3	75.2 [10]	41.3	44.3	80.2 [10]	13.7	15.2	9.5 J [10]
Lead, mg/kg	< 5.1 U	< 9.9 U	10.7	< 5.2 U	10.6	6.6 J	1.0 J	22.7	118
Manganese, mg/kg	0.44 J	23.6	181 [10]	< 1.0 U	137	205 [10]	6.49	35.0	446 [10]
Mercury, mg/kg	< 0.51 U	< 0.50 U	0.17 J	< 0.52 U	0.14 J	0.18 J	0.14 J	0.26 J	4.14
Nickel, mg/kg	5.64	11.6	9.26	4.1 J	11.6	10.6	1.5 J	19.7	72.0
Selenium, mg/kg	< 10 U	< 25 U	< 25 U	< 10 U	< 24 U	< 27 U	< 11 U	< 27 U	< 25 U
Silver, mg/kg	< 5.1 U	< 5.0 U	< 5.1 U	< 5.2 U	< 4.8 U	0.18 J	< 5.5 U	< 5.3 U	< 4.9 U
Thallium, mg/kg	< 5.1 U	< 5.0 U	< 5.1 U	< 5.2 U	< 4.8 U	< 5.4 U	< 5.5 U	< 5.3 U	< 4.9 U
Tin, mg/kg	< 10 U	< 9.9 U	1.1 J	< 10 U	1.1 J	0.97 J	< 11 U	0.49 J	1.8 J
Vanadium, mg/kg	< 5.1 U	1.3 J	1.2 J	1.9 J	1.3 J	1.5 J	< 5.5 U	1.6 J	1.4 J
Zinc, mg/kg	3.4 J	10.0	56.2	< 10 U	50.1	58.3	5.0 J	9.2 J	54.1

Note: See Table 3-12 for explanation of data flags

Table 3-16. Mustard Composition of Individual Samples – Sample Set #4 (Continued)

Ton Container Number	D47615			[redacted]			D14409		
Sample Identification	21-03-163	21-03-164	21-03-165	21-03-166	[redacted]		21-03-169	21-03-170	21-03-171
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]		Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	78.7			87.5			88.5		
Thiodiglycol, Wt.%	< 0.025 U			< 0.025 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.680			0.677			0.799		
Tetrachloroethylene, Wt.%	< 0.051 U			< 0.051 U			< 0.050 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U			< 0.051 U			< 0.050 U		
T, Wt.%	0.15 J			0.086 J			0.15 J		
Q, Wt.%	2.61			3.08			2.80		
Hexachloroethane (HCE), Wt.%	< 0.25 U			< 0.26 U			< 0.26 U		
Lewisite (L), mg/kg	< 5.0 U			< 5.0 U			< 5.1 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			NR			0.21		
1,4-Dithiane, Wt.%	0.30			NR			0.27		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.14			0.16			NR		
Bis (3-chloropropyl) sulfide, Wt.%	0.087			0.097			0.086		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	NR			NR			0.21		
1,2,5-Trithiepane, Wt.%	0.081			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	0.22			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	83.0			91.6			93.0		
Metals									
Aluminum, mg/kg	< 53 U	< 53 U	< 49 U	< 51 U	20 J	13 J	< 51 U	13 J	< 50 U
Antimony, mg/kg	< 5.3 U	1.7 J	1.2 J [7]	< 5.1 U	0.19 J	2.8 J [7]	< 5.1 U	1.0 J	0.80 J [7]
Arsenic, mg/kg	< 5.3 U	11.1	10.3	3.8 J	91.4	138	< 5.1 U	8.35	7.03
Barium, mg/kg	< 5.3 U	0.98 J	0.63 J	< 5.1 U	0.11 J	0.26 J	< 5.1 U	0.095 J	0.60 J
Beryllium, mg/kg	< 5.3 U	< 5.3 U	0.063 J	< 5.1 U	0.051 J	0.057 J	< 5.1 U	< 4.9 U	< 5.0 U
Boron, mg/kg	< 11 U	< 11 U	< 9.9 U	< 10 U	< 9.7 U	< 11 U	< 10 U	< 9.8 U	< 10 U
Cadmium, mg/kg	< 5.3 U	0.31 J	0.31 J	< 5.1 U	0.26 J	0.37 J	< 5.1 U	0.28 J	0.37 J
Chromium, mg/kg	2.9 J	64.6	49.0	3.1 J	10.6	21.7	2.9 J	23.5	28.9
Cobalt, mg/kg	< 1.1 U	8.65	6.23	< 1.0 U	2.45	5.73	< 1.0 U	4.75	4.76
Copper, mg/kg	29.8	26.2	34.3 [10]	65.7	68.3	281 [10]	17.2	12.7	39.0 [10]
Lead, mg/kg	< 5.3 U	35.5	26.0	< 5.1 U	7.0 J	25.6	< 5.1 U	11.0	13.4
Manganese, mg/kg	3.75	425	381 [10]	0.33 J	166	490 [10]	0.89 J	320	349 [10]
Mercury, mg/kg	< 0.53 U	0.29 J	0.28 J	< 0.51 U	< 0.49 U	0.14 J	< 0.51 U	0.45 J	0.38 J
Nickel, mg/kg	0.77 J	85.1	42.6	0.77 J	8.26	33.5	< 5.1 U	27.1	30.8
Selenium, mg/kg	< 11 U	< 27 U	< 25 U	< 10 U	< 24 U	< 28 U	< 10 U	< 24 U	< 25 U
Silver, mg/kg	< 5.3 U	< 5.3 U	0.062 J	< 5.1 U	0.25 J	< 5.5 U	< 5.1 U	< 4.9 U	< 5.0 U
Thallium, mg/kg	< 5.3 U	< 5.3 U	< 4.9 U	< 5.1 U	< 4.9 U	< 5.5 U	< 5.1 U	< 4.9 U	< 5.0 U
Tin, mg/kg	< 11 U	14.6	10.4	< 10 U	1.5 J	11 J	< 10 U	6.4 J	6.1 J
Vanadium, mg/kg	1.3 J	1.3 J	< 4.9 U	1.3 J	1.6 J	1.5 J	1.2 J	1.9 J	1.4 J
Zinc, mg/kg	< 11 U	82.0	81.8	4.7 J	64.9	200	< 10 U	33.3	34.2

Note: See Table 3-12 for explanation of data flags.

Table 3-16. Mustard Composition of Individual Samples – Sample Set #4 (Continued)

Ton Container Number	D43529		
Sample Identification	21-03-173	21-03-174	21-03-175
Sample Matrix	Liquid	NC Solid	Solid
Organic Compounds - Targets			
Bis (2-chloroethyl)sulfide (HD), Wt.%	95 4		
Thiodiglycol, Wt.%	< 0 025 U		
1,2-dichloroethane (DCE), Wt.%	0 759		
Tetrachloroethylene, Wt.%	0.025 J		
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U		
T, Wt.%	0 11 J		
Q, Wt.%	4.08		
Hexachloroethane (HCE), Wt.%	< 0.27 U		
Lewisite (L), mg/kg	< 4.8 U		
Organic Compounds - TICs			
1,4-Thioxane, Wt.%	0 093		
1,4-Dithiane, Wt.%	0.25		
2-Chloroethyl 3-chloropropyl sulfide, Wt %	0.23		
Bis (3-chloropropyl) sulfide, Wt.%	0 13		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.27		
1,2,5-Trithiepane, Wt.%	NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR		
Mass Balance, Wt. %	101		
Metals			
Aluminum, mg/kg	< 51 U	13 J	< 52 U
Antimony, mg/kg	< 5.1 U	0.23 J	1.7 J [7]
Arsenic, mg/kg	< 5.1 U	48.5	52.9
Barium, mg/kg	< 5.1 U	0 12 J	0.14 J
Beryllium, mg/kg	< 5 1 U	< 5.5 U	< 5 2 U
Boron, mg/kg	< 10 U	< 11 U	< 11 U
Cadmium, mg/kg	< 5 1 U	0.34 J	0.46 J
Chromium, mg/kg	3.2 J	14 3	15.9
Cobalt, mg/kg	< 1.0 U	1.48	3.57
Copper, mg/kg	64.6	85.4	124 [10]
Lead, mg/kg	< 5.1 U	15.8	19.7
Manganese, mg/kg	< 1.0 U	96.9	329 [10]
Mercury, mg/kg	< 0.51 U	0.089 J	0 36 J
Nickel, mg/kg	< 5 1 U	29.7	18.2
Selenium, mg/kg	< 10 U	< 28 U	< 26 U
Silver, mg/kg	< 5.1 U	< 5.5 U	0.088 J
Thallium, mg/kg	< 5.1 U	< 5.5 U	< 5.2 U
Tin, mg/kg	< 10 U	1.4 J	9.3 J
Vanadium, mg/kg	1.2 J	1.9 J	1.1 J
Zinc, mg/kg	4.8 J	43.0	95.7

Note: See Table 3-12 for explanation of data flags

Table 3-17. Mustard Composition of Individual Samples – Sample Set #5

Tpu Container Number	D46992			[redacted]			D15007		
Sample Identification	21-03-177	21-03-179	21-03-181	21-03-177	[redacted]		21-03-183	21-03-184	21-03-185
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]		Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	92.1 H			93.0 H			96.3 H		
Thiodiglycol, Wt.%	< 0.025 U			< 0.026 U			< 0.028 U		
1,2-dichloroethane (DCE), Wt.%	0.582			0.578			0.638		
Tetrachloroethylene, Wt.%	< 0.051 U			< 0.052 U			< 0.053 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U			< 0.052 U			< 0.053 U		
T, Wt.%	0.17 J			0.16 J			0.088 J		
Q, Wt.%	4.29			4.33			2.17		
Hexachloroethane (HCE), Wt.%	< 0.27 U			< 0.25 U			< 0.25 U		
Lewisite (L), mg/kg	12.7			13.9			< 5.2 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			NR			NR		
1,4-Dithiane, Wt.%	NR			0.15			0.089		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.16			0.20			0.16		
Bis (3-chloropropyl) sulfide, Wt.%	0.087			0.087			0.11		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.30			0.28			0.27		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	97.7			98.8			99.8		
Metals									
Aluminum, mg/kg	< 51 U	10 J	< 53 U	< 52 U	< 53 U	15 J	< 52 U	< 53 U	34 J
Antimony, mg/kg	< 5.1 U	0.41 JH	1.9 JH	< 5.2 U	0.29 JH	1.5 JH	< 5.2 U	0.61 J	1.3 J
Arsenic, mg/kg	21.6	309	2050 H	21.7	225	3940	4.3 J	513	79.3
Barium, mg/kg	< 5.1 U	0.20 J	0.22 J	< 5.2 U	0.14 J	0.19 J	< 5.2 U	0.16 J	0.22 J
Beryllium, mg/kg	< 5.1 U	< 5.0 U	< 5.3 UH	< 5.2 U	< 5.3 U	< 4.8 UH	< 5.2 U	< 5.3 U	< 5.5 U
Boron, mg/kg	< 10 U	< 10 U	< 11 UH	< 10 U	< 11 U	5.1 JH	< 10 U	< 11 U	< 11 U
Cadmium, mg/kg	< 5.1 U	0.13 J	0.27 J	< 5.2 U	0.12 J	0.28 J	< 5.2 U	0.18 J	0.29 J
Chromium, mg/kg	4.6 J	8.07	12.2	4.9 J	8.68	16.1	5.0 J	15.4	12.4
Cobalt, mg/kg	< 1.0 U	0.98 J	3.63	< 1.0 U	0.99 J	5.13	< 1.0 U	2.42	4.10
Copper, mg/kg	57.0	51.6	207	58.7	65.3	196	45.8	79.3	420
Lead, mg/kg	< 5.1 U	1.9 JH	14.9 H	< 5.2 U	3.0 JH	24.5 H	< 5.2 U	14.3	49.4
Manganese, mg/kg	0.52 J	67.3 [5]	301	0.52 J	69.0 [5]	384	< 1.0 U	172 [5]	306
Mercury, mg/kg	1.47	101 H	694 H	1.48	77.8 H	895 H	< 0.52 U	0.077 J	0.11 J
Nickel, mg/kg	1.1 J	8.93	30.8	1.1 J	13.1	26.8	< 5.2 U	26.7	16.2
Selenium, mg/kg	< 10 U	< 25 U	< 27 U	1.7 J	< 27 U	< 24 U	1.5 J	< 26 U	< 28 U
Silver, mg/kg	< 5.1 U	< 5.0 UH	< 5.3 UH	< 5.2 U	< 5.3 UH	< 4.8 UH	< 5.2 U	< 5.3 U	< 5.5 U
Thallium, mg/kg	< 5.1 U	< 5.0 UH	< 5.3 UH	< 5.2 U	< 5.3 UH	< 4.8 UH	< 5.2 U	< 5.3 U	< 5.5 U
Tin, mg/kg	< 10 U	1.5 JH	10.9 H	< 10 U	1.3 JH	8.0 JH	< 10 U	6.8 J	7.4 J
Vanadium, mg/kg	1.3 J	< 5.0 U	< 5.3 U	1.3 J	1.3 J	< 4.8 U	1.4 J	1.3 J	1.2 J
Zinc, mg/kg	< 10 U	22.8	133 H [10]	< 10 U	23.2	159 H [10]	< 10 U	91.7	287 [10]

Note: See Table 3-12 for explanation of data flags

Table 3-17. Mustard Composition of Individual Samples – Sample Set #5 (Continued)

Test Container Number	D33724			[redacted]			D6685		
Sample Identification	21-03-186	21-03-187	21-03-188	21-03-189	[redacted]	[redacted]	21-03-192	21-03-193	21-03-194
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	92.5 H			93.0			89.2		
Thiodiglycol, Wt.%	< 0.024 U			< 0.025 U			< 0.024 U		
1,2-dichloroethane (DCE), Wt.%	0.522			0.600			0.520		
Tetrachloroethylene, Wt.%	< 0.052 U			< 0.051 U			< 0.051 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.052 U			< 0.051 U			< 0.051 U		
T, Wt.%	0.18 J			0.13 J			0.16 J		
Q, Wt.%	5.66			2.96			3.03		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.25 U			< 0.25 U		
Lewisite (L), mg/kg	< 5.3 U			< 5.1 U			< 5.1 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.083			NR			0.18		
1,4-Dithiane, Wt.%	NR			NR			0.040		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.17			0.13			0.14		
Bis (3-chloropropyl) sulfide, Wt.%	0.096			0.10			0.094		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.28			0.26			0.25		
1,2,5-Trithiepane, Wt.%	NR			NR			0.12		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	99.5			97.2			93.7		
Metals									
Aluminum, mg/kg	< 52 U	< 55 U	< 51 U	23 J	< 53 U	14 J	< 54 U	13 J	22 J
Antimony, mg/kg	< 5.2 U	0.59 J	1.0 J	< 5.1 U	0.62 J	3.1 J	< 5.4 U	1.1 J	2.2 J
Arsenic, mg/kg	6.35	78.2	91.7	5.94	304	279	1.3 J	8.74	5.84
Barium, mg/kg	< 5.2 U	0.24 J	0.23 J	< 5.1 U	0.17 J	0.16 J	< 5.4 U	0.19 J	0.40 J
Beryllium, mg/kg	< 5.2 U	< 5.5 U	< 5.1 U	< 5.1 U	< 5.3 U	< 5.2 U	< 5.4 U	< 5.3 U	< 5.2 U
Boron, mg/kg	< 10 U	< 11 U	< 10 U	< 10 U	< 11 U	< 10 U	< 11 U	< 11 U	< 10 U
Cadmium, mg/kg	< 5.2 U	0.18 J	2.2 J	< 5.1 U	0.13 J	0.20 J	< 5.4 U	0.18 J	0.18 J
Chromium, mg/kg	4.9 J	11.4	21.2	4.7 J	14.1	11.0	4.3 J	69.9	93.6
Cobalt, mg/kg	< 1.0 U	1.98	3.99	< 1.0 U	2.39	3.26	< 1.1 U	12.4	9.98
Copper, mg/kg	44.4	47.6	2350	61.2	62.0	167	28.2	31.2	78.1
Lead, mg/kg	< 5.2 U	126	154	< 5.1 U	27.5	64.5	< 5.4 U	9.7 J	17.3
Manganese, mg/kg	0.58 J	145 [5]	299	1.04	183 [5]	261	2.93	273 [5]	285
Mercury, mg/kg	< 0.52 U	0.16 J	0.920	< 0.51 U	0.26 J	0.563	< 0.54 U	0.849	1.02
Nickel, mg/kg	2.4 J	10.8	18.2	3.1 J	17.7	26.6	0.53 J	25.1	57.2
Selenium, mg/kg	< 10 U	< 28 U	< 25 U	< 10 U	< 26 U	< 26 U	< 11 U	< 27 U	< 26 U
Silver, mg/kg	< 5.2 U	< 5.5 U	0.24 J	< 5.1 U	< 5.3 U	< 5.2 U	< 5.4 U	< 5.3 U	< 5.2 U
Thallium, mg/kg	< 5.2 U	< 5.5 U	< 5.1 U	< 5.1 U	< 5.3 U	< 5.2 U	< 5.4 U	< 5.3 U	< 5.2 U
Tin, mg/kg	< 10 U	2.5 J	11.2	< 10 U	3.1 J	3.8 J	< 11 U	8.4 J	7.8 J
Vanadium, mg/kg	1.3 J	< 5.5 U	< 5.1 U	< 5.1 U	1.4 J	< 5.2 U	1.2 J	2.0 J	1.9 J
Zinc, mg/kg	< 10 U	48.9	4950 [10]	< 10 U	61.2	86.0 [10]	< 11 U	76.0	97.4 [10]

Note: See Table 3-12 for explanation of data flags.

Table 3-17. Mustard Composition of Individual Samples – Sample Set #5 (Continued)

Ton Container Number	D43499			[redacted]			D610		
Sample Identification	21-03-195	21-03-196	21-03-197	21-03-198	[redacted]	[redacted]	21-03-201	21-03-202	21-03-203
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	98.8			92.4			88.1		
Thiodiglycol, Wt.%	< 0.026 U			< 0.026 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.615			0.612			0.321		
Tetrachloroethylene, Wt.%	< 0.053 U			< 0.052 U			< 0.051 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.053 U			< 0.052 U			< 0.051 U		
T, Wt.%	0.12 J			0.16 J			0.15 J		
Q, Wt.%	3.06			3.47			2.66		
Hexachloroethane (HCE), Wt.%	< 0.25 U			< 0.25 U			< 0.25 U		
Lewisite (L), mg/kg	< 5.3 U			< 5.1 U			< 5.1 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			NR			0.10		
1,4-Dithiane, Wt.%	NR			0.18			NR		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.15			0.14			0.11		
Bis (3-chloropropyl) sulfide, Wt.%	0.13			0.089			0.058		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.32			0.29			0.21		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	103			97.3			91.7		
Metals									
Aluminum, mg/kg	< 52 U	< 49 U	< 54 U	< 52 U	14 J	< 50 U	< 52 U	< 54 U	11 J
Antimony, mg/kg	< 5.2 U	0.47 J	1.1 J	< 5.2 U	0.77 J	0.27 J	< 5.2 U	< 5.4 U	2.3 J
Arsenic, mg/kg	11.3	119	28.7	< 5.2 U	5.73	3.8 J	< 5.2 U	1.4 J	11.3
Barium, mg/kg	< 5.2 U	0.19 J	0.22 J	< 5.2 U	3.2 J	0.43 J	< 5.2 U	0.18 J	0.27 J
Beryllium, mg/kg	< 5.2 U	< 4.9 U	< 5.4 U	< 5.2 U	< 5.6 U	< 5.0 U	< 5.2 U	< 5.4 U	< 4.8 U
Boron, mg/kg	< 10 U	< 9.8 U	< 11 U	< 10 U	< 11 U	< 10 U	< 10 U	< 11 U	< 9.7 U
Cadmium, mg/kg	< 5.2 U	0.15 J	0.26 J	< 5.2 U	0.20 J	0.20 J	< 5.2 U	0.16 J	0.12 J
Chromium, mg/kg	4.2 J	18.3	35.7	5.20	24.4	17.1	4.6 J	5.62	51.8
Cobalt, mg/kg	< 1.0 U	2.59	4.74	< 1.0 U	5.26	4.39	< 1.0 U	< 1.1 U	13.2
Copper, mg/kg	52.9	67.3	185	29.3	64.0	148	7.97	9.7 J	8.1 J
Lead, mg/kg	0.61 J	23.1	68.5	< 5.2 U	17.2	32.8	< 5.2 U	< 11 U	25.9
Manganese, mg/kg	0.38 J	170 [5]	430	< 1.0 U	348 [5]	337	4.97	7.2 J [5]	651
Mercury, mg/kg	< 0.52 U	0.13 J	0.22 J	< 0.52 U	0.35 J	0.25 J	< 0.52 U	0.083 J	1.91
Nickel, mg/kg	5.26	10.5	21.1	< 5.2 U	19.6	30.5	1.8 J	2.5 J	152
Selenium, mg/kg	< 10 U	< 24 U	< 27 U	2.0 J	< 28 U	< 25 U	< 10 U	< 27 U	< 24 U
Silver, mg/kg	< 5.2 U	< 4.9 U	< 5.4 U	< 5.2 U	< 5.6 U	< 5.0 U	< 5.2 U	< 5.4 U	< 4.8 U
Thallium, mg/kg	< 5.2 U	< 4.9 U	< 5.4 U	< 5.2 U	< 5.6 U	< 5.0 U	< 5.2 U	< 5.4 U	< 4.8 U
Tin, mg/kg	< 10 U	3.3 J	4.4 J	< 10 U	2.0 J	1.8 J	< 10 U	< 11 U	8.8 J
Vanadium, mg/kg	1.1 J	1.3 J	< 5.4 U	1.2 J	1.3 J	1.0 J	1.2 J	1.5 J	1.5 J
Zinc, mg/kg	< 10 U	78.8	182 [10]	< 10 U	92.4	142 [10]	< 10 U	< 11 U	6.6 J [10]

Note: See Table 3-12 for explanation of data flags

Table 3-17. Mustard Composition of Individual Samples – Sample Set #5 (Continued)

Test Container Number	D16541			[redacted]			D52603		
Sample Identification	21-03-204	21-03-205	21-03-206	21-03-207	[redacted]		21-03-210	21-03-211	21-03-212
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]		Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	93.0			95.4			101		
Thiodiglycol, Wt.%	< 0.025 U			< 0.026 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.447			0.530			0.615		
Tetrachloroethylene, Wt.%	< 0.051 U			< 0.053 U			< 0.051 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U			< 0.053 U			< 0.051 U		
T, Wt.%	0.13 J			0.11 J			0.094 J		
Q, Wt.%	2.89			3.78			2.45		
Hexachloroethane (HCE), Wt.%	< 0.25 U			< 0.25 U			< 0.25 U		
Lewisite (L), mg/kg	< 5.2 U			< 5.1 U			< 5.2 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.15			NR			NR		
1,4-Dithiane, Wt.%	0.28			0.12			NR		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.13			0.16			0.16		
Bis (3-chloropropyl) sulfide, Wt.%	0.079			0.13			0.088		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.25			0.28			0.25		
1,2,5-Trithiepane, Wt.%	0.082			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	97.4			101			105		
Metals									
Aluminum, mg/kg	< 51 U	11 J	< 48 U	< 51 U	16 J	19 J	< 52 U	18 J	< 54 U
Antimony, mg/kg	< 5.1 U	0.22 J	0.85 J	< 5.1 U	0.16 J	0.24 J	< 5.2 U	0.42 J	1.2 J
Arsenic, mg/kg	< 5.1 U	5.73	7.55	5.31	101	126	12.1	178	69.0
Barium, mg/kg	< 5.1 U	1.1 J	1.8 J	< 5.1 U	0.38 J	0.23 J	< 5.2 U	0.15 J	0.15 J
Beryllium, mg/kg	< 5.1 U	< 4.9 U	< 4.8 U	< 5.1 U	< 4.9 U	< 5.4 U	< 5.2 U	< 5.3 U	< 5.4 U
Boron, mg/kg	< 10 U	< 9.8 U	< 9.5 U	< 10 U	< 9.7 U	< 11 U	< 10 U	< 11 U	< 11 U
Cadmium, mg/kg	< 5.1 U	0.16 J	0.19 J	< 5.1 U	0.16 J	0.19 J	< 5.2 U	0.16 J	0.23 J
Chromium, mg/kg	3.4 J	20.1	38.2	4.2 J	14.9	19.1	4.4 J	11.6	12.8
Cobalt, mg/kg	< 1.0 U	3.51	7.16	< 1.0 U	1.87	3.32	< 1.0 U	2.75	6.22
Copper, mg/kg	20.2	17.7	42.4	68.5	76.2	176	60.0	68.8	151
Lead, mg/kg	< 5.1 U	8.0 J	15.5	< 5.1 U	4.6 J	103	< 5.2 U	5.9 J	18.1
Manganese, mg/kg	3.06	250 [5]	435	< 1.0 U	114 [5]	230	< 1.0 U	103 [5]	279
Mercury, mg/kg	< 0.51 U	0.39 J	0.519	< 0.51 U	< 0.49 U	0.081 J	< 0.52 U	0.088 J	0.21 J
Nickel, mg/kg	< 5.1 U	25.9	71.6	< 5.1 U	11.5	14.2	< 5.2 U	18.8	10.3
Selenium, mg/kg	< 10 U	< 25 U	< 24 U	< 10 U	< 24 U	< 27 U	< 10 U	< 27 U	< 27 U
Silver, mg/kg	< 5.1 U	< 4.9 U	< 4.8 U	< 5.1 U	< 4.9 U	< 5.4 U	< 5.2 U	< 5.3 U	< 5.4 U
Thallium, mg/kg	< 5.1 U	< 4.9 U	< 4.8 U	< 5.1 U	< 4.9 U	< 5.4 U	< 5.2 U	< 5.3 U	< 5.4 U
Tin, mg/kg	< 10 U	0.75 J	2.6 J	< 10 U	0.72 J	1.5 J	< 10 U	3.4 J	5.2 J
Vanadium, mg/kg	< 5.1 U	1.8 J	0.98 J	1.1 J	1.6 J	< 5.4 U	1.3 J	< 5.3 U	< 5.4 U
Zinc, mg/kg	< 10 U	37.6	71.0 [10]	< 10 U	63.2	111 [10]	< 10 U	51.2	140 [10]

Note: See Table 3-12 for explanation of data flags

Table 3-18. Mustard Composition of Individual Samples – Sample Set #6

Test Container Number	D47472			[redacted]			D17555		
Sample Identification	21-03-213	21-03-215	21-03-217	21-03-214	[redacted]		21-03-219	21-03-220	21-03-221
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]		Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	89.0			95.3			90.4		
Thiodiglycol, Wt.%	< 0.026 UH			< 0.026 UH			< 0.025 UH		
1,2-dichloroethane (DCE), Wt.%	0.690			0.671			0.628		
Tetrachloroethylene, Wt.%	< 0.053 U			< 0.051 U			< 0.054 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.053 U			< 0.051 U			< 0.054 U		
T, Wt.%	0.11 J [4]			0.098 J [4]			0.12 J [4]		
Q, Wt.%	4.93			4.75			3.09		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.26 U			< 0.26 U		
Lewisite (L), mg/kg	< 5.6 UH			< 5.3 UH			< 5.1 UH		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.12			NR			0.26		
1,4-Dithiane, Wt.%	0.22			0.19			0.61		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.16			0.15			0.12		
Bis (3-chloropropyl) sulfide, Wt.%	0.10			0.089			0.087		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.28			0.26			0.21		
1,2,5-Trithiepane, Wt.%	NR			NR			0.11		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			0.24		
Mass Balance, Wt. %	95.6			102			95.9		
Metals									
Aluminum, mg/kg	15 J	12 J	< 51 UH	23 J	10 J	12 JH	< 51 U	12 J	22 JH
Antimony, mg/kg	< 5.3 U	< 5.2 U	1.4 J	0.67 J	0.38 J	1.9 J	< 5.1 U	0.95 J	2.2 J
Arsenic, mg/kg	< 5.3 U	< 5.2 U	2.4 J	< 5.1 U	< 4.9 U	1.6 J	1.3 J	9.47	10.3
Barium, mg/kg	< 5.3 U	0.075 J	0.12 J	< 5.1 U	0.080 J	0.33 J	< 5.1 U	0.48 J	1.9 J
Beryllium, mg/kg	< 5.3 U	< 5.2 U	< 5.1 U	< 5.1 U	< 4.9 U	< 5.6 U	< 5.1 U	< 5.5 U	< 5.4 U
Boron, mg/kg	4.9 J	< 11 U	< 10 U	8.9 J	< 9.9 U	< 11 U	< 10 U	< 11 U	< 11 U
Cadmium, mg/kg	< 5.3 U	0.18 J	0.26 J	< 5.1 U	0.16 J	0.28 J	< 5.1 U	0.28 J	0.22 J
Chromium, mg/kg	5.2 J	2.9 J	17.0	5.56	3.5 J	15.6	5.23	27.6	105
Cobalt, mg/kg	< 1.1 U	< 1.1 U	3.86	< 1.0 U	< 0.99 U	4.09	< 1.0 U	5.70	10.1
Copper, mg/kg	45.4	48.4	115 [10]	45.7	26.2	114 [10]	32.0	25.3	20.3 [10]
Lead, mg/kg	< 5.3 U	< 11 U	35.4 [10]	< 5.1 U	< 9.9 U	30.8 [10]	< 5.1 U	27.9	73.1 [10]
Manganese, mg/kg	0.71 J	< 11 U	298	< 1.0 U	< 9.9 U	317	3.32	456	564
Mercury, mg/kg	< 0.53 U	< 0.52 U	0.893	< 0.51 U	< 0.49 U	0.684	< 0.51 U	0.749	0.661
Nickel, mg/kg	< 5.33 U	1.8 J	17.5	< 5.1 U	< 4.9 U	17.7	1.9 J	60.9	446
Selenium, mg/kg	< 11 U	< 26 U	< 26 U	< 10 U	< 25 U	< 28 U	< 10 U	< 28 U	< 27 U
Silver, mg/kg	< 5.3 U	< 5.2 U	< 5.1 U	< 5.1 U	0.087 J	0.084 J	< 5.1 U	< 5.5 U	< 5.4 U
Thallium, mg/kg	< 5.3 U	< 5.2 U	< 5.1 U	< 5.1 U	< 4.9 U	< 5.6 U	< 5.1 U	< 5.5 U	< 5.4 U
Tin, mg/kg	< 11 U	< 11 U	13.4	< 10 U	< 9.9 U	12.3	< 10 U	5.1 J	7.7 J
Vanadium, mg/kg	1.4 J	< 5.2 U	< 5.1 U	1.4 J	1.1 J	< 5.6 U	1.2 J	< 5.5 U	1.2 J
Zinc, mg/kg	< 11 U	< 11 U	69.5 [10]	< 10 U	< 9.9 U	63.9 [10]	< 10 U	109	59.4 [10]

Note: See Table 3-12 for explanation of data flags.

Table 3-18. Mustard Composition of Individual Samples – Sample Set #6 (Continued)

Test Container Number	D41617			[redacted]			D82228		
Sample Identification	21-03-222	21-03-223	21-03-224	21-03-225	[redacted]	[redacted]	21-03-228	21-03-229	21-03-230
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	93.2			90.7			90.2		
Thiodiglycol, Wt.%	< 0.024 UH			< 0.026 UH			< 0.026 UH		
1,2-dichloroethane (DCE), Wt.%	0.629			0.828			0.660		
Tetrachloroethylene, Wt.%	< 0.050 U			< 0.052 U			< 0.051 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.050 U			< 0.052 U			< 0.051 U		
T, Wt.%	0.092 J [4]			0.099 J [4]			0.053 J [4]		
Q, Wt.%	3.29			4.71			2.98		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.27 U			< 0.26 U		
Lewisite (L), mg/kg	< 5.2 UH			< 5.1 UH			2.8 JH		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.20			0.11			NR		
1,4-Dithiane, Wt.%	0.38			0.23			0.17		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.13			0.16			0.14		
Bis (3-chloropropyl) sulfide, Wt.%	NR			0.12			0.14		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.21			0.32			0.25		
1,2,5-Trithiepane, Wt.%	0.11			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	98.2			97.3			94.6		
Metals									
Aluminum, mg/kg	< 51 U	17 J	29 J	< 52 U	24 J	2930	28 J	21 J	11 J
Antimony, mg/kg	< 5.1 U	1.1 J	0.59 J	< 5.2 U	0.85 J	1.2 J	< 5.2 U	1.4 J	1.2 J
Arsenic, mg/kg	< 5.1 U	788	371	< 5.2 U	67.9	63.6	6.82	372	561
Barium, mg/kg	< 5.1 U	0.50 J	0.52 J	< 5.2 U	0.15 J	0.51 J	< 5.2 U	0.15 J	< 4.8 U
Beryllium, mg/kg	< 5.1 U	< 4.9 U	< 5.1 U	< 5.2 U	< 4.9 U	0.067 J	< 5.2 U	< 4.9 U	< 4.8 U
Boron, mg/kg	< 10 U	< 9.8 U	4.9 J	< 10 U	< 9.8 U	< 11 U	< 10 U	< 9.8 U	< 9.6 U
Cadmium, mg/kg	< 5.1 U	0.23 J	0.26 J	< 5.2 U	0.21 J	0.38 J	< 5.2 U	0.25 J	0.22 J
Chromium, mg/kg	5.0 J	22.1	18.9	9.69	12.4	17.2	6.46	9.14	10.4
Cobalt, mg/kg	< 1.0 U	5.01	3.12	< 1.0 U	3.14	3.70	< 1.0 U	2.95	2.84
Copper, mg/kg	26.4	29.8	100 [10]	52.8	89.9	292 [10]	59.0	62.0	118 [10]
Lead, mg/kg	< 5.1 U	32.3	24.6 [10]	< 5.2 U	9.8 J	39.1 [10]	< 5.2 U	16.0	18.5 [10]
Manganese, mg/kg	2.02	323	219	0.44 J	197	208	0.34 J	182	193
Mercury, mg/kg	< 0.51 U	0.22 J	0.13 J	1.62	343	95.0	< 0.52 U	0.41 J	0.19 J
Nickel, mg/kg	< 5.1 U	13.9	12.9	0.43 J	11.6	17.5	2.6 J	12.5	12.9
Selenium, mg/kg	< 10 U	< 24 U	< 26 U	< 10 U	< 25 U	< 26 U	< 10 U	< 25 U	< 24 U
Silver, mg/kg	< 5.1 U	< 4.9 U	< 5.1 U	< 5.2 U	< 4.9 U	0.090 J	< 5.2 U	< 4.9 U	< 4.8 U
Thallium, mg/kg	< 5.1 U	< 4.9 U	< 5.1 U	< 5.2 U	< 4.9 U	< 5.3 U	< 5.2 U	< 4.9 U	< 4.8 U
Tin, mg/kg	< 10 U	4.7 J	3.4 J	< 10 U	3.2 J	2.1 J	< 10 U	7.1 J	6.2 J
Vanadium, mg/kg	1.2 J	1.1 J	< 5.1 U	1.3 J	1.3 J	1.2 J	1.5 J	< 4.9 U	< 4.8 U
Zinc, mg/kg	< 10 U	85.5	136 [10]	< 10 U	56.7	265 [10]	< 10 U	68.5	101 [10]

Note: See Table 3-12 for explanation of data flags.

Table 3-18. Mustard Composition of Individual Samples – Sample Set #6 (Continued)

Tox Container Number	D54617			D32252					
Sample Identification	21-03-231	21-03-232	21-03-233	21-03-234			21-03-238	21-03-239	21-03-240
Sample Matrix	Liquid	NC Solid	Solid	Liquid			Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	89.6			86.2			92.9		
Thiodiglycol, Wt.%	< 0.025 U			< 0.026 U			< 0.025 U		
1,2-dichloroethane (DCE), Wt.%	0.676			0.597			0.619		
Tetrachloroethylene, Wt.%	< 0.052 U			< 0.052 U			0.039 J		
1,1,2,2-tetrachloroethane, Wt.%	< 0.052 U			< 0.052 U			< 0.050 U		
T, Wt.%	0.085 J [4]			0.090 J [4]			0.041 J [4]		
Q, Wt.%	4.84			3.00			3.91		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.26 U			< 0.25 U		
Lewisite (L), mg/kg	< 5.2 U			< 5.1 U			< 5.1 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.12			0.21			NR		
1,4-Dithiane, Wt.%	0.27			0.65			0.13		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.13			0.13			0.12		
Bis (3-chloropropyl) sulfide, Wt.%	NR			NR			0.076		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.27			0.24			0.14		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	96.0			91.1			98.0		
Metals									
Aluminum, mg/kg	< 51 U	19 J	12 J	< 51 U	46 J	23 J	< 53 U	18 J	< 49 U
Antimony, mg/kg	< 5.1 U	< 5.6 U	0.52 J	< 5.1 U	0.69 J	1.7 J	< 5.3 U	0.53 J	1.7 J
Arsenic, mg/kg	< 5.1 U	0.83 J	1.4 J	< 5.1 U	7.17	9.77	< 5.3 U	30.8	28.1
Barium, mg/kg	< 5.1 U	0.10 J	0.18 J	< 5.1 U	0.26 J	0.16 J	< 5.3 U	0.11 J	< 4.9 U
Beryllium, mg/kg	< 5.1 U	< 5.6 U	< 4.9 U	< 5.1 U	< 4.7 U	< 5.5 U	< 5.3 U	< 5.5 U	< 4.9 U
Boron, mg/kg	< 10 U	< 11 U	< 9.8 U	< 10 U	< 9.4 U	< 11 U	< 11 U	< 11 U	< 9.9 U
Cadmium, mg/kg	< 5.1 U	0.20 J	0.26 J	< 5.1 U	0.20 J	0.26 J	< 5.3 U	0.22 J	0.58 J
Chromium, mg/kg	5.77	4.4 J	13.6	5.58	24.6	55.1	5.47	9.46	9.87
Cobalt, mg/kg	< 1.0 U	< 1.1 U	3.42	< 1.0 U	5.01	10.1	< 1.1 U	2.00	3.39
Copper, mg/kg	43.3	42.5	58.3 [10]	18.6	15.4	13.8 [10]	47.0	42.2	231 [10]
Lead, mg/kg	< 5.1 U	< 11 U	13.2 [10]	< 5.1 U	19.2	51.3 [10]	< 5.3 U	11 J	46.9 [10]
Manganese, mg/kg	0.56 J	< 11 U	312	3.17	310	503	< 1.1 U	149	307
Mercury, mg/kg	< 0.51 U	0.099 J	1.18	< 0.51 U	0.34 J	0.25 J	< 0.53 U	0.086 J	0.11 J
Nickel, mg/kg	0.54 J	2.4 J	10.0	< 5.1 U	35.5	90.4	1.2 J	15.1	28.8
Selenium, mg/kg	< 10 U	< 28 U	< 25 U	< 10 U	< 24 U	< 28 U	< 11 U	< 27 U	< 25 U
Silver, mg/kg	< 5.1 U	< 5.6 U	< 4.9 U	< 5.1 U	< 4.7 U	< 5.5 U	< 5.3 U	< 5.5 U	< 4.9 U
Thallium, mg/kg	< 5.1 U	< 5.6 U	< 4.9 U	< 5.1 U	< 4.7 U	< 5.5 U	< 5.3 U	< 5.5 U	< 4.9 U
Tin, mg/kg	< 10 U	< 11 U	1.5 J	< 10 U	2.9 J	6.4 J	< 11 U	2.1 J	7.8 J
Vanadium, mg/kg	1.5 J	1.2 J	< 4.9 U	1.2 J	1.2 J	1.2 J	1.3 J	< 5.5 U	< 4.9 U
Zinc, mg/kg	< 10 U	< 11 U	93.5 [10]	< 10 U	38.5	59.6 [10]	< 11 U	43.1	276 [10]

Note: See Table 3-12 for explanation of data flags

Table 3-18. Mustard Composition of Individual Samples – Sample Set #6 (Continued)

Tea Container Number	D6800			[redacted]			D1841		
Sample Identification	21-03-241	21-03-242	21-03-243	21-03-244	[redacted]	[redacted]	21-03-247	21-03-248	21-03-249
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	93.6			85.2			94.4		
Thiodiglycol, Wt.%	< 0.025 U			< 0.025 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.592			0.598			0.571		
Tetrachloroethylene, Wt.%	0.027 J			0.0550			< 0.052 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U			< 0.052 U			< 0.052 U		
T, Wt.%	< 0.26 U			0.053 J [4]			0.066 J [4]		
Q, Wt.%	2.61			3.63			3.12		
Hexachloroethane (HCE), Wt.%	< 0.26 U			< 0.25 U			< 0.26 U		
Lewisite (L), mg/kg	< 5.1 U			< 5.1 U			< 5.0 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			0.083			0.17		
1,4-Dithiane, Wt.%	0.092			0.16			0.43		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.13			0.14			0.15		
Bis (3-chloropropyl) sulfide, Wt.%	NR			0.11			NR		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.14			0.29			0.27		
1,2,5-Trithiepane, Wt.%	NR			NR			0.093		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	97.2			90.3			99.3		
Metals									
Aluminum, mg/kg	< 52 U	34 J	< 54 U	< 53 U	183	< 51 U	25 J	19 J	24 J
Antimony, mg/kg	< 5.2 U	0.64 J	1.1 J	< 5.3 U	0.51 J	0.51 J	< 5.2 U	0.58 J	0.46 J
Arsenic, mg/kg	2.0 J	25.0	42.6	< 5.3 U	39.5	10.1	< 5.2 U	6.70	2.7 J
Barium, mg/kg	< 5.2 U	0.18 J	0.075 J	< 5.3 U	47.1	< 5.1 U	< 5.2 U	0.38 J	0.41 J
Beryllium, mg/kg	< 5.2 U	< 5.1 U	< 5.4 U	< 5.3 U	< 5.5 U	< 5.1 U	< 5.2 U	< 4.9 U	< 5.3 U
Boron, mg/kg	< 10 U	< 10 U	< 11 U	4.2 J	< 11 U	< 10 U	6.0 J	< 9.8 U	4.9 J
Cadmium, mg/kg	< 5.2 U	0.23 J	0.43 J	< 5.3 U	0.26 J	0.29 J	< 5.2 U	0.20 J	0.18 J
Chromium, mg/kg	8.11	24.7	27.8	8.20	56.0	9.53	29.9	64.7	397
Cobalt, mg/kg	< 1.0 U	6.86	11.3	< 1.1 U	2.14	3.36	< 1.0 U	4.19	2.13
Copper, mg/kg	70.7	85.1	212 [10]	58.3	62.9	231 [10]	8.50	11.1	16.1 [10]
Lead, mg/kg	< 5.2 U	19.4	368 [10]	< 5.3 U	92.0	10 J [10]	< 5.2 U	8.8 J	26.5 [10]
Manganese, mg/kg	0.54 J	204	377	0.62 J	117	391	5.84	316	193
Mercury, mg/kg	< 0.52 U	< 0.51 U	0.084 J	< 0.53 U	< 0.55 U	0.16 J	< 0.52 U	0.597	0.45 J
Nickel, mg/kg	5.50	8.46	19.3	2.8 J	12.5	51.7	15.7	22.1	75.2
Selenium, mg/kg	< 10 U	< 25 U	< 27 U	< 11 U	< 27 U	< 25 U	< 10 U	< 24 U	< 27 U
Silver, mg/kg	< 5.2 U	< 5.1 U	< 5.4 U	< 5.3 U	< 5.5 U	< 5.1 U	< 5.2 U	< 4.9 U	< 5.3 U
Thallium, mg/kg	< 5.2 U	< 5.1 U	< 5.4 U	< 5.3 U	< 5.5 U	< 5.1 U	< 5.2 U	< 4.9 U	< 5.3 U
Tin, mg/kg	< 10 U	3.0 J	3.5 J	< 11 U	2.6 J	1.7 J	< 10 U	2.6 J	1.0 J
Vanadium, mg/kg	1.1 J	1.6 J	< 5.4 U	1.4 J	< 5.5 U	< 5.1 U	1.3 J	< 4.9 U	< 5.3 U
Zinc, mg/kg	3.2 J	103	405 [10]	< 11 U	113	81.4 [10]	29.4	3.0 J	8.5 J [10]

Note: See Table 3-12 for explanation of data flags.

Table 3-19. Mustard Composition of Individual Samples – Sample Set #7

Ton Container Number	D50373			[redacted]			D00775		
Sample Identification	21-03-254	21-03-256	21-03-258	21-03-255	[redacted]	[redacted]	21-03-262	21-03-263	21-03-264
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	85.4			88.1			92.3		
Thiodiglycol, Wt.%	< 0.025 U			< 0.026 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.391			0.369			0.858		
Tetrachloroethylene, Wt.%	< 0.053 U			< 0.051 U			< 0.052 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.053 U			< 0.051 U			< 0.052 U		
T, Wt.%	0.355			0.353			0.11 J		
Q, Wt.%	2.55			2.52			3.39		
Hexachloroethane (HCE), Wt.%	< 0.026 U			< 0.026 U			< 0.025 U		
Lewisite (L), mg/kg	< 5.1 UH			< 5.0 UH			< 5.2 UH		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.14			0.14			NR		
1,4-Dithiane, Wt.%	0.21			0.11			0.16		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.10			0.097			0.13		
Bis (3-chloropropyl) sulfide, Wt.%	0.062			0.079			0.070		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.18			0.18			0.21		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			0.28			NR		
Mass Balance, Wt. %	89.4			92.2			97.2		
Metals									
Aluminum, mg/kg	< 53 U	< 49 U	14 JH [1]	< 52 U	< 52 U	< 47 UH	< 52 U	16 J	< 51 UH
Antimony, mg/kg	< 5.3 U	3.3 J	3.1 J [2]	< 5.2 U	2.0 J	2.5 J [2]	< 5.2 U	0.51 J	2.1 J [2]
Arsenic, mg/kg	2.2 J	5.99	5.94	2.4 J	8.19	6.44	1.5 J	74.9	58.2
Barium, mg/kg	< 5.3 U	0.86 J	5.4 J	< 5.2 U	0.53 J	6.55	< 5.2 U	0.40 J	0.066 J
Beryllium, mg/kg	< 5.3 U	< 4.9 U	< 5.5 UH	< 5.2 U	< 5.2 U	< 4.7 UH	< 5.2 U	< 5.4 U	< 5.1 UH
Boron, mg/kg	< 11 U	< 9.8 U	< 11 UH	< 10 U	< 10 U	< 9.4 UH	< 11 U	< 11 U	< 10 UH
Cadmium, mg/kg	< 5.3 U	0.23 J	0.22 J	< 5.2 U	0.23 J	0.21 J	< 5.2 U	0.30 J	0.31 J
Chromium, mg/kg	2.9 J	127 [4]	78.2	3.1 J	76.6 [4]	79.6	2.5 J	77.3 [4]	9.28
Cobalt, mg/kg	< 1.1 U	18.0	16.6	< 1.0 U	10.7	17.5	< 1.1 U	2.41	3.22
Copper, mg/kg	7.53	195 [4]	131	8.87	111 [4]	125	61.7	109 [4]	315
Lead, mg/kg	< 5.3 U	91.7	81.6 [10]	< 5.2 U	55.1	67.4 [10]	0.84 J	1340	12.5 [10]
Manganese, mg/kg	< 1.1 U	777 [10]	789	< 1.0 U	492 [10]	808	< 1.1 U	145 [10]	289
Mercury, mg/kg	< 0.53 U	0.808	0.747	< 0.52 U	0.45 J	0.832	< 0.52 U	< 0.54 U	0.17 J
Nickel, mg/kg	< 5.3 U	301 [4]	376	< 5.2 U	213 [4]	385	< 5.2 U	47.2 [4]	33.0
Selenium, mg/kg	< 11 U	< 25 U	< 27 U	< 10 U	< 26 U	< 24 U	< 11 U	1.1 J	< 25 U
Silver, mg/kg	< 5.3 U	< 4.9 U	< 5.5 U	< 5.2 U	< 5.2 U	< 4.7 U	< 5.2 U	< 5.4 U	< 5.1 U
Thallium, mg/kg	< 5.3 U	< 4.9 U	< 5.5 U	< 5.2 U	< 5.2 U	< 4.7 U	< 5.2 U	< 5.4 U	< 5.1 U
Tin, mg/kg	< 11 U	26.2	16.8	< 10 U	15.4	17.3	< 11 U	2.6 J	2.6 J
Vanadium, mg/kg	< 5.3 U	< 4.9 U	< 5.5 U	< 5.2 U	< 5.2 U	< 4.7 U	< 5.2 U	1.2 J	< 5.1 U
Zinc, mg/kg	< 11 U	53.9 [4]	32.6 [5]	5.2 J	32.5 [4]	25.9 [5]	5.4 J	136 [4]	153 [5]

Note: See Table 3-12 for explanation of data flags

Table 3-19. Mustard Composition of Individual Samples – Sample Set #7 (Continued)

Ton Container Number	D47810			[redacted]			D51059		
Sample Identification	21-03-265	21-03-266	21-03-267	21-03-269	[redacted]	[redacted]	21-03-273	21-03-274	21-03-275
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	93.2			86.6			82.2		
Thiodiglycol, Wt.%	< 0.027 U			< 0.027 U			< 0.025 U		
1,2-dichloroethane (DCE), Wt.%	0.551			1.02			0.718		
Tetrachloroethylene, Wt.%	< 0.053 U			< 0.053 U			< 0.053 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.053 U			< 0.053 U			< 0.053 U		
T, Wt.%	0.11 J			0.14 J			0.10 J		
Q, Wt.%	4.69			3.44			2.48		
Hexachloroethane (HCE), Wt.%	< 0.027 U			< 0.027 U			< 0.025 U		
Lewisite (L), mg/kg	< 5.1 UH			< 5.1 UH			< 5.0 UH		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			0.16			NR		
1,4-Dithiane, Wt.%	0.13			1.04			0.76		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.14			0.10			0.087		
Bis (3-chloropropyl) sulfide, Wt.%	0.071			NR			0.055		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.22			0.16			0.13		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	99.1			92.7			86.5		
Metals									
Aluminum, mg/kg	< 51 U	38 J	< 50 U	15 J	< 49 U	< 50 U	< 53 U	< 50 U	51.1 [3]
Antimony, mg/kg	< 5.1 U	1.3 J	1.8 J [2]	< 5.2 U	0.22 J	1.8 J [2]	< 5.3 U	0.14 J	1.2 J [2]
Arsenic, mg/kg	1.3 J	36.7	34.5	5.90	267	1770	1.7 J	14.1	89.4
Barium, mg/kg	< 5.1 U	< 4.9 U	< 5.0 U	< 5.2 U	< 4.87 U	< 5.0 U	< 5.3 U	0.088 J	0.062 J
Beryllium, mg/kg	< 5.1 U	< 4.9 U	< 5.0 U	< 5.2 U	< 4.9 U	< 5.0 U	< 5.3 U	0.054 J	< 4.7 U
Boron, mg/kg	< 10 U	< 9.7 U	< 10 U	4.1 J	< 9.8 U	< 10 U	< 11 U	< 10 U	< 9.4 U
Cadmium, mg/kg	< 5.1 U	0.23 J	0.21 J	< 5.2 U	0.20 J	0.22 J	< 5.3 U	0.17 J	0.26 J
Chromium, mg/kg	2.7 J	9.61 [4]	17.7	2.7 J	9.91 [4]	26.3	3.1 J	6.98 [4]	31.3
Cobalt, mg/kg	< 1.0 U	2.00	4.06	< 1.0 U	2.47	6.24	< 1.1 U	0.88 J	5.54
Copper, mg/kg	38.9	39.2 [4]	51.5	36.1	50.5 [4]	135	29.2	33.8 [4]	80.3
Lead, mg/kg	< 5.1 U	9.5 J	16.4 [10]	< 5.2 U	7.8 J	27.6 [10]	< 5.26 U	4.5 J	64.2 [10]
Manganese, mg/kg	< 1.0 U	110 [10]	208	1.96	176 [10]	365	3.23	46.0 [10]	352
Mercury, mg/kg	< 0.51 U	< 0.485 U	0.096 J	27.4	2910	5590	5.75	87.3	996
Nickel, mg/kg	< 5.1 U	16.9 [4]	8.99	< 5.2 U	22.6 [4]	33.8	0.92 J	9.72 [4]	39.1
Selenium, mg/kg	< 10 U	< 24 U	< 25 U	< 10 U	< 24 U	< 25 U	< 11 U	< 25 U	< 24 U
Silver, mg/kg	< 5.1 U	< 4.9 U	< 5.0 U	< 5.2 U	< 4.9 U	< 5.0 U	< 5.3 U	< 5.0 U	< 4.7 U
Thallium, mg/kg	< 5.1 U	< 4.9 U	< 5.0 U	< 5.2 U	< 4.9 U	< 5.0 U	< 5.3 U	< 5.0 U	< 4.7 U
Tin, mg/kg	< 10 U	4.2 J	8.2 J	< 10 U	1.1 J	3.0 J	< 11 U	0.67 J	4.0 J
Vanadium, mg/kg	< 5.1 U	< 4.9 U	< 5.0 U	< 5.2 U	< 4.9 U	< 5.0 U	< 5.3 U	< 5.0 U	< 4.7 U
Zinc, mg/kg	< 10 U	33.1 [4]	61.5 [5]	< 10 U	39.8 [4]	149 [5]	< 11 U	12.7 [4]	94.3 [5]

Note: See Table 3-12 for explanation of data flags.

Table 3-19. Mustard Composition of Individual Samples – Sample Set #7 (Continued)

Tote Container Number	D27635			[redacted]			D45179		
Sample Identification	21-03-276	21-03-277	21-03-278	21-03-279	[redacted]		[redacted]	21-03-283	[redacted]
Sample Matrix	Liquid	NC Solid	Solid	Liquid			Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	95.5			86.7			87.5		
Thiodiglycol, Wt.%	< 0.027 U			< 0.025 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.568			0.741			0.895		
Tetrachloroethylene, Wt.%	< 0.052 U			< 0.049 U			< 0.050 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.052 U			< 0.049 U			< 0.050 U		
T, Wt.%	0.080 J			0.10 J			0.11 J		
Q, Wt.%	3.60			2.34			2.58		
Hexachloroethane (HCE), Wt.%	< 0.027 U			< 0.026 U			< 0.026 U		
Lewisite (L), mg/kg	< 5.2 UH			< 5.1 U			< 5.0 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			NR			0.15		
1,4-Dithiane, Wt.%	0.085			0.24			0.85		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.12			0.097			0.094		
Bis (3-chloropropyl) sulfide, Wt.%	0.056			0.057			0.060		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.13			0.14			0.15		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			0.090			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			0.050		
Mass Balance, Wt. %	100			90.5			92.4		
Metals									
Aluminum, mg/kg	39 J	< 48 U	14 J [3]	< 53 U	< 48 U	12 J [3]	< 53 U	< 51 U	< 53 U
Antimony, mg/kg	< 5.3 U	0.16 J	0.25 J [2]	< 5.3 U	0.82 J	0.87 J [2]	< 5.3 U	< 5.1 U	1.5 J [2]
Arsenic, mg/kg	15.3	311	226	< 5.3 U	5.84	10.0	14.1	15.3	478
Barium, mg/kg	< 5.3 U	< 4.8 U	< 5.2 U	< 5.3 U	2.5 J	0.35 J	< 5.3 U	< 5.1 U	0.42 J
Beryllium, mg/kg	< 5.3 U	< 4.8 U	< 5.2 U	< 5.3 U	< 4.8 U	< 4.9 U	< 5.3 U	< 5.1 U	< 5.3 U
Boron, mg/kg	9.2 J	< 9.7 U	< 10 U	< 11 U	< 9.7 U	< 9.8 U	< 11 U	< 10 U	< 11 U
Cadmium, mg/kg	< 5.3 U	0.24 J	0.34 J	< 5.3 U	0.40 J	0.24 J	< 5.3 U	0.18 J	0.32 J
Chromium, mg/kg	3.7 J	19.9 [4]	10.3	4.3 J	31.7 [4]	67.5	3.5 J	2.0 J [4]	32.5
Cobalt, mg/kg	< 1.1 U	1.38	2.59	< 1.1 U	10.0	21.0	< 1.1 U	< 1.0 U	4.72
Copper, mg/kg	63.6	124 [4]	168	28.6	55.9 [4]	75.7	40.0	45.3 [4]	129
Lead, mg/kg	< 5.3 U	15.4	127 [10]	< 5.3 U	63.3	18.8 [10]	< 5.31 U	< 10 U	37.5 [10]
Manganese, mg/kg	< 1.1 U	89.8 [10]	218	2.58	303 [10]	566	2.93	3.5 J [10]	307
Mercury, mg/kg	< 0.53 U	< 0.484 U	< 0.52 U	< 0.53 U	0.27 J	0.760	17.1	17.2	1600
Nickel, mg/kg	1.4 J	27.8 [4]	10.5	1.0 J	58.0 [4]	88.8	< 5.3 U	1.2 J [4]	36.8
Selenium, mg/kg	< 11 U	< 24 U	< 26 U	< 11 U	< 24 U	< 25 U	< 11 U	< 26 U	< 27 U
Silver, mg/kg	< 5.3 U	< 4.8 U	< 5.2 U	< 5.3 U	0.060 J	< 4.9 U	< 5.3 U	< 5.1 U	< 5.3 U
Thallium, mg/kg	< 5.3 U	< 4.8 U	< 5.2 U	< 5.3 U	< 4.8 U	< 4.9 U	< 5.3 U	< 5.1 U	< 5.3 U
Tin, mg/kg	< 11 U	1.5 J	2.7 J	< 11 U	13.5	5.1 J	< 11 U	< 10 U	8.0 J
Vanadium, mg/kg	< 5.3 U	< 4.8 U	< 5.2 U	< 5.3 U	1.1 J	1.5 J	< 5.3 U	< 5.1 U	< 5.3 U
Zinc, mg/kg	3.7 J	54.4 [4]	290 [5]	< 11 U	1430 [4]	133 [5]	< 11 U	< 10 U	104 [5]

Note: See Table 3-12 for explanation of data flags.

Table 3-19. Mustard Composition of Individual Samples – Sample Set #7 (Continued)

Ton Container Number	D19497			[redacted]			D44007		
Sample Identification	21-03-286	21-03-287	21-03-288	21-03-290	[redacted]		21-03-294	21-03-295	21-03-296
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]		Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	93.2			89.9			86.1		
Thiodiglycol, Wt.%	< 0.025 U			< 0.026 U			< 0.026 U		
1,2-dichloroethane (DCE), Wt.%	0.583			0.669			0.716		
Tetrachloroethylene, Wt.%	0.016 J			< 0.052 U			< 0.052 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.052 U			< 0.052 U			< 0.052 U		
T, Wt.%	0.054 J			0.080 J			0.12 J		
Q, Wt.%	2.47			3.04			2.18		
Hexachloroethane (HCE), Wt.%	< 0.026 U			< 0.026 U			< 0.025 U		
Lewisite (L), mg/kg	< 5.1 U			< 5.1 U			< 5.1 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			NR			0.14		
1,4-Dithiane, Wt.%	0.048			0.12			0.78		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.086			0.094			0.085		
Bis (3-chloropropyl) sulfide, Wt.%	0.043			0.053			0.059		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.079			0.14			0.12		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	96.6			94.1			90.3		
Metals									
Aluminum, mg/kg	13 J	< 49 U	48 J [3]	< 52 U	< 52 U	12 J [3]	< 53 U	< 53 U	< 55 U
Antimony, mg/kg	< 5.4 U	0.35 J	< 5.1 U	< 5.2 U	0.36 J	1.3 J [2]	< 5.3 U	3.0 J	1.7 J [2]
Arsenic, mg/kg	3.0 J	152	56.0	13.4	316	1430	5.68	361	545
Barium, mg/kg	< 5.4 U	0.047 J	< 5.1 U	< 5.2 U	< 5.2 U	< 4.7 U	< 5.3 U	0.20 J	0.058 J
Beryllium, mg/kg	< 5.4 U	< 4.9 U	< 5.1 U	< 5.2 U	< 5.2 U	< 4.7 U	< 5.3 U	< 5.3 U	< 5.5 U
Boron, mg/kg	< 11 U	< 9.9 U	5.9 J [3]	< 10 U	< 10 U	< 9.5 U	< 11 U	< 11 U	< 11 U
Cadmium, mg/kg	< 5.4 U	0.24 J	0.21 J	< 5.2 U	0.26 J	0.37 J	< 5.3 U	0.29 J	0.28 J
Chromium, mg/kg	3.7 J	20.0 [4]	25.6	3.2 J	11.7 [4]	24.1	1.6 J	43.5 [4]	28.8
Cobalt, mg/kg	< 1.1 U	2.67	2.57	< 1.0 U	2.38	6.57	< 1.1 U	6.05	7.07
Copper, mg/kg	68.2	79.7 [4]	146	50.1	56.2 [4]	100	34.5	29.2 [4]	68.0
Lead, mg/kg	< 5.4 U	35.8	34.0 [10]	< 5.2 U	7.6 J	71.5 [10]	< 5.27 U	14.1	31.8 [10]
Manganese, mg/kg	0.36 J	199 [10]	209	< 1.0 U	139 [10]	371	4.12	383 [10]	504
Mercury, mg/kg	< 0.54 U	< 0.49 U	< 0.51 U	< 0.52 U	0.14 J	0.561	16.3	1210	1740
Nickel, mg/kg	0.46 J	14.0 [4]	22.9	2.8 J	7.52 [4]	14.8	0.52 J	123 [4]	62.4
Selenium, mg/kg	< 11 U	< 25 U	< 25 U	< 10 U	< 26 U	< 24 U	< 11 U	< 27 U	< 28 U
Silver, mg/kg	< 5.4 U	< 4.9 U	< 5.1 U	< 5.2 U	< 5.2 U	< 4.7 U	< 5.3 U	< 5.3 U	< 5.5 U
Thallium, mg/kg	< 5.4 U	< 4.9 U	< 5.1 U	< 5.2 U	< 5.2 U	< 4.7 U	< 5.3 U	< 5.3 U	< 5.5 U
Tin, mg/kg	< 11 U	4.1 J	4.6 J	< 10 U	1.1 J	3.6 J	< 11 U	8.9 J	8.3 J
Vanadium, mg/kg	< 5.4 U	< 4.9 U	< 5.1 U	< 5.2 U	< 5.2 U	< 4.7 U	< 5.3 U	< 5.3 U	< 5.5 U
Zinc, mg/kg	3.7 J	92.5 [4]	79.2 [5]	< 10 U	66.0 [4]	368 [5]	< 11 U	63.0 [4]	83.5 [5]

Note: See Table 3-12 for explanation of data flags.

Table 3-19. Mustard Composition of Individual Samples – Sample Set #7 (Continued)

Test Container Number	D94138			[illegible]			D10372		
Sample Identification	21-03-298	21-03-299	21-03-300	21-03-301	[illegible]	[illegible]	21-03-304	21-03-305	21-03-306
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[illegible]	[illegible]	NC Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl)sulfide (HD), Wt.%	88.8			83.7			86.2		
Thiodiglycol, Wt.%	< 0.026 U			< 0.026 U			< 0.025 U		
1,2-dichloroethane (DCE), Wt.%	0.700			0.850			0.792		
Tetrachloroethylene, Wt.%	< 0.052 U			< 0.050 U			< 0.052 U		
1,1,2,2-tetrachloroethane, Wt.%	< 0.052 U			< 0.050 U			< 0.052 U		
T, Wt.%	0.098 J			0.11 J			0.092 J		
Q, Wt.%	3.69			1.97			2.11		
Hexachloroethane (HCE), Wt.%	< 0.026 U			< 0.025 U			< 0.025 U		
Lewisite (L), mg/kg	< 5.1 U			< 5.1 U			< 4.9 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			0.17			NR		
1,4-Dithiane, Wt.%	0.20			0.87			0.87		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.089			0.080			0.097		
Bis (3-chloropropyl) sulfide, Wt.%	0.050			NR			0.055		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.14			0.12			0.14		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			0.14			0.15		
Mass Balance, Wt. %	93.8			88.0			90.5		
Metals									
Aluminum, mg/kg	19 J	< 54 U	< 48 U	< 50 U	< 55 U	< 50 U	12 J	< 50 U	26 J [3]
Antimony, mg/kg	< 5.4 U	0.31 J	0.97 J [7]	< 5.0 U	1.5 J	1.2 J [3]	< 5.3 U	0.67 J	1.4 J [7]
Arsenic, mg/kg	2.8 J	220	1850	10.9	1170	961	< 5.3 U	6.43	12.2
Barium, mg/kg	< 5.4 U	< 5.4 U	0.057 J	< 5.0 U	< 5.5 U	< 5.0 U	< 5.3 U	1.5 J	2.9 J
Beryllium, mg/kg	< 5.4 U	< 5.4 U	< 4.8 U	< 5.0 U	< 5.5 U	< 5.0 U	< 5.3 U	< 5.0 U	< 5.2 U
Boron, mg/kg	4.1 J	< 11 U	< 9.6 U	< 10 U	< 11 U	< 10 U	< 11 U	< 10 U	6.0 J [3]
Cadmium, mg/kg	< 5.4 U	0.22 J	0.26 J	< 5.0 U	0.23 J	0.20 J	< 5.3 U	0.21 J	0.25 J
Chromium, mg/kg	2.7 J	19.8 [4]	41.8	2.9 J	36.6 [4]	42.4	1.7 J	18.7 [4]	45.2
Cobalt, mg/kg	< 1.1 U	4.43	10.8	< 1.0 U	3.71	3.72	< 1.1 U	6.02	9.40
Copper, mg/kg	51.7	54.9 [4]	132	36.0	29.8 [4]	49.7	26.8	34.4 [4]	78.4
Lead, mg/kg	< 5.4 U	6.1 J	27.4 [10]	0.54 J	16.6	19.6 [10]	< 5.3 U	9.0 J	41.7 [10]
Manganese, mg/kg	< 1.1 U	193 [10]	459	2.91	258 [10]	267	3.37	268 [10]	521
Mercury, mg/kg	0.096 J	0.20 J	1.18	65.0	1810	1960	< 0.53 U	0.41 J	1.48
Nickel, mg/kg	< 5.4 U	12.2 [4]	15.9	0.78 J	62.8 [4]	39.1	< 5.3 U	35.6 [4]	54.5
Selenium, mg/kg	< 11 U	< 27 U	< 24 U	< 10 U	< 27 U	< 25 U	< 11 U	< 25 U	< 26 U
Silver, mg/kg	< 5.4 U	< 5.4 U	< 4.8 U	< 5.0 U	< 5.5 U	< 5.0 U	< 5.3 U	< 5.0 U	< 5.2 U
Thallium, mg/kg	< 5.4 U	< 5.4 U	< 4.8 U	< 5.0 U	< 5.5 U	< 5.0 U	< 5.3 U	< 5.0 U	< 5.2 U
Tin, mg/kg	< 11 U	1.5 J	3.7 J	< 10 U	6.1 J	7.1 J	< 11 U	9.0 J	16.8
Vanadium, mg/kg	< 5.4 U	< 5.4 U	< 4.8 U	< 5.0 U	< 5.5 U	< 5.0 U	< 5.3 U	< 5.0 U	1.4 J
Zinc, mg/kg	3.7 J	71.7 [4]	213 [5]	< 10 U	40.7 [4]	32.3 [5]	3.7 J	67.8 [4]	103 [5]

Note: See Table 3-12 for explanation of data flags

Table 3-20. Mustard Composition of Individual Samples – Sample Set #8

Ton Container Number	D77859			[redacted]			D15990		
Sample Identification	21-03-307	21-03-309	21-03-311	21-03-30[redacted]			21-03-313	21-03-314	21-03-315
Sample Matrix	Liquid	NC Solid	Solid	Liquid			Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl) sulfide, Wt.%	93 0 H			92 5 H			88.9 H		
Thiodiglycol, Wt.%	< 0.025 U			< 0.026 U			< 0.025 U		
1,2-Dichloroethane, Wt.%	0.197			0.202			0.769		
Tetrachloroethylene, Wt.%	< 0.052 U			< 0.049 U			< 0.051 U		
1,1,2,2-Tetrachloroethane, Wt.%	< 0.052 U			< 0.049 U			< 0.051 U		
T, Wt.%	0.13 J [4]			0.13 J [4]			0.20 J [4]		
Q, Wt.%	0 467			0 448			2.90		
Hexachloroethane, Wt.%	0.040			0.0390			< 0.025 U		
Lewisite, mg/kg	< 5.2 U			< 5.1 U			< 5.1 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			NR			0.16		
1,4-Dithiane, Wt.%	NR			NR			NR		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.11			0.12			0.15		
Bis (3-chloropropyl) sulfide, Wt.%	0.084			0.10			NR		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.18			0.17			0.27		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	0.20			0.19			NR		
Mass Balance, Wt. %	94.4			93.9			93.4		
Metals									
Aluminum, mg/kg	13 J	< 54 U	19 J	15 J	< 56 U	< 52 U	21 J	< 50 U	< 50 U
Antimony, mg/kg	< 5 3 U	< 5.4 U	0.69 J	< 5.3 U	0.26 J	0.68 J	< 5.2 U	< 5.0 U	0.90 J
Arsenic, mg/kg	2 6 J	238	528	3.0 J	352	702	< 5.2 U	4.1 J	12.3
Barium, mg/kg	< 5.3 U	0.15 J	0 10 J	< 5.3 U	0.12 J	0.066 J	< 5.2 U	0.053 J	1.2 J
Beryllium, mg/kg	< 5.3 U	< 5.4 U	< 5.4 U	< 5.3 U	< 5.6 U	< 5.2 U	< 5.2 U	< 5.0 U	< 5.0 U
Boron, mg/kg	7.6 J	< 11 U	< 11 U	5.4 J	< 11 U	< 10 U	5.4 J	< 10 U	< 10 U
Cadmium, mg/kg	< 5.3 U	0.22 J	0.24 J	< 5.3 U	0.25 J	0.22 J	< 5.2 U	0.21 J	0.27 J
Chromium, mg/kg	1.5 J	25.5	53 1 [10]	1.6 J	37.4	55.4 [10]	1.4 J	11.1	39.3 [10]
Cobalt, mg/kg	< 1 1 U	0.71 J	2.67	< 1.1 U	1.1 J	2.00	< 1.0 U	2.20	6.12
Copper, mg/kg	< 5 3 U	45.8	121 [10]	< 5.3 U	127	104 [10]	30.6	27.2	90.1 [10]
Lead, mg/kg	< 5.3 U	17.2	115	< 5 3 U	83.7	63.3	< 5.21 U	6.1 J	40.2
Manganese, mg/kg	< 1 1 U	14.3 [5]	71.5	0.39 J	21.3 [5]	47.0	2.81	118 [5]	336
Mercury, mg/kg	0.055 J	9.29 [10]	23.3 [10]	0.075 J	14.6 [10]	25.6 [10]	0.088 J	1.65 [10]	10.1 [10]
Nickel, mg/kg	< 5.3 U	16.8	36.8	< 5.3 U	24.0	38.3	0.56 J	11.4	52.4
Selenium, mg/kg	< 11 U	< 27 U	< 27 U	< 11 U	< 28 U	< 26 U	< 10 U	< 25 U	< 25 U
Silver, mg/kg	< 5.3 U	< 5.4 U	< 5.4 U	< 5.3 U	< 5.6 U	< 5.2 U	< 5.2 U	< 5.0 U	< 5.0 U
Thallium, mg/kg	< 5 3 U	< 5.4 U	0.41 J	< 5.3 U	< 5.6 U	< 5.2 U	< 5.2 U	< 5.0 U	< 5.0 U
Tin, mg/kg	< 11 U	0.73 J	2.8 J	< 11 U	1.3 J	2.3 J	< 10 U	2.0 J	6.7 J
Vanadium, mg/kg	< 5 3 U	< 5.4 U	< 5 4 U	< 5.3 U	< 5.6 U	< 5.2 U	< 5.2 U	1.1 J	1.7 J
Zinc, mg/kg	< 11 U	14 2	47.1 [10]	< 11 U	61.3	44.0 [10]	< 10 U	37.4	92.4 [10]

Note: See Table 3-12 for explanation of data flags.

Table 3-20. Mustard Composition of Individual Samples – Sample Set #8 (Continued)

Ton Container Number	D92455			[redacted]			D43395		
Sample Identification	21-03-316	21-03-317	21-03-318	21-03-319	[redacted]	[redacted]	21-03-322	21-03-323	21-03-324
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl) sulfide, Wt.%	87.4 H			87.3 H			88.7 H		
Thiodiglycol, Wt.%	< 0.025 U			< 0.025 U			< 0.024 U		
1,2-Dichloroethane, Wt.%	0.620			0.638			0.688		
Tetrachloroethylene, Wt.%	< 0.051 U			< 0.050 U			< 0.051 U		
1,1,2,2-Tetrachloroethane, Wt.%	< 0.051 U			< 0.050 U			< 0.051 U		
T, Wt.%	0.20 J [4]			0.19 J [4]			0.18 J [4]		
Q, Wt.%	2.72			3.16			2.59		
Hexachloroethane, Wt.%	< 0.025 U			< 0.026 U			< 0.026 U		
Lewisite, mg/kg	< 5.0 U			< 5.0 U			< 4.9 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.16			0.17			NR		
1,4-Dithiane, Wt.%	0.67			0.53			NR		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.12			0.15			0.12		
Bis (3-chloropropyl) sulfide, Wt.%	0.14			NR			NR		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.21			0.28			0.21		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	0.12			0.16			0.19		
Mass Balance, Wt. %	92.4			92.6			92.7		
Metals									
Aluminum, mg/kg	< 53 U	19 J	< 52 U	14 J	< 51 U	17 J	< 53 U	11 J	14 J
Antimony, mg/kg	< 5.3 U	4.2 J	0.53 J	< 5.3 U	< 5.1 U	0.42 J	< 5.3 U	1.3 J	4.6 J
Arsenic, mg/kg	< 5.3 U	10.6	0.94 J	< 5.3 U	1.7 J	11.7	< 5.3 U	8.57	24.3
Barium, mg/kg	< 5.3 U	5.81	0.50 J	< 5.3 U	0.18 J	1.5 J	< 5.3 U	0.31 J	0.24 J
Beryllium, mg/kg	< 5.3 U	< 4.8 U	< 5.2 U	< 5.3 U	< 5.1 U	< 5.3 U	< 5.3 U	< 5.0 U	< 4.7 U
Boron, mg/kg	< 11 U	< 9.6 U	< 10 U	< 11 U	< 10 U	4.9 J	< 11 U	< 9.9 U	< 9.4 U
Cadmium, mg/kg	< 5.3 U	0.20 J	0.23 J	< 5.3 U	0.20 J	0.29 J	< 5.3 U	0.24 J	0.36 J
Chromium, mg/kg	< 5.3 U	184	20.3 [10]	< 5.3 U	9.26	26.8 [10]	1.7 J	44.5	126 [10]
Cobalt, mg/kg	< 1.1 U	10.2	2.97	< 1.1 U	0.16 J	5.05	< 1.1 U	6.76	21.4
Copper, mg/kg	25.3	43.4	28.0 [10]	17.5	19.9	19.1 [10]	23.9	35.3	73.3 [10]
Lead, mg/kg	< 5.3 U	72.2	8.1 J	2.7 J	19.0	462	< 5.3 U	19.5	77.5
Manganese, mg/kg	1.57	735 [5]	107	1.26	14.6 [5]	429	1.60	362 [5]	994
Mercury, mg/kg	< 0.53 U	0.14 J [10]	0.12 J [10]	0.092 J	0.090 J [10]	2.24 [10]	< 0.53 U	0.22 J [10]	0.795 [10]
Nickel, mg/kg	< 5.3 U	591	21.8	< 5.3 U	16.1	34.3	< 5.3 U	70.7	239
Selenium, mg/kg	< 11 U	< 24 U	< 26 U	< 11 U	< 25 U	< 27 U	< 11 U	< 25 U	< 24 U
Silver, mg/kg	< 5.3 U	< 4.8 U	< 5.2 U	< 5.3 U	< 5.1 U	< 5.3 U	< 5.3 U	< 5.0 U	< 4.7 U
Thallium, mg/kg	< 5.3 U	< 4.8 U	< 5.2 U	< 5.3 U	< 5.1 U	< 5.3 U	< 5.3 U	< 5.0 U	< 4.7 U
Tin, mg/kg	< 11 U	16.8	2.6 J	< 11 U	< 10 U	2.1 J	< 11 U	8.8 J	24.1
Vanadium, mg/kg	< 5.3 U	< 4.8 U	1.2 J	< 5.3 U	< 5.1 U	< 5.3 U	< 5.3 U	< 5.0 U	< 4.7 U
Zinc, mg/kg	< 11 U	48.7	26.9 [10]	< 11 U	7.6 J	120 [10]	< 11 U	92.0	259 [10]

Note: See Table 3-12 for explanation of data flags.

Table 3-20. Mustard Composition of Individual Samples – Sample Set #8 (Continued)

Test Container Number	D49972			[redacted]			D50997		
Sample Identification	21-03-325	21-03-326	21-03-327	21-03-329	[redacted]	[redacted]	21-03-333	21-03-334	21-03-335
Sample Matrix	Liquid	NC Solid	Solid	Liquid [1,2]	[redacted]	[redacted]	Liquid [1]	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl) sulfide, Wt.%	91.0 H			85.3 H			87.7 H		
Thiodiglycol, Wt.%	< 0.025 U			< 0.026 U			< 0.026 U		
1,2-Dichloroethane, Wt.%	1.04			0.657			0.523		
Tetrachloroethylene, Wt.%	< 0.051 U			< 0.051 U			< 0.051 U		
1,1,2,2-Tetrachloroethane, Wt.%	< 0.051 U			< 0.051 U			< 0.051 U		
T, Wt.%	0.23 J [4]			0.20 J [4]			0.19 J [4]		
Q, Wt.%	3.12			2.69			2.55		
Hexachloroethane, Wt.%	< 0.026 U			< 0.025 U			< 0.026 U		
Lewisite, mg/kg	21.8 [5]			16.0 [5]			< 4.9 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	NR			0.17			NR		
1,4-Dithiane, Wt.%	NR			0.91			0.70		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.12			0.13			0.13		
Bis (3-chloropropyl) sulfide, Wt.%	NR			NR			NR		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.23			0.26			0.24		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	95.7			90.3			92.0		
Metals									
Aluminum, mg/kg	12 J	< 49 U	22 J	< 51 U	10 J	10 J	< 54 U	14 J	105
Antimony, mg/kg	< 5.1 U	0.44 J	2.4 J	< 5.1 U	< 4.8 U	1.8 J	< 5.4 U	1.2 J	6.19
Arsenic, mg/kg	54.7	1860	10300	22.4	62.0	361	1.4 J	111	33.4
Barium, mg/kg	< 5.1 U	0.13 J	0.16 J	< 5.1 U	0.35 J	0.096 J	< 5.4 U	0.13 J	1.3 J
Beryllium, mg/kg	< 5.1 U	< 4.9 U	< 4.9 U	< 5.1 U	< 4.8 U	< 4.8 U	< 5.4 U	< 5.2 U	< 5.6 U
Boron, mg/kg	< 10 U	< 9.8 U	5.0 J	< 10 U	< 9.5 U	< 9.5 U	< 11 U	< 10 U	4.5 J
Cadmium, mg/kg	< 5.1 U	0.18 J	0.26 J	< 5.1 U	0.18 J	0.28 J	< 5.4 U	0.32 J	0.39 J
Chromium, mg/kg	2.1 J	13.8	25.6 [10]	1.7 J	5.37	34.9 [10]	1.9 J	40.1	295 [10]
Cobalt, mg/kg	< 1.0 U	1.44	4.65	< 1.0 U	< 0.95 U	3.43	< 1.1 U	12.7	8.69
Copper, mg/kg	23.7	28.3	98.5 [10]	27.8	32.7	75.7 [10]	19.0	26.7	18.1 [10]
Lead, mg/kg	< 5.1 U	3.7 J	21.5	< 5.1 U	< 9.5 U	22.3	< 5.4 U	43.8	130
Manganese, mg/kg	1.10	112 [5]	359	< 1.0 U	9.2 J [5]	295	1.24	625 [5]	1200
Mercury, mg/kg	6.96	621 [10]	2200 [10]	55.8	75.9 [10]	3020 [10]	3.02	210 [10]	185 [10]
Nickel, mg/kg	1.9 J	12.7	31.9	< 5.1 U	48.4	115	< 5.4 U	188	1230
Selenium, mg/kg	< 10 U	< 25 U	< 25 U	< 10 U	< 24 U	< 24 U	< 11 U	< 26 U	< 28 U
Silver, mg/kg	< 5.1 U	< 4.9 U	< 4.9 U	< 5.1 U	< 4.8 U	0.22 J	< 5.4 U	< 5.2 U	< 5.6 U
Thallium, mg/kg	< 5.1 U	< 4.9 U	< 4.9 U	< 5.1 U	< 4.8 U	< 4.8 U	< 5.4 U	< 5.2 U	< 5.6 U
Tin, mg/kg	< 10 U	1.6 J	5.3 J	< 10 U	< 9.5 U	10.4	< 11 U	11.9	8.7 J
Vanadium, mg/kg	< 5.1 U	< 4.9 U	< 4.9 U	< 5.1 U	< 4.8 U	< 4.8 U	< 5.4 U	< 5.2 U	1.8 J
Zinc, mg/kg	< 10 U	20.7	65.1 [10]	< 10 U	2.2 J	49.8 [10]	< 11 U	122	27.3 [10]

Note: See Table 3-12 for explanation of data flags.

Table 3-20. Mustard Composition of Individual Samples – Sample Set #8 (Continued)

Tea Container Number	D8633			[redacted]			D17698		
Sample Identification	21-03-337	21-03-338	21-03-339	21-03-341	[redacted]	[redacted]	21-03-345	21-03-346	21-03-347
Sample Matrix	Liquid	NC Solid	Solid	Liquid	[redacted]	[redacted]	Liquid	NC Solid	Solid
Organic Compounds - Targets									
Bis (2-chloroethyl) sulfide, Wt.%	88.4 H			88.9 H			93.1 H		
Thiodiglycol, Wt.%	< 0.025 U			< 0.026 U			< 0.025 U		
1,2-Dichloroethane, Wt.%	0.993			1.06			0.684		
Tetrachloroethylene, Wt.%	< 0.051 U			< 0.051 U			< 0.051 U		
1,1,2,2-Tetrachloroethane, Wt.%	< 0.051 U			< 0.051 U			< 0.051 U		
T, Wt.%	0.23 J [4]			0.26 J [4]			0.13 J [4]		
Q, Wt.%	2.56			3.38			3.57		
Hexachloroethane, Wt.%	< 0.026 U			< 0.027 U			< 0.026 U		
Lewisite, mg/kg	< 5.0 U			14.7 [5]			< 5.0 U		
Organic Compounds - TICs									
1,4-Thioxane, Wt.%	0.22			NR			NR		
1,4-Dithiane, Wt.%	0.76			0.98			NR		
2-Chloroethyl 3-chloropropyl sulfide, Wt.%	0.12			0.13			0.13		
Bis (3-chloropropyl) sulfide, Wt.%	0.12			0.11			0.20		
2-Chloroethyl 4-chlorobutyl sulfide, Wt.%	0.24			0.23			0.25		
1,2,5-Trithiepane, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) disulfide, Wt.%	NR			NR			NR		
Bis (2-chloroethyl) trisulfide, Wt.%	NR			NR			NR		
Mass Balance, Wt. %	93.6			95.1			98.1		
Metals									
Aluminum, mg/kg	< 53 U	< 54 U	< 56 U	< 53 U	< 50 U	16 J	< 52 U	< 53 U	17 J
Antimony, mg/kg	< 5.3 U	< 5.4 U	0.18 J	< 5.3 U	0.51 J	2.3 J	< 5.2 U	< 5.3 U	0.26 J
Arsenic, mg/kg	< 5.3 U	0.65 J	1.3 J	38.5	6350	12900	< 5.2 U	3.1 J	< 5.6 U
Barium, mg/kg	< 5.3 U	0.31 J	< 5.6 U	< 5.3 U	0.12 J	2.9 J	< 5.2 U	< 5.3 U	0.047 J
Beryllium, mg/kg	< 5.3 U	< 5.4 U	< 5.6 U	< 5.3 U	< 5.0 U	< 4.9 U	< 5.2 U	< 5.3 U	< 5.6 U
Boron, mg/kg	< 11 U	< 11 U	< 11 U	< 11 U	< 10 U	< 9.7 U	< 10 U	< 11 U	< 11 U
Cadmium, mg/kg	< 5.3 U	0.21 J	0.25 J	< 5.3 U	0.21 J	0.33 J	< 5.2 U	0.22 J	0.29 J
Chromium, mg/kg	1.4 J	147	22.5 [10]	< 5.3 U	28.2	51.5 [10]	2.7 J	9.59	30.5 [10]
Cobalt, mg/kg	< 1.1 U	1.98	6.09	< 1.1 U	4.00	9.17	< 1.0 U	1.46	4.45
Copper, mg/kg	35.1	57.4	150 [10]	20.2	22.3	103 [10]	51.3	78.2	129 [10]
Lead, mg/kg	< 5.3 U	26.2	15.3	< 5.3 U	15.6	169	< 5.2 U	6.6 J	19.8
Manganese, mg/kg	1.27	58.2 [5]	266	< 1.1 U	311 [5]	604	0.37 J	72.0 [5]	291
Mercury, mg/kg	0.18 J	< 0.54 U	0.25 J [10]	4.06	1700 [10]	4780 [10]	0.078 J	0.077 J [10]	0.14 J [10]
Nickel, mg/kg	< 5.3 U	557	18.2	< 5.3 U	60.5	27.4	0.93 J	11.4	10.5
Selenium, mg/kg	< 11 U	< 27 U	< 28 U	< 11 U	< 25 U	< 24 U	< 10 U	< 26 U	< 28 U
Silver, mg/kg	< 5.3 U	< 5.4 U	0.071 J	< 5.3 U	< 5.0 U	< 4.9 U	< 5.2 U	< 5.3 U	< 5.6 U
Thallium, mg/kg	< 5.3 U	< 5.4 U	< 5.6 U	< 5.3 U	< 5.0 U	< 4.9 U	< 5.2 U	< 5.3 U	< 5.6 U
Tin, mg/kg	< 11 U	< 11 U	2.6 J	< 11 U	2.2 J	4.4 J	< 10 U	1.0 J	2.3 J
Vanadium, mg/kg	< 5.3 U	2.1 J	< 5.6 U	< 5.3 U	< 5.0 U	< 4.9 U	1.1 J	< 5.3 U	1.1 J
Zinc, mg/kg	< 11 U	13.0	52.8 [10]	< 11 U	112	138 [10]	< 10 U	40.3	102 [10]

Note: See Table 3-12 for explanation of data flags.

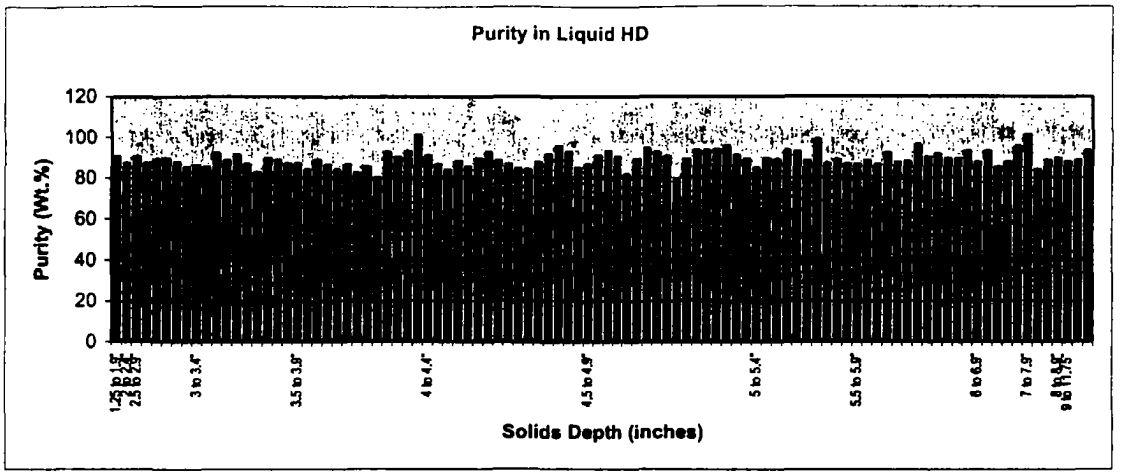
Table 3-21. Mustard Ton Containers with Mercury

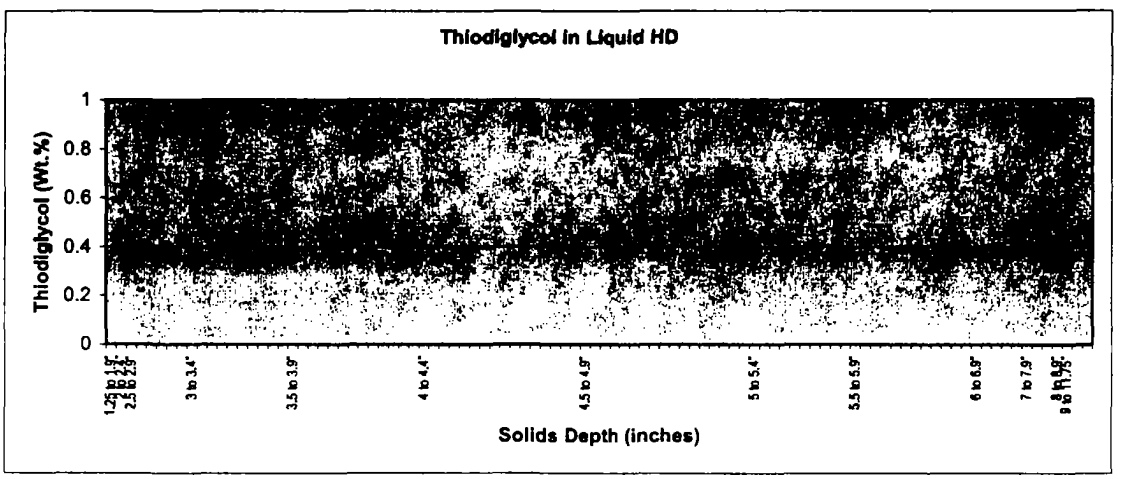
TC Number	Sample ID	Lot Number	Mercury Concentration (mg/kg)			Sample Set	Note
			Liquid	NC Solid	Solid		
D42249	21-03-021, -022, -023	RM-113-165	24.5	2830	1680	1	
D46537	21-03-051, -052, -053	RM-113-193	41.1	1450	2440	2	
D48309	21-03-057, -058, -059	RM-113-231	17.8	861	10300	2	
D46491	21-03-072, -073, -074	RM-113-170	26.3	2120	2140	2	
D41559	21-03-105, -106, -107	RM-113-92	46.8	1560	2010	3	
D50034	21-03-135, -136, -135	RM-113-150	57.2	2580	2000	3	
D49168	21-03-141, -142, -143	RM-113-191	5.2	238	442	3	
D46992	21-03-177, -179, -181	RM-113-278	1.47	101	694	5	Also in Field Dup
D47708	21-03-225, -226, -227	RM-113-282	1.62	343	95	6	
D48273	21-03-269, -270, -271	RM-113-164	27.4	2910	5590	7	
D51059	21-03-273, -274, -275	RM-113-176	5.75	87.3	996	7	
D45179	21-03-282, -283, -284	RM-113-180	17.1	17.2	1600	7	
D44007	21-03-294, -295, -296	RM-113-188	16.3	1210	1740	7	
D48980	21-03-301, -302, -202	RM-113-157	65	1810	1960	7	
D49972	21-03-325, -326, -327	RM-113-193	6.96	621	2200	8	
D41787	21-03-329, -330, -331	RM-113-92	55.8	75.9	3020	8	
D50997	21-03-333, -334, -335	RM-113-92	3.02	210	185	8	
D44485	21-03-341, -342, -343	RM-113-193	4.06	1700	4780	8	

Table 3-22. Lewisite Results for Non-cohesive Solid and Solid Samples

TC Number	Sample ID	Laboratory ID	Matrix	Lewisite (mg/kg)	
				PQL	Result
D42249	21-03-22	030004-01431	Non-Cohesive Solid	4.96	1.36 J
	21-03-22DUP	030004-01431	Non-Cohesive Solid	4.45	1.77 J
	21-03-23	030004-01421	Solid	5.26	2.85 J
	21-03-23DUP	030004-01421	Solid	4.25	3.63 J
D46537	21-03-52	030004-01701	Non-Cohesive Solid	5.25	1.38 J
	21-03-52DUP	030004-01701	Non-Cohesive Solid	5.49	1.09 J
	21-03-53	030004-01720	Solid	5.36	1.14 J
	21-03-53DUP	030004-01720	Solid	4.35	0.94 J

Note: J - Result estimated since value was between the MDL and PQL.





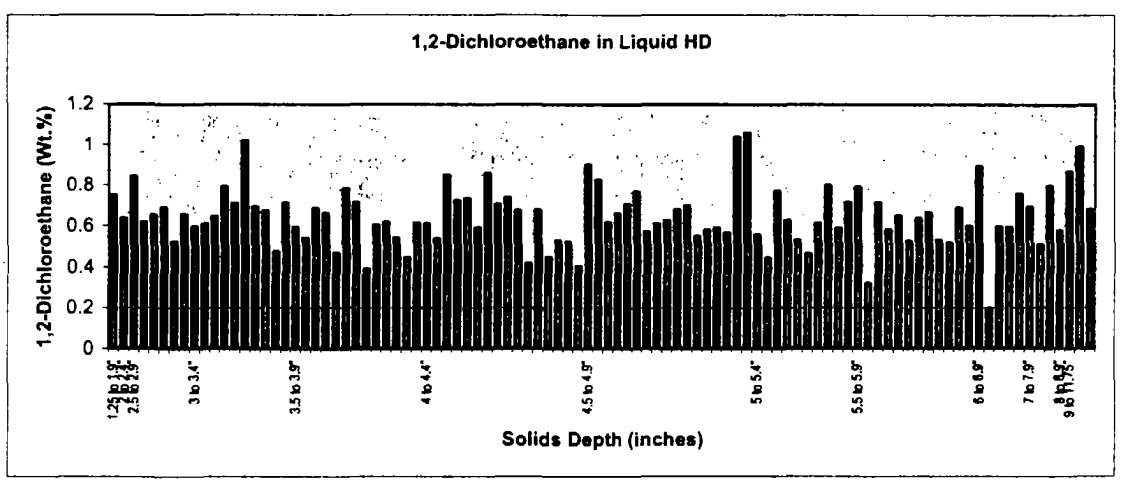
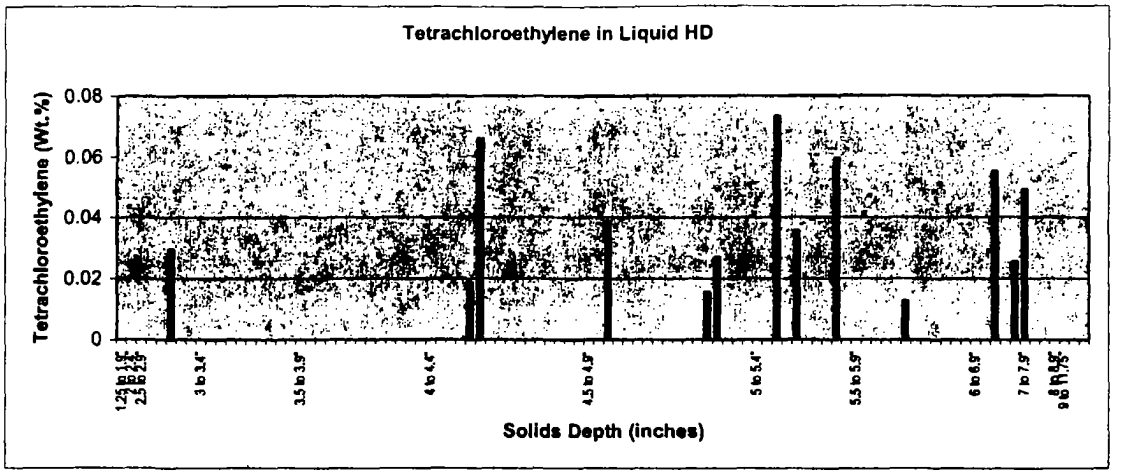
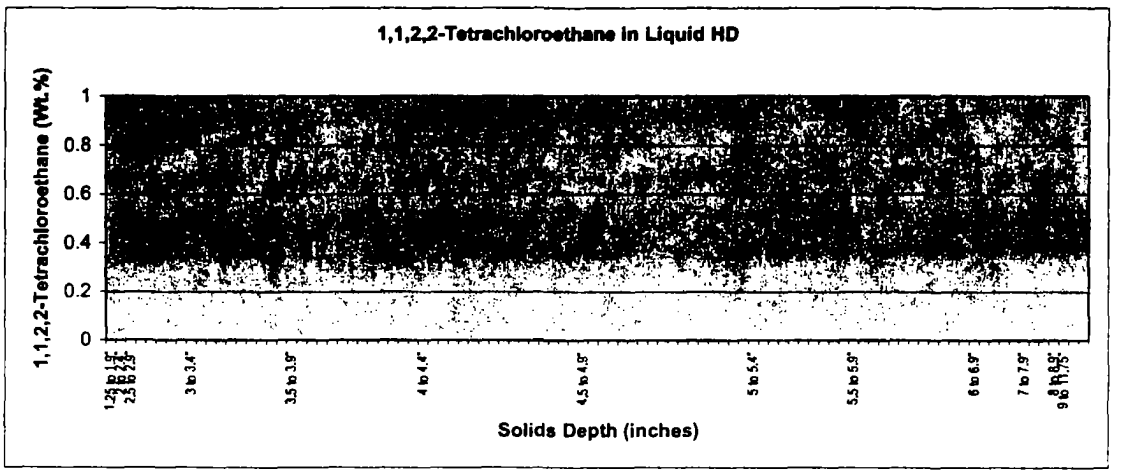


Figure 3-1. Organic Results by Solids Depth





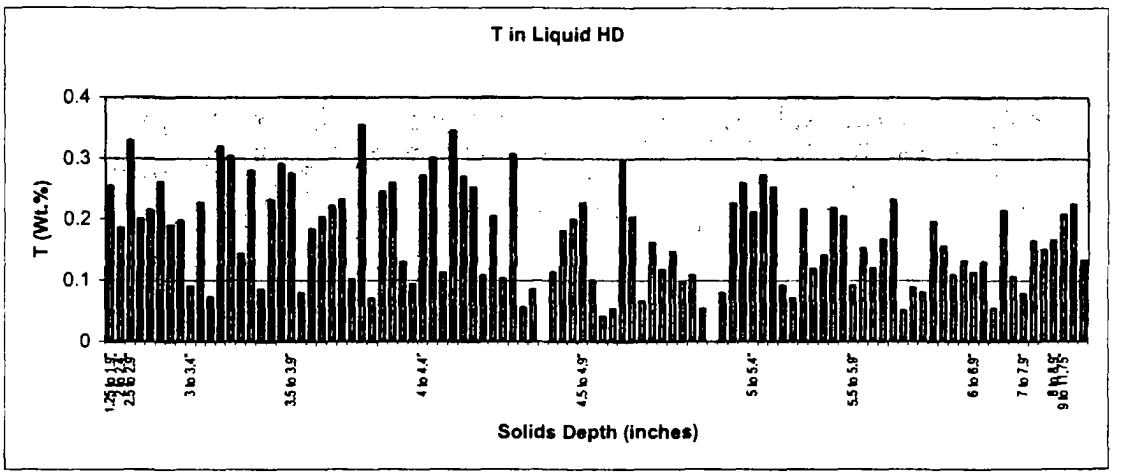
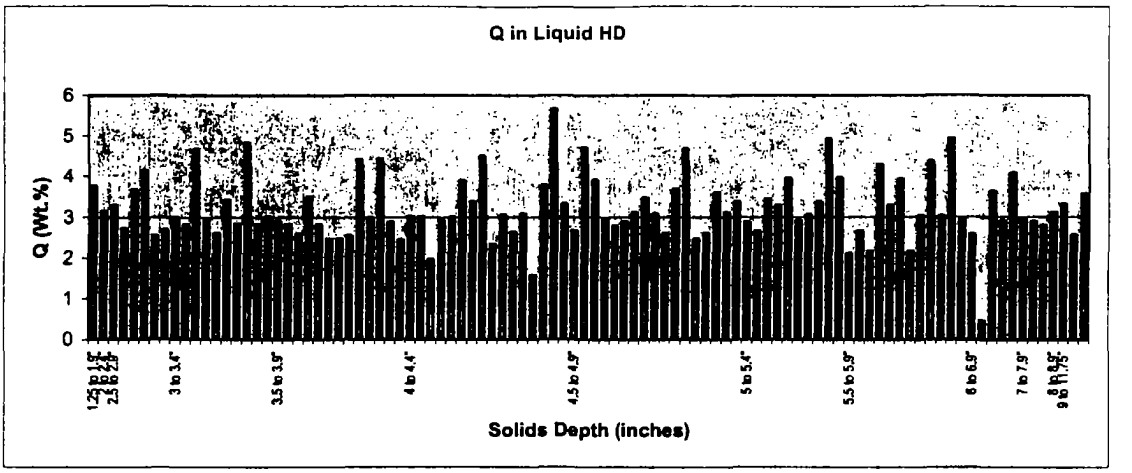
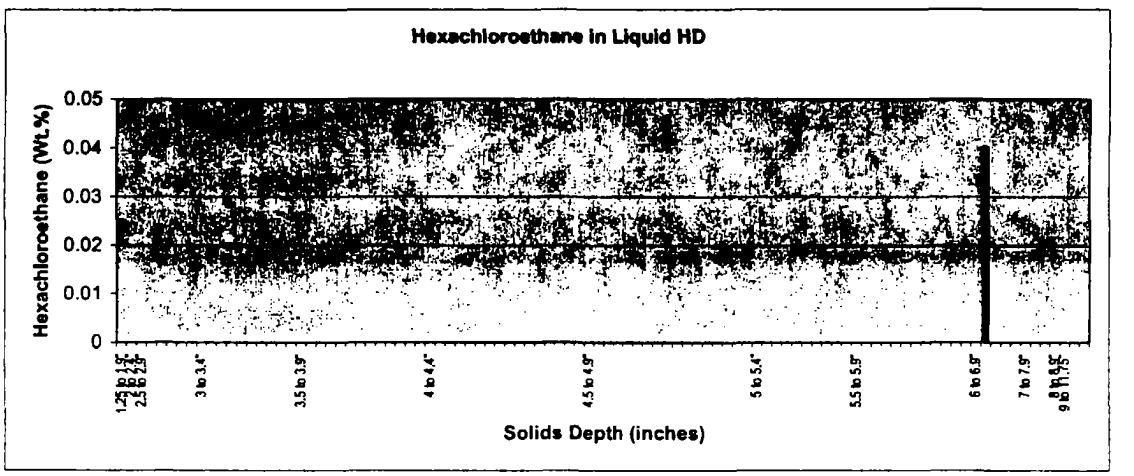


Figure 3-1. Organic Results by Solids Depth (Continued)





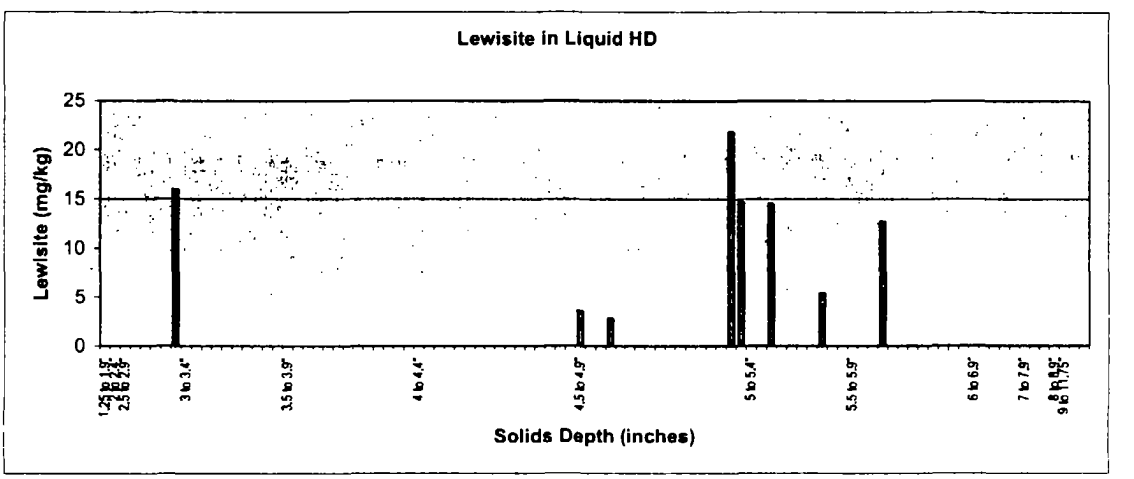
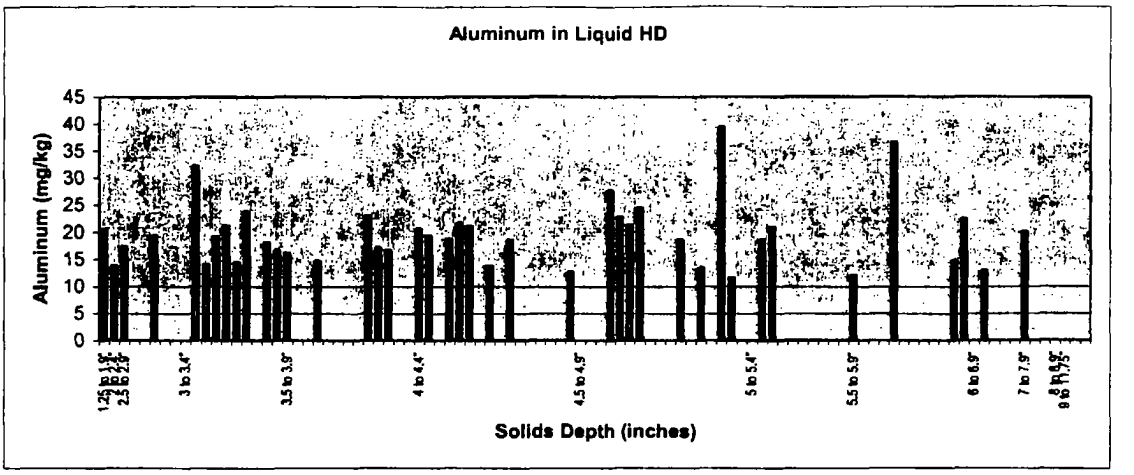
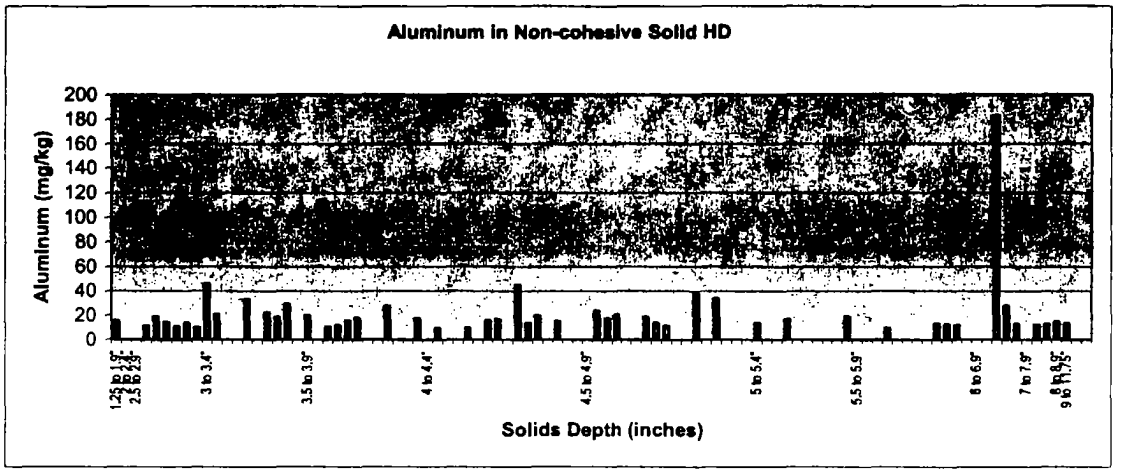


Figure 3-1. Organic Results by Solids Depth (Continued)





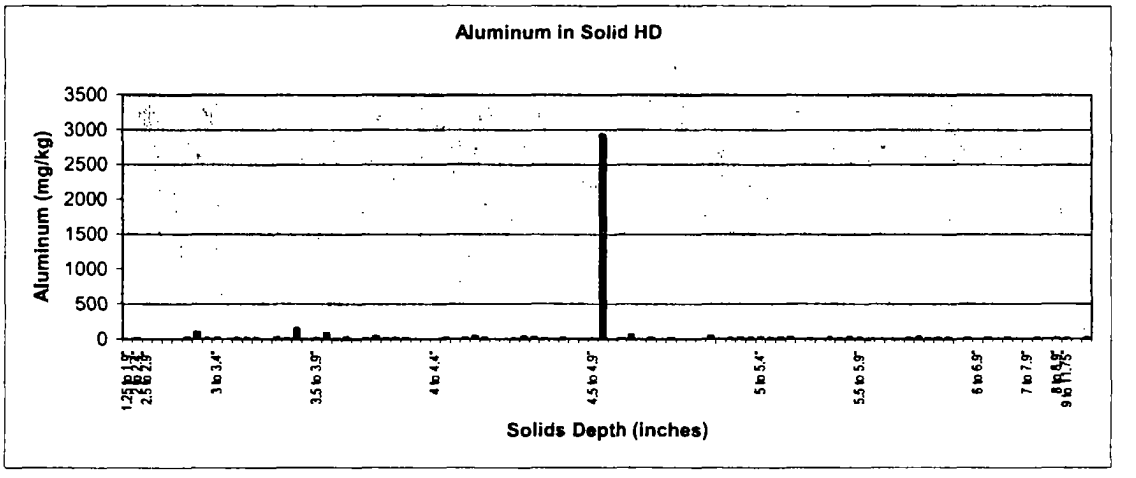
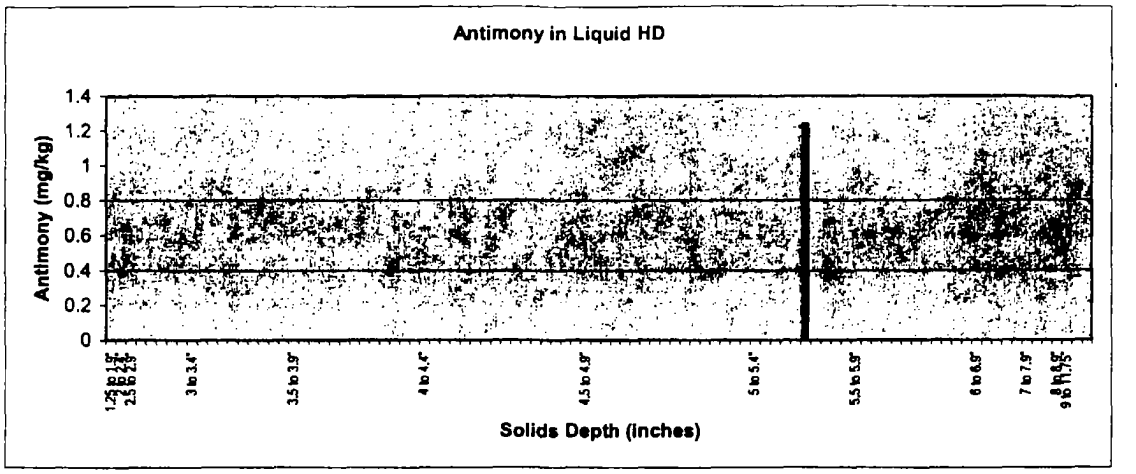
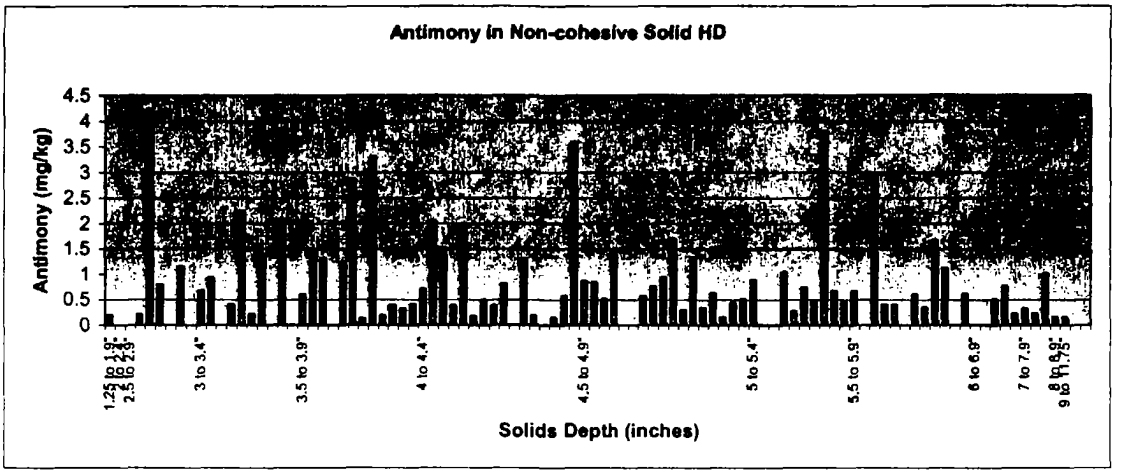


Figure 3-2. Aluminum Results by Solids Depth





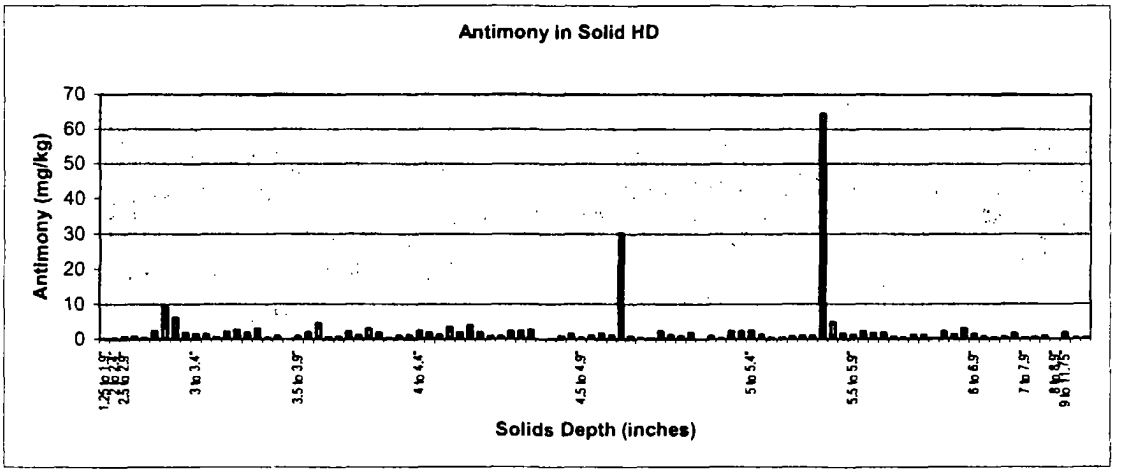
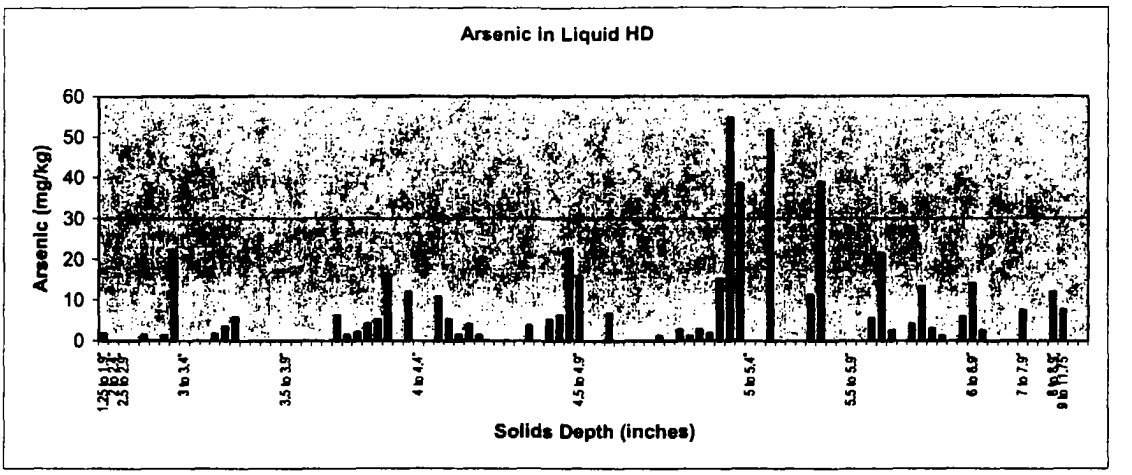
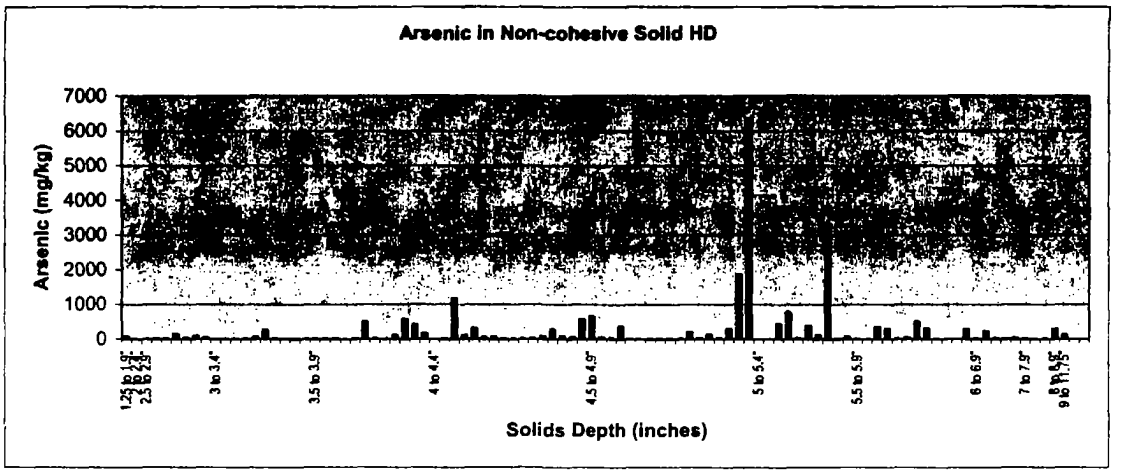


Figure 3-3. Antimony Results by Solids Depth





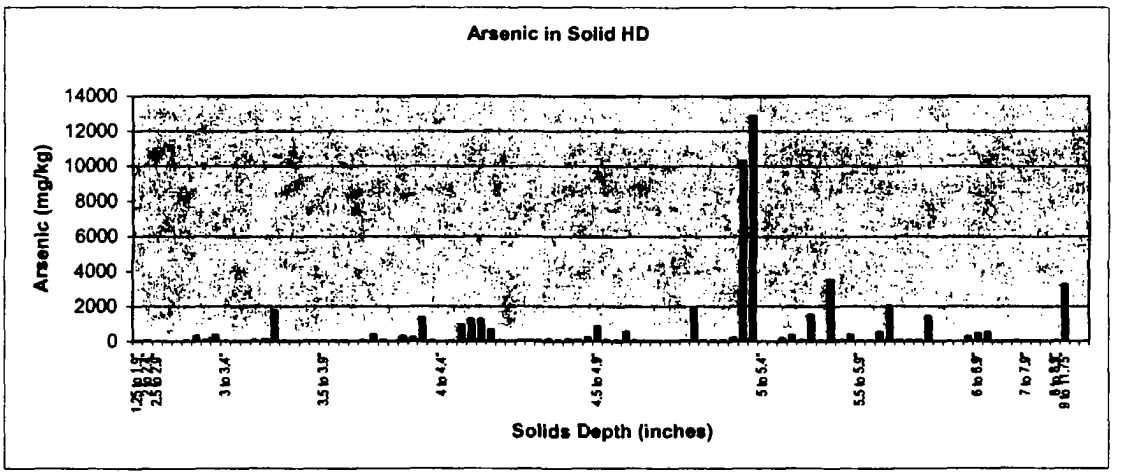


Figure 3-4. Arsenic Results by Solids Depth

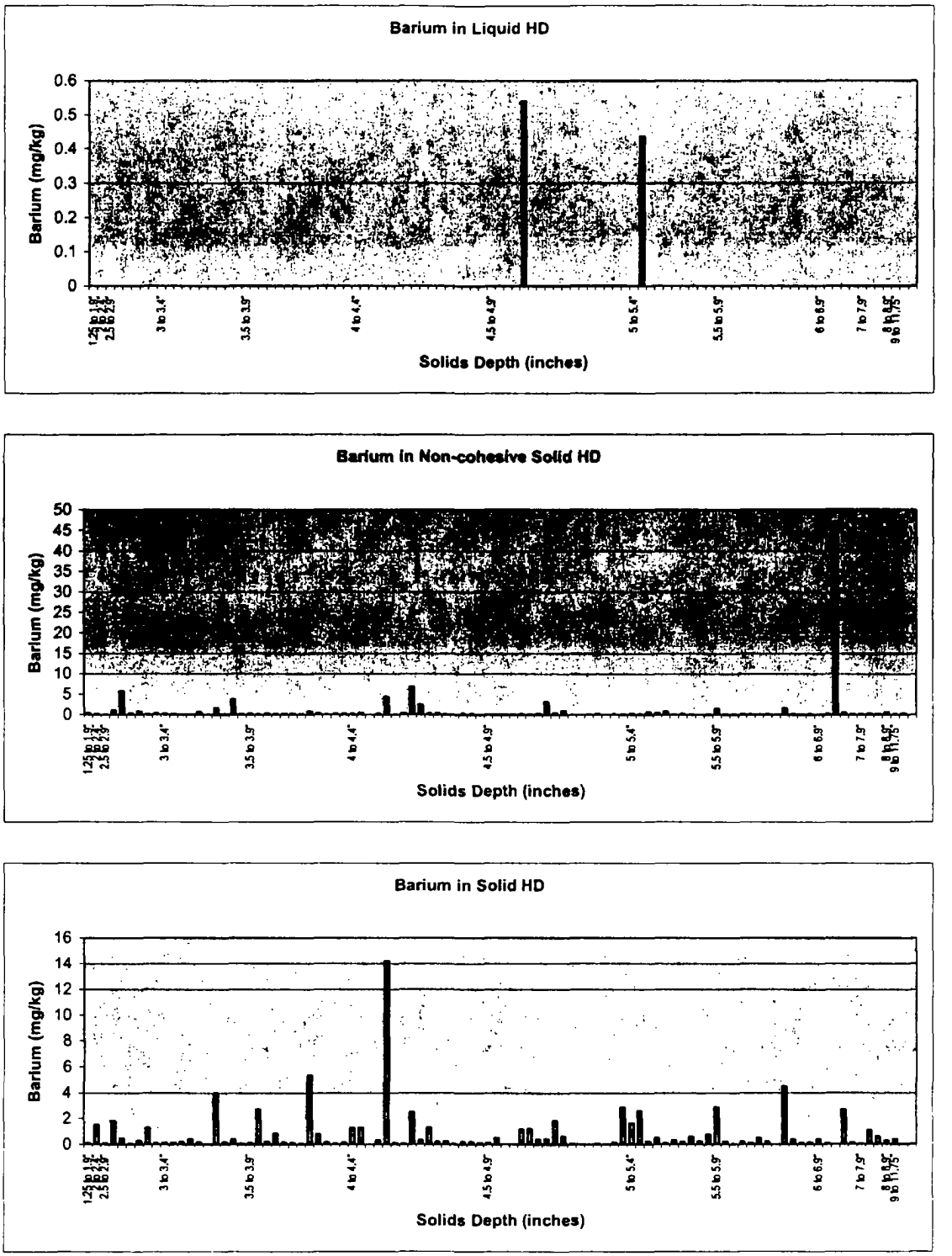


Figure 3-5. Barium Results by Solids Depth

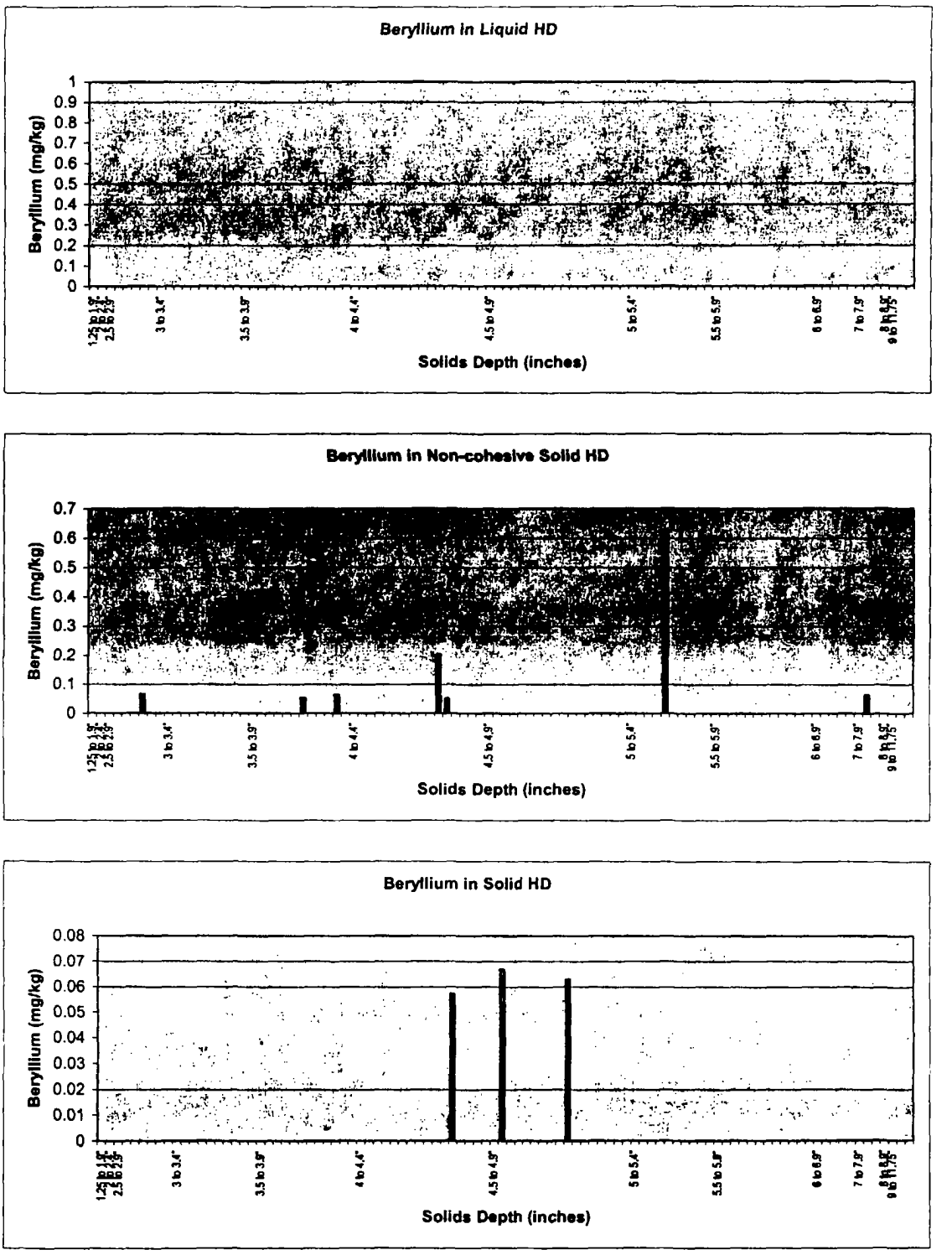
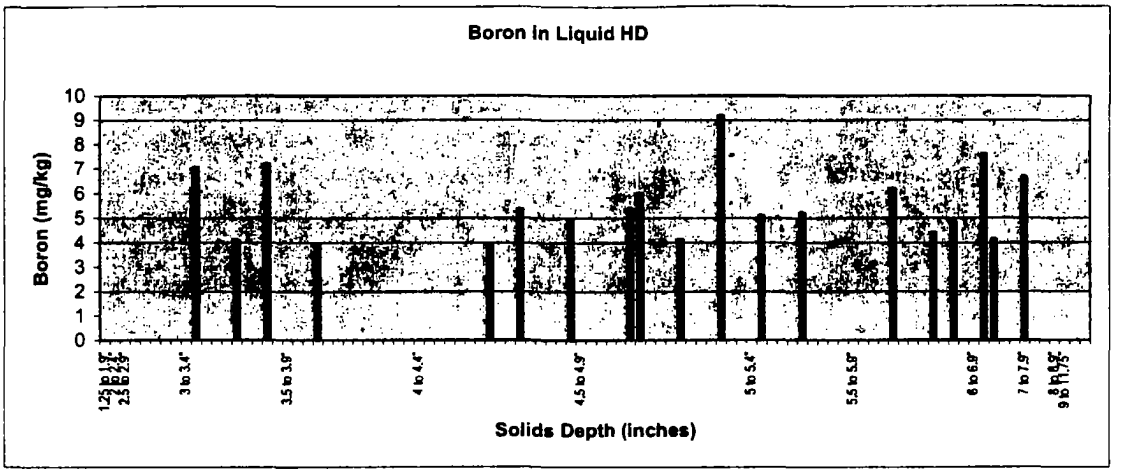
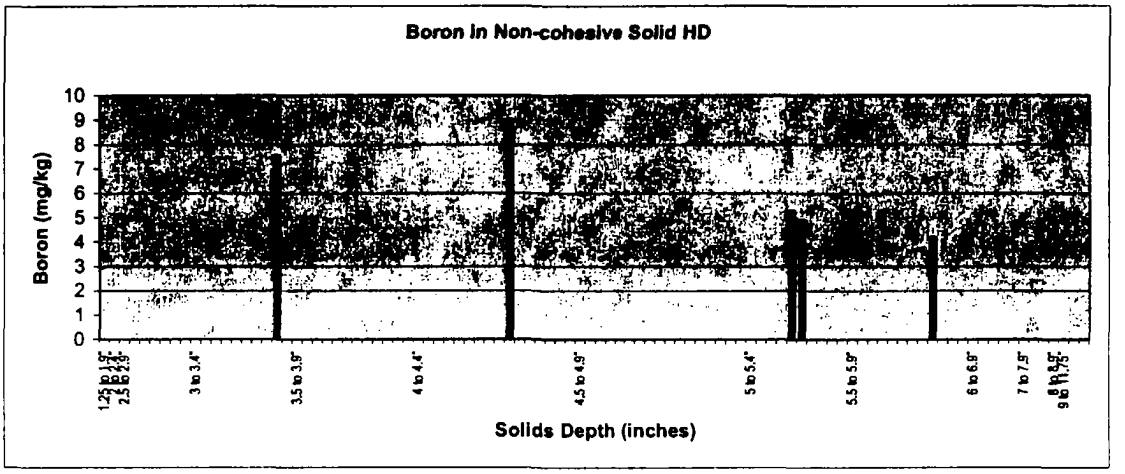


Figure 3-6. Beryllium Results by Solids Depth





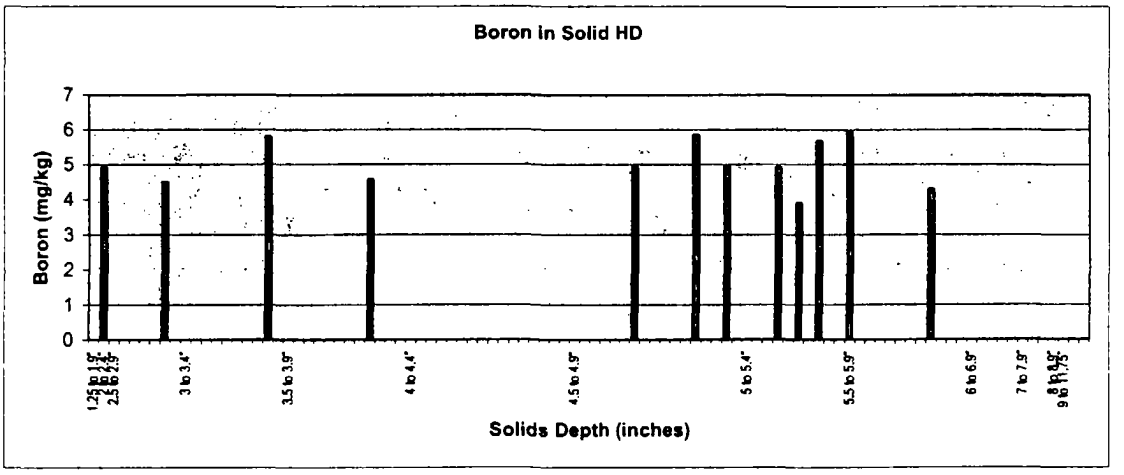


Figure 3-7. Boron Results by Solids Depth

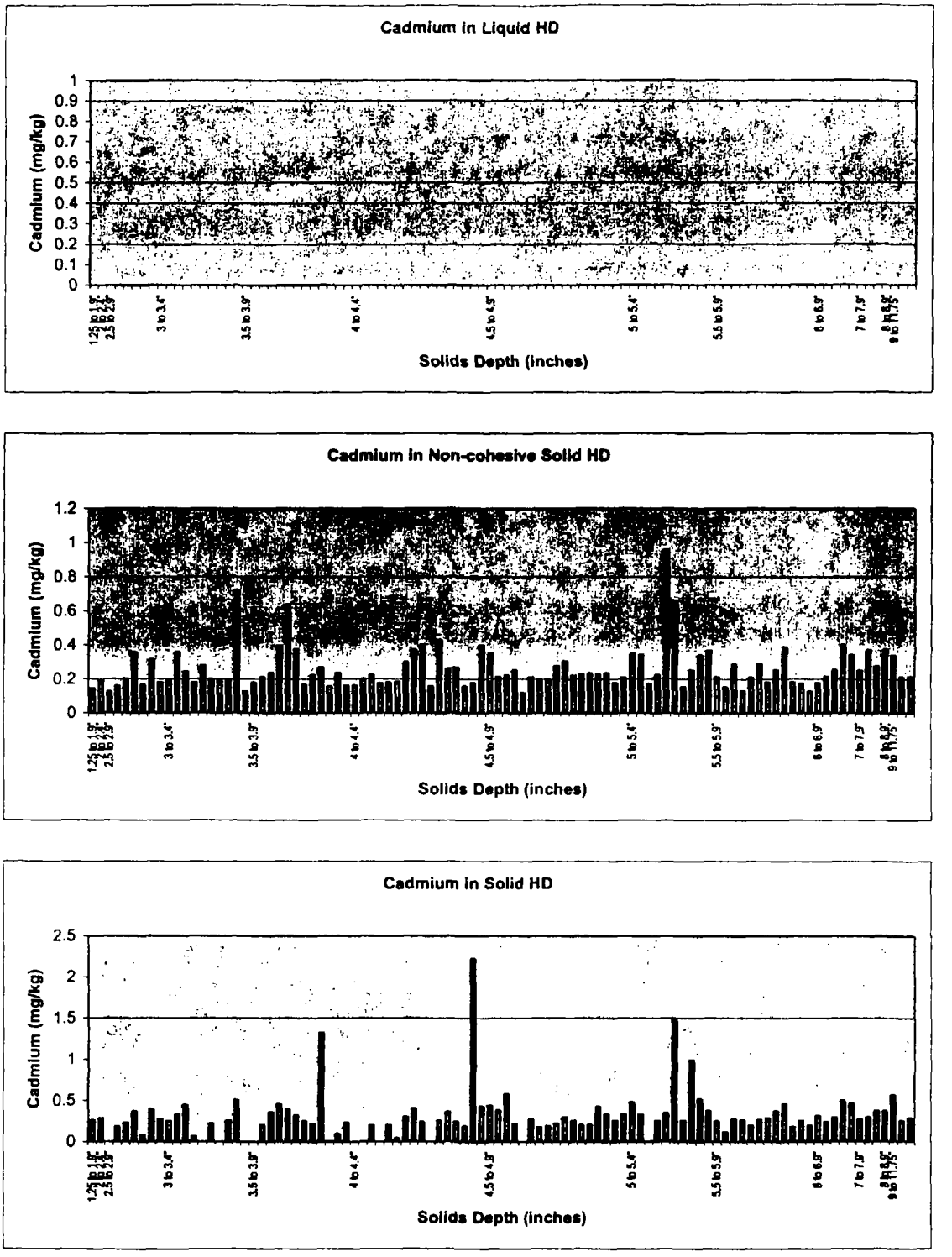
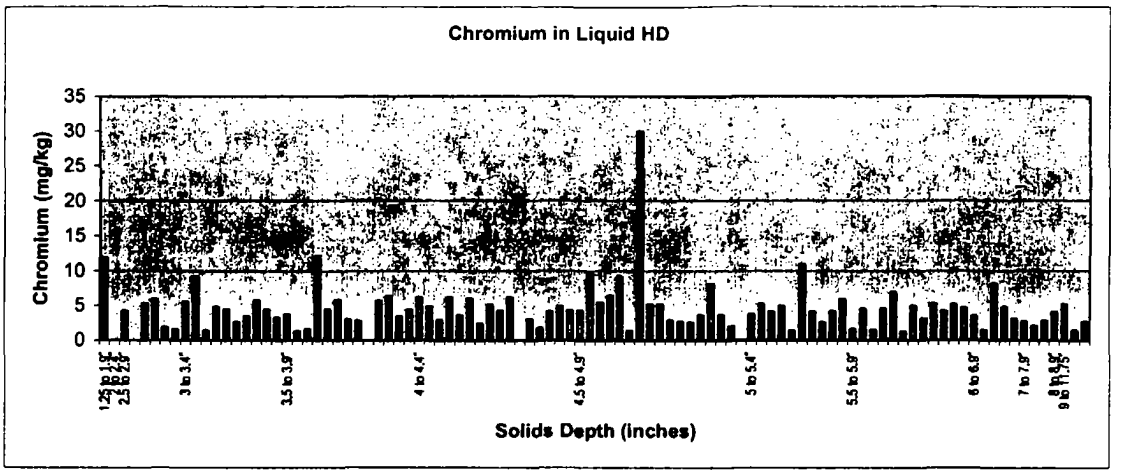
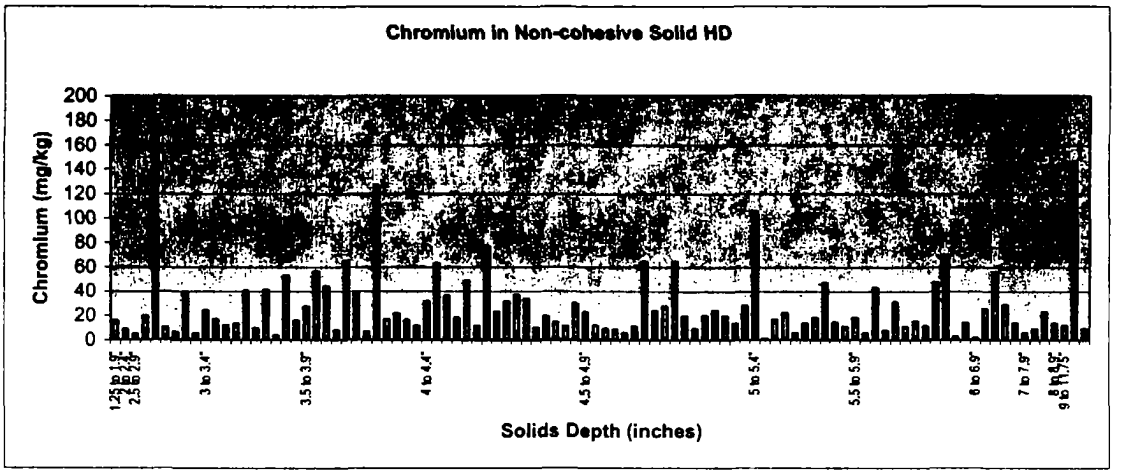


Figure 3-8. Cadmium Results by Solids Depth





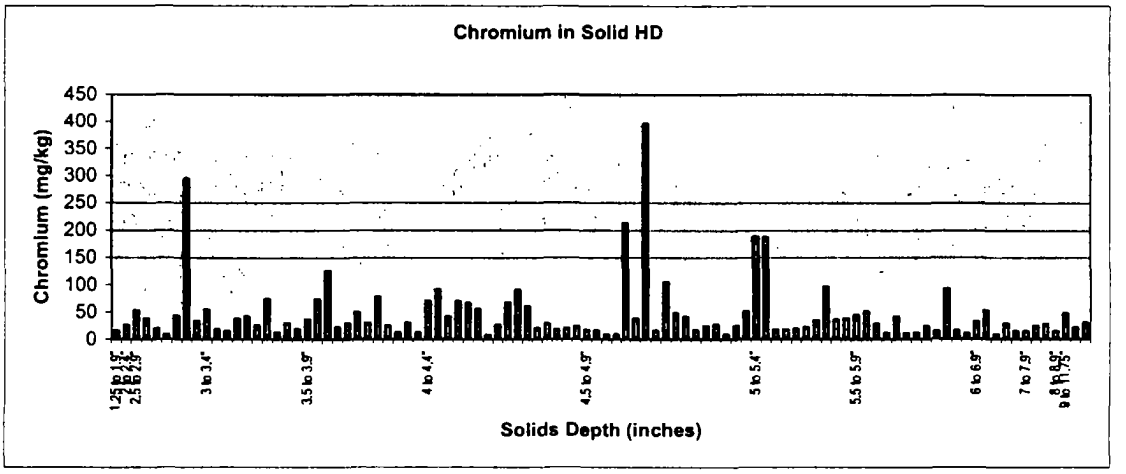
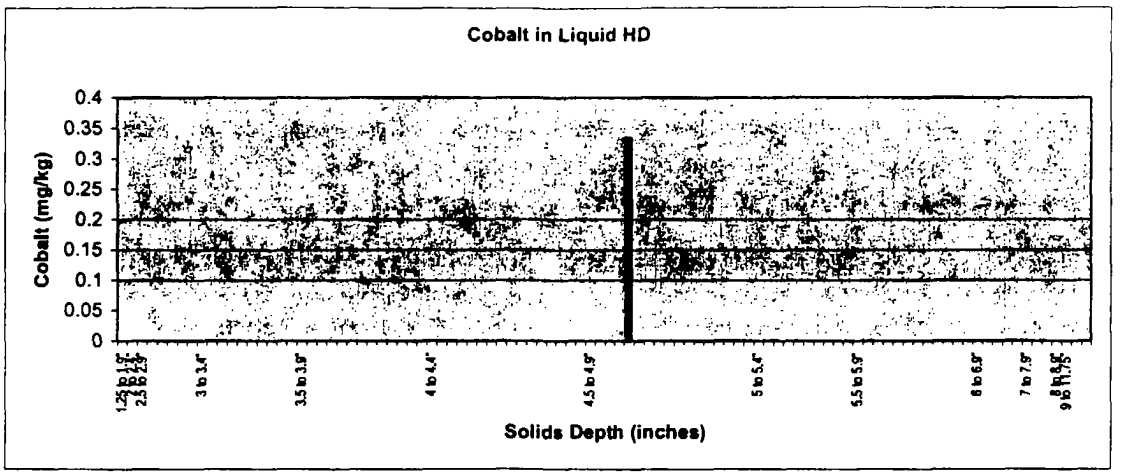
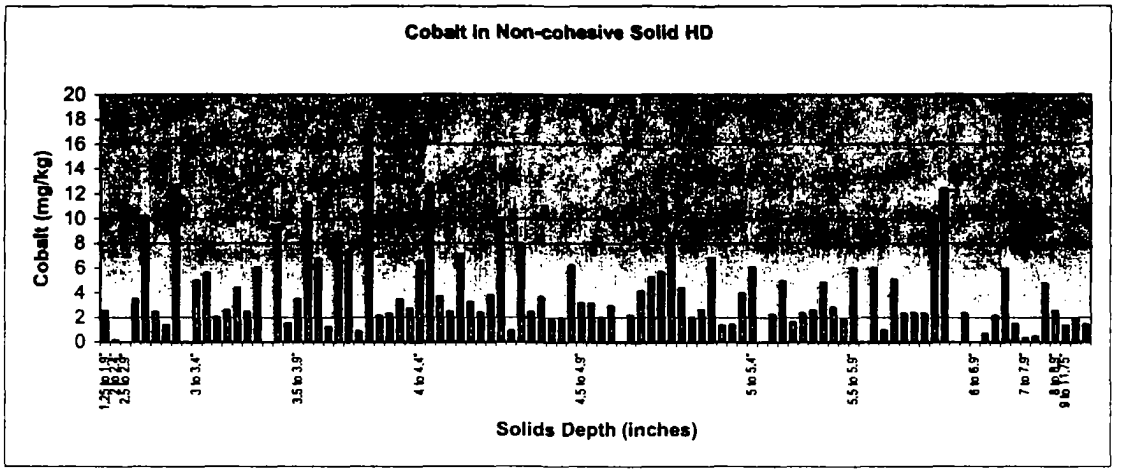


Figure 3-9. Chromium Results by Solids Depth





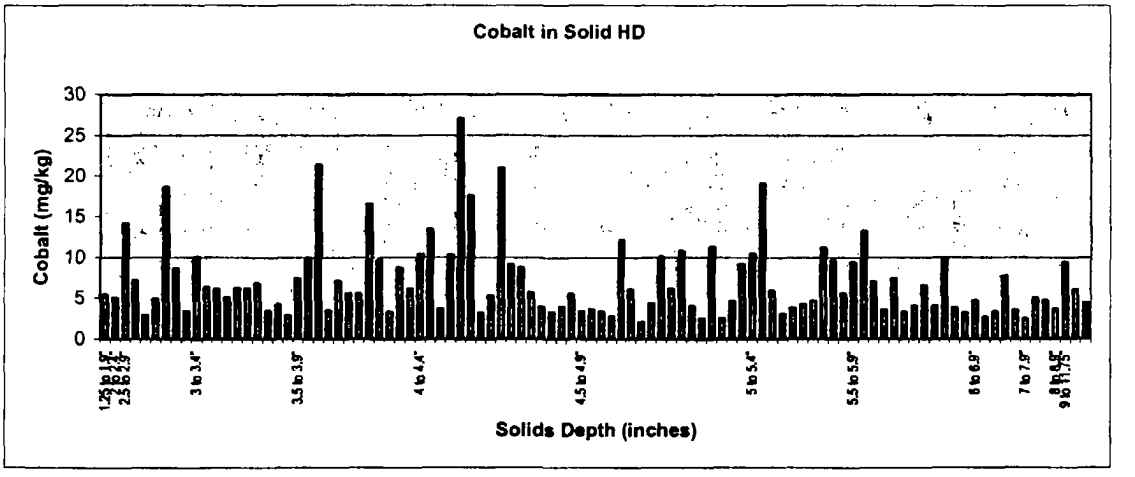
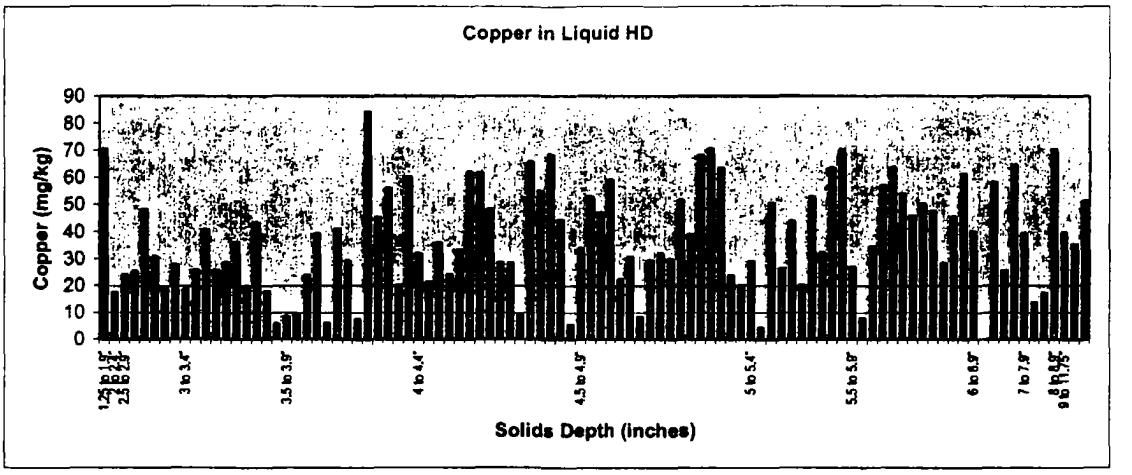
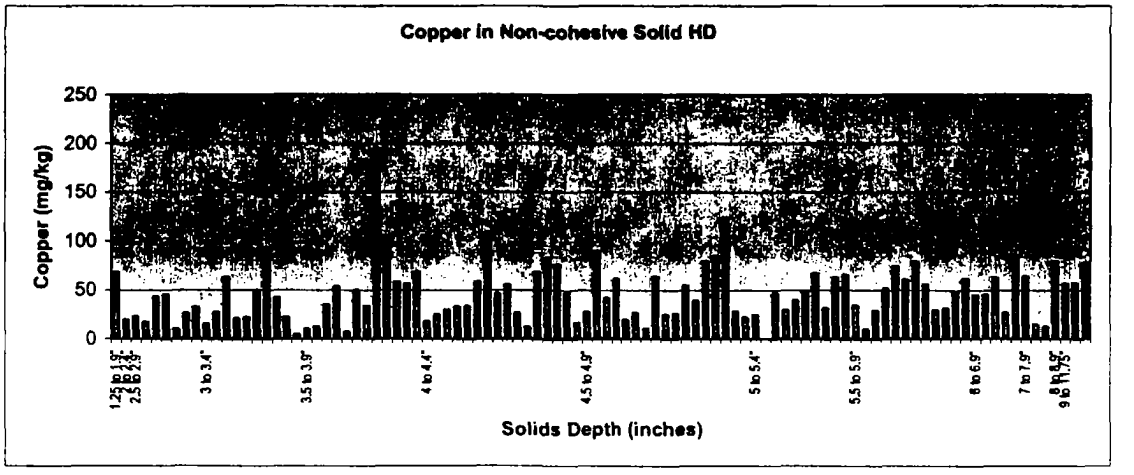


Figure 3-10. Cobalt Results by Solids Depth





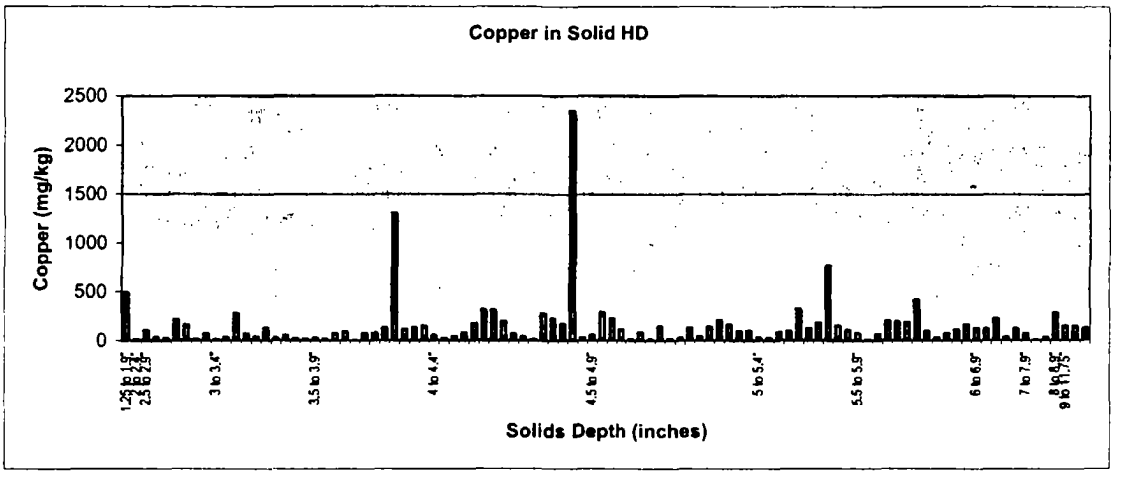
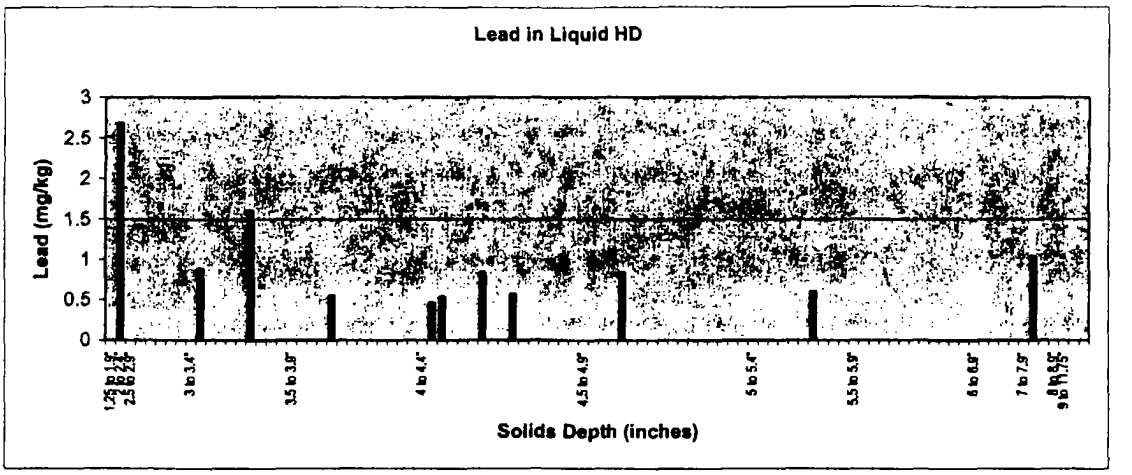
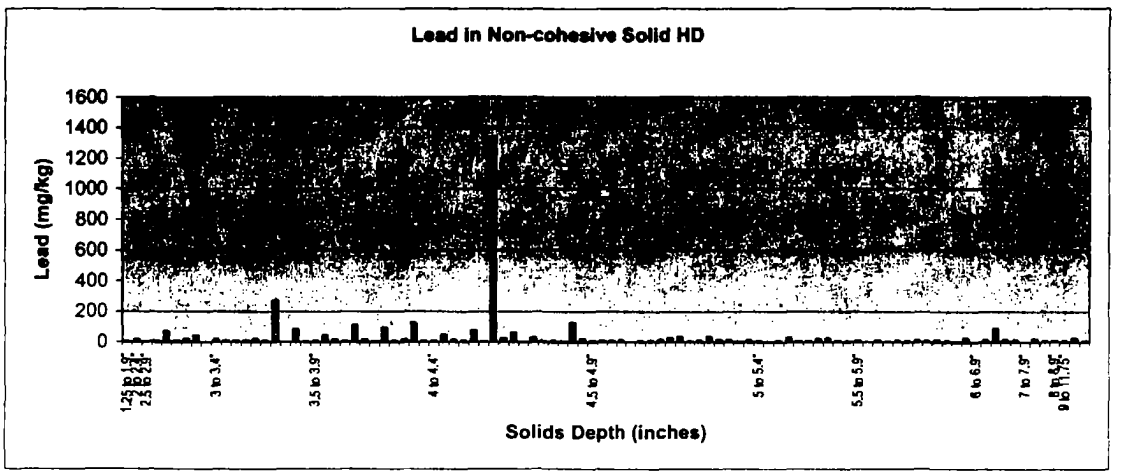


Figure 3-11. Copper Results by Solids Depth





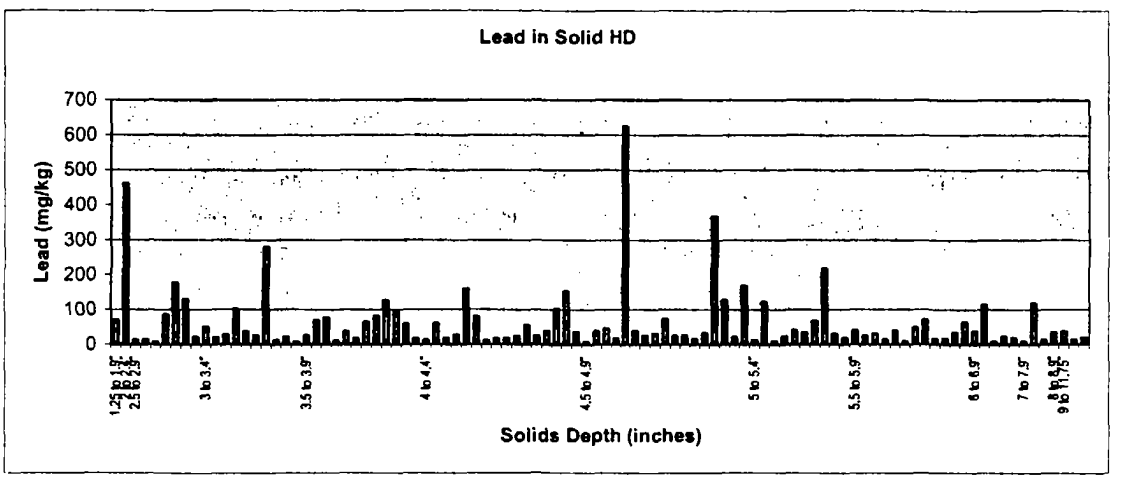
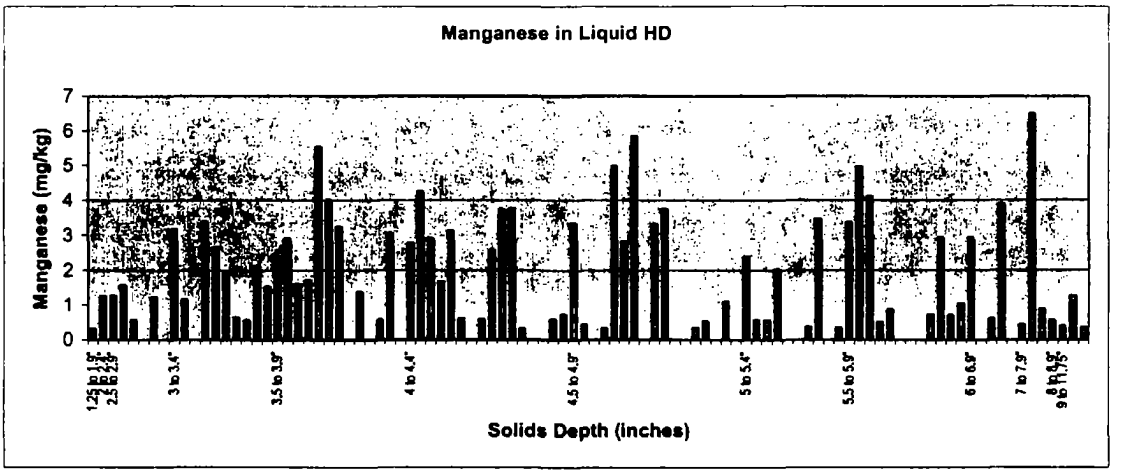
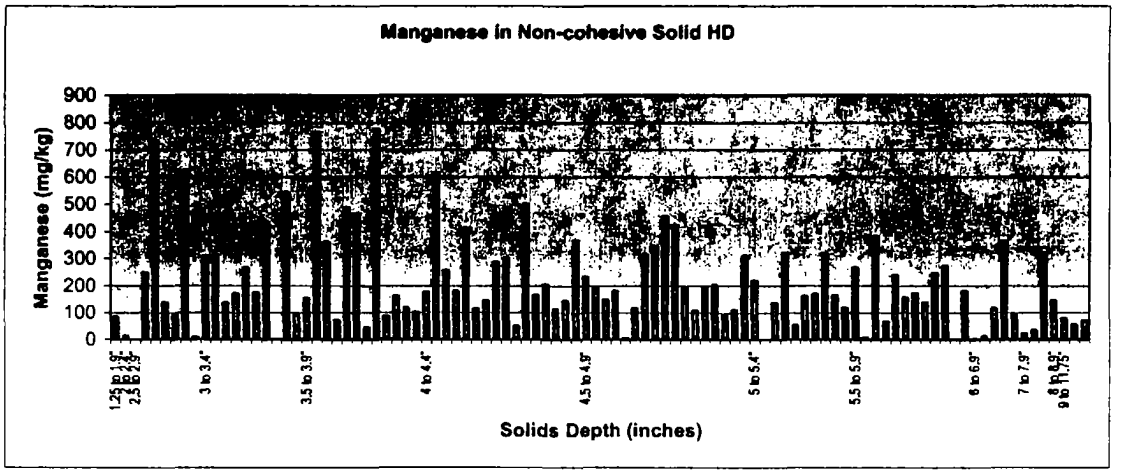


Figure 3-12. Lead Results by Solids Depth





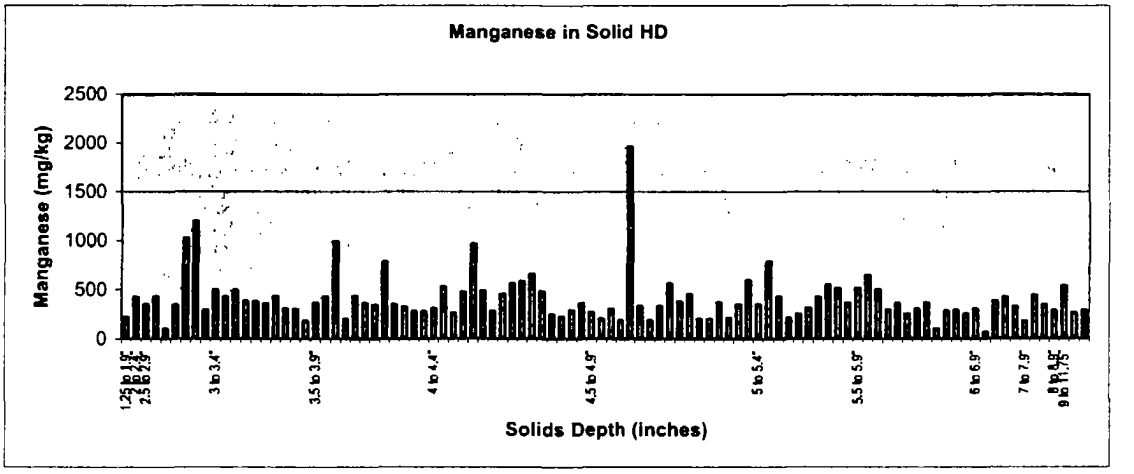
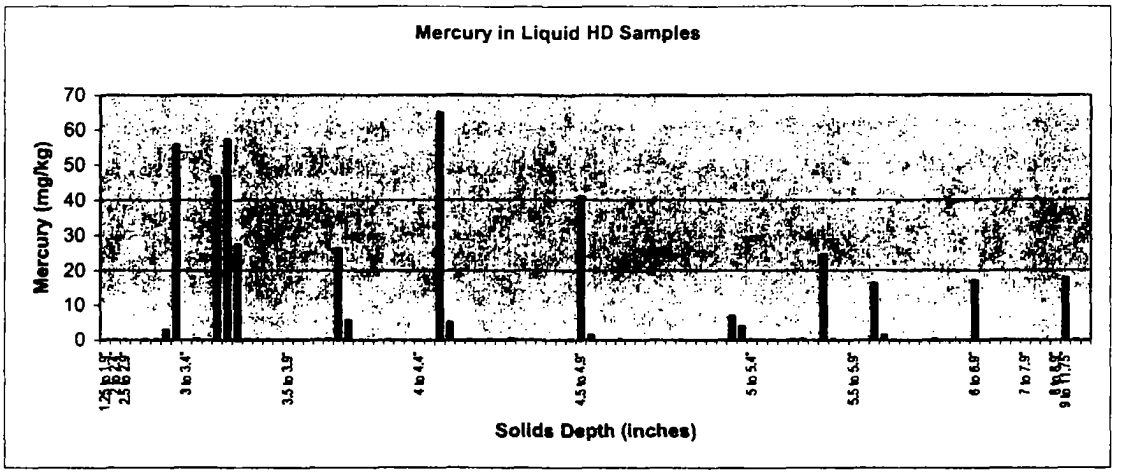
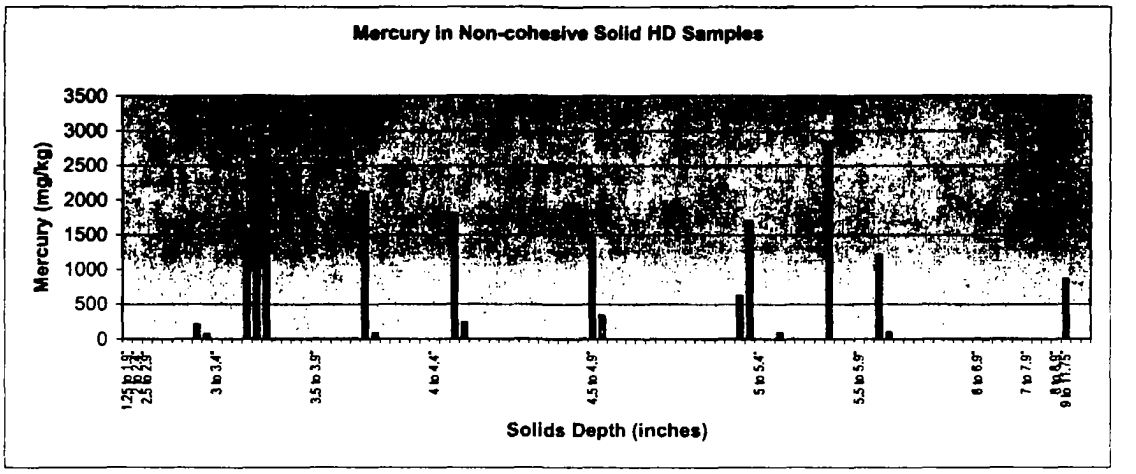


Figure 3-13. Manganese Results by Solids Depth





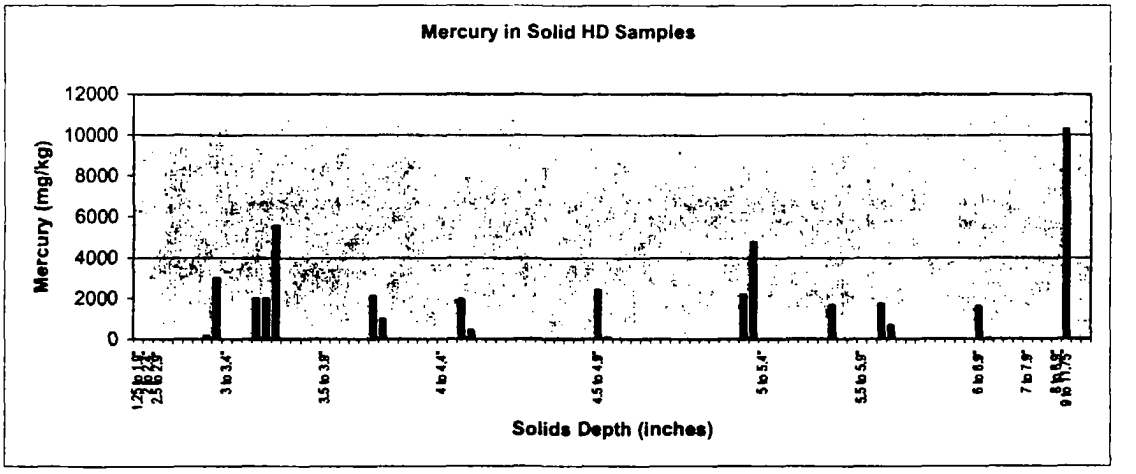
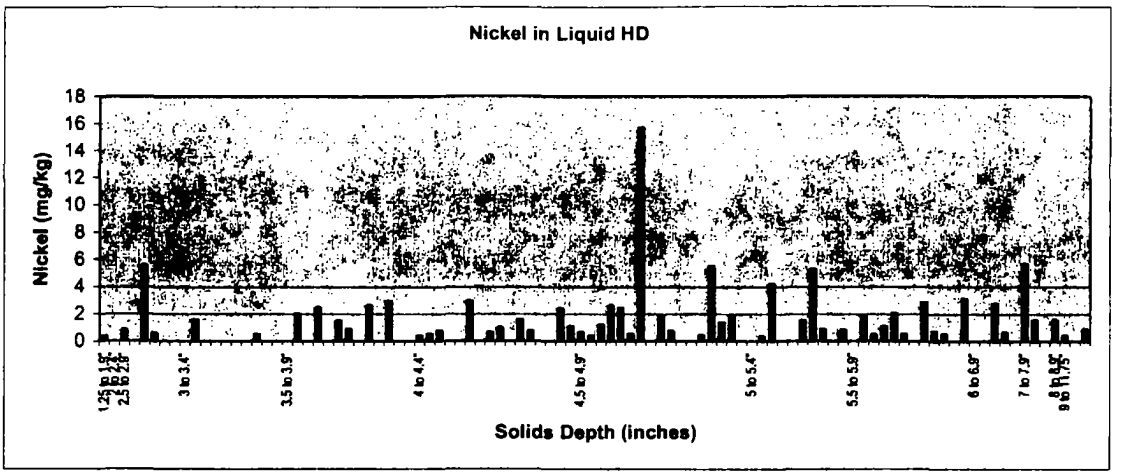
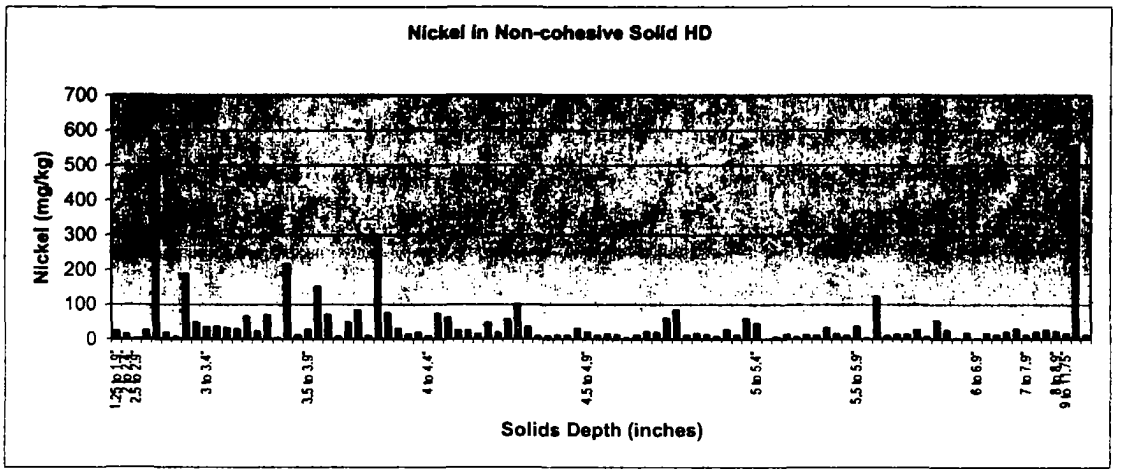


Figure 3-14. Mercury Results by Solids Depth





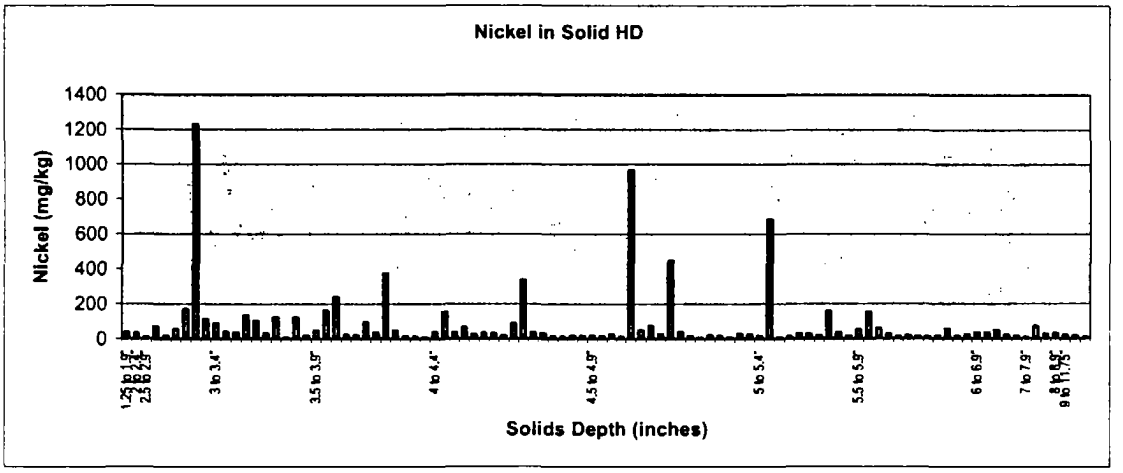
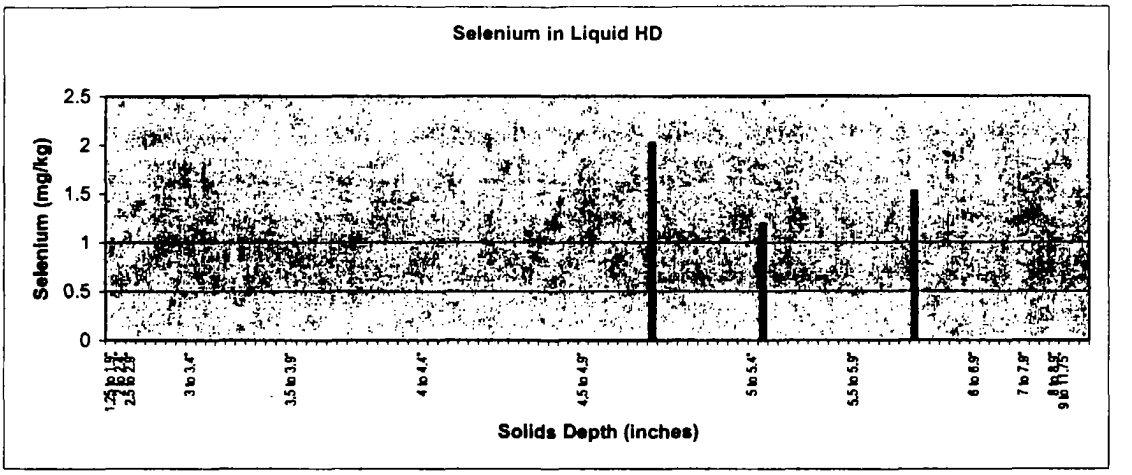
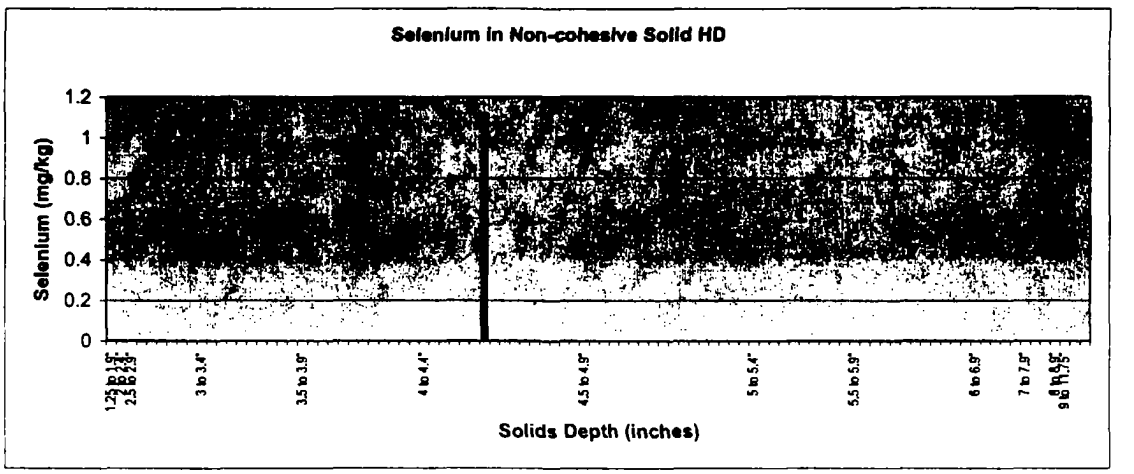


Figure 3-15. Nickel Results by Solids Depth





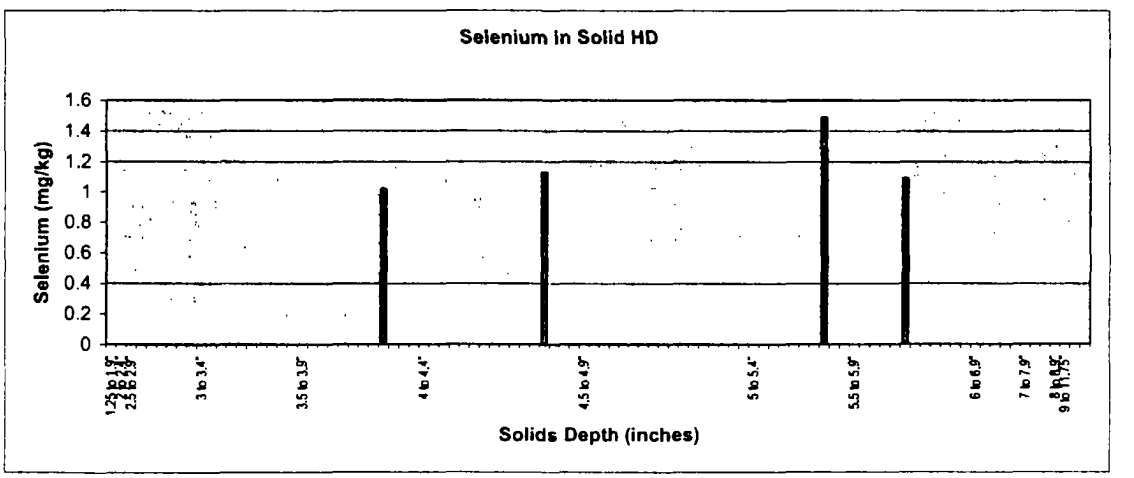
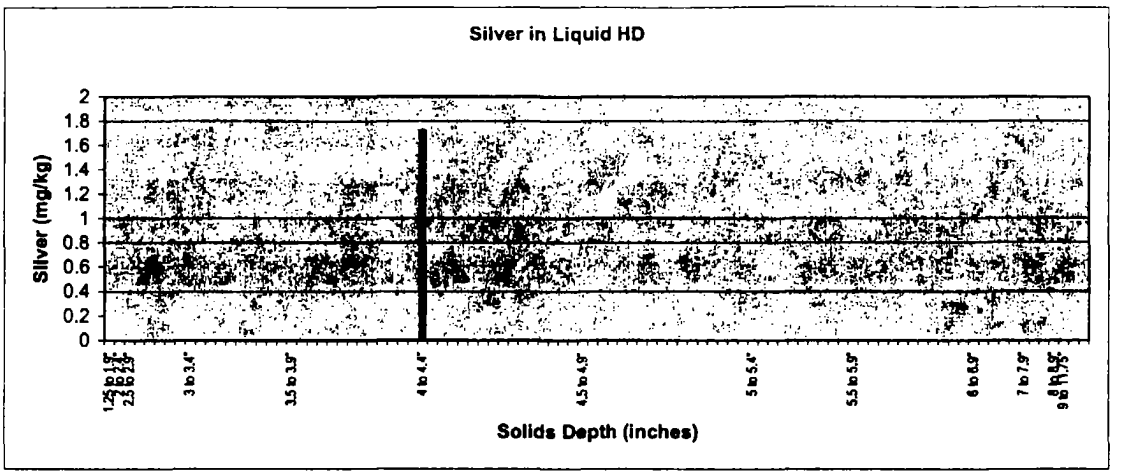
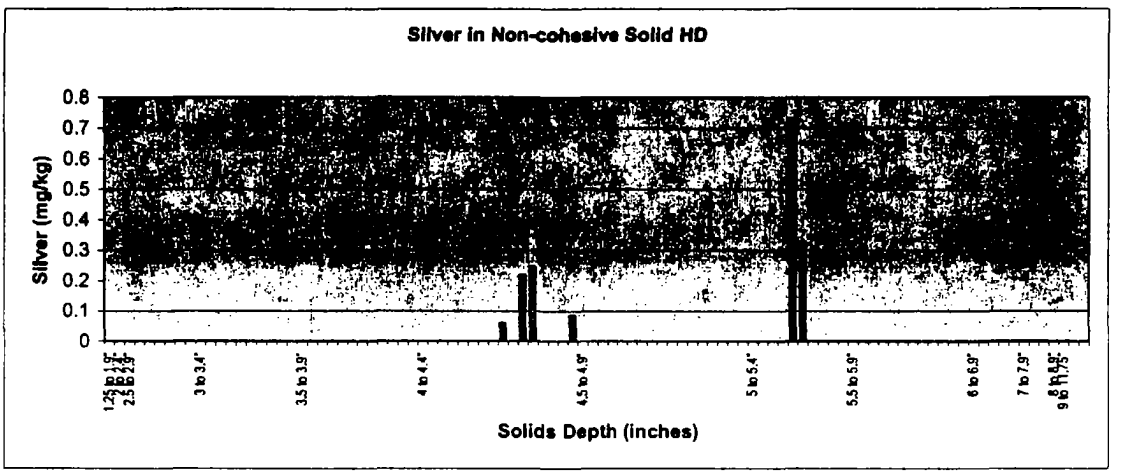


Figure 3-16. Selenium Results by Solids Depth





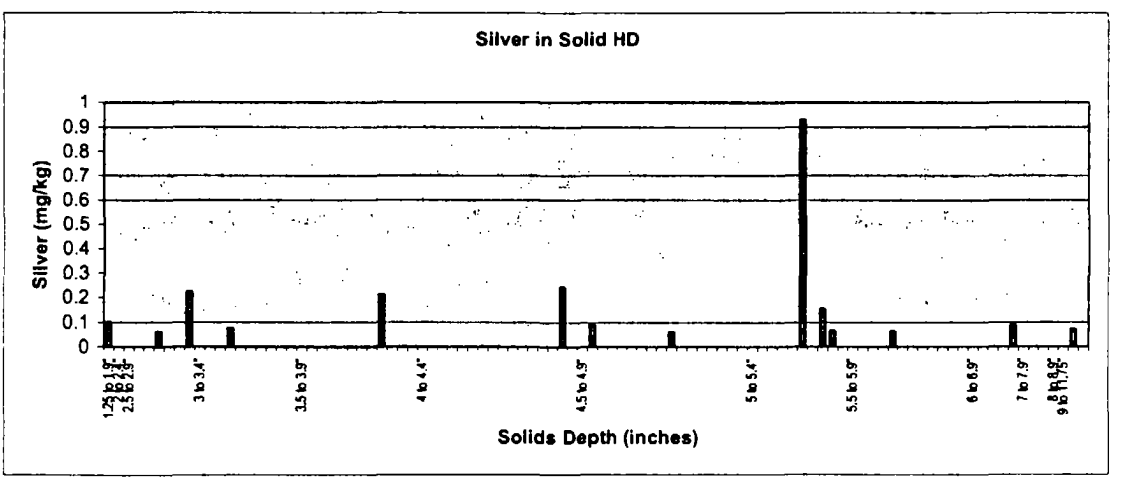


Figure 3-17. Silver Results by Solids Depth

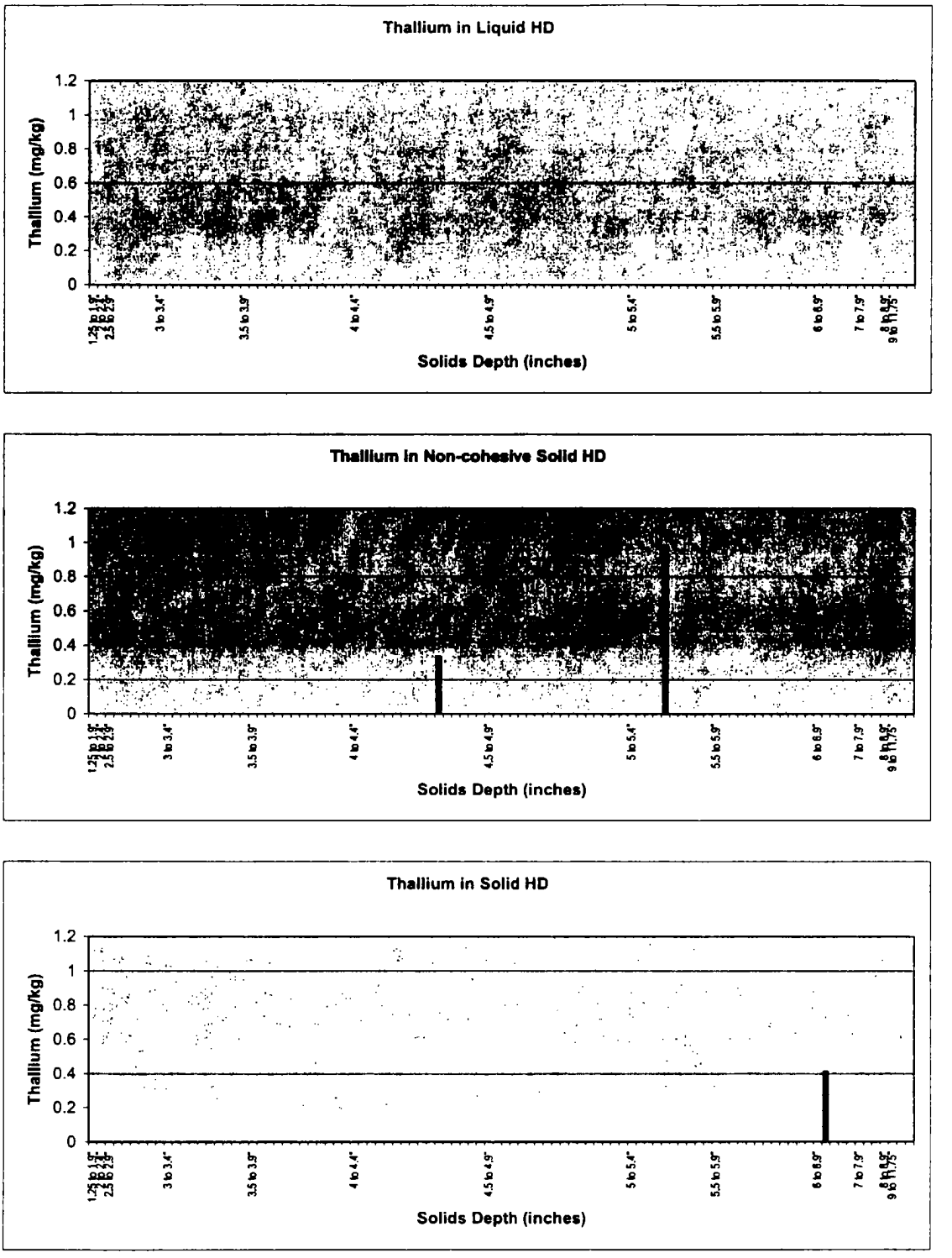


Figure 3-18. Thallium Results by Solids Depth

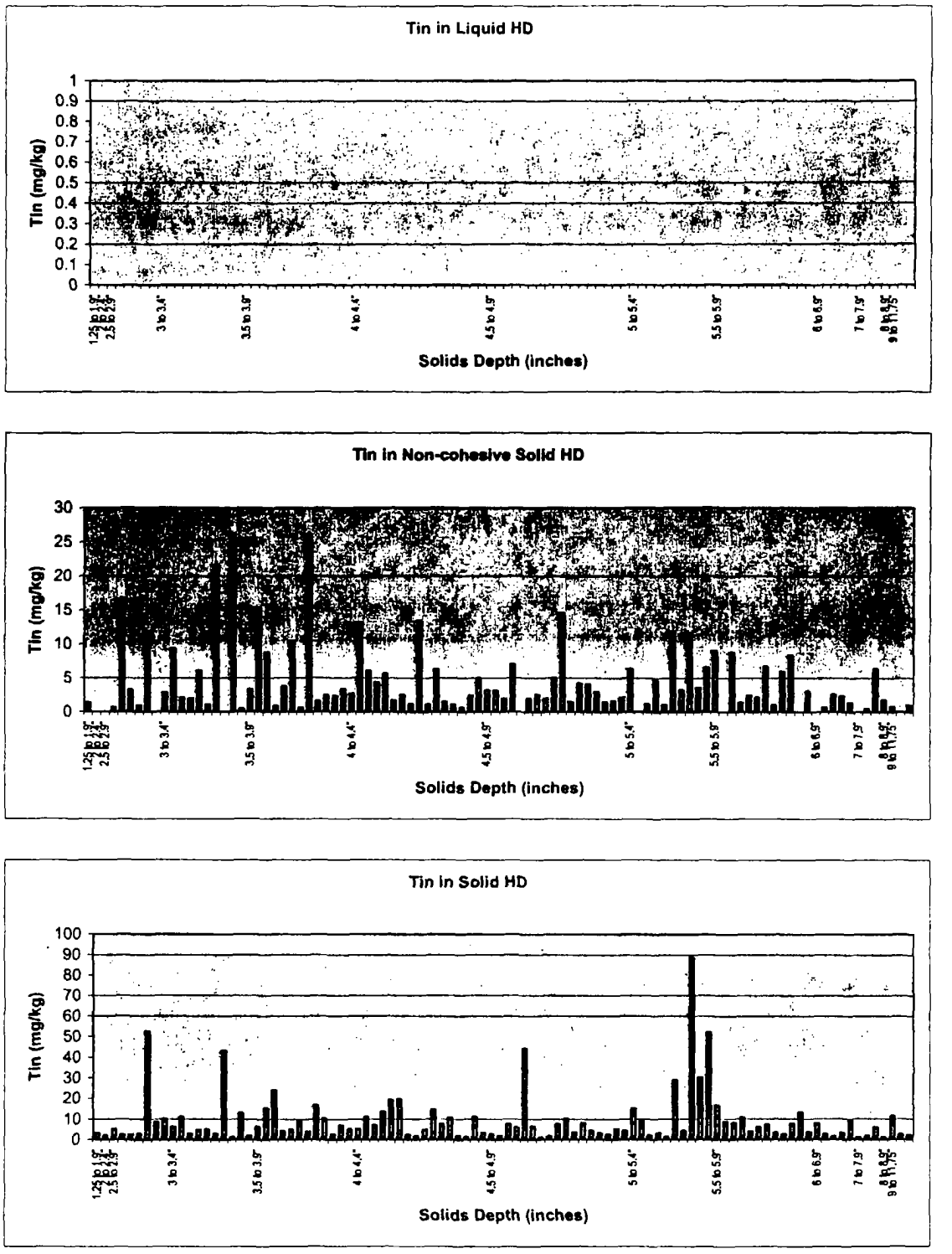
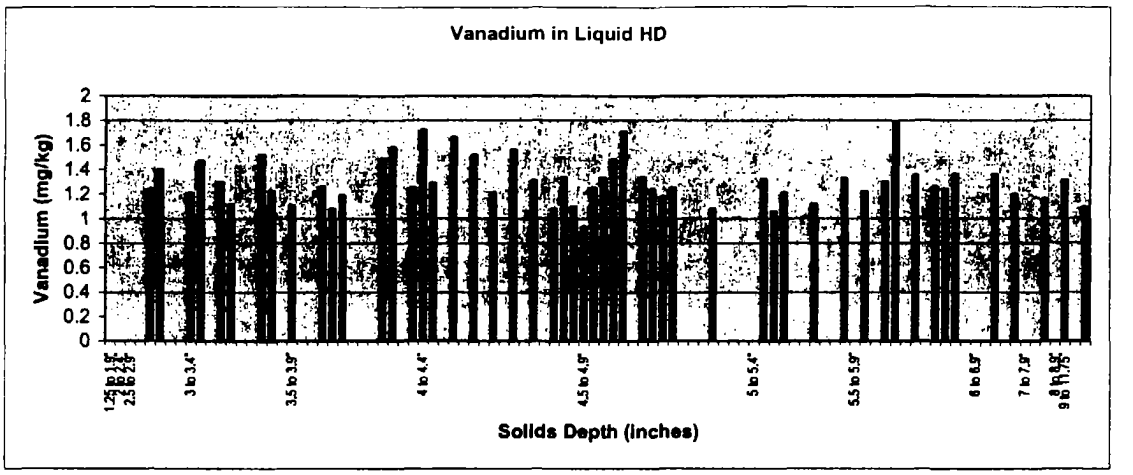
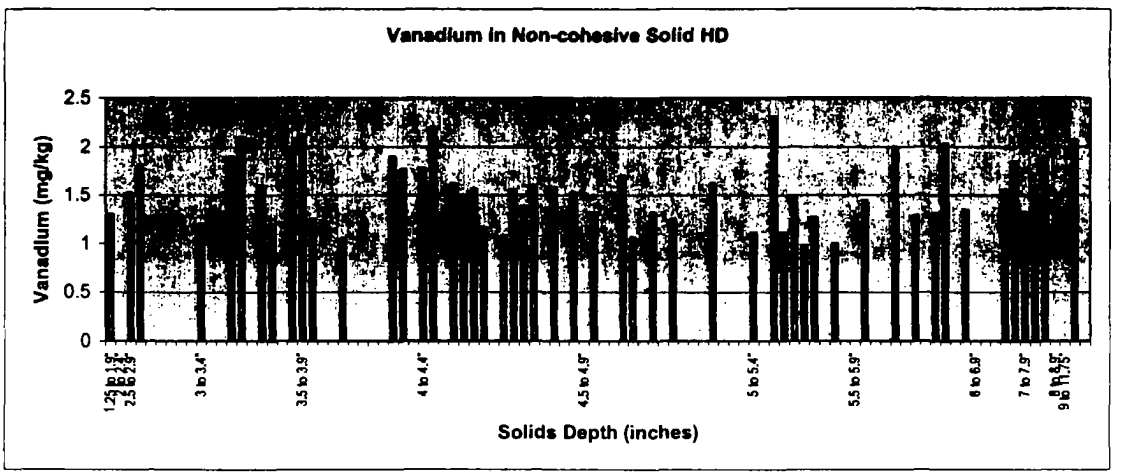


Figure 3-19. Tin Results by Solids Depth





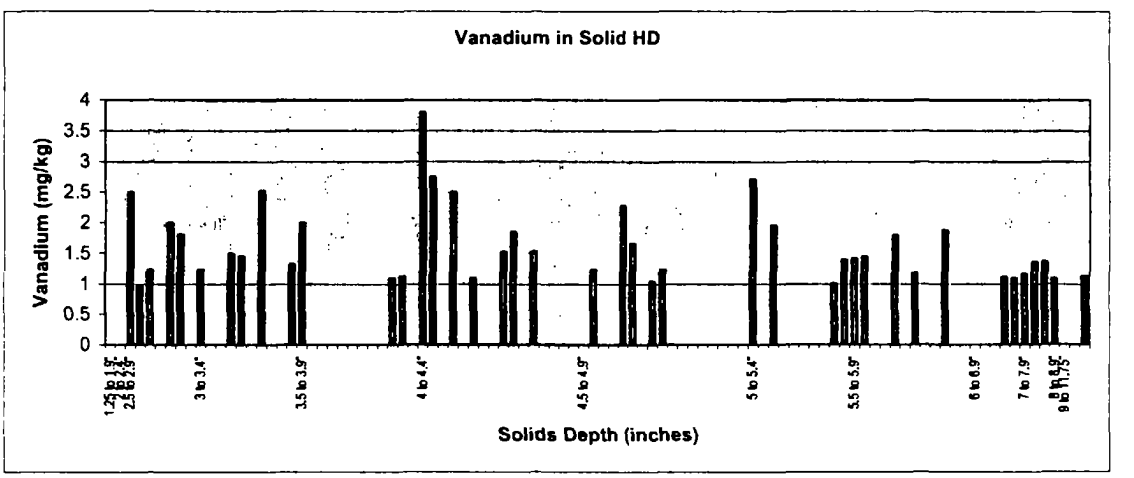
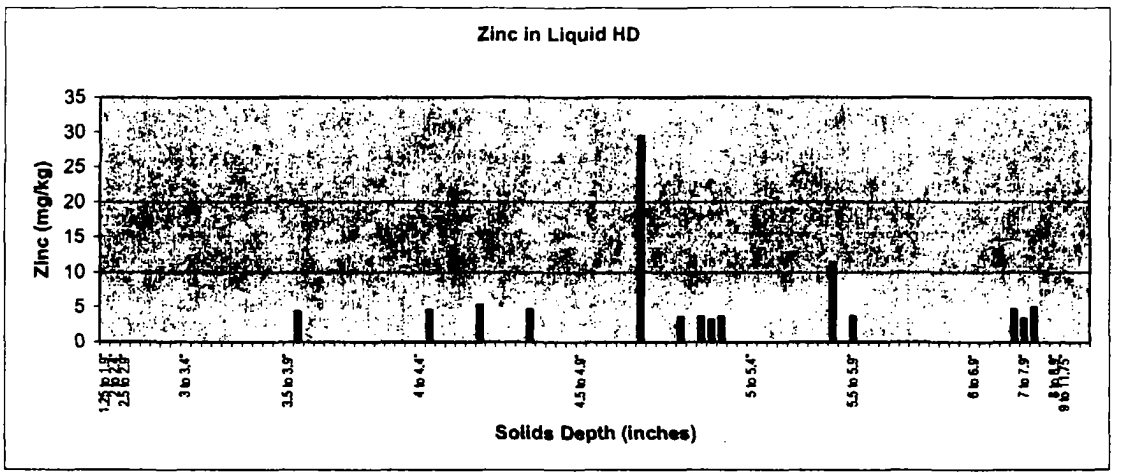
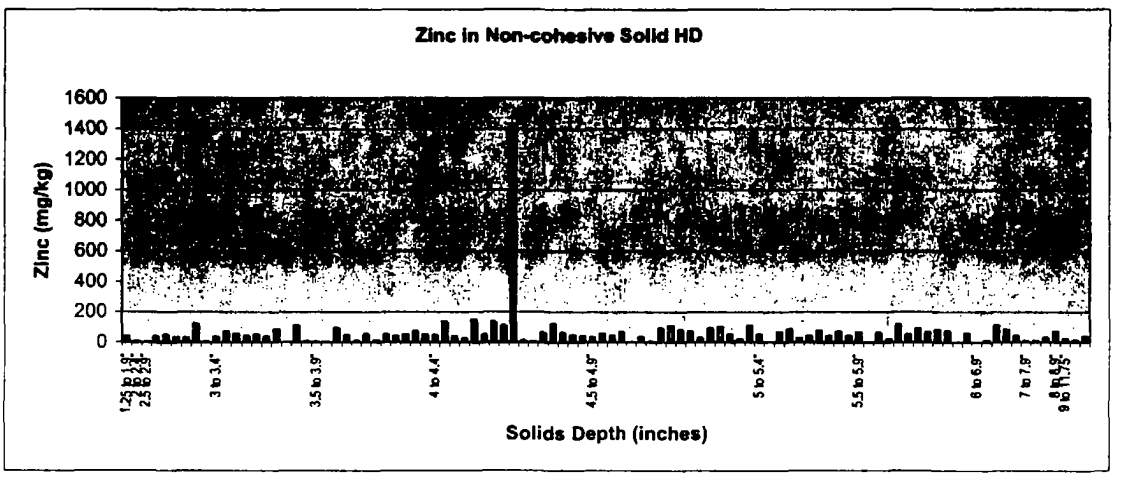


Figure 3-20. Vanadium Results by Solids Depth





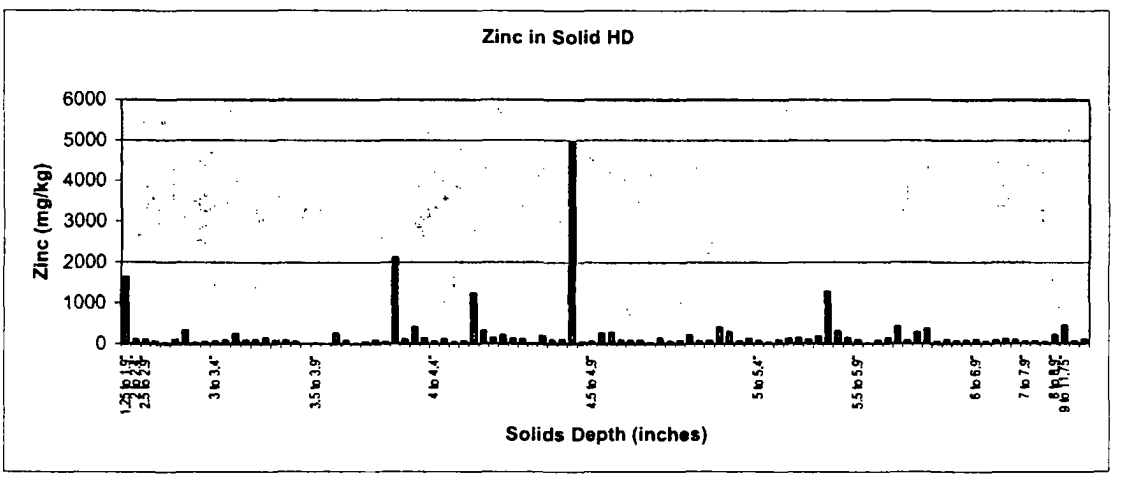


Figure 3-21. Zinc Results by Solids Depth

4.0 QUALITY ASSURANCE/QUALITY CONTROL DATA EVALUATION

Quality Control Criteria (QCC) were established in Section 5.0 of the QAPP[1] for each method used to analyze samples for this project. This set of criteria was used to ensure that the data were acceptable for this project. This section discusses briefly how well the QCC were met for each method and presents an overall evaluation of data quality. A more in-depth data quality evaluation is presented in Appendix D, QA/QC Report.

4.1 Audit Sample Results

The Utah DSHW selected munitions-grade liquid, non-cohesive solid and solid HD samples for the purpose of preparing blind challenge spike samples during sample collection for Sample Sets #1 and #7. OMF personnel performed the spiking operation under the direction of DSHW representatives. The personnel performing the sample analyses were not informed which compounds were spiked or their concentrations. Results of these analyses are provided in Tables 4-1 and 4-2.

Table 4-1. Mustard Composition of DSHW-Spiked Samples – Sample Set #1

TC Serial Number	D94558				D46667					
GAMDS Sample ID	21-03-007a	21-03-007b	21-03-007c	21-03-007d	21-03-014a	21-03-01[illegible]	[illegible]	[illegible]	[illegible]	21-03-009c
Sample Matrix	Liquid	Liquid	Liquid	Liquid	NC Solid	NC Solid	[illegible]	[illegible]	[illegible]	Solid
Organic Compounds										
Bis (2-chloroethyl)sulfide (HD), Wt.%	49.2	50.6	48.8	42.4						
Thiodiglycol, Wt.%	< 0.029 U	< 0.026 U	< 0.025 U	< 0.025 U						
1,2-dichloroethane (DCE), Wt.%	0.518	0.447	0.501	0.425						
Tetrachloroethylene, Wt.%	< 0.051 U	0.024 J	0.030 J	0.028 J						
1,1,2,2-tetrachloroethane, Wt.%	< 0.051 U	< 0.052 U	< 0.051 U	< 0.049 U						
T, Wt.%	0.045 J	0.052 J	0.048 J	0.050 J						
Q, Wt.%	3.18	3.41	3.33	3.28						
Hexachloroethane (HCE), Wt.%	< 0.24 U	< 0.25 U	< 0.27 U	0.019 J						
Lewisite (L), mg/kg	5150 H	< 5.3 UH	< 5.3 UH	< 5.0 UH						
Metals										
Aluminum, mg/kg	< 50 U	43 J	< 55 U	18 J	< 51 U	< 48 U	< 55 U	17 J	< 50 U	13 J
Antimony, mg/kg	< 5.0 U	< 5.8 U	< 5.5 U	< 5.3 U	0.25 J	0.66 J	< 5.5 U	2.3 J	2.1 J	2.0 J
Arsenic, mg/kg	1920	9.77	16.5	21.8	319	2710	81.5	951	2940	241
Barium, mg/kg	< 5.0 U	< 5.8 U	< 5.5 U	< 5.3 U	< 5.1 U	0.14 J	0.17 J	2.2 J	0.23 J	0.35 J
Beryllium, mg/kg	< 5.0 U	< 5.8 U	< 5.5 U	< 5.3 U	< 5.1 U	< 4.8 U	< 5.5 U	< 4.9 U	< 5.0 U	< 5.1 U
Boron, mg/kg	< 10 U	8.0 J	< 11 U	< 11 U	< 10 U	< 9.5 U	< 11 U	4.4 J	< 10.0 U	< 10 U
Cadmium, mg/kg	< 5.0 U	< 5.8 U	< 5.5 U	< 5.3 U	0.27 J	0.27 J	0.27 J	1.5 J	0.65 J	0.36 J
Chromium, mg/kg	< 5.0 U	< 5.8 U	< 5.5 U	< 5.3 U	19.0	16.9	14.4	29.6	53.4	20.6
Cobalt, mg/kg	< 1.0 U	< 1.2 U	< 1.1 U	< 1.1 U	3.59	3.96	2.96	9.75	21.6	9.18
Copper, mg/kg	85.1	60.9	56.9	9.73	58.7	69.0	64.6	1100	424	142
Lead, mg/kg	< 5.0 U	64.7	72.0	215	551	8880	12.1	1040	1720	14.4
Manganese, mg/kg	1.20	< 1.2 U	< 1.1 U	< 1.1 U	210	181	193	329	615	423
Mercury, mg/kg	0.072 J	95.5	84.3	495	1630	6900	0.36 J	575	2780	0.43 J
Nickel, mg/kg	5.05	0.41 J	1.1 J	0.39 J	18.8	20.6	18.5	39.5	15.7	30.3
Selenium, mg/kg	< 10 U	< 12 U	< 11 U	< 11 U	< 26 U	< 24 U	< 27 U	1.6 J	1.3 J	0.79 J
Silver, mg/kg	< 5.0 U	< 5.8 U	< 5.5 U	< 5.3 U	< 5.1 U	< 4.8 U	< 5.5 U	0.19 J	0.061 J	< 5.1 U
Thallium, mg/kg	< 5.0 U	< 5.8 U	< 5.5 U	< 5.3 U	< 5.1 U	< 4.8 U	< 5.5 U	< 4.9 U	< 5.0 U	< 5.1 U
Tin, mg/kg	< 10 U	< 12 U	< 11 U	< 11 U	3.7 J	5.3 J	2.6 J	18.1	14.6	8.7 J
Vanadium, mg/kg	< 5.0 U	< 5.8 U	< 5.5 U	< 5.3 U	< 5.1 U	< 4.8 U	< 5.5 U	< 4.9 U	< 5.0 U	< 5.1 U
Zinc, mg/kg	3.2 J	< 12 U	< 11 U	< 11 U	93.0	120	64.9	2160	1280	176

Notes: J - Result estimated since value wasbetween the MDL and the PQL.
U - Analyte not detected above the MDL, results reported as less than the PQL.
H - Analysis conducted past 28-day holding time; result considered valid based on Stability Study results.

Table 4-2. Mustard Composition of DSHW-Spiked Samples – Sample Set #7

TC Serial Number	D50373					[redacted]							
CAMDS Sample ID	21-03-251A	21-03-251B	21-03-251C	21-03-251D	21-03-251E	[redacted]							21-03-253D
Sample Matrix	Liquid	Liquid	Liquid	Liquid	Liquid	[redacted]				Solid	Solid	Solid	Solid
Organic Compounds													
Bis(2-chloroethyl)sulfide (HD), Wt.%	84.5	72.8	85.5	0.212	84.9								
Thiodiglycol, Wt.%	< 0.027 U	< 0.028 U	< 0.026 U	< 0.027 U	< 0.027 U								
1,2-dichloroethane (DCE), Wt.%	0.402	0.377	0.424	< 0.053 U	0.386								
Tetrachloroethylene, Wt.%	< 0.054 U	< 0.047 U	< 0.053 U	< 0.053 U	< 0.053 U								
1,1,2,2-tetrachloroethane, Wt.%	< 0.054 U	< 0.047 U	< 0.053 U	< 0.053 U	< 0.053 U								
T, Wt.%	0.489	0.936	0.400	0.032 J	0.375								
Q, Wt.%	2.79	2.88	2.62	0.096 J	2.56								
Hexachloroethane (HCE), Wt.%	< 0.027 U	0.0969	< 0.026 U	0.287	< 0.027 U								
Lewisite (L), mg/kg	< 5.3 UH	< 5.3 UH	< 5.2 UH	< 5.3 UH	< 5.3 UH								
Metals													
Aluminum, mg/kg	< 54 U	12 J	< 52 U	11 J	30 J	14 J	117	< 39 U	< 54 U	12 JH	16.6 H	8.1 JH	< 52 UH
Antimony, mg/kg	< 5.4 U	< 5.5 U	< 5.2 U	< 5.2 U	< 5.3 U	0.18 J	< 5.0 U	< 3.9 U	< 5.4 U	2.61	2.59	2.40	5.72
Arsenic, mg/kg	16.2	2.2 J	2.0 J	< 5.2 U	9.55	5700	2.4 J	2.6 J	8.09	1770	7.18	6.40	436
Barium, mg/kg	< 5.4 U	< 5.5 U	< 5.2 U	< 5.2 U	< 5.3 U	0.49 J	0.67 J	0.15 J	< 5.4 U	9.46	9.38	7.48	8.00
Beryllium, mg/kg	< 5.4 U	< 5.5 U	< 5.2 U	< 5.2 U	< 5.3 U	< 4.5 U	< 5.0 U	< 3.9 U	< 5.4 U	< 1.4 UH	< 0.72 UH	< 1.6 UH	< 5.2 UH
Boron, mg/kg	7.0 J	6.1 J	4.8 J	7.2 J	8.6 J	< 9.1 U	< 10 U	< 7.9 U	< 11 U	1.8 JH	0.95 JH	< 3.2 UH	< 10 UH
Cadmium, mg/kg	< 5.4 U	< 5.5 U	< 5.2 U	< 5.2 U	< 5.3 U	0.24 J	0.35 J	0.21 J	0.17 J	0.099 J	0.098 J	0.10 J	0.19 J
Chromium, mg/kg	3.0 J	3.6 J	2.9 J	< 5.2 U	2.9 J	2.3 J	5.70	11.1	3.6 J	89.4	80.9	88.3	58.6
Cobalt, mg/kg	< 1.1 U	< 1.1 U	< 1.0 U	< 1.0 U	< 1.1 U	< 0.91 U	0.21 J	0.10 J	< 1.1 U	20.9	20.1	20.3	15.6
Copper, mg/kg	5.86	8.93	12.3	< 5.2 U	8.21	11.3	13.3	10.8	10 J	137	142	132	108
Lead, mg/kg	< 5.4 U	300	< 5.2 U	< 5.2 U	46.6	< 9.1 U	4.7 J	1810	88.5	79.0	90.3	821	467
Manganese, mg/kg	< 1.1 U	0.38 J	< 1.0 U	< 1.0 U	< 1.1 U	< 9.1 U	< 10 U	< 7.9 U	< 11 U	1070	1130	1050	706
Mercury, mg/kg	< 0.54 U	871	< 0.52 U	< 0.52 U	158	< 0.45 U	< 0.50 U	2000	170	0.965	1.17	820	594
Nickel, mg/kg	< 5.4 U	0.58 J	< 5.2 U	0.42 J	< 5.3 U	0.62 J	1.2 J	5.30	< 5.4 U	554	633	567	366
Selenium, mg/kg	< 11 U	< 11 U	< 10 U	< 10 U	< 11 U	< 23 U	< 25 U	< 20 U	< 27 U	< 6.8 U	< 3.6 U	< 8.1 U	< 26 U
Silver, mg/kg	< 5.4 U	< 5.5 U	< 5.2 U	< 5.2 U	< 5.3 U	< 4.5 U	< 5.0 U	< 3.9 U	< 5.4 U	0.028 J	0.029 J	0.026 J	< 5.2 U
Thallium, mg/kg	< 5.4 U	< 5.5 U	< 5.2 U	< 5.2 U	< 5.3 U	< 4.5 U	< 5.0 U	< 3.9 U	< 5.4 U	< 1.4 U	< 0.72 U	< 1.6 U	< 5.2 U
Tin, mg/kg	< 11 U	< 11 U	< 10 U	< 10 U	< 11 U	< 9.1 U	< 10 U	< 7.9 U	< 11 U	20.5	20.5	19.0	15.0
Vanadium, mg/kg	< 5.4 U	< 5.5 U	< 5.2 U	< 5.2 U	< 5.3 U	< 4.5 U	1.1 J	< 3.9 U	< 5.4 U	< 1.4 U	< 0.72 U	0.40 J	< 5.2 U
Zinc, mg/kg	< 11 U	6.0 J	4.9 J	4.5 J	< 11 U	5.6 J	3.7 J	3.0 J	< 11 U	28.2	33.4	26.4	26.1

Notes: J - Result estimated since value wasbetween the MDL and the PQL.
U - Analyte not detected above the MDL, results reported as less than the PQL.
H - Analysis conducted past 28-day holding time; result considered valid based on Stability Study results.

4.2 Metals Data Evaluation

The QCC for the evaluation of metals data were outlined in Tables 5-1 and 5-2 of the QAPP.[1] Data from the metals analyses were evaluated against these QCC. The EC/B FAC reports for each sample set provide these evaluations along with summary data for some of the QC samples (see Appendix C). The QC samples analyzed included blanks, initial calibration samples, continuing calibration verification (CCV) samples, and laboratory control samples (LCS) – also referred to as blank spikes (BS) in the laboratory reports.

4.2.1 Liquid Samples

The ICP/MS instrument was calibrated on a daily basis and checked with the Initial Calibration Verification (ICV) standard. Initial calibration demonstrated that the instrument was capable of acceptable performance prior to sample analysis. For Sample Set #6, the ICV result for selenium (86 %R) was outside the criterion of ±10%, however both CCV samples produced acceptable results, therefore the results were considered valid.

The CCV results were acceptable for all sample sets with the following exceptions:

> Sample Set #1 – Aluminum fell just outside the acceptance criterion of ±10% with an average deviation of –11.1% and boron deviated by –26.4%, therefore reported values for aluminum and boron will be slightly underestimated;
>
> Sample Set #2 – Boron recoveries were low at 84.2% and 86.6%, therefore reported boron values will be slightly underestimated;
>
> Sample Set #8 – Beryllium recoveries were low at 89.2% and 87.5%, therefore beryllium values will be slightly underestimated.

Results showed that metals were not detected at or above the PQL in the method blank samples for all sample sets.

The LCS results met the acceptance criteria for all sample sets, with the exception of boron for Sample Set #5 where the recovery of 74% did not meet the lower criterion of 75% recovery.

The MS/MSD results for the target elements met the criteria for all sample sets, with exception of Sample Set #1, where the boron recoveries (67.2% and 66.2%) were below the lower criterion of 75% recovery. All relative percent difference (RPD) results were acceptable.

The holding time criterion was met for all elements for all sample sets, with the exception of Sample Set #3, where aluminum, beryllium, and boron were analyzed between 32 and 35 days after sample collection for samples 21-03-090, 21-03-096, 21-03-099, 21-03-102, 21-03-105, 21-03-108, 21-03-111, and 21-03-114.

As discussed in Section 3.0, a stability study was conducted by the EC/B FAC to demonstrate that several organic and inorganic target analytes are stable in munitions-grade HD for a period longer than 28 days. The stability of mercury, the most volatile of the inorganic target analytes, was included in this study. Consistent results were demonstrated for mercury over a period of 152 days (initial concentration 4.41 mg/kg; standard deviation 0.28 mg/kg). As a result of this study, it was determined that the inorganic results that exceeded the 28-day holding time limit are valid and provide an accurate indication of the inorganic concentrations for the samples collected.

4.2.2 Non-Cohesive Solid Samples

The ICP/MS instrument was calibrated on a daily basis and checked with the ICV standard. Initial calibration demonstrated that the instrument was capable of acceptable performance prior to sample analysis.

The CCV results were acceptable for all sample sets with the following exceptions:

> Sample Set #1 – The CCV recovery results for boron averaged -18.8% (outside the criterion of ±10%), therefore the results for boron will be slightly underestimated.
>
> Sample Set #2 – The first CCV recovery result for boron was 87.6%, therefore the results for boron will be slightly underestimated.
>
> Sample Set #3 – The CCV results for aluminum were 110.7% and 112.7% for samples that needed to be diluted and rerun due to high native concentrations. Therefore, the aluminum results will be slightly overestimated for 21-03-106, 21-03-127, 21-03-130, 21-03-133, 21-03-136, 21-03-139, 21-03-142, 21-03-145, 21-03-148, and 21-03-151.
>
> Sample Set #8 - The CCV results for boron were slightly below the criterion of ±10%, with results of 84.8% and 88.4%, therefore the results for boron will be slightly underestimated.

Results showed that metals were not detected at or above the PQL in the method blank samples for all sample sets.

The LCS results met the acceptance criteria for all sample sets, with the exception of Sample Set #1, where the boron recovery (74%) was outside the criterion of 75 – 125%.

The MS/MSD results for the target elements met the criteria for all sample sets, with the following exceptions:

> For Sample Set #1, the MSD recovery for boron (62%) failed to meet the minimum criterion of 75%.
>
> For Sample Set #2, the high native sample concentrations of arsenic (>7x spike level) resulted in MS/MSD/RPD values that could not be properly evaluated. Elevated native

sample concentrations of manganese (>3x spike level) resulted in MS/MSD recoveries (228% and 147%) that were outside the upper criterion of 125% and a RPD value (81%) that was outside the criterion of ≤25%.

For Sample Set #3, the elevated native sample concentration of manganese (~2x spike level) resulted in MS/MSD values (162% and 64%) that were outside the criterion of 75 – 125% and a RPD value (98%) that was outside the criterion of ≤25%.

For Sample Set #4, the elevated native sample concentration of manganese (>2x spike level) resulted in a MS value (127%) that was outside the criterion of 75 – 125%.

For Sample Set #5, high native sample concentrations of arsenic (>5x spike level) and mercury (>38x spike level) resulted in MS/MSD/RPD values that could not be properly evaluated for those elements. The MS/MSD recoveries for manganese (149% and 131%) were outside the criterion of 75 – 125%.

For Sample Set #7, the high native sample concentration of lead (>27x spike level) resulted in MS/MSD/RPD values that could not be properly evaluated. In addition, elevated native sample concentrations of chromium (~1.5x spike level), copper (~2x spike level), manganese (~3x spike level), nickel (~1x spike level), and zinc (>2x spike level) resulted in MS/MSD values for chromium (-35% and -33%), copper (45% and 41%), manganese (MS 34%), nickel (36% and 30%), and zinc (-53% and -55%) that were outside the criterion of 75 – 125% (50 – 150% for zinc).

For Sample Set #8, elevated native sample concentrations of manganese (>2x spike level) and zinc (~1x spike level) resulted in MS/MSD values for manganese (275% and 225%) and zinc (MS 158%) that were outside the criterion of 75 – 125% (50 – 150% for zinc).

The holding time criterion was met for all elements for all sample sets, with the following exceptions:

Sample Set #2 – Due to reanalysis of samples and diluted samples, some of the final analyses were conducted after the 28-day holding time. Samples 21-03-034 and 21-03-040 were analyzed for arsenic 48 and 42 days after sample collection. Samples 21-03-034, 21-03-055, and 21-03-064 were analyzed for manganese 48, 38, and 36 days after sample collection. Sample 21-03-034 was analyzed for mercury 29 days after sample collection.

Sample Set #3 – Due to reanalysis of samples and diluted samples, some of the final analyses were conducted after the 28-day holding time. Aluminum, beryllium, and boron were analyzed between 29 and 37 days after sample collection for all samples except for samples 21-03-130, 21-03-133, 21-03-136, 21-03-139, 21-03-142, 21-03-145, 21-03-148, and 21-03-151. Mercury was analyzed 35, 34, 33, and 32 days after sample collection for samples 21-03-109, 21-03-112, 21-03-142, and 21-03-145.

Sample Set #5 – Due to instrument failure, some of the final analyses were conducted after the 28-day holding time. Antimony, lead, mercury, silver, thallium, and tin were analyzed 29 days after sample collection for samples 21-03-179 and 21-03-180.

Based on the results of the stability study, discussed in Sections 3.0 and 4.2.1, it was concluded that the inorganic results that exceeded the 28-day holding time limit are valid and provide an accurate indication of the inorganic concentrations for the samples collected.

4.2.3 Solid Samples

The ICP/MS instrument was calibrated on a daily basis and checked with the ICV standard. Initial calibration demonstrated that the instrument was capable of acceptable performance prior to sample analysis. The ICV results were acceptable for all sample sets, with the following exceptions:

Sample Set #1 – The ICV recovery results for selenium (116.7%) and silver (110.6%) were outside the criterion of ±10%.

Sample Set #3 – The ICV recovery results for boron and beryllium (both 78%) were outside the criterion of ±10%; however, both subsequent CCV results were acceptable.

Sample Set #6 – The ICV recovery result for selenium (87%) was outside the criterion of ±10%; however, both subsequent CCV results were acceptable.

The CCV results were acceptable for all sample sets with the following exceptions:

Sample Set #1 – Silver (120%) was outside the acceptance criterion of ±10% for the last CCV.

Sample Set #7 – All samples will be slightly underestimated for antimony (89% average CCV recovery), which was outside the acceptance criterion of ±10%. During reanalysis of samples and dilutions, aluminum (113% CCV recovery) and boron (113% recovery for first CCV), were outside the acceptance criterion of ±10%.

Results showed that metals were not detected at or above the PQL in the method blank samples for all sample sets.

The LCS results met the acceptance criterion for all sample sets.

The MS/MSD results for the target elements met the criteria for all sample sets, with the following exceptions:

For Sample Set #1, high native sample concentrations of copper (>7x spike level) and manganese (>5x spike level) resulted in MS/MSD/RPD values that could not be properly evaluated for those elements. The MS/MSD recoveries for antimony (MSD 126%),

arsenic (161% and 259%), barium (MSD 126%), cadmium (MSD 134%), lead (168% and 230%), mercury (159% and 159%), nickel (MSD 140%), silver (MSD 154%), thallium (135%), tin (130% and 131%), and zinc (179% and 366%) were outside the acceptance criterion of 75 – 125% (50 – 150% for arsenic, mercury, silver, and zinc). The RPD results for arsenic (97%), cadmium (26%), chromium (34%), cobalt (28%), lead (62%), nickel (48%), selenium (29%), silver (29%), thallium (28%), and zinc (187%) were outside the criterion of ≤25%.

For Sample Set #2, high native sample concentrations of arsenic (>30x spike level) and manganese (>6x spike level) resulted in MS/MSD/RPD values that could not be properly evaluated for those elements.

For Sample Set #3, elevated native sample concentrations of manganese (>3x spike level) resulted in a MS recovery value (374%) that exceeded the upper criterion of 125% and an RPD value (294%) that exceeded the criterion of ≤25%.

For Sample Set #4, elevated native sample concentrations of copper (>1.5x spike level) and manganese (>3x spike level) resulted in MS/MSD recoveries for copper (MS 142%) and manganese (142% and 64%) that exceeded the criterion of 75 – 125%. RPD values for copper (37%) and manganese (78%) also exceeded the criterion of ≤25%.

For Sample Set #5, high native sample concentrations of arsenic (>41x spike level), copper (>4x spike level), manganese (>6x spike level), and mercury (>282x spike level) resulted in MS/MSD/RPD values that could not be properly evaluated for those elements. An elevated native sample concentration of zinc (>2x spike level) resulted in a MSD recovery (14%) below the lower criterion of 50% and a RPD value (81%) that exceeded the criterion of ≤25%.

For Sample Set #6, a high native sample concentration of manganese (>5x spike level) resulted in MS/MSD/RPD values that could not be properly evaluated for manganese. Elevated native sample concentrations of copper (>2x spike level), lead (~1x spike level), and zinc (~1x spike level) resulted in MSD recoveries for copper (299%), lead (144%), and zinc (213%) that exceeded the upper criterion of 125% (150% for zinc). In addition, the RPD values for copper (181%), lead (53%), and zinc (129%) exceeded the criterion of ≤25%.

For Sample Set #7, high native sample concentrations for copper (>6x spike level) and manganese (>5x spike level) resulted in MS/MSD/RPD values that could not be properly evaluated for these elements. Elevated native sample concentrations for zinc (3x spike level) resulted in MS/MSD values (159% and 517%) that exceeded the upper criterion of 150%. The RPD value for zinc (358%) exceeded the criterion of ≤25%. For lead, the MSD recovery (161%) exceeded the upper criterion of 125% and the RPD value (58%) exceeded the criterion of ≤25%.

For Sample Set #8, high native sample concentrations for manganese (>6x spike level) resulted in MS/MSD/RPD values that could not be properly evaluated for manganese.

Elevated native sample concentrations for mercury (>3x spike level) and zinc (~2x spike level) resulted MSD values for mercury (277%) and zinc (155%) that exceeded the upper criterion of 150%. The RPD values for copper (48%), mercury (169%), and zinc (65%) exceeded the criterion of ≤25%. In addition, the MSD value (134%) and RPD value (27%) for chromium exceeded their respective upper criterion.

The holding time criterion was met for all elements for all sample sets, with the following exceptions:

Sample Set #1 – Samples 21-03-003 and 21-03-006 were analyzed after the 28-day holding time for all elements. These samples were analyzed 29 days after sample collection.

Sample Set #2 – Due to reanalysis of samples and diluted samples, some of the final analyses were conducted after the 28-day holding time. Antimony, chromium, cobalt, copper, manganese, mercury, nickel, silver, and vanadium were analyzed between 32 and 49 days after sample collection for all samples except sample 21-03-074 for mercury, which was analyzed within the 28-day holding time. Zinc and cadmium were analyzed between 32 and 49 days after sample collection for samples 21-03-035, 21-03-065, 21-03-068, 21-03-071D, 21-03-074, 21-03-077, 21-03-080, 21-03-083, 21-03-086, and 21-03-089. Arsenic was analyzed 44, 42, and 41 days after sample collection for samples 21-03-035, 21-03-053, and 21-03-059.

Sample Set #3 – Due to reanalysis of samples and diluted samples, some of the final analyses were conducted after the 28-day holding time. Aluminum, beryllium, boron, and thallium were analyzed between 31 and 42 days after sample collection for all samples. Copper was analyzed between 31 and 43 days after sample collection for samples 21-03-092, 21-03-125, 21-03-128, 21-03-131, 21-03-134, 21-03-137, 21-03-140, 21-03-143, 21-03-146, 21-03-149, and 21-03-152. Samples 21-03-113, 21-03-131, 21-03-134, 21-03-143, and 21-03-152 were analyzed for arsenic between 31 and 39 days after sample collection. Sample 21-03-092 was analyzed for chromium 42 days after sample collection. Sample 21-03-149 was analyzed for lead 31 days after sample collection. Samples 21-03-116, 21-03-119, 21-03-128, 21-03-131, 21-03-134, 21-03-143, 21-03-149, and 21-03-152 were analyzed for manganese between 31 and 39 days after sample collection. All samples except for 21-03-098, 21-03-101, 21-03-104, 21-03-137, and 21-03-143 were analyzed for mercury between 31 and 43 days after sample collection. Sample 21-03-092 and 21-03-149 were analyzed for nickel 42 and 31 days after sample collection. Sample 21-03-125 and 21-03-152 were analyzed for zinc 34 and 31 days after sample collection.

Sample Set #5 – Due to reanalysis of samples and diluted samples, some of the final analyses were conducted after the 28-day holding time. Samples 21-03-181 and 21-03-182 were analyzed 30 days after sample collection for antimony, beryllium, boron, lead, mercury, silver, thallium, tin, and zinc. Sample 21-03-181 was analyzed 29 days after sample collection for arsenic.

Sample Set #6 – All samples were analyzed within the 28-day holding time except for samples 21-03-217, 21-03-218, and 21-03-221 which were analyzed 29 days after sample collection for aluminum.

Sample Set #7 – Due to reanalysis of samples and diluted samples, some of the final analyses were conducted after the 28-day holding time. Samples 21-03-253A through D, 21-03-258, 21-03-259, and 21-03-264 were analyzed for aluminum, beryllium, and boron 29 days after sample collection.

Based on the results of the stability study, discussed in Sections 3.0 and 4.2.1, it was concluded that the inorganic results that exceeded the 28-day holding time limit are valid and provide an accurate indication of the inorganic concentrations for the samples collected.

4.3 Mustard Purity Data Evaluation

The QCC for the evaluation of mustard purity data were outlined in Table 5-3 of the QAPP.[1] Data from the purity analyses were evaluated against these QCC. The EC/B FAC reports for each sample set provide these evaluations along with summary data for some of the QC samples (see Appendix C). The QC samples analyzed included blanks, initial calibration samples, continuing calibration check (CCC) samples – also referred to as CCV samples in the laboratory reports, and LCSs.

The decafluorotriphenylphosphine (DFTPP) tunes met the acceptance criteria for all sample sets.

The calibration curves for the target compound (HD) resulted in acceptable correlation coefficients and percent recoveries for individual points for all sample sets with the exception of the 2 mg/mL standard for Sample Set #3 that had a recovery of 124% as compared to the upper criterion of 115%. However, the r^2 met the criteria so the calibration curve was not rerun.

The CCC results met the acceptance criterion for all sample sets.

The CASARM-grade HD LCS results met the acceptance criterion for all sample sets.

Results showed that HD was not detected at or above the PQL in the method blank or reagent blank samples for all sample sets with the exception of Sample Set #2, where the initial method blank sample showed a response of 38%. Laboratory personnel concluded that there was a problem with the sample preparation and prepared a new method blank. Subsequent analysis showed that HD was not detected at or above the PQL in the MB sample, thus meeting the QCC.

The holding time criterion was not met for a number of the samples associated with Sample Sets #1, #2, #3, #5, and #8. Due to concerns with the analytical results, Sample Sets #1, #2, and #8 were all reprepared and reanalyzed beyond the 28-day holding time. The "oldest" samples from these sample sets were analyzed 119 days (Set #1), 112 days (Set #2), 35 days (Set #3), and 79 days (Set #8) after sample collection, respectively. Four samples from Sample Set #5 were not

analyzed within the 28-day holding time. These samples were analyzed 29 and 30 days after sample collection.

The stability study, discussed in Sections 3.0 and 4.2.1, also demonstrated the stability of HD over a period of 146 days (initial concentration 86.8 Wt. %; standard deviation 5.1 Wt. %). As a result of this study, it was determined that the purity results that exceeded the 28-day holding time limit are valid and provide an accurate indication of the mustard purity for the samples collected.

4.4 Non-Volatile (Thiodiglycol) Data Evaluation

The QCC for the evaluation of thiodiglycol data were outlined in Table 5-4 of the QAPP.[1] Data from the thiodiglycol analyses were evaluated against these QCC. The EC/B FAC reports for each sample set provide these evaluations along with summary data for some of the QC samples (see Appendix C). The QC samples analyzed included tune evaluation and performance standards, initial calibration samples, CCC samples – also referred to as CCV samples in the laboratory reports, MS/MSD samples, sample duplicates, LCSs – also referred to as BS samples in the laboratory reports, and blanks.

The DFTPP tune and the tune evaluation and performance standard met the acceptance criteria for all sample sets.

The calibration curves for the target compound (TDG) and the surrogate (TDG-d8) resulted in acceptable correlation coefficients and percent recoveries for individual points for all sample sets with the exception of the 2.5 µg/mL TDG standard for Sample Sets #1 – 4 (recoveries of 125%, 125%, 116%, and 124% as compared to the upper criterion of 115%), the 5 µg/mL TDG standard for Sample Sets #3 and #6 (recoveries of 130% and 125%), the 10 µg/mL TDG standard for Sample Set #6 (recovery of 117%), and the 2.5 µg/mL TDG-d8 surrogate for Sample Set #5 (recovery 83%). No corrective action was taken since there was no TDG detected in any of the samples.

The CCC results met the acceptance criterion for all sample sets.

The surrogate recoveries were all acceptable with the exception of sample 21-03-155 (Sample Set #4) where the surrogate spike was not detected. Since no TDG was present in this or any sample from this project, no corrective action was taken.

The MS/MSD results for the target compound (TDG) met the criteria for all sample sets, with the exception of Sample Set #5, where the MSD result of 39.9% exceeded the criterion of ±50% recovery and the RPD result of 70% exceeded the criterion of ≤25%.

The sample duplicate results were not relevant since TDG was not detected in any sample.

The LCS results met the acceptance criterion for all sample sets.

Results showed that TDG was not detected at or above the PQL in the method blank or reagent blank samples for all sample sets.

The holding time criterion was met for all samples with the following exceptions: Sample Set #3 – Samples 21-03-090, 21-03-096, 21-03-099, and 21-03-102; Sample Set #4 – Samples 21-03-154 and 21-03-155; and Sample Set #6 – Samples 21-03-213, 21-03-214, 21-03-219, 21-03-222, 21-03-225, 21-03-228. Since no TDG was detected in any of the samples, the missed holding time does not impact the usability of the data.

4.5 Volatile Data Evaluation

The QCC for the evaluation of volatile compound data were outlined in Table 5-5 of the QAPP.[1] Data from the volatile analyses were evaluated against these QCC. The EC/B FAC reports for each sample set provide these evaluations along with summary data for some of the QC samples (see Appendix C). The QC samples analyzed included tune evaluation and performance standards, initial calibration samples, CCC samples – also referred to as CCV samples in the laboratory reports, MS/MSD samples, sample duplicates, LCSs – also referred to as BS samples in the laboratory reports, and blanks.

The 4-bromofluorobenzene (BFB) tune and the tune evaluation and performance standard met the acceptance criteria for all sample sets.

The calibration curves for the target compounds/surrogates resulted in acceptable correlation coefficients and percent recoveries for individual points for all sample sets with the exception of the 5.0 µg/mL 1,2-dichloroethane standard for Sample Set #3 (recovery of 121% as compared to the upper criterion of 115%).

The CCC results met the acceptance criterion for all sample sets.

The surrogate recoveries were acceptable for all sample sets.

The MS/MSD results for the target compounds met the criteria for all sample sets, with the exception of Sample Set #3, where the RPD for 1,2-dichloroethane (61%), tetrachloroethylene (60%), and 1,1,2,2-tetrachloroethane (62%) failed to meet the acceptance criterion of ≤25%. The sample duplicate results met the RPD criterion for all sample sets, with the exception of Sample Set #1, with 1,2-dichloroethane at 26.4% RPD compared to ≤25%.

The LCS results met the acceptance criterion for all sample sets.

The target compounds were not detected at or above the PQL in the method blank and reagent blank samples for all sample sets.

The holding time criterion was met for all samples with the exception of samples 21-03-033 and 21-03-036 (Sample Set #2), which were analyzed at 30 days and 29 days, respectively, after sample collection.

The stability study, discussed in Sections 3.0 and 4.2.1, also demonstrated the stability of spiked volatile compounds (1,2-dichloroethane, tetrachloroethylene, and 1,1,2,2-dichloroethane) over a period of 149 days (initial concentrations of 0.573 Wt. %, 1.06 Wt. %, and 1.54 Wt. %, respectively; standard deviations of 0.055 Wt. %, 0.077 Wt. %, and 0.095 Wt. %, respectively). As a result of this study, it was concluded that the volatile results that exceeded the 28-day holding time limit are valid and provide an accurate indication of the target volatile compounds present in the samples collected.

4.6 Semi-Volatile Data Evaluation

The QCC for the evaluation of semi-volatile compound data were outlined in Table 5-6 of the QAPP.[1] Data from the semi-volatile analyses were evaluated against these QCC. The EC/B FAC reports for each sample set provide these evaluations along with summary data for some of the QC samples (see Appendix C). The QC samples analyzed included tune evaluation and performance standards, initial calibration samples, CCC samples – also referred to as CCV samples in the laboratory reports, MS/MSD samples, sample duplicates, LCSs – also referred to as BS samples in the laboratory reports, and blanks.

The DFTPP tune and the tune evaluation and performance standard met acceptance criteria for all sample sets.

The calibration curves for the target compounds/surrogates resulted in acceptable correlation coefficients and percent recoveries for individual points for all sample sets. Beginning with Sample Set #1, native concentrations of Q found in the samples exceeded the standard curve originally validated for Method AM-117 (0.5 – 100 µg/mL). As a result, a curve containing five points at higher levels from 25 to 500 µg/mL was validated and used. In addition, due to the non-linearity of T at low levels, the original PQL value of 2.5 µg/mL was revised to 25 µg/mL.

For Sample Set #1, the recoveries of the 25 µg/mL and 50 µg/mL standards for Q were 122% and 120% of the known concentration (outside the upper criterion of 115%). The recoveries of the 100 µg/mL, 250 µg/mL, and 500 µg/mL standards met the acceptance criterion. The concentrations of Q found in the samples for Sample Set #1 ranged from 144 µg/mL to 453 µg/mL. As a result, no corrective action was taken and these results were determined to be valid.

The CCC results met the acceptance criterion for all sample sets, with the exception of Sample Set #3, where T had a recovery of 72% (compared to the lower criterion of 75%) at the 50 µg/mL level. All samples from this sample set had results less than 30 µg/mL.

The surrogate recoveries were acceptable for all sample sets, with the exception of samples 21-03-251D and 21-03-265 (Sample Set #7) which had recoveries of 0% and 223%. Based on these results, the first sample may not have been spiked whereas the second sample may have been doubly spiked.

The MS/MSD results for the target compounds met the criteria for all sample sets with several exceptions:

For Sample Set #1, the Q MSD recovery of 15% failed to meet the minimum criterion of 50%. In addition, the Q RPD of 47% was outside the acceptance criterion of ≤25%. The spiking level of 70 µg/mL was insufficient when compared to the native concentration of Q. In addition, the MS/MSD results for T (22% and 23%) failed to meet the minimum acceptance criterion of 50% recovery. The spiking level of 10 µg/mL was below the PQL of 25 µg/mL for Sample Set #1.

For Sample Set #2, the MS/MSD results for T (35% and 38%) failed to meet the minimum acceptance criterion. The spiking level of 10 µg/mL was below the PQL of 25 µg/mL for Sample Set #2.

For Sample Set #3, the MS/MSD results for T (4% and 2%) and Q (48% and 46%) failed to meet the minimum acceptance criterion.

Due to the consistent native Q concentrations (300 – 350 µg/mL) greater than the initial spiking level, the spiking level was increased from 100 µg/mL to 500 µg/mL, beginning with Sample Set #6.

For Sample Set #6, the MS/MSD results for T (44% and 42%) failed to meet the minimum acceptance criterion.

For Sample Set #8, the MS/MSD results for T (18% and 16%) failed to meet the minimum acceptance criterion.

The sample duplicate results met the RPD criterion for all sample sets, with the exception of Sample Set #1 for T (25.6% as compared to the criterion of ≤25%).

The LCS results met the acceptance criterion for all sample sets, with the exception of T for Sample Sets #2 and #3, where the recoveries of the LCS/laboratory control sample duplicate (LCSD) samples were 186% / 159% (Sample Set #2) and 245% / 223% (Sample Set #3).

The target compounds were not detected at or above the PQL in the method blank and reagent blank samples for all sample sets.

The holding time criterion was met for all samples with the exception of samples 21-03-033, 21-03-036, 21-03-039, 21-03-042, 21-03-045, 21-03-048, 21-03-051, 21-03-054, 21-03-057, 21-03-060, 21-03-063, 21-03-066, and 21-03-069D (Sample Set #2), which were analyzed between 29 and 37 days after sample collection.

The stability study, discussed in Sections 3.0 and 4.2.1, also demonstrated the stability of spiked semi-volatile compounds (T, Q, and hexachloroethane) over a period of 151 days (initial concentrations of 1.04 Wt. %, 5.47 Wt. %, and 1.05 Wt. %, respectively; standard deviations of 0.15 Wt. %, 0.54 Wt. %, and 0.12 Wt. %, respectively). As a result of this study, it was concluded that the volatile results that exceeded the 28-day holding time limit are valid and

provide an accurate indication of the target semi-volatile compounds present in the samples collected.

4.7 Lewisite Data Evaluation

The QCC for the evaluation of Lewisite data were outlined in Table 5-7 of the QAPP.[1] Data from the Lewisite analyses were evaluated against these QCC. The EC/B FAC reports for each sample set provide these evaluations along with summary data for some of the QC samples (see Appendix C). The QC samples analyzed included tune evaluation and performance standards, initial calibration samples, CCC samples – also referred to as CCV samples in the laboratory reports, MS/MSD samples, sample duplicates, LCSs – also referred to as BS samples in the laboratory reports, and blanks.

Problems were encountered with initially low recoveries for MS/MSD spikes and CCC standards for Sample Sets #1 and #2. It was determined that an insufficient amount of the derivatization agent [1,3-Propanedithiol (1,3-PDT)] was being added. The procedure was modified to add 10 µL of 1,3-PDT to each sample just prior to GC/MS analysis.

The DFTPP tune and tune evaluation and performance standard met acceptance criteria for all sample sets.

After evaluation of the calibration curve data, it was decided that a quadratic curve best represented the existing data. Six concentration levels were used in this determination. This meets the minimal requirements specified in SW-846 Method 8000B. The calibration curves resulted in acceptable correlation coefficients and percent recoveries for individual points for all sample sets, with the exception of Sample Sets #4 and #6 where recoveries of the lowest point (50 ng/mL) were 119% and 131% which exceeded the upper criterion of 115%.

The CCC results met the acceptance criterion for all sample sets.

The MS/MSD results for Lewisite met the criteria for all sample sets, with the following exceptions:

> Sample Set #2, where the relative RPD of 72% failed to meet the acceptance criterion of ≤25%; and
>
> Sample Set #8, where the MS/MSD recoveries of 168% and 159% exceeded the upper criterion of 150%.

The sample duplicate results were not calculated for all sample sets except for Sample Set #5, since Lewisite was not detected in the sample/sample duplicate pairs. For Sample Set #5, the RPD was acceptable at 0.8%.

The LCS results met the acceptance criterion for all sample sets. However, due to the wrong vial being analyzed at the end of the batch sequence, no final LCS result is available for Sample Set #8.

Lewisite was not detected at or above the PQL in the method blank and reagent blank samples for all sample sets.

The holding time criterion was met for all samples with the following exceptions:

Sample Set #1 – All samples were analyzed between 37 and 44 days after sample collection.

Sample Set #2 – All samples were analyzed between 36 and 47 days after sample collection.

Sample Set #6 – Samples 21-03-213, 21-03-214, 21-03-219, 21-03-222, 21-03-225, and 21-03-228, which were analyzed between 29 and 31 days after sample collection;

Sample Set #7 – Samples 21-03-251A-E, 21-03-254, 21-03-255, 21-03-262, 21-03-265, 21-03-269, 21-03-273, and 21-03-276, which were analyzed between 29 and 31 days after sample collection.

The stability study, discussed in Sections 3.0 and 4.2.1, also demonstrated the stability of spiked Lewisite over a period of 151 days (initial concentration 232 mg/kg; standard deviation 47 mg/kg). As a result of this study, it was concluded that the Lewisite results that exceeded the 28-day holding time limit are valid and provide an accurate indication of Lewisite present in the samples collected.

5.0 REFERENCES

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2. ***RCRA Waste Sampling Draft Technical Guidance***, EPA530-D-02-002, August 2002.

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Appendix A

Technical Report 21-07
HD Ton Container Sampling

TECHNICAL REPORT 21-07

HD Ton Container Sampling

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HD TON CONTAINER SAMPLING

Technical Report 21-07

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HD TON CONTAINER SAMPLING

TECHNICAL REPORT 21-07

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HD TON CONTAINER SAMPLING

TECHNICAL REPORT 21-07

SECTION I. INTRODUCTION.

1. BACKGROUND.

a. The Project Manager for Chemical Demilitarization requested that Deseret Chemical Depot (CAMDS Site) collect a liquid and solids sample of chemical agent Distilled Mustard, bis-(2-chloroethyl) sulfide (HD) from 91 HD Ton Containers (TC)s stored at Deseret Chemical Depot (DCD). Tooele Chemical Disposal Facility (TOCDF) requested an additional 7 HD TCs to be sampled for a total of 98 TCs.

b. The samples were shipped by Technical Escort Personnel to Edgewood Chemical Biological Center (ECBC) for analysis. The analysis was used by TOCDF to develop mustard trial burn plans.

c. The sampling operation of HD TCs were performed in the Multipurpose Demilitarization Facility/Bulk Item Facility (MDF/BIF).

d. The Utah Department of Solid and Hazardous Waste (DSHW) requested that samples be taken representing three areas inside the TC. The first area (L) is the liquid layer above the non-cohesive and cohesive solid layers. The second area (N) is a mobile, non-cohesive layer on the top of the cohesive solid layer. The third area (S) is a solid cohesive layer that has adhered to the outer shell of the TC. These samples were taken without agitating the contents of the TC.

2. OBJECTIVE. Collect and ship munitions grade chemical agent samples from HD-filled TCs to ECBC for organic and Health Risk Assessment Metal analysis.

3. REFERENCES. References are provided in Appendix E.

SECTION II. RESULTS.

1. RESULTS.

a. 98 TCs were sampled for liquid, non-cohesive solid, and cohesive solid chemical agent HD, a total of 348 samples were taken between 22 January 2003 and 31 May 2003 (Figures C-1 through C-6, Appendix C).

b. Six audit samples were split and spiked by the CAMDS Laboratory (LAB) under the observation of the DSHW. All the samples were packaged (Figures C-7 through C-11, Appendix C) by certified packaging personnel from ECBC and transported by Technical Escort Personnel to the Laboratory at ECBC for HRA analysis on eight separate transfers.

SECTION II. DISSCUSSION.

2. DISCUSSION.

a. Ultrasound Tests.

(1) TCs were ultrasound tested to determine the amount of non-cohesive layer and cohesive layer inside each TC. The tests were performed inside a heated igloo in Area 10 before being shipped to the CAMDS Site for sampling.

(2) The ultrasound tests indicated heels varying in thickness from 2.25 inches to 7.5 inches.

(3) Ultrasound testing revealed the non-cohesive layer in some cases and was undetectable in other instances. Many of the TCs that had no evidence of a non-cohesive layer from the ultrasound test had a small amount of non-cohesive material in the bottom of the sample vial (Figures C-6 through C-9, Appendix C).

b. Internal Pressure Of Ton Containers

(1) During sample operations it was discovered two TCs that had different shape configurations on the chime.

(a) The Pressure Test and Release Device [PTRD (Figure C-12, Appendix C)] was not capable of sealing against some chimes for venting and purging the interior gases of the TC.

(b) On one TC the PTRD fit over the plug and provided protection from splattering and the plug itself becoming a projectile when interior pressure was released. On the second TC the operator removed the plug utilizing a ratchet assembly consisting of ratchet, shielded extension, and socket.

(c) Corrosion of many of the TC surfaces made it difficult to seal the PTRD to the face of the chime around the plugs.

(2) The pressure inside the TCs were measured prior to venting and purging the TCs.

(a) Gas samples were only collected from TCs selected by the Project Manager with headspace pressures greater than or equal to (≥) 25 psig.

(b) TC headspace gas pressures ranged from 0 to 115 pounds per square inch (psi).

(c) 35 TCs had no measurable pressure.

(d) 16 gas samples were drawn from 15 separate TCs (two gas samples were taken from one TC). These samples were transported by Technical Escort Personnel to ECBC for analysis.

(3) 63 of the TCs had measurable pressure in them.

b. Sample Collection

(1) Individual TC skin temperatures ranged between 62 degrees Fahrenheit (° F) and 89° F during the sampling process.

(2) On the first TC to be sampled it was discovered that the TC valves could not be opened. The TC could not be vented in the manner described in the Work Plan.

(3) The Plan was changed to use a PTRD which allowed removal of a sampling plug while keeping the inside of the TC under pressure. This allowed the TC's internal pressure to be measured and controlled while venting and purging gases from the inside of the TC. The PTRD was used for sampling all TCs covered in this report.

(4) Liquid Samples were taken from all 98 TCs (Figures C-1 and C-2, Appendix C) one TC had to be resampled for a total of 99 recorded samples.

(5) Non-cohesive layer samples were successfully taken from 98 TCs. (Figures C-3 and C-4, Appendix C)

(6) Solid Samples (Figures C-5 and C-6, Appendix C) were taken from 91 TCs. 33 solid samples were taken with Method 1 and 58 samples were taken using Method 2.

(7) On April 2003, 510 gram core samples were taken from two TCs (310 grams from D-14409 and 200 grams from 43529) for the purpose of a solubility study on solid materials found in the TCs.

(8) Data was collected for each sample taken (Figures B-1 through B-9, Appendix B).

(9) TC D-48980 was sampled a second time because holding times for the lab analysis had expired on the first set of samples taken.

c. Sample Spiking and Packaging

(1) Three 20 mL spiking samples were drawn during the project for DSHW audit spiking.

(2) Samples were spiked in the CAMDS Agent room by DSHW and CAMDS LAB personnel. The samples were packaged by a certified packaging team from ECBC.

(3) All Chain of Custody transactions (Figure D-4, Appendix D) were documented on AMSSB Form 2350. Any residual agent was destroyed IAW SOP OPN 66-00-01-05.

APPENDIX A
PROCEDURES
AND EQUIPMENT

PROCEDURES AND EQUIPMENT

1. RECEIVE AND TRANSFER TC.

a. Control Module Operator (CMO) ensured Limiting Conditions of Operation (LCO)s were met before sampling operations began.

b. TCs were transferred and received in accordance with (IAW) SOP OPN 42-00-01-01.

c. While on the CAMDS Site, TCs were stored in the Materials Holding Area (MHA), Unpack Area (UPA), and Material Demilitarization Facility/Bulk Item Facility (MDF/BIF).

d. DA Form 4508 (Figure D-3, Appendix D) was used to track the HD TCs to and from the CAMDS Site. Operations personnel tracked the samples via labeling and the Chain-Of-Custody on Form 2350, Analysis Report (Figure D-4, Appendix D) and DD Form 1348-1A, Issue Release/Receipt Document (Figure D-5, Appendix D) were used to record and transfer samples selected for shipment to ECBC.

e. The forklift operator wore a protective mask. Operators that came in contact with the TC wore Level D (1) Personal Protective Equipment (PPE) with apron.

f. The HD TC was received at the UPA Unpack Area IAW DCD SOP TT-0000-L-145.

(1) DA Form 4508 was complete.

(2) The TC was placed in a cradle and transfer to MDF/BIF Loading Area.

g. The TC Surface Temperature was measured.

(1) The Raygnar Pyrometer was pointed at the center of the TC.

(2) The Pyrometer was activated one to two feet from the TC and the digital temperature recorded.

(3) The temperature was verified as greater than (>) 60 °F.

h. Move TC to MDF/BIF Airlock using MDF conveyor system.

(1) The 98 HD TCs were stored inside an igloo heated above 60° F before being transported to the CAMDS Site.

(2) TCs were stored at CAMDS Site in a heated facility and maintained above 60° F prior to the sampling process.

c. Department of the Army (DA) Form 4508 (Figure C-2, Appendix C) was used to track the HD TCs to and from the CAMDS Site. Operations personnel tracked the samples via labeling and the Chain-Of-Custody on Form 2350, *Analysis Report* (Figure C-3, Appendix C). Department of Defense (DD) Form 1348-1A, *Issue Release/Receipt Document* (Figure C-4, Appendix C) was used to record and transfer samples selected for shipment to ECBC.

2. PREPARING THE TC FOR SAMPLING.

a. The TC was moved and positioned

(1) The M-1 Lifting Beam was used to move the TC to the MDF/BIF Agent Drain Bay.

(2) The TC was lowered onto the holding fixture and was rotated so the arrow indicating the heel was pointing downward.

b. The TC was vented and the headspace purged by removing the top plug from the TC and venting through a Pressure Test and Relief Device (PTRD). The headspace gas was vented through a sealed drum, a carbon filter, and directly into the ventilation system.

(1) The CMO kept the cameras in the BIF Agent Drain Bay on the TC during venting.

(2) The strap was installed to ground the TC

(3) A breaker bar was used to turn the plug prior to installing the PTRD

(4) The plug was turned only far enough to ensure that it could be removed with the PTRD.

c. The PTRD was attached and tested.

(1) The frame was positioned and secured in the chime of the TC to permit removal of the top plug.

(2) The gasket retainer on the pressure chamber was retracted by loosening the thumbscrew and turning the retainer.

(3) The pressure chamber was positioned over the top plug and the socket was placed down over the plug. The plug head seated ¾-inch into the socket.

(4) The pressure chamber was adjusted until it was tight against the frame by turning the handle clockwise. Care was taken to lift the pressure chamber up so that the socket slipped off the head of the plug.

(5) The pressure chamber-sealing gasket had about the same gap on the surface of the chime all around the surface perimeter. Once this alignment was achieved, the pressure chamber and frame was tightened.

(6) The gasket retainer on the pressure chamber was extended by turning the retainer until it contacted the chime.

(7) The guide into the pressure assembly was threaded and a pin placed through the socket extension.

(8) The 3-way valve was turned to the PRESSURE position. The pressure chamber was pressurized to approximately 40 psig.

(9) Once 40 psig pressure was realized, the 3-way valve turned to the OFF position. The pressure decrease was <5 psig/minute.

(10) When the pressure decrease was >5 psig/minute and PTRD could not be sealed on the TC, the Project Manager and Safety Representative verbally approved venting and purging the TC using the PTRD.

d. The Project Manager determined the need to collect gas samples.

e. The TC was vented. The 3-way valve was slowly opened to vent the TC at a maximum flow rate of 15 standard cubic feet per minute (scfm).

f. The TC was purged by repeating the following steps three times.

(1) The 3-way valve was turned to the PRESSURE position to pressurize the TC with nitrogen gas to 30 psig.

(2) The 3-way valve was slowly open to vent the TC at a maximum flow rate of 15 scfm.

g. The PTRD device was removed and the top plug placed in decontamination solution.

3. COLLECT GAS SAMPLES. Gas samples were only collected from TCs identified by the Project Manager that had a minimum of 25 psig headspace gas pressure.

a. Operators tracked gas samples via labeling and AMSSB Form 2350, Chain of Custody. Data Collectors recorded the following information:

(1) Pressure of the TC after the sampling line was purged.

(2) Vacuum gauge readings of the gas canister both before and after the gas sample were obtained.

(3) Canister and TC numbers.

b. A headspace gas sample was obtained.

(1) The metering valve on the headspace sampling line was slowly opened until the pressure gauge dropped 5 psig to purge the gas sampling line.

(2) The metering valve was closed.

(3) The vent line was disconnected and the gas sampling line installed onto the manifold quick disconnect.

(4) The valve on the gas sampling bag was verified as opened prior to installing the sampling bag on the end of the gas sampling line.

(5) The sampling bag was installed on the end of the gas sampling line.

(6) The ball valve was opened and then the metering valve was slowly opened to fill the sampling bag.

(7) When the sampling bag was full, the metering valve and the ball valve were closed.

c. The sample was transferred to a collection canister.

(1) The gas sampling line with the attached gas sampling bag was removed at the quick disconnect.

(2) The line and bag was transferred to the MDF/BIF Airlock.

(3) The line was connected to the adapter on the collection canister sampling line.

(4) The ball valve on the sampling line was opened and the valve on the collection canister was slowly opened to draw the gas into the canister.

(5) When the sample bag was deflated, or the vacuum gauge on the collection canister read 1-5" Hg, the valve on the collection canister was closed. When the vacuum gauge on the collection canister read <1" Hg, the Entry Supervisor or the Project Manager determined whether the sample was invalid.

(6) The gas sampling line with the attached sampling bag was disconnected from the adapter on the collection canister.

(7) The sampling bag was removed and cut it in half and the bag was discarded.

(8) The adapter was removed from the collection canister and the valve capped.

d. The collection canister was transferred.

(1) The collection canister was transferred into the MDF/BIF shower.

(2) The canister was placed in a plastic bag and monitored via ACAMS until the reading was <0.2 TWA.

(3) The cleared canister was transferred to the MHA or other approved storage area.

4. SAMPLING PROCEDURES.

a. The TC liquid layer was sampled.

(1) One 5 mL liquid HD duplicate sample was obtained from the first TC of each shipment.

(2) A Stainless Steel (SS) guide tube was inserted into the TC though the plughole.

(3) A new 42 X ¼-inch polypropylene liquid sampling tube was inserted through the SS guide until the tube contacted the heel of the TC.

(4) A cap was placed over the end of the tube before pulling the tube from the TC.

(5) The end of the sampling tube was placed into a petri dish and the cap removed. Liquid was transferred to the petri dish.

(6) Approximately 5 mL of the sample was transferred into a sample vial using a 60 mL syringe.

(7) The lid was placed on the sample vial.

b. The TC non-cohesive layer was sampled.

(1) One 5 mL non-cohesive HD duplicate sample was obtained from the first TC of each shipment.

(2) The SS guide tube was verified in place.

(3) A new sampling tube with a new 140 mL syringe connected through the SS guide was inserted until the tube contacted the heel of the TC.

(4) Approximately 100 mL of liquid was collected using the syringe.

(5) The syringe was removed from the sampling tube.

(6) The syringe was set in a position that allowed the solid material to settle on the stopper of the syringe.

(7) Excess liquid was transferred back into the TC.

(8) Approximately 5 mL of non-cohesive material was transferred into the sample vial.

(9) The lid was placed on sample vial.

(10) The sampling tube and SS guide were removed from TC.

(11) A new plug, if required, was installed and tightened into the TC.

c. Alternative Sampling Method for the TC Non-Cohesive layer. The following alternative method was used to extract non-cohesive material from the TC if the method described in Step b (above) was ineffective.

(1) The SS guide tube was verified in place.

(2) The SS sampling tool with scoop was inserted into the TC plughole until the tool was sitting on the heel layer.

(3) The SS sampling tool was pushed along the top of the solid heel of the TC to collect the non-cohesive material.

(4) The SS sampling tool was removed from the TC.

(5) The non-cohesive material was transferred to a new sample vial (approximately 5 mL).

(6) When necessary, a clean plastic knife and/or Teflon® Rod and a new funnel was used to transfer the non-cohesive material into the vial.

(7) A lid was placed on the sample vial.

(8) The sampling tube and SS guide was remove from the TC.

(9) A new plug, if required, was installed and tightened into the TC.

d. The TC was rotated and a plug removed.

(1) The plugs were verified as tight.

(2) The TC was rotated so the arrow was pointing UP.

(3) The highest plug was removed from the end of the TC.

(4) The plug was loosened with a breaker bar.

(5) The breaker bar was removed and a ratchet assembly used to remove the plug. (Ratchet assembly consists of ratchet, shielded extension, and socket.)

(6) Operators did not stand in front of the plug being removed.

(7) After plug removal, the Operator took the following precautions:

(8) Operators stood to the side of the TC for a minimum of one minute and observed the TC plughole for signs that the pressure was being released. Operators stood to the side of the TC until the pressure was released.

(9) If after one minute there were no signs that the pressure had been released, a shielded sampling probe was inserted approximately 2 inches into the TC plughole to clear any blockage and ensure that pressure was released prior to resuming the sampling operations.

(10) One 5 mL solid HD duplicate sample was obtained from the first TC of each shipment.

f. The TC Solid Material was sampled.

(1) A new, cleaned SS Scraping Tool was inserted through the highest plug.

(2) The Scraping Tool was pushed far enough to scrape the top inner surface of the TC.

(3) After the top inner surface of the TC was scraped, the scraper was removed and the material transferred into a vial.

(4) When necessary, operators used a clean plastic knife and/or Teflon® Rod and a new funnel to transfer the non-cohesive material into the vial. A sampling probe was used if approved by the Project Manager or Project Coordinator.

(5) A lid was placed on the sample vial.

g. TC solids were sampled using the core method.

(1) A coring tool was insert through the plughole and rotated until it was inserted approximately 4 inches into the TC.

(2) A funnel was screwed into a bottle and placed in a holding fixture.

(3) The coring tool was removed and the end placed in the funnel.

(4) A round bar was inserted into the coring tool to force the solid sample into the bottle. The core sample was intact while placing it in the sample bottle.

(5) The funnel, coring tool, and round bar were decontaminated and rinse with water. This tool/funnel/bar setup was be used to obtain all core samples and the setup was decontaminated and rinsed between TCs.

(6) Labels were placed on the sample bottles with a "D" number, date collected, and sequence number specific to the core samples.

h. The Data Collector completed the TC Data Collection Sheet.

i. New plugs were placed into the TC.

(1) The interior threads of TC were wiped clean.

(2) The previously prepared new plug (wrapped with Teflon® tape two-thirds of the way up the threads) was seated into the TC.

(3) A wire brush was used to clean any Teflon® tape or other residue from the outside area surrounding the plug.

(4) Surveillance personnel verified that the plug was secure. Surveillance annotated the Operator's logbook.

j. The exterior of the sampled TC was decontaminated IAW SOP OPN 95-07-07-01.

(1) The TC was monitored.
(2) The TC was transferred to the MDF/BIF Monitoring Airlock.

(3) When readings were > LOQ, (0.2 TWA), step j (above) was repeated.

(4) When readings were < LOQ, the TC was transferred to the MHA or approved storage area.

5. SAMPLE HANDLING AND DECONTAMINATION.

a. Sample Vial.

(1) The sample vial was decontaminated and then dried with a Kimwipe®.

(2) The sample vials were labeled and place in an overpack.

(3) The overpacked vials were placed in a carrier box inside a plastic bag.

(4) The contents of the plastic bag were monitored with ACAMS.

(a) When monitoring results were > 0.7, the vial was decontaminated, dried, and monitored again.

(b) When monitoring results were < 0.7 TWA, a label and custody seal were placed on the vial.

(5) The carrier box was placed in a partitioned carrier box that was stored on ice inside a cooler in the doffing room.

b. The Partitioned Carrier Box.

(1) The partitioned carrier box was sealed with a tamper-proof, metal identification.

(2) A frangible seal was placed across the leading edge of the carrier box lid to the box (or between the carrier box and its lid).

(3) The box was transferred to the MHA igloo or the CAMDS Site LAB Agent Room. The box was placed in a refrigerator (≤ 4 °C).

c. The Consolidated Liquid Agent Samples.

(1) Two carrier boxes were placed end to end on a hazardous material mat on the floor of the igloo.

(2) The metal identification seal was removed.

(3) The sample vials were placed in carrier boxes as needed.

(4) The documentation was updated to indicate the new storage locations.

(5) New metal identification seals were placed on the carrier boxes.

(6) The boxes were placed in the refrigerator (≤ 4 °C).

6. TRIP BLANKS AND CHEMICAL AGENT HD SAMPLES WERE PREPARED.

a. One 5 mL liquid "Trip Blank" sample was prepared prior to sampling the first TC of each shipment.

b. The trip blank sample was prepared.

(1) A funnel was placed in a 10 mL sample vial and 18 megohm DI water was poured into a vial.

(2) A lid was placed on the vial.

(3) The vial was labeled with a mark sample number, TC serial number, sample date, and quantity sampled (See 7. b. Special Requirements).

(4) An AMSSB Form 2350 was completed.

(5) The funnels, tools, agitation tubes, plastic knives, and dishes were cleaned. Alconox® soap solution was used for cleaning then triple rinsed with process water. The items were rinsed with 18 megohm DI water and placed in double plastic bags.

(6) The vial was placed in a sample container.

7. SPECIAL REQUIREMENTS.

a. Level A PPE was worn for operations in the MDF/BIF or the UPA Toxic Vestibule.

b. Vial Labeling.

(1) Sample vial lids were marked with an engraving tool indicating the D-number from the TC; L for liquid samples pulled from the TC, N for liquid/solids samples pulled from the non-cohesive layer, and S for solids samples taken as close as possible to the outer shell of the TC.

(2) Samples were numbered using the following format: 21-02-001-01. "21" designates the Site building block number where the sample were taken (MDF/BIF Agent Drain Bay); "02" represented the year 2002; "001" represented the sample number and the "01" represented the split sample No. 1, "02" Split sample No. 2, etc.

c. Management and disposal of liquid waste were IAW SOP OPN 19-00-05-01.

d. Data collection representatives and Plant Operations personnel recorded data and approved changes in each respective logbook.

e. Shipment and chain of custody of each TC were IAW SOP OPN 42-00-01-01.

8. EQUIPMENT, TOOLS, GAUGES, AND SUPPLIES.

a. TC Cradle

b. N_2 Gas Cylinder and Regulator

c. Model R2IT Raygnar Pyrometer

d. Agitation Tubes

e. 140cc Syringe

f. 60 cc Syringe

g. Sample vials and Lids

h. 120 mL glass sample bottle w/ Teflon® lid

i. TC Holding Fixture

j. SS Scraping Tool

k. SS Sample Thief

l. Disposable plastic knives

m. Teflon® Rod, 1/8 x 72 inches

n. Plastic funnel
o. SS guide tube

p. 91-inch SS liquid sampling tube

q. Sterile Petri dishes

r. 42 X ¼ Inch Polypropylene Sampling Tubes

s. 42 X 3/8 Inch Teflon® Sampling Tubes

t. Sampling probe

u. Coring tool

APPENDIX B
TABLES

TON CONTAINER SAMPLING DAILY SUMMARY

Date: 31 May 2003
Number of Ton Containers Sampled To Date: 99

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
22 Jan 03	94550	21-03-001	L (5 ml)	28 Jan 03	30 Jan 03	0 PSI	71 Degrees	Black	Water	1 Layer
		21-03-002	N (5 ml)	28 Jan 03	30 Jan 03			Black	Thin Syrup	1 Layer
		21-03-003	S (5 ml)	28 Jan 03	30 Jan 03			Black Brown Rust	Solid	1 Layer
		21-03-004	L (5 ml)	28 Jan 03	30 Jan 03			Black	Water	1 Layer
		21-03-005	N (5 ml)	28 Jan 03	30 Jan 03			Black	Thin Syrup	1 Layer
		21-03-006	S (5 ml)	28 Jan 03	30 Jan 03			Black Brown Rust	Solid	1 Layer
		21-03-007	L (20 ml)	***DSHW Audit Spiking***	30 Jan 03			Black	Water	1 Layer
27 Jan 03	94550	21-03-007a	L (5 ml)	28 Jan 03	30 Jan 03					
		21-03-007b	L (5 ml)	28 Jan 03	30 Jan 03					
		21-03-007c	L (5 ml)	28 Jan 03	30 Jan 03					
		21-03-007d	L (5 ml)	28 Jan 03	30 Jan 03					
22 Jan 03	94550	21-03-009	S (20 ml)	***DSHW Audit Spiking***	30 Jan 03			Black Brown Rust	Solid W/chunks	1 Layer
27 Jan 03	94550	21-03-009a	S (1.5 ml)	28 Jan 03	30 Jan 03					
		21-03-009b	S (1.5 ml)	28 Jan 03	30 Jan 03					
		21-03-009c	S (1.5 ml)	28 Jan 03	30 Jan 03					
22 Jan 03	94550	21-03-010	L (17 ml)	28 Jan 03	30 Jan 03			Black Brown Rust	Water	1 Layer
23 Jan 03	46673	21-03-011	L (5 ml)	28 Jan 03	30 Jan 03	0 PSI	77 Degrees	Black	Water	1 Layer
		21-03-012	N (5 ml)	28 Jan 03	30 Jan 03			Dark Brown Tan	Water on top Sandy on bottom	2 Layers

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
23 Jan 03	46673	21-03-013	*S (5 ml)*	28 Jan 03	30 Jan 03	0 PSI	77 Degrees	Rust	Solid	1 Layers
		21-03-014	N (20 ml)	***DSHW Audit spiking***	30 Jan 03			Dark Brown Tan	Water on top Sandy on bottom	2 Layers
27 Jan 03	46673	21-03-014a	N (1 mL)	28 Jan 03	30 Jan 03					
		21-03-014b	N (1 mL)	28 Jan 03	30 Jan 03					
		21-03-014c	N (1 mL)	28 Jan 03	30 Jan 03					
23 Jan 03	14944	21-03-015	L (5 ml)	28 Jan 03	30 Jan 03	10 PSI	88 Degrees	Dark Brown Black	Water	1 Layer
		21-03-016	N (5 ml)	28 Jan 03	30 Jan 03			Dark Brown Black	Water Sand	2 Layers
		21-03-017	S (5 ml)	28 Jan 03	30 Jan 03			Dark Brown Tan	Solid Sludge	1 Layer
24 Jan 03	15056	21-03-018	L (5 ml)	28 Jan 03	30 Jan 03	0 PSI	78 Degrees	Black	Water	1 Layer
		21-03-019	N (5 ml)	28 Jan 03	30 Jan 03			Black	Water	1 Layer
		21-03-020	S (5 ml)	28 Jan 03	30 Jan 03			Black	Solid	1 Layer
	42249	21-03-021	L (5 ml)	28 Jan 03	30 Jan 03	80 PSI	82 Degrees	Black	Water	1 Layer
		21-03-022	N (3 ml)	28 Jan 03	30 Jan 03			Tan	Sandy	2 Layers
		21-03-023	S (5 ml)	28 Jan 03	30 Jan 03			Light Brown	Peanut butter	1 Layer
28 Jan 03	1650	21-03-024	L (5 ml)	28 Jan 03	30 Jan 03	45 PSI	80 Degrees	Dark Brown	Water	1 Layer
		21-03-025	N (5 ml)	28 Jan 03	30 Jan 03			Light Brown Tan	Water Sludge	2 Layers
		21-03-026	S (5 ml)	28 Jan 03	30 Jan 03			Red clay with specs	Solid	1 Layer
	79439	21-03-027	L (5 ml)	28 Jan 03	30 Jan 03	0 PSI	73 Degrees	Dark Brown	Water	1 Layer
		21-03-028	N (5 ml)	28 Jan 03	30 Jan 03			Reddish brown	Water & Sand	2 Layers
		21-03-029	S (5 ml)	28 Jan 03	30 Jan 03			Reddish brown	Solid	4 Layers
29 Jan 03	613	21-03-030	L (5 ml)	28 Jan 03	30 Jan 03	50 PSI	76 Degrees	Dark Brown	Water	1 Layer
		21-03-031	N (5 ml)	28 Jan 03	30 Jan 03			Dark Brown (reddish) Light Brown	Water & sludge	2 Layers
		21-03-032	S (5 ml)	28 Jan 03	30 Jan 03			Choc. Brown	Mud	1 Layer
	85521	21-03-033	L (5 ml)	10 Feb 03	13 Feb 03	20 PSI	80 Degrees	Black	Water	2 Layers
		21-03-034	N (5 ml)	10 Feb 03	13 Feb 03			Choc. Brown	Water Sand	2 Layers

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
29 Jan 03	85521	21-03-035	S (5 ml)	10 Feb 03	13 Feb 03	20 PSI	80 Degrees	Red	Solid	Several Layers
30 Jan 03	7814	21-03-036	L (5 ml)	10 Feb 03	13 Feb 03	52 PSI	81 Degrees	Black	Water/Oil	1 Layer
		21-03-037	N (5 gr)	10 Feb 03	13 Feb 03			Reddish Tan Red	Liquid Sand	2 Layers
		21-03-038	S (5 gr)	10 Feb 03	13 Feb 03			Reddish	Sludge	1 Layer
31 Jan 03	17290	21-03-039	L (5 ml)	10 Feb 03	13 Feb 03	0 PSI	70 Degrees	Carmel	Water	1 Layer
		21-03-040	N (5 gr)	10 Feb 03	13 Feb 03			Tan	Water	2 Layer
		21-03-041	S (5 gr)	10 Feb 03	13 Feb 03			Rusty/Tan	Solid	1 Layer
	14856	21-03-042	L (5 ml)	10 Feb 03	13 Feb 03	28 PSI	86 Degrees	Dark	Water	0 Layers
		21-03-043	N (5 gr)	10 Feb 03	13 Feb 03			Reddish Brown	Water	3 Layers
		21-03-044	S (5 gr)	10 Feb 03	13 Feb 03			Dark Brown Reddish Particles	Solid	1 Layer
03 Feb 03	8207	21-03-045	L (5 ml)	10 Feb 03	13 Feb 03	40 PSI	73 Degrees	Black	Water	1 Layer
		21-03-046	N (5 gr)	10 Feb 03	13 Feb 03			Dark Brown Amber	Water Sand	2 Layers
		21-03-047	S (5 gr)	10 Feb 03	13 Feb 03			Reddish Brown	Mud/Solid	1 Layer
	19397	21-03-048	L (5 ml)	10 Feb 03	13 Feb 03	60 PSI	83 Degrees	Black	Water	1 Layer
		21-03-049	N (5 gr)	10 Feb 03	13 Feb 03			Light Brown & Brown	Water & Sand	1 Layer
		21-03-050	S (5 gr)	10 Feb 03	13 Feb 03			Reddish Brown	Solid	1 Layer
04 Feb 03	46537	21-03-051	L (5 ml)	10 Feb 03	13 Feb 03	90 PSI	79 Degrees	Black/brown	Water	1 Layer
		21-03-052	N (5 gr)	10 Feb 03	13 Feb 03			Dark Brown	Water & Sand	2 Layers
		21-03-053	S (5 gr)	10 Feb 03	13 Feb 03			Reddish Brown	Molasses Solid	1 Layer
	14354	21-03-054	L (5 ml)	10 Feb 03	13 Feb 03	Blew seal @40 PSI Undeter-mined	75 Degrees	Dark Brown	Water	1 Layer
		21-03-055	N (5 gr)	10 Feb 03	13 Feb 03			Reddish Brown	Sandy Sludge	1 Layer
		21-03-056	S (5 gr)	10 Feb 03	13 Feb 03			Rust Red	Crusty Solid	1 Layer
05 Feb 03	48309	21-03-057	L (5 ml)	10 Feb 03	13 Feb 03	60 PSI dropped to 10 PSI	72 Degrees	Black/light on bottom	Water with flakes on bottom	2 layers
		21-03-058	N (5 gr)	10 Feb 03	13 Feb 03			Dark Brown Light Brown	Water Sludge	2 Layers
		21-03-059	S (5 gr)	10 Feb 03	13 Feb 03	60 PSI dropped to 10 PSI	72 Degrees	Rust Brown	Clay	1 Layer
	47125	21-03-060	L (5 ml)	10 Feb 03	13 Feb 03	30 PSI	70 Degrees	Black	Water	1 Layer
		21-03-061	N (5 gr)	10 Feb 03	13 Feb 03			Black Tan	Water Sand	2 Layers
		21-03-062	S (5 gr)	10 Feb 03	13 Feb 03			Black	Solid Sludge	1 Layer

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
06 Feb 03	15856	21-03-063	L (5 ml)	10 Feb 03	13 Feb 03	0 PSI	70 Degrees	Dark Brown	Water	1 Layer
		21-03-064	N (5 gr)	10 Feb 03	13 Feb 03			Brown/Sand	Sandy water	1 Layer
		21-03-065	S (3 gr)	10 Feb 03	13 Feb 03			Brown/Sand	Watery with Chunks	1 Layer
	14498	21-03-066	L (5 ml)	10 Feb 03	13 Feb 03	65 PSI	72 Degrees	Dark Brown	Water	1 Layer
		21-03-067	N (5 gr)	10 Feb 03	13 Feb 03			Dark Brown Tan	Water Sand	2 Layers
		21-03-069-D	L (5 ml) Duplicate	10 Feb 03	13 Feb 03			Dark Brown	Water	1 Layer
		21-03-070-D	N (5 gr) Duplicate	10 Feb 03	13 Feb 03			Dark Brown	Water	1 Layer
07 Feb 03	14498	21-03-068	S (5 gr)	10 Feb 03	13 Feb 03	65 PSI	57 Degrees	Dark Chocolate	Solid	1 Layer
		21-03-071-D Duplicate	S (5 gr)	10 Feb 03	13 Feb 03			Dark Chocolate	Solid	1 Layer
	46491	21-03-072	L (5 ml)	10 Feb 03	13 Feb 03	75 PSI	74 Degrees	Black	Water	1 Layer
		21-03-073	N (7 gr)	10 Feb 03	13 Feb 03			Light Brown	Chunky Syrup	1 Layer
		21-03-074	S (5 gr)	10 Feb 03	13 Feb 03			Light Brown	Honey	1 Layer
08 Feb 03	54643	21-03-075	L (5 gr)	10 Feb 03	13 Feb 03	Pressure didn't hold verified w/safety Rep to vent TC	64 Degrees	Solid Black	Water	No Layer
		21-03-076	N (5 gr)	10 Feb 03	13 Feb 03			Tan	Liquid on top Sandy on bottom	2 Layers
		21-03-077	S (5 gr)	10 Feb 03	13 Feb 03			Dark Brown	Coffee Consistency	No Layers
	85182	21-03-078	L (5 ml)	10 Feb 03	13 Feb 03	48 PSI	62 Degrees	Dark Brown	Water	2 Layers
		21-03-079	N (5 gr)	10 Feb 03	13 Feb 03			Dark Thick Brown	Liquid	2 Layers
		21-03-080	S (5 gr)	10 Feb 03	13 Feb 03			Rusty to Black	Thick Chunky	No Layers
	28506	21-03-081	L (5 ml)	10 Feb 03	13 Feb 03	10 PSI	68 Degrees	Dark Brown	Water	No Layers
		21-03-082	N (5 gr)	10 Feb 03	13 Feb 03			Bright Orange to Sparkle	Sludge	2 Layers
		21-03-083	S (5 gr)	10 Feb 03	13 Feb 03			Reddish	Solid to Sludge	No Layers
10 Feb 03	83852	21-03-084	L (5 ml)	10 Feb 03	14 Feb 03	5 PSI	74 Degrees	Black	Water	1 Layer
		21-03-085	N (7 gr)	10 Feb 03	13 Feb 03			Dark Rust Rusty Tan	Liquid Sand	2 Layers
		21-03-086	S (5 gr)	10 Feb 03	13 Feb 03			Rust	Paste	1 Layer
	17164	21-03-087	L (5 ml)	10 Feb 03	13 Feb 03	50 PSI	73 Degrees	Black	Water	1 Layer
		21-03-088	N (5 gr)	10 Feb 03	13 Feb 03			Dk Brn & Lt Brn	Water Sand	2 Layers
		21-03-089	S (5 gr)	10 Feb 03	13 Feb 03			Dark Brown	Sandy Gravel	1 Layer

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
11 Feb 03	14637	21-03-090	L (5 ml)	24 Feb 03	27 Feb 03	50 PSI	72 Degrees	Black	Water	1 Layer
		21-03-091	N (7 gr)	24 Feb 03	27 Feb 03			Reddish Brown	Water Sand	2 Layers
		21-03-092	S (5 gr)	24 Feb 03	27 Feb 03			Reddish Brown	Thick Sludge Peanut Butter	1 Layer
11 Feb 03	48980	21-03-093	L (4 ml)	24 Feb 03	27 Feb 03	70 PSI	65 Degrees	Dark Amber	Water	1 Layer
		21-03-094	N (6 gr)	24 Feb 03	27 Feb 03			Dark Amber Cloudy Light Brown	Water Water Sand	3 Layers
		21-03-095	S (6 gr)	24 Feb 03	27 Feb 03			Black Light Tan	Gravel & Sand Dry & Sticky	2 Layers
12 Feb 03	21934	21-03-096	L (5 ml)	24 Feb 03	27 Feb 03	0 PSI	74 Degrees	Dark Brown	Water	1 Layer
		21-03-097	N (5 gr)	24 Feb 03	27 Feb 03			Dark Brown Brown	Molasses Sand	2 Layers
		21-03-098	S (5 gr)	24 Feb 03	27 Feb 03			Black	Tar	1 Layer
	10679	21-03-099	L (5 ml)	24 Feb 03	27 Feb 03	35 PSI	75 Degrees	Black	Water	1 Layer
		21-03-100	N (9 gr)	24 Feb 03	27 Feb 03			Dark Brown Brown	Syrup	2 Layers
		21-03-101	S (5 gr)	24 Feb 03	27 Feb 03			Light brown with Orange & gray	Sandy	1 Layer
	81547	21-03-102	L (4 ml)	24 Feb 03	27 Feb 03	0 PSI	86 Degrees	Reddish Brown	Water	1 Layer
		21-03-103	N (5 gr)	24 Feb 03	27 Feb 03			Reddish Brown	Liquid Granules	2 Layers
		21-03-104	S (5 gr)	24 Feb 03	27 Feb 03			Yellowish Red	Solid Sludge	1 Layer
13 Feb 03	41559	21-03-105	L (5 ml)	24 Feb 03	27 Feb 03	115 PSI	71 Degrees	Black	Water	1 Layer
		21-03-106	N (9 gr)	24 Feb 03	27 Feb 03			Dark Brown Dark Gray	Water Sand	2 Layers
		21-03-107	S (5 gr)	24 Feb 03	27 Feb 03			Dark Gray	Pasty with grit	1 Layer
	14767	21-03-108	L (5 ml)	24 Feb 03	27 Feb 03	70 PSI	75 Degrees	Black	Water	1 Layer
		21-03-109	N (7 gr)	24 Feb 03	27 Feb 03			Dark Brown Orange Brown	Water Sand	2 Layers
		21-03-110	S (9gr)	24 Feb 03	27 Feb 03			Dark Brown	Pasty Sludge	1 Layer
14 Feb 03	38422	21-03-111	L (5 ml)	24 Feb 03	27 Feb 03	40 PSI	74 Degrees	Black Lighter on bottom	Water	2 Layers
		21-03-112	N (4 gr)	24 Feb 03	27 Feb 03			Black Light Tan Brown	Water Sand Solid	3 Layers
		21-03-113	S (5 gr)	24 Feb 03	27 Feb 03			Orange Dark Brown	Peanut Butter	1 Layer

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
14 Feb 03	79558	21-03-114	L (5 ml)	24 Feb 03	27 Feb 03	65 PSI	73 Degrees	Dark Brown	Water w/Sand	1 Layer
		21-03-115	N (5 gr)	24 Feb 03	27 Feb 03			Black	Thin Syrup	1 Layer
		21-03-116	S (7 gr)	24 Feb 03	27 Feb 03	65 PSI	73 Degrees	Dark Brown with colored chunks	Thin Syrup	1 Layer
18 Feb 03	19116	21-03-117	L (5 ml)	24 Feb 03	27 Feb 03	50 PSI	72 Degrees	Dark Brown	Water	1 Layer
		21-03-118	N (9 gr)	24 Feb 03	27 Feb 03			Dark Brown Sandy brown	Water	2 Layers
		21-03-119	S (5 gr)	24 Feb 03	27 Feb 03			Brownish Gold	Thick Paste	1 Layer
	22757	21-03-120	L (5 ml)	24 Feb 03	27 Feb 03	38 PSI	71 Degrees	Dark Brown	Water	1 Layer
		21-03-121	N (4 gr)	24 Feb 03	27 Feb 03			Brown Red	Water	2 Layers
		21-03-122	S (5 gr)	24 Feb 03	27 Feb 03			Reddish Brown	Putty	1 Layer
19 Feb 03	93179	21-03-123	L (5 ml)	24 Feb 03	27 Feb 03	70 PSI	70 Degrees	Dark Brown	Water	1 Layer
		21-03-124	N (7 gr)	24 Feb 03	27 Feb 03			Tan	Gritty Liquid	1 Layer
		21-03-125	S (5 gr)	24 Feb 03	27 Feb 03			Black	Gritty Dough	1 Layer
	79762	21-03-126	L (4 ml)	24 Feb 03	27 Feb 03	0 PSI	72 Degrees	Black	Thin Oil	1 Layer
		21-03-127	N (6 gr)	24 Feb 03	27 Feb 03			Black, Copper	Oil, Sand	2 Layers
		21-03-128	S (5 gr)	24 Feb 03	27 Feb 03			Dark Brown Rust	Pasty Liquid	2 Layers
20 Feb 03	52785	21-03-129	L (5 ml)	24 Feb 03	27 Feb 03	45 PSI	79 Degrees	Black Lighter Gray	Grainy Water	2 Layers
		21-03-130	N (7 gr)	24 Feb 03	27 Feb 03			Dark Amber Med. Amber Light Amber	Water Fine Sediment Sand	3 Layers
		21-03-131	S (5 gr)	24 Feb 03	27 Feb 03			Dark brown Light Amber Green	Wet Play dough	1 Layer
		21-03-132	L (5 ml)	24 Feb 03	27 Feb 03			Black Gray	Water Sand	2 Layers
		21-03-133	N (7 gr)	24 Feb 03	27 Feb 03			Dark Amber Light Amber	Water Sand	2 Layers
		21-03-134	S (5 gr)	24 Feb 03	27 Feb 03			Dark Brown	Wet Sand	1 Layer
	50034	21-03-135	L (5 ml)	24 Feb 03	27 Feb 03	60 PSI	76 Degrees	Dark Brown	Water	1 Layer
		21-03-136	N (5 gr)	24 Feb 03	27 Feb 03			Dark Brown Sandy	Water Sand	2 Layers
		21-03-137	S (5 gr)	24 Feb 03	27 Feb 03			Brown,black,rust	Wet brownie mixed with chunks	1 Layer

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
21 Feb 03	56368	21-03-138	L (5 ml)	24 Feb 03	27 Feb 03	80 PSI	73 Degrees	Black	Water	1 Layer
		21-03-139	N (7 gr)	24 Feb 03	27 Feb 03			Amber	Oil	2 Layers
		21-03-140	S (.5 gr)	24 Feb 03	27 Feb 03			Burnt Brown	Sandy	Can't tell
	49168	21-03-141	L (5 ml)	24 Feb 03	27 Feb 03	70 PSI	85 Degrees	Black	Water	
		21-03-142	N (6 gr)	24 Feb 03	27 Feb 03			Copper Rust	Syrup	2 Layers
		21-03-143	S (5 gr)	24 Feb 03	27 Feb 03			Chocolate	Paste	1 Layer
22 Feb 03	17911	21-03-144	L (5 ml)	24 Feb 03	27 Feb 03	0 PSI	79 Degrees	Dark Olive	Water	1 Layer
		21-03-145	N (9 gr)	24 Feb 03	27 Feb 03			Dark On top Tan on bottom	Water Sandy	2 Layers
		21-03-146	S (5 gr)	24 Feb 03	27 Feb 03			Rusty & Gray	Chunky	1 Layer
	55096	21-03-147	L (4 ml)	24 Feb 03	27 Feb 03	100 PSI	82 Degrees	Dark Brown	Water	1 Layer
		21-03-148	N (7 gr)	24 Feb 03	27 Feb 03			Brown	Water	1 Layer
		21-03-149	S (5 gr)	24 Feb 03	27 Feb 03			Olive/Brown	Grain	1 Layer
	45274	21-03-150	L (5 ml)	24 Feb 03	27 Feb 03	40 PSI	79 Degrees	Dark Brown	Water	1 Layer
		21-03-151	N (9 gr)	24 Feb 03	27 Feb 03			Brown Red	Top/Water Bottom/Sand	2 Layers
		21-03-152	L (5 gr)	24 Feb 03	27 Feb 03			Reddish Brown	Peanut Butter	1 Layer
01 Apr 03	46680	21-03-153	Core Sample (30 gr)	*07 Apr 03*	9 Apr 03					
		21-03-154	L (3.5 ml)	*07 Apr 03*	9 Apr 03	45 PSI	84 Degrees	Dark Brown	Water	1 Layer
		21-03-155	L (4 ml)	*07 Apr 03*	9 Apr 03			Dark Brown	Water	1 Layer
		21-03-156	N (5 ml)	*07 Apr 03*	9 Apr 03			Brown, Tan	Water, Sediment	2 Layers
		21-03-157	N (7 ml)	*07 Apr 03*	9 Apr 03			Brown Tan	Water Sand Sediment	2 Layers
		21-03-158	S (9 gr)	*07 Apr 03*	9 Apr 03			Brownish tan	Sludge granulated	1 Layer
		21-03-159	S (5 gr)	7 Apr 03	9 Apr 03			Brownish Tan	Granulated sludge	1 Layer
02 Apr 03	56259	21-03-160	L (5 ml)	7 Apr 03	9 Apr 03	40 PSI	87 Degrees	Clear Brown	Water	1 Layer
		21-03-161	N (3 gr)	7 Apr 03	9 Apr 03			Dark Brown	Water	1 Layer
		21-03-162	S (5 gr)	7 Apr 03	9 Apr 03			Reddish Brown	Paste	1 Layer
03 Apr 03	47615	21-03-163	S (5 ml)	7 Apr 03	9 Apr 03	70 PSI	71 Degrees	Dark Brown	Water	1 Layer
		21-03-164	N (9 ml)	7 Apr 03	9 Apr 03			Dark Brown	Sandy Water	1 Layer
		21-03-165	S (5 gr)	7 Apr 03	9 Apr 03			Rust	Gritty Paste	1 Layer
	79202	21-03-166	L (5 ml)	7 Apr 03	9 Apr 03	0 PSI	75 Degrees	Dark Brown	Water	1 Layer
		21-03-167	N (5 gr)	7 Apr 03	9 Apr 03			Dk Brn Rust	Water Sand	2 Layers
		21-03-168	S (7 gr)	7 Apr 03	9 Apr 03			Rust	Paste	1 Layer
04 Apr 03	14409	21-03-169	L (5 ml)	7 Apr 03	9 Apr 03	50 PSI	75 Degrees	Dark Yellow	Water	1 Layer
		21-03-170	N (8 gr)	7 Apr 03	9 Apr 03			Reddish tan Dark Brown	Liquid Soft Sand	2 Layers

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
04 Apr 03	14409	21-03-171	S (5 gr)	7 Apr 03	9 Apr 03			Reddish	Paste	1 Layer
		21-03-172	***Core Sample***	7 Apr 03	9 Apr 03	50 PSI	75 Degrees			
		21-03-172a	***Core Sample (30 g)***	7 Apr 03	9 Apr 03					
		21-03-172b	***Core Sample (40 g)***	7 Apr 03	9 Apr 03					
		21-03-172c	***Core Sample (40 g)***	7 Apr 03	9 Apr 03					
		21-03-172d	***Core Sample (40 g)***	7 Apr 03	9 Apr 03					
		21-03-172e	***Core Sample (40 g)***	7 Apr 03	9 Apr 03					
		21-03-172f	***Core Sample (40 g)***	7 Apr 03	9 Apr 03					
		21-03-172g	***Core Sample (40 g)***	7 Apr 03	9 Apr 03					
		21-03-172h	***Core Sample (40 g)***	7 Apr 03	9 Apr 03					

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
5 Apr 03	43529	21-03-173	L (5 ml)	7 Apr 03	9 Apr 03	0 PSI	75 Degrees	Black Tan	Water Sandy	2 Layers
		21-03-174	N (5 gr)	7 Apr 03	9 Apr 03			Light Brown	Sand	1 Layer
		21-03-175	S (6 gr)	7 Apr 03	9 Apr 03			Black	Paste	1 Layer
		21-03-176	***Core Sample***	7 Apr 03	9 Apr 03					
		21-03-176a	***Core Sample (40g)***	7 Apr 03	9 Apr 03					
		21-03-176b	***Core Sample (40g)***	7 Apr 03	9 Apr 03					
		21-03-176c	***Core Sample (40g)***	7 Apr 03	9 Apr 03					
		21-03-176d	***Core Sample (40g)***	7 Apr 03	9 Apr 03					
		21-03-176e	***Core Sample (40g)***	7 Apr 03	9 Apr 03					
14 Apr 03	46992	21-03-177	L (5 ml)	21 Apr 03	24 Apr 03	10 PSI	71 Degrees	Dark Brown	Water	1 Layer
		21-03-178	L (4.5ml)	21 Apr 03	24 Apr 03			Dark Brown	Water	1 Layers
		21-03-179	N (9 gr)	21 Apr 03	24 Apr 03			Dark Brown Rust Tan	Water Sand	2 Layers
		21-03-180	*N (5 gr)*	21 Apr 03	24 Apr 03			Dark Brown Rust Tan	Water Sand	2 Layers
		21-03-181	*S (5 gr)*	21 Apr 03	24 Apr 03			Tan Sandy	Wet Sand	1 Layer
		21-03-182	*S (5 gr)*	21 Apr 03	24 Apr 03			Sandy Tan	Wet Sand	1 Layer
15 Apr 03	15007	21-03-183	*L (4 gr)*	21 Apr 03	24 Apr 03	10 PSI	69 Degrees	Black	Oily	1 Layer
		21-03-184	*N (9 gr)*	21 Apr 03	24 Apr 03			Black Tan	Water Sand	2 Layers
		21-03-185	*S (5 gr)*	21 Apr 03	24 Apr 03			Tan	Sandy	1 Layer
	33724	21-03-186	*L (4.5 ml)*	21 Apr 03	24 Apr 03	0 PSI	74 Degrees	Dark Brown	Water	1 Layer
		21-03-187	*N (5 gr)*	21 Apr 03	24 Apr 03			Dark Brown Rust	Water Sand	2 Layers
		21-03-188	*S (5 gr)*	21 Apr 03	24 Apr 03			Rust	Dry Clay	1 Layer

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
16 Apr 03	27815	21-03-189	*L (5 ml)*	21 Apr 03	24 Apr 03	0 PSI	77 Degrees	Dark Brown Light Brown	Water Sand	2 Layers
		21-03-190	*N (5 gr)*	21 Apr 03	24 Apr 03			Dark Brown Tan	Water Sand	2 Layers
		21-03-191	*S (8 gr)*	21 Apr 03	24 Apr 03			Multi-Colored	Sand	1 Layer
	8685	21-03-192	*L (4 ml)*	21 Apr 03	24 Apr 03	60 PSI	80 Degrees	Brown	Water	1 Layer
		21-03-193	*N (5 gr)*	21 Apr 03	24 Apr 03			Reddish Brown Rust	Water Sand	2 Layers
		21-03-194	*S (5 gr)*	21 Apr 03	24 Apr 03			Reddish Brown	Paste	1 Layer
17 Apr 03	43499	21-03-195	*L (5 ml)*	21 Apr 03	24 Apr 03	10 PSI	80 Degrees	Dark Oil	Water	1 layer
		21-03-196	*N (9 gr)*	21 Apr 03	24 Apr 03			Dark Tan Light Tan	Watery Sand	2 Layers
		21-03-197	*S (5 gr)*	21 Apr 03	24 Apr 03			Gray Brown Dark	Gritty	2 Layers
	17045	21-03-198	*L (5 ml)*	21 Apr 03	24 Apr 03	0 PSI	78 Degrees	Dark Brown	Water	1 Layer
		21-03-199	*N (5 gr)*	21 Apr 03	24 Apr 03			Dark Rusty	Liquid Solid	2 Layers
		21-03-200	*S (5 gr)*	21 Apr 03	24 Apr 03			Black	Peanut Butter	1 Layer
18 Apr 03	610	21-03-201	*L (5 ml)*	21 Apr 03	24 Apr 03	35 PSI	74 Degrees	Rusty	Liquid	1 Layer
		21-03-202	*N (7 gr)*	21 Apr 03	24 Apr 03			Rusty Tan	Liquid Solid Sandy Bottom	2 Layers
		21-03-203	*S (8 gr)*	21 Apr 03	24 Apr 03			Dark Brown	Sludge	1 Layer
18 Apr 03	16541	21-03-204	*L (3 ml)*	21 Apr 03	24 Apr 03	45 PSI	76 Degrees	Brown	Honey	1 Layer
		21-03-205	*N (5 gr)*	21 Apr 03	24 Apr 03			Brown	Liquid Solid	2 Layers
		21-03-206	*S (5 gr)*	21 Apr 03	24 Apr 03			Reddish	Strawberry Jam	1 Layer
19 Apr 03	19186	21-03-207	*L (5 ml)*	21 Apr 03	24 Apr 03	15 PSI	83 Degrees	Reddish Black	Liquid	1 Layer
		21-03-208	*N (5 gr)*	21 Apr 03	24 Apr 03			Green Brown	Liquid Sand	2 Layers
		21-03-209	*S (5 gr)*	21 Apr 03	24 Apr 03			Blackish Brown	Solid	1 Layer
	52603	21-03-210	*L (5 ml)*	21 Apr 03	24 Apr 03	0 PSI	81 Degrees	Blackish Red	Liquid	1 Layer
		21-03-211	*N (9 gr)*	21 Apr 03	24 Apr 03			Brown Red	Liquid Solid	2 Layers
		21-03-212	*S (5 gr)*	21 Apr 03	24 Apr 03			Brownish Red	Solid	1 Layer

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
28 Apr 03	47472	21-03-213	*L (4 ml)*	5 May 03	8 May 03		72 Degrees	Dark Brown/Black	Oil	1 Layer
		21-03-214	*L (4 ml)*	5 May 03	8 May 03			Dark Brown/Black	Oil	1 Layer
		21-03-215	*N (7 gr)*	5 May 03	8 May 03			Black Rust	Oil Sand	2 Layers
		21-03-216	*N (5 gr)*	5 May 03	8 May 03			Black Rust	Oil Sand	2 Layers
		21-03-217	*S (5 gr)*	5 May 03	8 May 03			Black w/red	Coarse Sand/Gravel	1 Layer
		21-03-218	*S (5 gr)*	5 May 03	8 May 03			Black w/red	Coarse Sand/Gravel	1 Layer
	17555	21-03-219	*L (5 ml)*	5 May 03	8 May 03	60 PSI	84 Degrees	Black	Water	1 Layer
		21-03-220	*N (5 gr)*	5 May 03	8 May 03			Black Red	Water Sand	2 Layers
		21-03-221	*S (4 gr)*	5 May 03	8 May 03			Rusty Brown	Gravel	1 Layer
29 Apr 03	41617	21-03-222	*L (5 ml)*	5 May 03	8 May 03	45 PSI	77 Degrees	Dark Brown	Water	1 Layer
		21-03-223	*N (8 gr)*	5 May 03	8 May 03			Dark Brown Light Rust Brown	Water Sand	2 Layers
		21-03-224	*S (5 gr)*	5 May 03	8 May 03			Light Sandy Brown	Thick Paste	1 Layer
29 Apr 03	47708	21-03-225	*L (5 ml)*	5 May 03	8 May 03	35 PSI	79 Degrees	Black	Oil	1 Layer
		21-03-226	*N (5 gr)*	5 May 03	8 May 03			Dark Brown Sandy Brown	Water Sand	2 Layers
		21-03-227	*S (5 gr)*	5 May 03	8 May 03			Light Orange Brown	Clay	1 Layer
30 Apr 03	82228	21-03-228	*L (4 ml)*	5 May 03	8 May 03	0 PSI	80 Degrees	Light Brown Light Tan	Water Small Gravel/Sand	2 Layers
		21-03-229	*N (5 gr)*	5 May 03	8 May 03			Light Brown Light Tan	Water Sand Gravel	3 Layers
		21-03-230	*S (7 gr)*	5 May 03	8 May 03			Light Green Yellow Red	Honey Sugar Paste	3 Layers
1 May 03	54617	21-03-231	*L (5 ml)*	5 May 03	8 May 03	NA	84 Degrees	Dark Brown	Water	1 Layer
		21-03-232	*N (5 gr)*	5 May 03	8 May 03			Black	Water	1 Layer
		21-03-233	*S (5 gr)*	5 May 03	8 May 03			Dark Gray	Gravel	1 Layer

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
	449	21-03-234	*L (5 ml)*	5 May 03	8 May 03	80 PSI	85 Degrees	Dark Brown	Water	1 Layer
		21-03-235	*N (5 gr)*	5 May 03	8 May 03			Dark Brown Light Rust	Oil	2 Layers
		21-03-236	*S (2 gr)*	5 May 03	8 May 03			Red Rust	Sand	1 Layer
		21-03-237	*Gas Canister*		8 May 03					
2 May 03	32252	21-03-238	*L (4 ml)*	5 May 03	8 May 03	0 PSI	79 Degrees	Black	Light Oil	1 Layer
		21-03-239	*N (9 gr)*	5 May 03	8 May 03			Black Light Brown	Oil Sand	2 Layers
		21-03-240	*S (7 gr)*	5 May 03	8 May 03			Black, Brown, Tan	Gravel	1 Layer
3 May 03	6800	21-03-241	*L (4 ml)*	5 May 03	8 May 03	0 PSI	86 Degrees	Black	Liquid	1 Layer
		21-03-242	*N (5 gr)*	5 May 03	8 May 03			Black Tan	Liquid Sandy	2 Layers
		21-03-243	*S (5 gr)*	5 May 03	8 May 03			Reddish Gray	Pasty	2 Layers
	82164	21-03-244	*L (4 ml)*	5 May 03	8 May 03	10 PSI	83 Degrees	Light Brown	Oil	1 Layer
		21-03-245	*N (9 gr)*	5 May 03	8 May 03			Light Brown	Sandy	2 Layers
		21-03-246	*S (7 gr)*	5 May 03	8 May 03			Copper Dark Brown	Sandy	2 Layers
	1841	21-03-247	*L (5 ml)*	5 May 03	8 May 03	40 PSI	83 Degrees	Black	Liquid w/Sand	1 Layer
		21-03-248	*N (6 gr)*	5 May 03	8 May 03			Black Dark Gray w/red tint	Liquid	2 Layers
		21-03-249	*S (6 gr)*	5 May 03	8 May 03			Reddish Amber Light & Dark	Paste	2 Layers
		21-03-250	*Gas Canister* 1066		8 May 03	40 PSI 30 PSI				

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
12 May 03	50373	21-03-251	*L (20 ml)*	***DSHW Audit Spiking***		85 PSI	75 Degrees	Light Brown	Water	
		21-03-251a	*L (1 ml)*	19 May 03	21 May 03	85 PSI	67 Degrees			
		21-03-251b	*L (1 ml)*	19 May 03	21 May 03					
		21-03-251c	*L (1 ml)*	19 May 03	21 May 03					
		21-03-251d	*L (0.1ml)*	19 May 03	21 May 03					
		21-03-251e	*L (5 ml)*	19 May 03	21 May 03					
		21-03-252	*N (20 gr)*	***DSHW Audit Spiking***		85 PSI	67 Degrees	Dark Brown Light Brown	Water Chunky	2 Layers
		21-03-252a	*N (0.1 g)*	19 May 03	21 May 03					
		21-03-252b	*N (0.1 g)*	19 May 03	21 May 03					
		21-03-252c	*N (0.1 g)*	19 May 03	21 May 03					
		21-03-252d	*N (1.0 g)*	19 May 03	21 May 03					
		21-03-253	*S (20 gr)*	***DSHW Audit Spiking***		85 PSI	67 Degrees	Dark Green	Sticky Paste	1 Layer
		21-03-253a	*S (0.1 gr)*	***DSHW Audit Spiking***	21 May 03					
		21-03-253b	*S (0.1 gr)*	***DSHW Audit Spiking***	21 May 03					
		21-03-253c	*S (0.1 gr)*	***DSHW Audit Spiking***	21 May 03					
		21-03-253d	*S (1.0 gr)*	***DSHW Audit Spiking***	21 May 03					
		21-03-254	*L (3.5 ml)*	19 May 03	21 May 03	85 PSI	75 Degrees	Light Brown	Water	1 Layer
		21-03-255	*L (4 ml)*	19 May 03	21 May 03					
		21-03-256	*N (5 gr)*	19 May 03	21 May 03	85 PSI	75 Degrees	Dark Brown Light Brown	Water Chunky	2 Layers
		21-03-257	*N (5 gr)*	19 May 03	21 May 03					
		21-03-258	*S (5 gr)*	19 May 03	21 May 03	85 PSI	67 Degrees	Dark Green	Sticky Paste	1 Layer
		21-03-259	*S (5 gr)*	19 May 03	21 May 03					
		21-03-260	*Gas Canister 1078*		21 May 03	100 PSI				
		21-03-261	*Gas Canister 1065*		21 May 03	90 PSI 85 PSI				

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
12 May 03 (Cont')	80775	21-03-262	*L (4.5 ml)*	19 May 03	21 May 03	0 PSI	85 Degrees	Dark Brown	Wate	1 Layer
		21-03-263	*N (7 gr)*	19 May 03	21 May 03			Light Brown Tan	Water Sandy	2 Layers
		21-03-264	*S (5 gr)*	19 May 03	21 May 03			Light Brown Dark Brown	Water Sand	2 Layers
13 May 03	47810	21-03-265	*L (4 ml)*	19 May 03	21 May 03	10 PSI	82 Degrees	Dark Brown	Water	1 Layer
		21-03-266	*N (7 gr)*	19 May 03	21 May 03			Light Brown Rus	Liquid Snot	2 Layers
		21-03-267	*S (7 gr)*	19 May 03	21 May 03			Rust Dark Rust	Grain	2 Layers
	48273	21-03-268	*Gas Canister* **1082**		21 May 03	65 PSI				
		21-03-269	*L (3.4 ml)*	19 May 03	21 May 03	65 PSI	89 Degrees	Black	Oil	1 Layer
		21-03-270	*N (7 gr)*	19 May 03	21 May 03			Dark Red Light Red	Water Sandy	2 Layers
		21-03-271	*S (5 ml)*	19 May 03	21 May 03			Dark Red	Paste	1 Layer
14 May 03	51059	21-03-272	**L (4.5 ml**		21 May 03	50 PSI	80 Degrees	Brownish Black	Water	1 Layer
		21-03-273	*N (5 gr)*	19 May 03	21 May 03			Brownish Black	Water Sandy	2 Layers
		21-03-274	*N (5 gr)*	19 May 03	21 May 03			Reddish Brown	Sandy	1 Layer
		21-03-275	*Gas Canister #1080*		21 May 03					
	27635	21-03-276	*L (4 ml)*	19 May 03	21 May 03	0 PSI	84 Degrees	Black	Water	1 Layer
		21-03-277	*N (6 gr)*	19 May 03	21 May 03			Light Brown Sandy	Water Sandy	2 Layers
		21-03-278	*S (7 gr)*	19 May 03	21 May 03			Red Brown Black	Chunky	3 Layers
15 May 03	22213	21-03-279	*L (5 ml)*	19 May 03	21 May 03	0 PSI	78 Degrees	Dark Brown	Liquid	1 Layer
		21-03-280	*N (7 gr)*	19 May 03	21 May 03			Dark Light	Liquid Sandy	2 Layers
		21-03-281	*S (5 gr)*	19 May 03	21 May 03			Multi-Color	Sand/Paste	1 Layer
	45179	21-03-282	*L (5 ml)*	19 May 03	21 May 03	0 PSI	79 Degrees	Dark	Water	1 Layer
		21-03-283	*N (7 gr)*	19 May 03	21 May 03			Dark	Water	1 Layer
		21-03-284	*S (7 gr)*	19 May 03	21 May 03			Brown	Mud	1 Layer

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
16 May 03	19497	21-03-285	*Gas Canister #1081*		21 May 03	55 PSI				
		21-03-286	*L (5 ml)*	19 May 03	21 May 03	10 PSI	82 Degrees	Black	Water	1 Layer
		21-03-287	*N (7 gr)*	19 May 03	21 May 03			Black	Water Solid	2 Layers
		21-03-288	*S (5 gr)*	19 May 03	21 May 03			Dark Brown	Gravelly	1 Layer
	43072	21-03-289	*Gas Canister #1079*		21 May 03	44 PSI 2-3 PSI				
		21-03-290	*L (4.5 ml)*	19 May 03	21 May 03	44 PSI	80 Degrees	Light Amber to Dark Amber	Water	1 Layer
		21-03-291	*N (5 gr)*	19 May 03	21 May 03			Amber Dark Brown Sandy	Water Sandy	3 Layers
		21-03-292	*S (9 gr)*	19 May 03	21 May 03			Dark Red Gray Dark Brown Light Amber	Muddy Clay Fine	4 Layers
	44007	21-03-293	*Gas Canister #1084*		21 May 03	80 PSI 75 PSI				
		21-03-294	*L (5 ml)*	19 May 03	21 May 03	80 PSI	80 Degrees	Dark	Water	1 Layer
		21-03-295	*N (7 gr)*	19 May 03	21 May 03			Light Amber Dark Amber	Fine Flour	1 Layer
		21-03-296	*S (5 gr)*	19 May 03	21 May 03			Black Dark Red	Mud	2 Layer
	94138	21-03-297	*Gas Canister #1067*		21 May 03	55 PSI 10 PSI				
		21-03-298	*L (5 ml)*	19 May 03	21 May 03	10 PSI	83 Degrees	Dark	Motor Oil	1 Layer
		21-03-299	*N (5 gr)*	19 May 03	21 May 03			Amber Tan	Sand	2 Layers
		21-03-300	*S (5 gr)*	19 May 03	21 May 03			Reddish Orange	Paste	1 Layer

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
17 May 03	48980	21-03-301	*L (5 ml)*	19 May 03	21 May 03	0 PSI	80 Degrees	Dark Brown	Water	1 Layer
		21-03-302	*N (9 gr)*	19 May 03	21 May 03			Dark Brown Light Brown	Water Sandy	2 Layers
		21-03-303	*S (7 gr)*	19 May 03	21 May 03			Reddish Brown	Paste	2 Layers
	20382	21-03-304	*L (5 ml)*	19 May 03	21 May 03	0 PSI	72 Degrees	Dark Brown	Water	1 Layer
		21-03-305	*N (8 gr)*	19 May 03	21 May 03			Dark	Gritty	1 Layer
		21-03-306	*S (8 gr*	19 May 03	21 May 03			Reddish Brown	Gritty	1 Layer
27 May 03	77859	21-03-307	*L (4 ml)*	02 June 03	04 June 03	0 PSI	69 Degrees	Light Brown	Oil	1 Layer
		21-03-308	*L (4 ml)*	02 June 03	04 June 03			Light Brown	Oil	1 Layer
		21-03-309	*N (5 gr)*	02 June 03	04 June 03			Dark Brown	Water	1 Layer
		21-03-310	*N (5 gr)*	02 June 03	04 June 03			Dark Brown	Water	1 Layer
		21-03-311	*S (5 gr)*	02 June 03	04 June 03			Black	Pudding	1 Layer
		21-03-312	*S (5 gr)*	02 June 03	04 June 03			Black	Pudding	1 Layer
	15990	21-03-313	*L (5 ml)*	02 June 03	04 June 03	0 PSI	75 Degrees	Dark Amber	Water	1 Layer
		21-03-314	*N (7 gr)*	02 June 03	04 June 03			Black Light Tan	Water Sandy	2 Layers
		21-03-315	*S (7 gr)*	02 June 03	04 June 03			Rust	Paste	1 Layer
	92455	21-03-316	*L (5 ml)*	02 June 03	04 June 03	98 PSI	83 Degrees	Maple	Sandy	1 Layer
		21-03-317	*N (4 gr)*	02 June 03	04 June 03			Light Brown Dark Brown	Water Sandy	2 Layers
		21-03-318	*S (3 gr)*	02 June 03	04 June 03			Brown	Water	1 Layer
28 May 03	56861	21-03-319	*L (5 ml)*	02 June 03	04 June 03	40 PSI	66 Degrees	Dark Brown	Water	1 Layer
		21-03-320	*N (7 gr)*	02 June 03	04 June 03			Dark Brown	Water	1 Layer
		21-03-321	*S (5 gr)*	02 June 03	04 June 03			Reddish Brown	Ear Wax	1 Layer
	43395	21-03-322	*L (4.5 ml)*	02 June 03	04 June 03	45 PSI	88 Degrees	Black	Water	1 Layer
		21-03-323	*N (6 gr)*	02 June 03	04 June 03			Reddish	Fine Sand	2 Layers
		21-03-324	*S (5 gr)*	02 June 03	04 June 03			Reddish	Mud	1 Layer

Date Collected	TC Number	Sample Number	Sample Type (Size)	Date Packaged	Date Shipped To ECBC	TC Pressure (psi)	TC Temp (° F)	Color	Consistency	Phase
29 May 03	49972	21-03-325	*L (5 ml)*	02 June 03	04 June 03	62 PSI	77 Degrees	Dark Brown	Water	1 Layer
		21-03-326	*N (7 gr)*	02 June 03	04 June 03			Dark Brown Light Brown	Gritty	2 Layers
		21-03-327	*S (7 gr)*	02 June 03	04 June 03			Red	Clay	1 Layer
		21-03-328	*Gas Canister #1071*		04 June 03	62 PSI 10 PSI				
	41787	21-03-329	*L (5 ml)*	02 June 03	04 June 03	90 PSI	79 Degrees	Dark Brown	Water	1 Layer
		21-03-330	*N (7 gr)*	02 June 03	04 June 03			Dark Brown	Water	1 Layer
		21-03-331	*S (5 gr)*	02 June 03	04 June 03			Dark Brown Light Brown	Sandy	2 Layer
		21-03-332	*Gas Canister #1070*		04 June 03	90 PSI 80 PSI				
	50997	21-03-333	*L (4.5 ml)*	02 June 03	04 June 03	10 PSI	88 Degrees	Dark Brown	Water	1 Layer
		21-03-334	*N (5 gr)*	02 June 03	04 June 03			Light Brown	Sandy	1 Layer
		21-03-335	*S (5 gr)*	02 June 03	04 June 03			Dark Brown	Grain	1 Layer
		21-03-336	*Gas Canister #1073*	02 June 03	04 June 03	110 PSI 105 PSI				
30 May 03	8633	21-03-337	*L (5 ml)*	02 June 03	04 June 03	85 PSI	76 Degrees	Black	Water	1 Layer
		21-03-338	*N (9 gr)*	02 June 03	04 June 03			Black	Water	1 Layer
		21-03-339	*S (5 gr)*	02 June 03	04 June 03			Dark Brown	Brownie Dough	1 Layer
		21-03-340	*Gas Canister #1076*		04 June 03	85 PSI 0 PSI				
31 May 03	44485	21-03-341	*L (5 ml)*	02 June 03	04 June 03	30 PSI	75 Degrees	Dark Brown	Water	1 Layer
		21-03-342	*N (7 gr)*	02 June 03	04 June 03			Light Brown Dark Brown	Liquid Sandy	2 Layers
		21-03-343	*S (5 gr)*	02 June 03	04 June 03			Reddish Brown	Clay	2 Layers
		21-03-344	*Gas Canister #1068*		04 June 03	30 PSI 25 PSI				
	17698	21-03-345	*L (4 ml)*	02 June 03	04 June 03	15 PSI	78 Degrees	Dark Brown	Syrup	1 Layer
		21-03-346	*N (9 gr)*	02 June 03	04 June 03			Light Brown Greenish Brown	Sandy	2 Layers
		21-03-347	*S (7 gr)*	02 June 03	04 June 03			Light Green Brown	Gravel	2 Layer
		21-03-348	*Gas Canister #1074*		04 June 03	15 PSI 10 PSI				

APPENDIX C
PHOTOGRAPHS
AND DRAWING

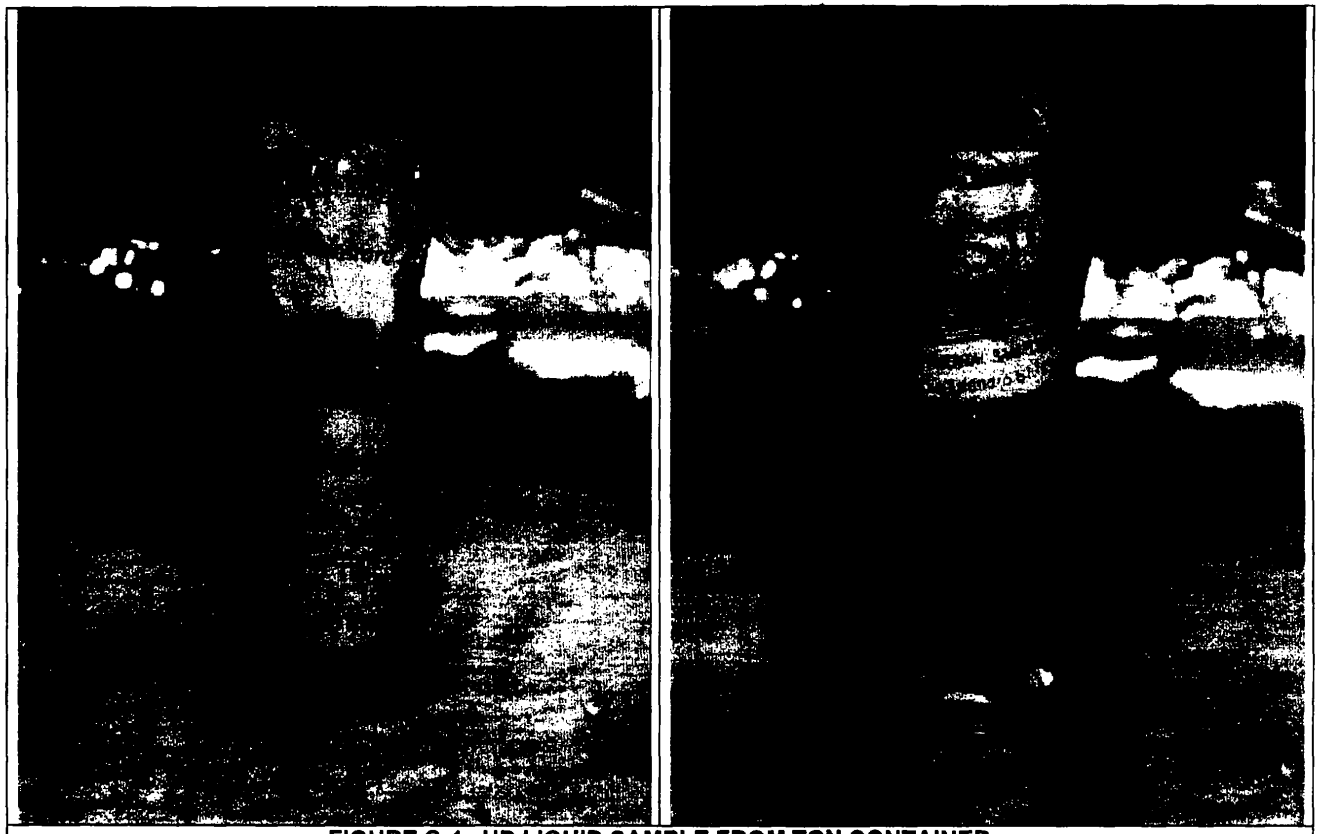

FIGURE C-1. HD LIQUID SAMPLE FROM TON CONTAINER

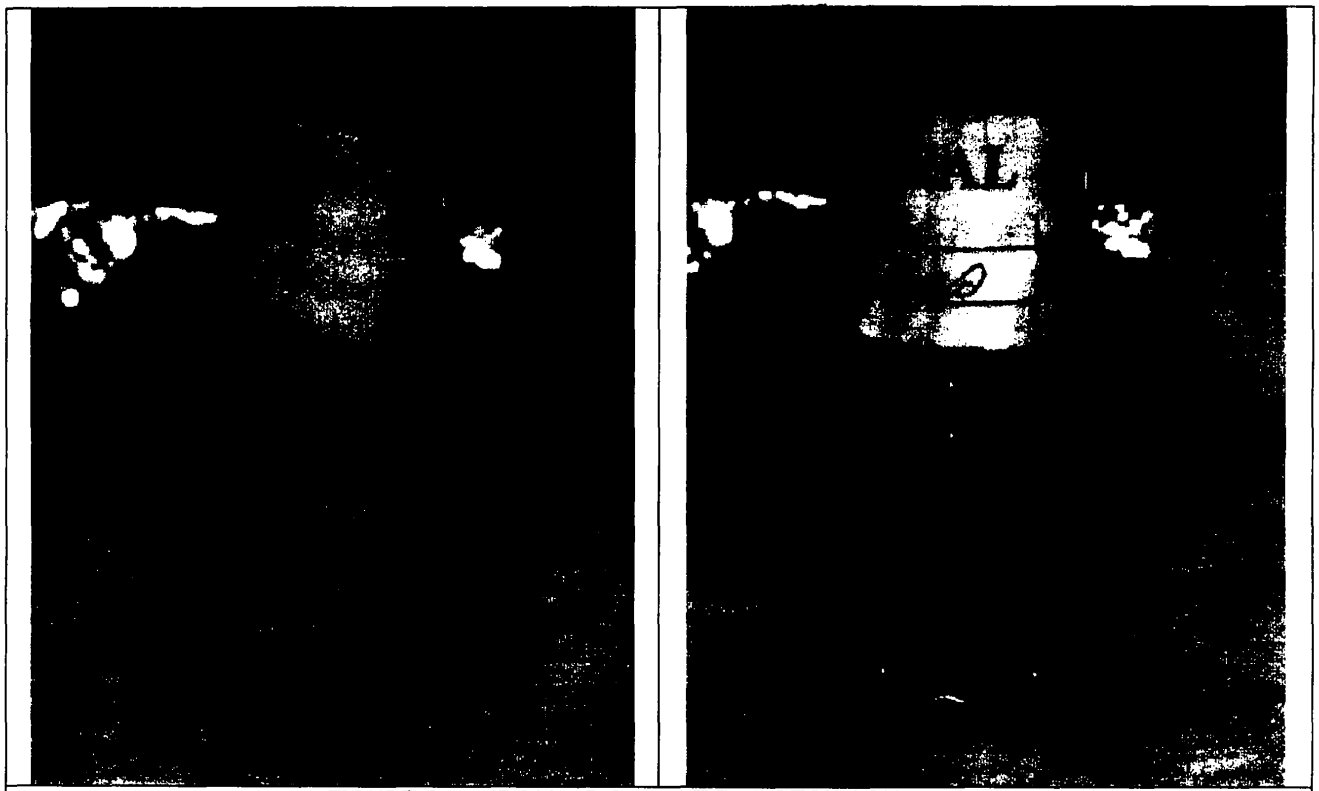

FIGURE C-2. HD LIQUID SAMPLE FROM TON CONTAINER

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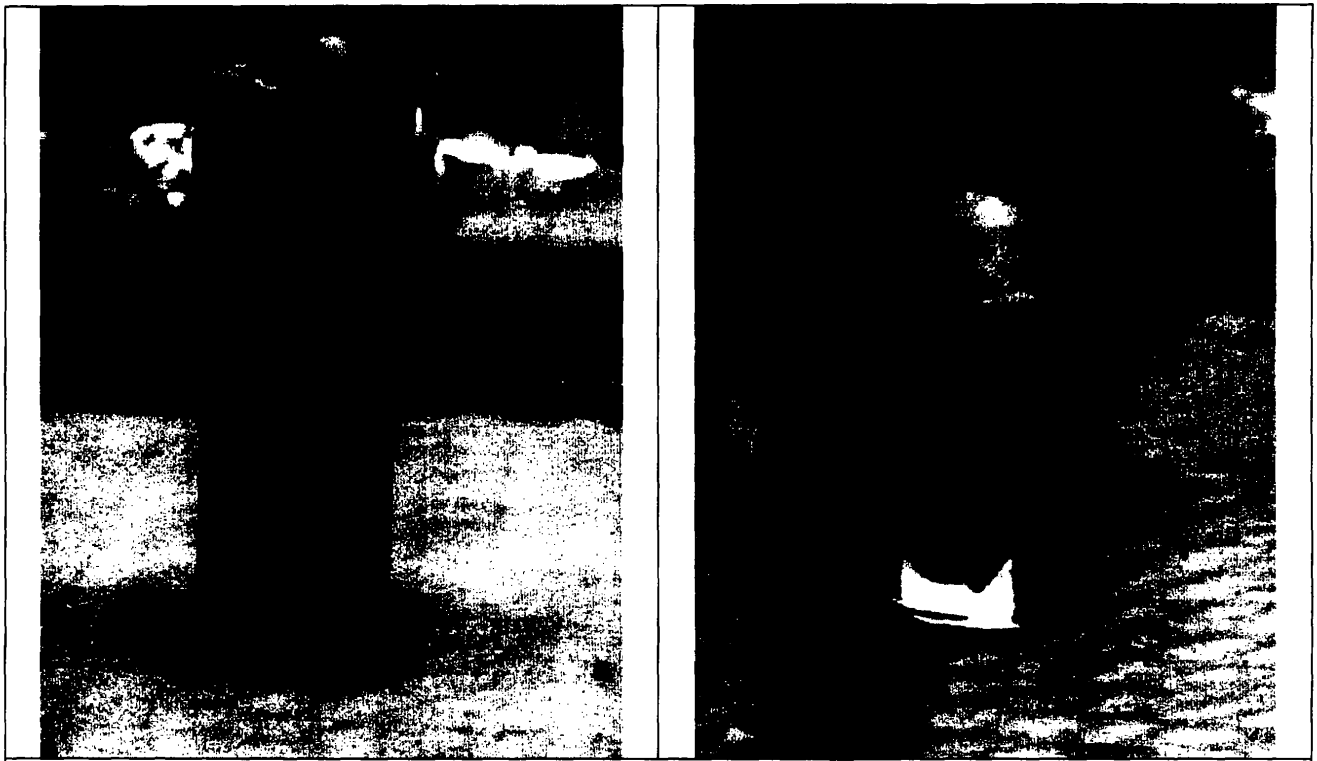

FIGURE C-3. HD NON-COHESIVE SAMPLE FROM TON CONTAINER

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FIGURE C-4. HD SOLID SAMPLE FROM TON CONTAINER

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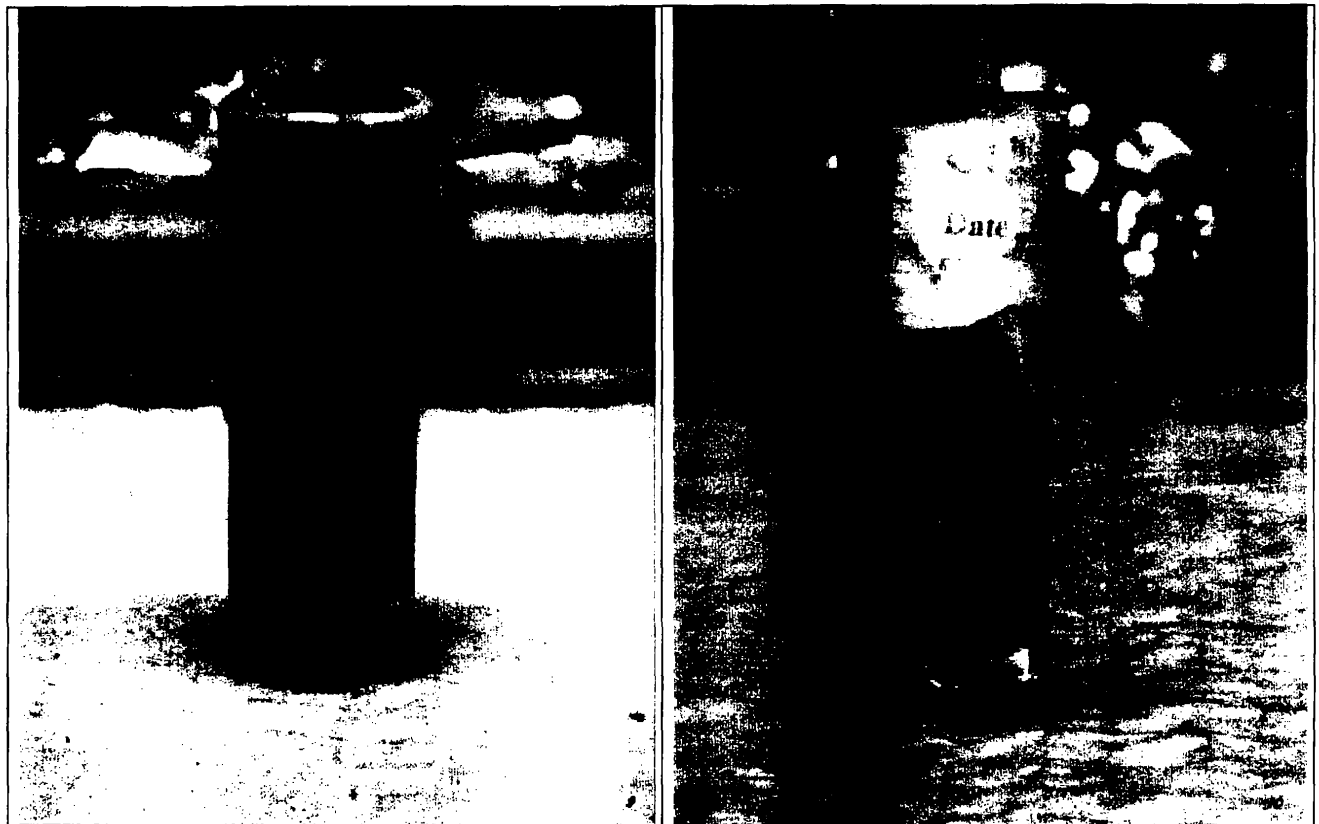

FIGURE C-5. HD SOLID SAMPLE FROM TON CONTAINER

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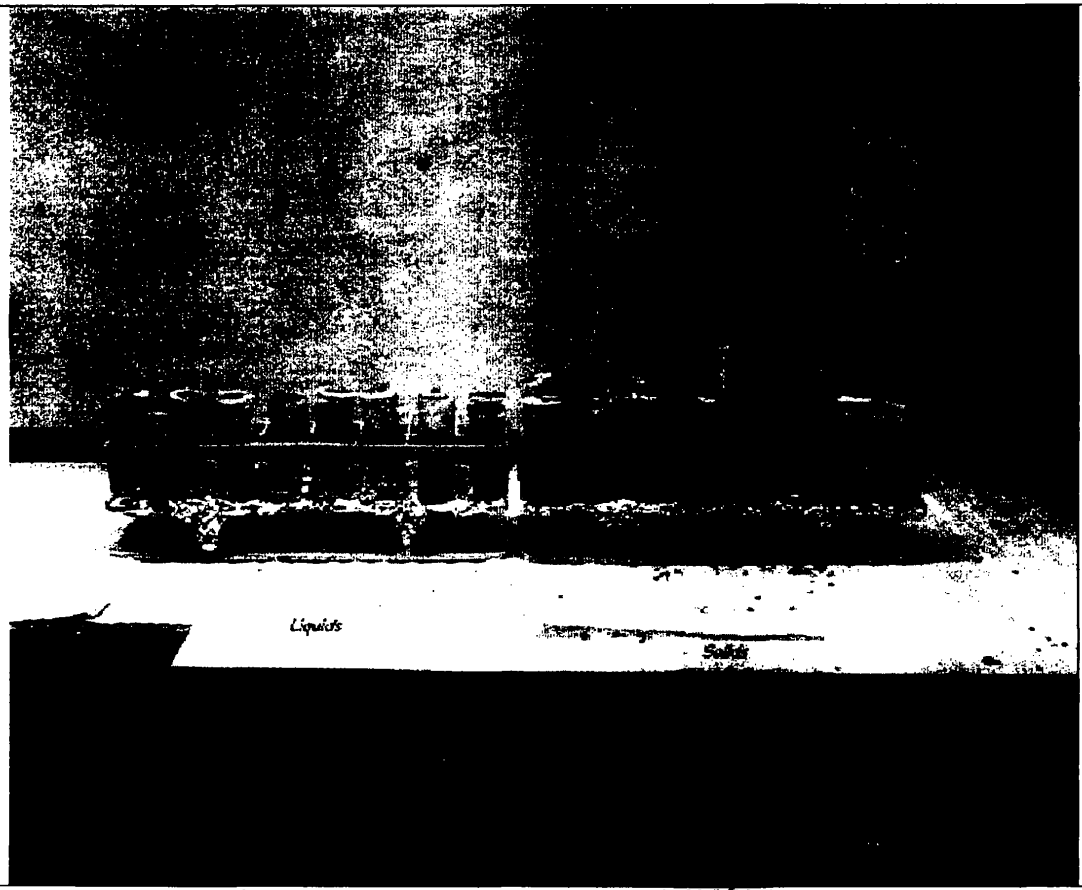

FIGURE C-6. HD SAMPLES READY TO BE PACKAGED FOR SHIPMENT

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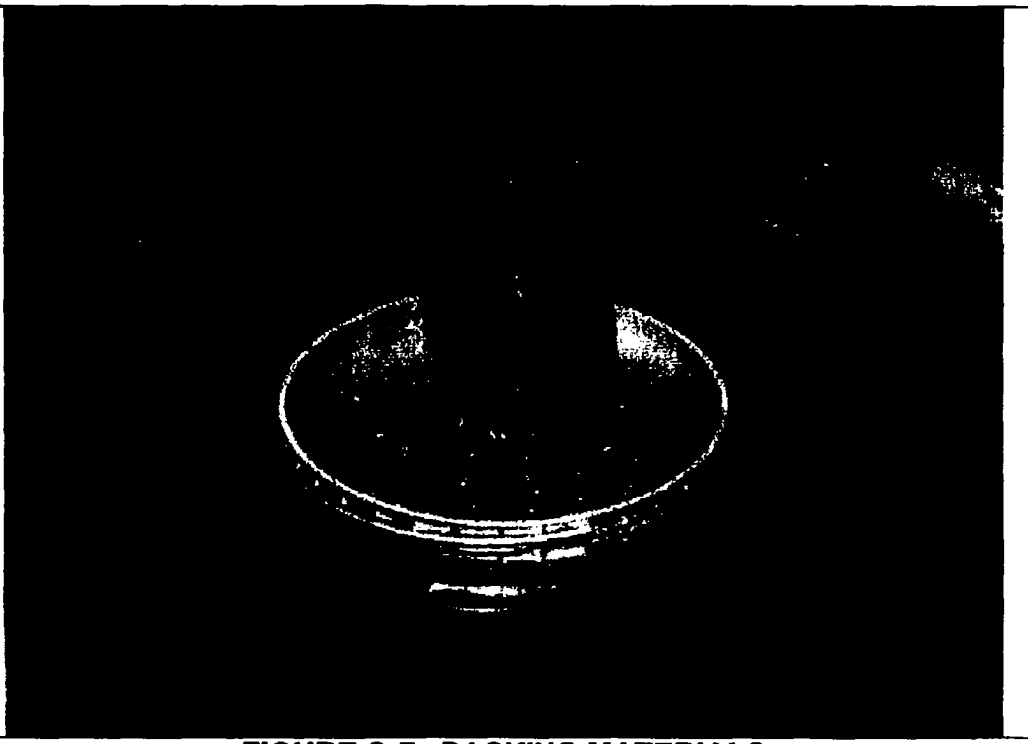

FIGURE C-7. PACKING MATERIALS

FIGURE C-8. SAMPLE PACKAGING TUBES AND LABELS

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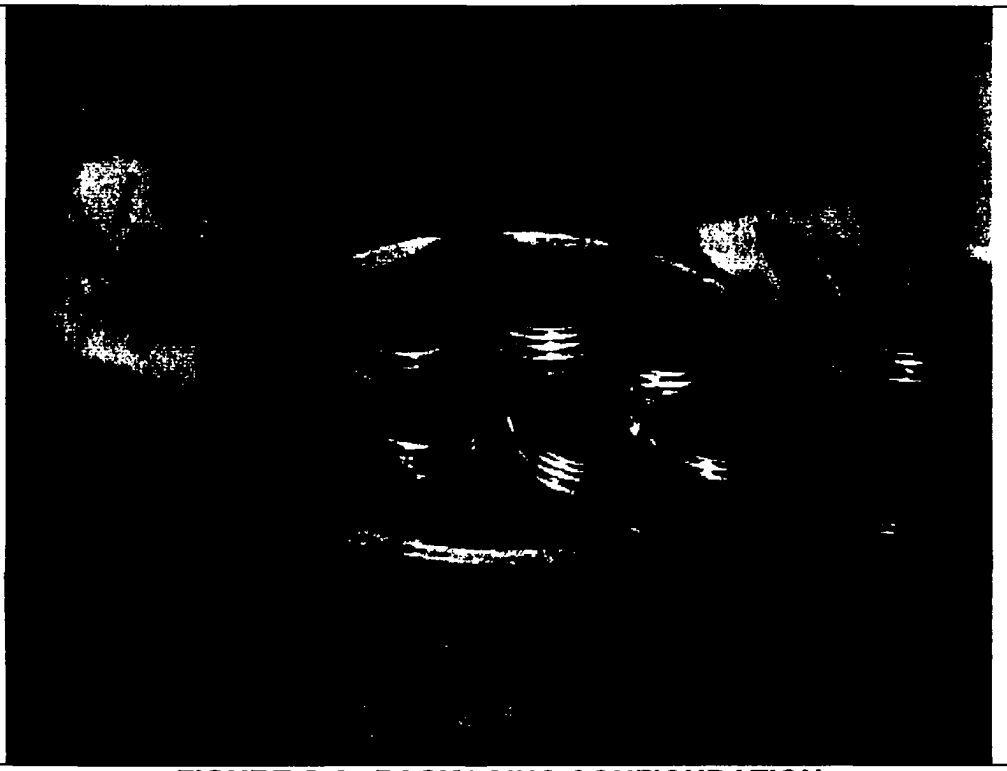

FIGURE C-9. PACKAGING CONFIGURATION

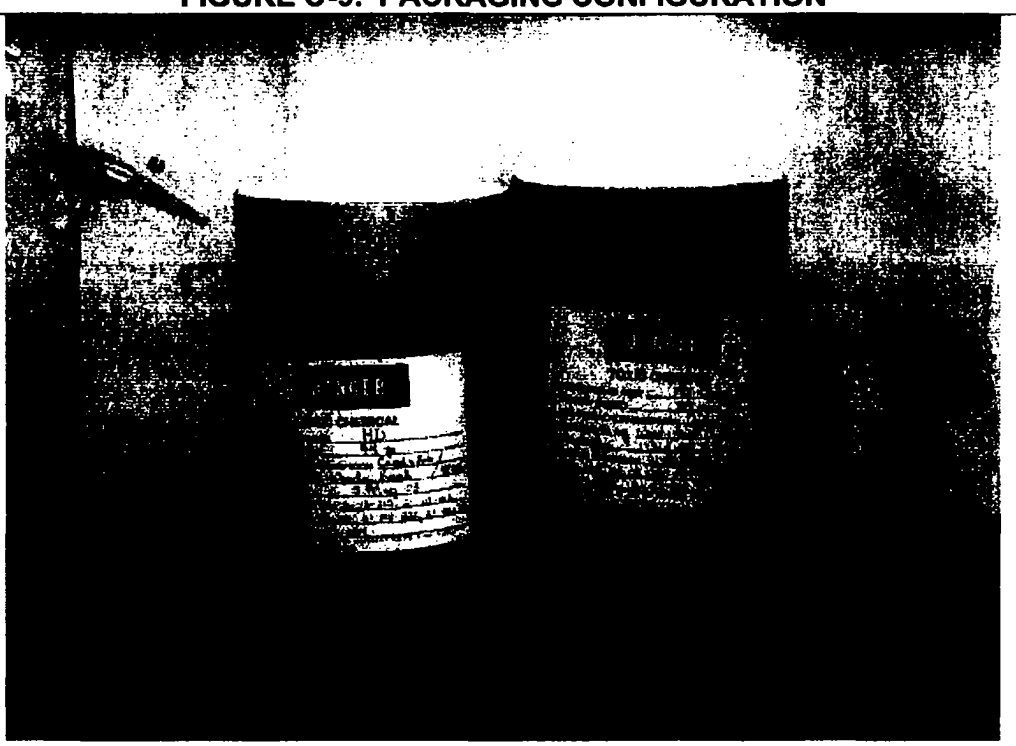

FIGURE C-10. HD SAMPLES PACKAGED FOR SHIPMENT

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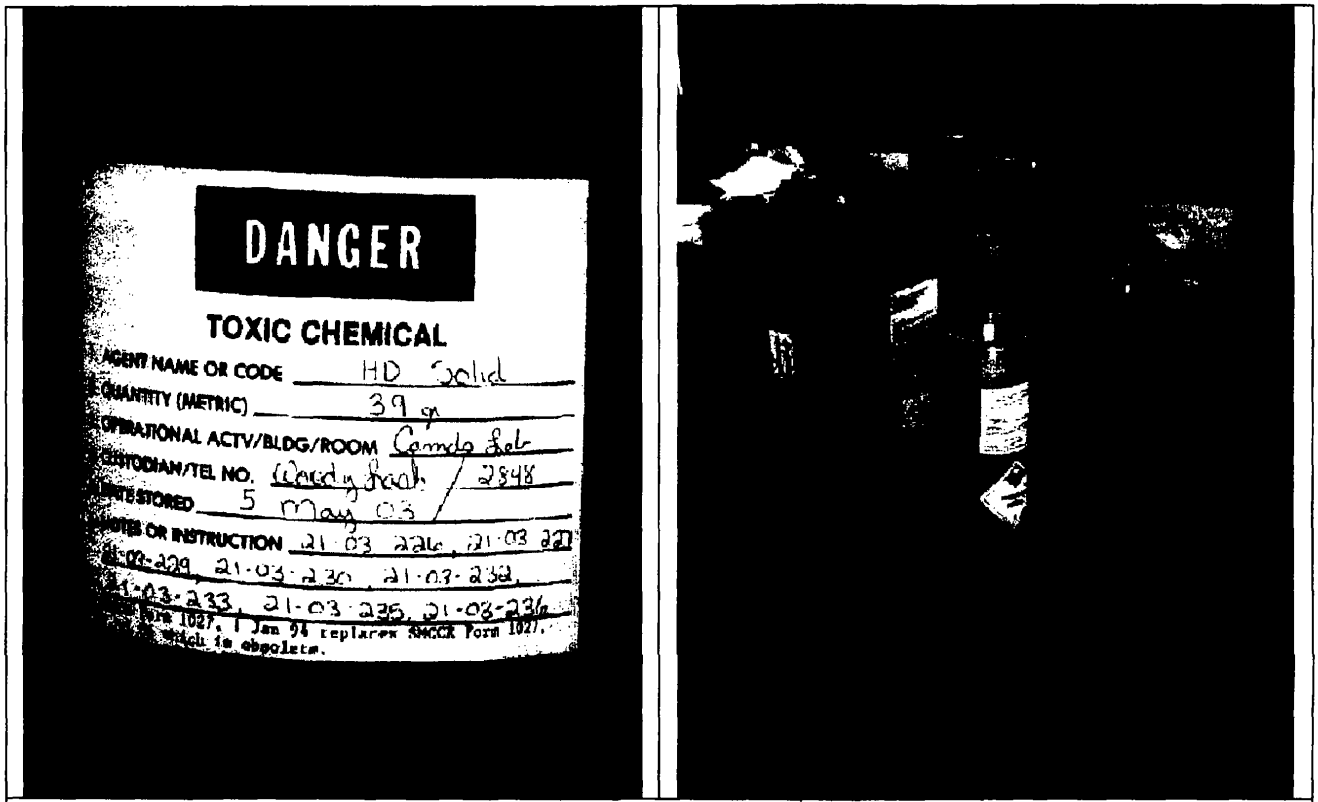

FIGURE C-11. LABELING AND SHIPPING OVERPACKS

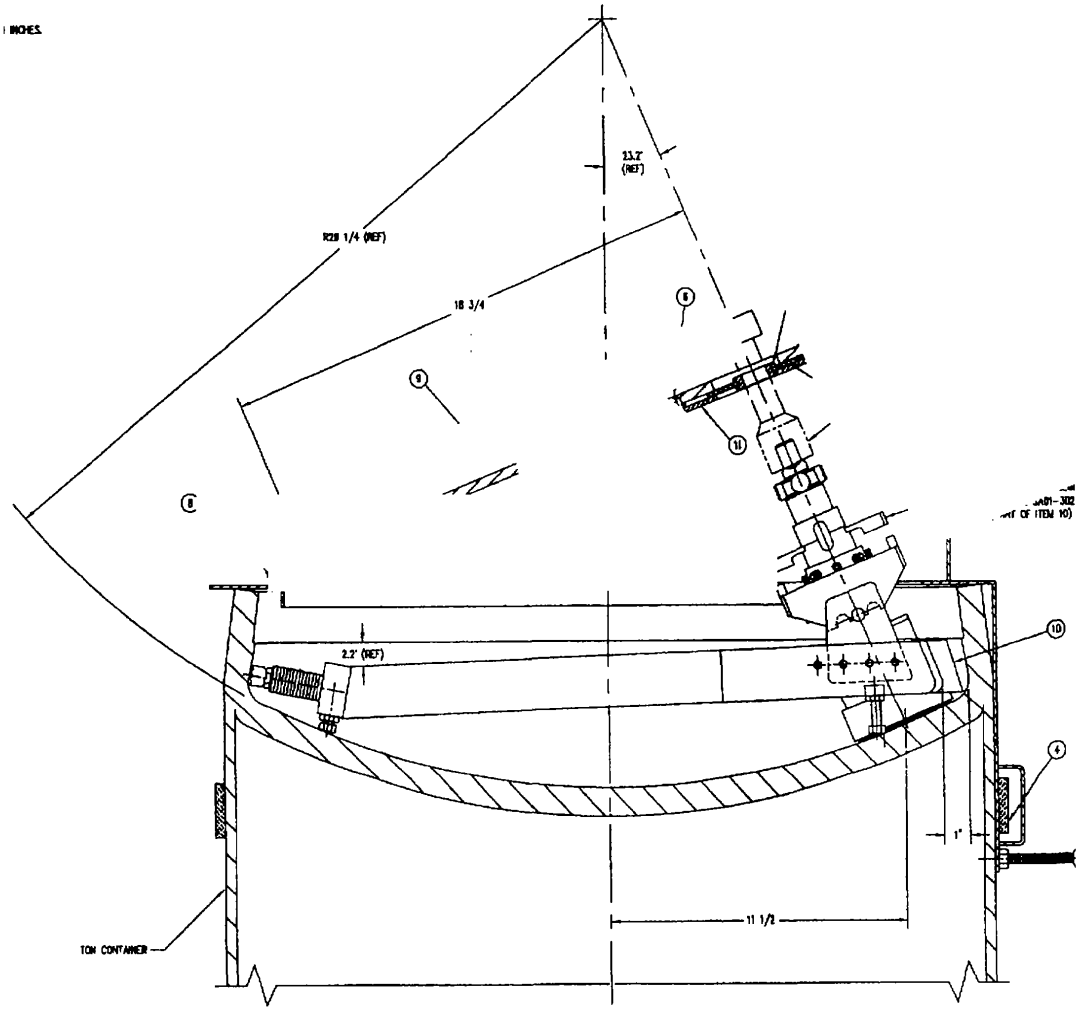

FIGURE C-12. PRESURE TEST AND RELEIF DEVICE

APPENDIX D
DOCUMENTATION

Date_____ Page 1 of 2

LIMITING CONDITIONS FOR OPERATIONS
HD TON CONTAINER SAMPLING

DAILY-BEFORE PROCESSING

A. Site Preparation	Yes/No	Init.
1. Medical Support Present	_____	_____
2. CAIC Personnel on duty	_____	_____
3. Laboratory Support on line (LCO Present at CMO)	_____	_____
4. Down Wind Hazard does not exceed Depot Boundaries	_____	_____
5. Three sources of electrical power available for filters	_____	_____
6. Monitoring System operating in accordance with Acceptance/rejections Guidelines for MDF/BIF HD TCs IAW the Site Monitoring Plan 49-03	_____	_____
7. PA System working	_____	_____
8. Evacuation Bus operational	_____	_____
9. All CMO clocks (Graphic Computers, CCTV, and LED) are set to correct time, Ref. A900 clock.	_____	_____
B. Plant Operations		
1. Primary Filter flow adequate (Main manifold pressure at -4.0 iwc (+ or -) -0.5 iwc (SOP OPN 99-00-99-04)	_____	_____
2. Back Up filter available for use	_____	_____
3. MDF/BIF Area Ventilation Alarm turned OFF)	_____	_____
4. Decon supply proper and adequate (DA PAM 385-61)	_____	_____
5. Two or more Plant Air Compressors on-line	_____	_____
6. LSS Air Certified to operational Areas	_____	_____
7. CMO MDF Fire panel Operational	_____	_____

FIGURE D-1. LIMITING CONDITIONS OF OPERATION FOR THE BIF (PAGE 1)

Date _____ Page 2 of 2

LIMITING CONDITIONS FOR OPERATIONS

HD TON CONTAINER SAMPLING

DAILY-BEFORE PROCESSING

	Yes/No	Init.
9. Temp' inside the MDF/BIF is acceptable for DPE Entry	_____	_____
10. Emergency Doors available for use	_____	_____
11. Signs and Placards posted	_____	_____
12. The MDF/BIF building is Ready for operation	_____	_____

C. Review (Compliance Inspector Section)

1. Are any (Limiting Conditions) not Met.	_____	_____

Control Room Operator Signature:

_____

Compliance Inspector (QC Branch) Signature:

_____

Condition not Met.

_____

_____

_____

.....

Operate with one or more (LCOs) not Met.

Shift Supervisor Signature

_____

Safety Representative Signature

FIGURE D-2. LIMITING CONDITIONS OF OPERATION FOR THE BIF (PAGE 2)

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AMMUNITION TRANSFER RECORD, DA FORM 4508, MAY 76.

AMMUNITION TRANSFER RECORD
For use of this form, see TM743-700-1, the proponent agency is AMC

DATE PREPARED | CONTROL NUMBER

FROM: STOCK NUMBER | NOMENCLATURE | TO: STOCK NUMBER | NOMENCLATURE

SERIAL/LOT NUMBER: SERIAL	SERIAL/LOT NUMBER: LOT	COND	SITE LOCATION	GRID LOCATION	RESITE	T/S	L/C	METH	MGR.	QUANTITY	NO PKG	UP QTY	SERIAL/LOT NUMBER: SERIAL	SERIAL/LOT NUMBER: LOT	COND	SITE LOCATION	GRID LOCATION	RESITE	T/S	L/C	METH	MGR	QUANTITY	NO. PKG	UP QTY

REMARKS

TYPE OF ACTION
- ☐ LOCATION CHANGE
- ☐ SERIAL/LOT NUMBER CHANGE
- ☐ STOCK NUMBER CHANGE
- ☐ RECLASSIFICATION
- ☐ OTHER
- ☐ ITEM DATA CHANGE

SIGNATURE OF FOREMAN/CHECKER/INSPECTOR | DATE OF ACTION

APPROVED/DATE

APPROVED/DATE

DA FORM 4508, MAY 76

FIGURE D-3. DA FORM 4508

ANALYSIS REPORT

FROM. RM DIVISION

TO: CAMDS ANALYTICAL BRANCH,
CAMDS LAB or _____

Requester and Phone No: _____ Date: _____

Sample Time: _____ Sample No: _____ Lab Log: _____

Location: _____ Type: (1) Liquid _____ (2) Bubbler _____

_____ (3) Solid _____ (4) HCSS _____

_____ Flow Rate: _____

Hazardous Waste Sheet No: _____ Sample Duration: _____

Date Results Required _____ Contact QC Inspector with the results at X4518

1. _____ GB by GCMSD _____ mg/m³
2. _____ GB by GC _____ ng/mL
3. _____ VX by GCMSD _____ mg/m³
4. _____ VX by GC _____ ng/mL
5. _____ HD by GCMSD _____ ng/mL
6. _____ HD by GC _____ ng/mL
7. _____ pH _____
8. _____ % NaOH _____ (Sodium Hydroxide)
9. _____ %Na2CO3 _____ (Sodium Carbonate)
10. _____ % NaHCO3 _____ (Sodium Bicarbonate)
11. _____ % NaHCl _____ (Sodium Hypochlorite)
12. _____ % Glycol _____
13. _____ % Chlorine _____
14. _____ % Moisture _____
15. _____ Specific Gravity _____
16. _____ Dissolved Solids _____
17. _____ Suspended Solids _____
18. _____ GC Mass Spec Analysis _____
19. _____ Ignitability _____
20. _____ TOG _____
21. _____ Liquids Test _____
22. _____ Other Analysis as noted _____
23. _____ Hold Sample for _____

Analysis reported to: _____ Date _____ Time _____

Analysis performed by _____ Date: _____

Analysis reviewed by: _____ Date: _____

Submitted by: _____ Date: _____

Chief, Analytical Branch _____ Date: _____

CHAIN OF CUSTODY:

Collector: _____ Phone No. _____ Date _____

Time: _____ Sample preservation: _____

Sample Deficiencies Noted During Collection: _____

_____

_____

Released by: _____ Received by: _____

Date: _____ Time: _____

Released by: _____ Received by: _____

Date: _____ Time: _____

Released by: _____ Received by: _____

Date: _____ Time: _____

Sample disposition by: _____ Phone No: _____

Date: _____ Time: _____

SCDTE Form 2350-R-E, 15 July 97, Rev 09 May 00

FIGURE D-4. FORM 2350, ANALYSIS REPORT

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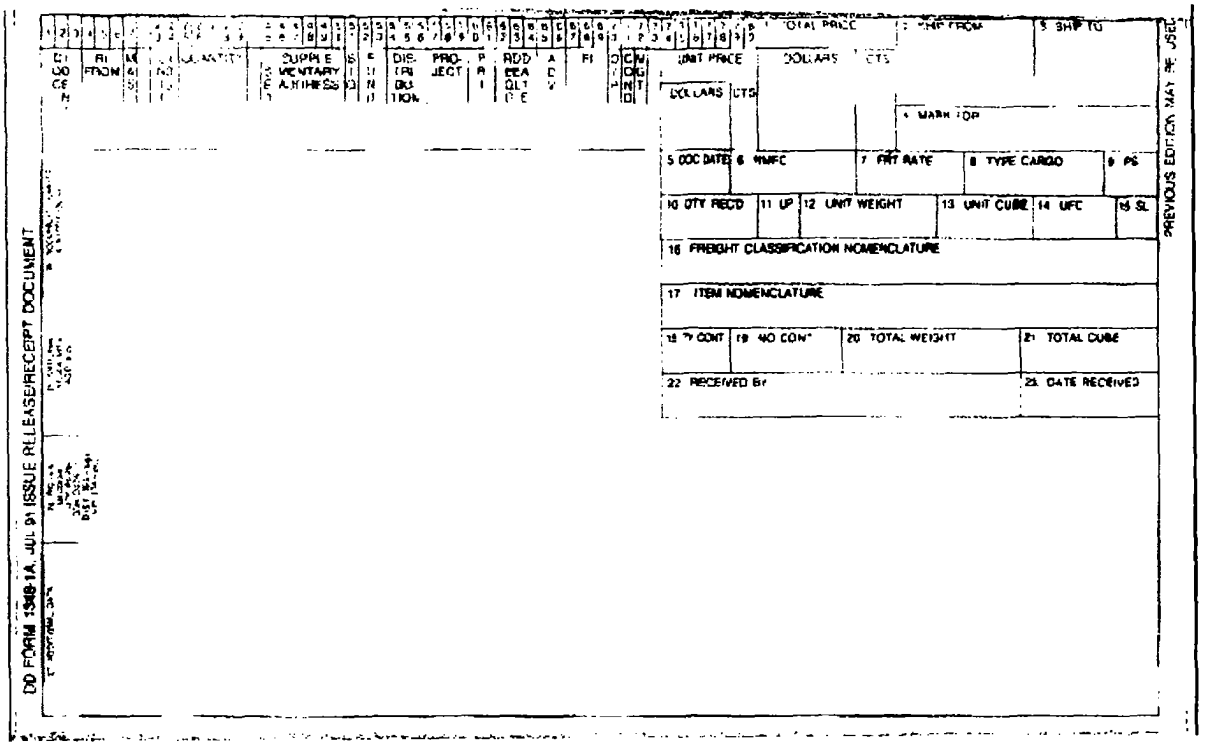

FIGURE D-5. DD FORM 1348

HD TC SAMPLING DATA COLLECTION SHEET

DATE **TIME**

DATA	SAMPLE	
SAMPLE NUMBER		
HD TC LOT NUMBER		
HD TC SERIAL NUMBER		
SAMPLE SIZE (mL)		
COLOR (Light/Dark)[1]		
CONSISTENCY[2]		
PHASE[3]		
TON CONTAINER TEMPERATURE		
[1]Color = Yellow Brown Red Black	[2]Consistency = Foam Water Honey Solid	[3]Phase = 1 layer 2 layers 3 layers
TC = Ton container, mL = milliliter, AMB. = ambient		
ENTRY SUPERVISOR'S SIGNATURE		
DPE SAMPLE COLLECTOR'S SIGNATURE		
DPE SAMPLE COLLECTOR'S SIGNATURE		

FIGURE D-6. HD TON CONTAINER SAMPLING DATA SHEET

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APPENDIX E
REFERENCES

APPENDIX E. REFERENCES

SECTION 1. CAMDS SITE SOPs.

1. LAB 66-00-00-15, C2, *Agent Transfer, Unpack and Repack for Shipment*, 25 September 2002.

2. LAB 66-00-01-04, R4, *Agent Storage Inventory Control and Transfer Operations*, 15 July 2002.

3. LAB 66-00-01-05, R1, *Instructions For Neutralizing Neat Agent For Decontamination And Disposal*, 25 June 2002.

4. LAB 66-00-04-01, C2, Storage, Handling And Use Of Compressed Gas Cylinder, 24 September 2002.

5. LAB 66-03-01-01, C1, *Analysis of HD HCSS/NRT Tubes*, 30 April 2002.

6. LAB 66-03-01-02, C1, *Analysis of HD Liquid Waste, Brine Salts, and Furnace Ash Samples*, 30 April 2002.

7. OPN 19-00-05-01, R4, C5, Receiving and Transferring Waste Liquids in the Toxic Maintenance Facility (TMF), 01 October 2002.

8. OPN 95-07-07-01, R2, C4, *Processing TC(s) from the BIF and ECC No. 1 UPA*, 03 October 2002.

9. OPN 99-00-99-04, R5, *Startup of CAMDS Site*, 28 October 2002.

10. OPN 99-00-99-05, R6, C5, *Transferring SDS to TMF and or BDA*, 07 November 2001.

11. SOP TT-0000-L-145, R3, *Transportation*, 10 September 2001.

SECTION 2. OTHER APPLICABLE DOCUMENTS.

1. Site Plan 49-01N, *Analytical Branch Quality Control Plan*, 17 October 2001.

2. Site Plan 49-03M, *Laboratory Support Division Monitoring Branch Quality Control Plan*, 29 August 2001.

3. Army Regulation (AR) 50-6, 01 February 1995.

4. DA PAM 385-61, *Toxic Chemical Agent Safety Standards*, 31 March 1997.

5. 40 CFR Part 63, Subpart EEE, 01 July 2000.

6. RCRA Part B Permit, 26 September 1999.

APPENDIX F
GLOSSARY

APPENDIX F. GLOSSARY

Section 1. Abbreviations

ACAMS	Automatic Continuous Air Monitoring System
AR	Army Regulation
CFR	Code of Federal Regulations
CMO	Control Module Operator
DA	Department of Army
DAAMS	Depot Area Air Monitoring System
DCD	Deseret Chemical Depot
DD	Department Of Defense
DPE	Demilitarization Protective Ensemble
ECBC	Edgewood Chemical Biological Center
ECC	Explosive Containment Cubical
HW	Hazardous Waste
IAW	In Accordance With
LAB	CAMDS Laboratory
LCO	Limiting Conditions of Operation
LOQ	Limit of Quantification
MDF/BIF	Multipurpose Demilitarization Facility/Bulk Item Facility
MHA	Munition Holding Area
OPCW	Organization for the Prohibition of Chemical Weapons
OPN	Operations
RCRA	Resource Conservation and Recovery Act
RSA	Residual Storage Area
SOP	Standing Operating Procedure
SS	Stainless Steel
TOCDF	Tooele Chemical Disposal Facility
TC	Ton Container
TWA	Time Weighted Average
UPA	Unpack Area

Section 2. Terms

° C	Degrees Celsius
cS	Centistoke
®	Registered Trademark
HD	Chemical Agent Distilled Mustard, bis-(2-chloroethyl) sulfide
GB	Isopropylmethylphosphonofluoridate (Sarin)
iwc	inches water column
L	Liquid sample from upper third of ton container
N	Sample from Non-cohesive layer of ton container

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N_2	Nitrogen
psig	Pounds Per Square Inch Gauge
scfm	standard cubic feet per minute

SECTION 3. Special Abbreviations And Terms

LOQ	Limit of Quantification. The lowest (target) analyte concentration that 97.5% (1-A) of the time results in 97.5% (1-B) confidence that the agent is detected by the method or monitoring system. Where A is the risk that agent is present but not reportable, by the method or monitor, and B is the risk that agent is reportable by the method or monitor when no agent is present. This limit can be determined graphically from the upper and lower limits of the 95% confidence interval around the regression line, $6.1 \times {}^{10\text{-}4}$ mg/m^3 for chemical agent HD.
TWA	Time Weighted Average. The airborne agent concentration to which unprotected personnel may be repeatedly exposed for 8 hours per day, 5 days per week, for a working lifetime without adverse health risk effects. This monitoring level is operationally treated as a ceiling value for the purpose of masking workers at demilitarization facilities. For HD, 1TWA equals 0.003 mg/m^3.

Appendix B

Laboratory Analytical Methods

Appendix B-1

EC/B FAC Method AM-118

Reviewed By:	Approved By:
for James H Newman 4/15/03	Dennis J Reutter 15 April 2003
JAMES C. PETERSON , Ph.D., Date Laboratory Manager, Battelle	STEPHEN E. LAWHORNE, Date Acting Chief, Edgewood C/B FAC
Issue Date: 15 APRIL 2003	

1. TITLE

Determination of Metals in Chemical Agent/Chemical Agent Sludge by Microwave Digestion Inductively Coupled Plasma/ Mass Spectrometry (ICP/MS).

2. AUTHOR

Michael W. Wensing, Ph.D, Battelle Memorial Institute, Edgewood Operations.

3. KEYWORDS

Inductively Coupled Plasma/Mass Spectrometry (ICP/MS). Metals, chemical agent, Aluminum (Al), Antimony (Sb), Arsenic (As), Barium (Ba), Beryllium (Be), Boron (B), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Selenium (Se), Silver (Ag), Tin (Sn), Thallium (Tl), Vanadium (V), Zinc (Zn), Quantitative

4. REVISION HISTORY

Revision 0 – 08 January 2003
Revision 1 – 10 February 2003

5. CONTACT OFFICE

Commander
U.S. Army Soldier and Biological Chemical Command
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6. PURPOSE AND APPLICATION

The purpose of this method is to detect and quantitate Aluminum, Antimony, Arsenic, Beryllium, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese,

Mercury, Nickel, Selenium, Silver, Thallium, Tin, Vanadium, Zinc, in chemical agent/chemical agent sludge samples by ICP/MS. This method is based upon EPA method 6020A Revision 1 entitled "Inductively Coupled Plasma – Mass Spectrometry".

6.1 ANALYTE CONCENTRATION RANGE

The calibration curve analysis ranges from 1 ng/mL to 500 ng/mL for all metals except mercury which ranges from 0.5 ng/mL to 5 ng/mL, Boron which ranges from 10 ng/mL to 10,000 ng/mL, and Aluminum which ranges from 5 ng/mL to 1000 ng/mL. This is equivalent to concentrations from 1 µg/g to 500 µg/g (for all metals except mercury) 0.5 µg/g to 5 µg/g mercury, 10 µg/g to 10,000 µg/g boron, and 5 µg/g to 1000 µg/g for Aluminum in chemical agent/chemical agent sludge samples when 100 mg of chemical agent or chemical agent sludge is digested in the microwave and diluted 1000 fold. Higher concentrations may be quantitated after dilution into range of the calibration curve.

6.2 SAMPLE MATRICES AND INTERFERENCES

The sample matrix is HD or HD sludge. Argon chloride may interfere with the determination of arsenic. Interferences are corrected by using interference equations and verified using an interference check solution spiked with the elements of interest.

6.3 THROUGHPUT

Approximately twenty-four (24) samples can be prepared and analyzed in an eight (8) hour period.

6.4 DETECTION LIMIT

The detection limit is dependent on the analyte and the amount of chemical agent diluted. Results below the detection limit are reported as not detected – "nd". Detection limits for the elements are given in µg analyte/g matrix when 100 mg of chemical agent and chemical agent sludge is diluted 1000x and microwave digested. Table I presents the detection limits and practical quantitation limits for the analytes obtained in CASARM HD, while Table II depicts the detection limits and practical quantitation limits obtained in HD Sludge.

Table I – MDLs, PQLs in CASARM HD

Element (Isotope(s) Used)	MDL (µg/g)	PQL (µg/g)
Aluminum (27)	10.0	50.0
Antimony (121)	0.63	5.00
Arsenic (75)	1.22	5.00
Barium (137)	0.43	5.00
Beryllium (9)	0.90	5.00
Boron (11)	3.74	10.00
Cadmium (111)	0.41	5.00
Chromium (52)	1.29	5.00
Cobalt (59)	0.27	1.00
Copper (63)	2.43	5.00
Lead (206, 207, 208)	0.41	5.00
Manganese (55)	0.32	1.00
Mercury (199, 200, 201, 202)	0.05	0.5
Nickel (60)	0.35	5.00
Selenium (82)	1.17	10.00
Silver (107)	0.47	5.00
Thallium (205)	0.98	5.00
Tin (118)	2.49	10.00
Vanadium (51)	1.00	5.00
Zinc (66)	3.12	10.00

Table II – MDLs, PQLs in HD Sludge

Element (Isotope(s) Used)	MDL (µg/g)	PQL (µg/g)
Aluminum (27)	10.0	50.0
Antimony (121)	0.13	5.00
Arsenic (75)	0.57	5.00
Barium (137)	0.04	5.00
Beryllium (9)	0.05	5.00
Boron (11)	4.00	10.00
Cadmium (111)	0.02	5.00
Chromium (52)	1.00	5.00
Cobalt (59)	0.12	1.00
Copper (63)	3.23	10.00
Lead (206, 207, 208)	1.89	10.00
Manganese (55)	3.30	10.00
Mercury (199, 200, 201, 202)	0.07	0.5
Nickel (60)	0.62	5.00
Selenium (82)	0.71	25.00
Silver (107)	0.06	5.00
Thallium (205)	0.33	5.00
Tin (118)	0.44	10.00
Vanadium (51)	1.00	5.00
Zinc (66)	2.20	10.00

7. RISK AND SAFETY ASSESSMENT

Low risks to the analyst are associated with this method as long as the proper safety precautions are strictly adhered to. Wearing of lab coat, safety glasses, double nitrile gloves is required for handling all solutions, in addition nonstandard butyl gloves or TAP gloves are required when handling any sample with chemical agents at surety levels. Concentrated acid used in this method poses a risk to the analyst and must be handled with care inside of a well-ventilated hood. Chemical agents at Surety and RDT&E levels must be handled with extreme caution and only in an approved hood. Guidelines for handling solvents and agent materiel can be found in WI-090 (Sample Receipt and Handling) and in ERDECR 40-3 (Chemical Hygiene Plan).

8. SCIENTIFIC BASIS

A 100 mg sample of chemical agent is initially diluted 100 fold with concentrated acid. The sample is then subjected to microwave digestion. The sample is then diluted 10 fold more. The sample is analyzed by ICP/MS to determine the concentration of metals using an external standard method of quantitation.

9. TRAINING

The analyst must meet the qualification requirements specified in EC/B FAC operating procedure OP-180. The analyst must have a thorough knowledge of operating a Hewlett Packard (HP) (Agilent) ICP/MS. The analyst must have a thorough knowledge of the ChemStation ICP/MS software. Personnel performing sample preparation activities must have completed training in Basic Chemical Sample Preparation Techniques as defined by the EC/B FAC quality system.

10. APPARATUS

10.1 INSTRUMENTATION

HP (Agilent) 4500 ICP/MS with autosampler (or equivalent)
Mars V Microwave (or equivalent)

10.2 GLASSWARE, MISCELLANEOUS EQUIPMENT AND SUPPLIES

Analytical balance with a readability of 0.1 mg (i.e. 4 decimal places)
Disposable plastic droppers
Polypropylene bottles or equivalent
Polypropylene Graduated Cylinders or equivalent
Polypropylene volumetric flasks, Class B or equivalent
Falcon Tubes, 15 mL and 50 mL or equivalent
Pipettes covering the range 100 uL to 5 mL
Dispensers/Repipettors (10 mL and 5 mL maximum ranges) or equivalent

MARS 5 Microwave or equivalent w/ XP-1500 Plus Vessels or equivalent

10.3 CHEMICALS / STANDARDS

All commercially available standards are supplied with an expiration date of approximately one year from the date of shipment. All solutions generated in-house expire 3 months after the date that they are prepared.

10.3.1 Reagents

Nitric acid, sub-boiled, High Purity Standards, Cat. #SB-HNO3-1L or equivalent
Hydrochloric acid, sub-boiled, High Purity Standards, Cat. #SB-HCL-1L or equivalent
Water, HPLC Grade, Burdick & Jackson, Cat. # AH365-4 or equivalent.

10.3.2 Standards

Note: All standards should be made with plastic containers. Avoid the use of glass volumetric flasks since Pb, at least, is a contaminant.

Solutions from at least *two* different vendors/sources are needed to provide the following metal analytes: Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Thallium, Tin, Vanadium, and Zinc. Calibration solutions are generated from one vendor/source, while spiking solutions and the ICV (Independent Calibration Verification Solution) are obtained from another vendor/source.

An example of one set of solutions, which when combined, can be used to provide the analytes is:

1000 µg/mL Tin solution, ICP-MS Grade, Spex, Catalog # CLSN2-2Y or equivalent
1000 µg/mL Antimony solution, ICP-MS Grade, Spex, Catalog # CLSB7-2Y or equivalent
1000 µg/mL Boron solution, ICP-MS Grade, High Purity Standards, Cat # 10007-4 or equivalent

Multi-element analyte solution, ICP-MS Grade, Spex, Catalog # CLMS-2, or equivalent (contains 10µg/mL: Ag, Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Cs, Cu, Fe, Ga, In, K, Li, Mg, Mn, Na, Ni, Pb, Rb, Se, Sr, Tl, U, V, Zn)

10 µg/mL Hg solution: Spex Catalog # CLHG2-1AY or equivalent.

An example of a second set of solutions (from a different vendor), which when combined, can be used to provide the analytes, is:

Multi-element analyte solution, ICP-MS Grade, Inorganic Ventures, Catalog # BMI-2 (contains 10 µg/mL: Al, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Se, Ag, Tl, V, Zn in 2% HNO3) or equivalent

Multi-element analyte solution, ICP-MS Grade, Inorganic Ventures, Catalog # BMI-3 (contains 100 µg/mL B, 10 µg/mL Sb, Sn, 2% HNO3, trace HF) or equivalent.

1000 µg/mL Hg solution: Inorganic Ventures Catalog # CGHG1-1 or equivalent.

Multi-element Internal Standard containing 10 µg/mL Bi,Ho,In,Li6,Sc,Tb,Y, ICP-MS Grade, Spex, Catalog #CLISS-1 or equivalent

Other Useful Analyte Solutions:

Multi-element analyte solution, ICP-MS Grade, Inorganic Ventures, Catalog # BMI-4 (contains 100 µg/mL: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Se, Ag, Tl, V, Zn, 1000 µg/mL Al in 2% HNO3) or equivalent

Multi-element analyte solution, ICP-MS Grade, Inorganic Ventures, Catalog # BMI-5 (contains 1000 µg/mL B, 100 µg/mL Sb, Sn, 2% HNO3, trace HF) or equivalent.

Interference Check Solutions:

Interference Check Solution 1 containing 10,000 µg/mL Cl, 2,000 µg/mL C, 1000 µg/mL Ca, Fe, K, Mg, Na, P, S, 20 µg/mL Mo, Ti, ICP-MS Grade, Inorganic Ventures, Catalog # BMI-ICS-1 or equivalent

10.3.3 **Reagent Solutions**

4:1 HNO_3/HCl:
Transfer 40 mL conc. nitric acid to a 50 mL polypropylene falcon tube, add 10 mL conc. HCl. Add cap. Mix.

10 % 4:1 HNO_3/HCl
Fill a 500 mL polypropylene class B volumetric flask approximately ½ way with HPLC Grade bottled water. Transfer approximately 50 mL of the 4:1 HNO_3/HCl to the polypropylene Volumetric Flask. Fill to the line with HPLC Grade bottled water. Add cap. Mix. Transfer to 500 mL plastic wash bottle.

10.3.4 **Stock Standard Solutions and Working Solutions**

10.3.4.1 **Used to prepare calibration solutions:**

10.3.4.1.1. 100 µg/mL B, 10 µg/mL Sb, Sn, 0.2 µg/mL Au solution in 10% 4:1 HNO_3/HCl acid (Mixed Analytes Working Solution 1 for Calibration Curve): Tare a 15 mL polypropylene falcon tube. Bring up to approximately 5 mL w/ 10% 4:1 HNO_3/HCl acid. Add 1 mL of 1000 µg/mL High Purity Standards B, Boron. Swirl. Add 20 µL of 100 µg/mL Gold, Au (Spex Catalog # CLAU1-1Y). Swirl. Add 100 µL of 1000 µg/mL High Purity Standards Sb, Antimony. Swirl. Add 100 µL of 1000 µg/mL High Purity Standards Sn, Tin. Swirl. Bring up to 10.0±0.1 g with 10% 4:1 HNO_3/HCl acid. Add falcon tube cap. Mark cap with page and sample number. Swirl for 30 seconds.

10.3.4.1.2. 2.5 µg/mL B , 0.25 µg/mL Sb, Sn, CLMS-2, 0.22 µg/mL Au solution in 10% 4:1 HNO_3/HCl acid (Mixed Analytes Working Solution 2 for Calibration Curve): Tare a 15 mL polypropylene falcon tube. Bring up to approx. 5 mL w/ 10% 4:1 HNO_3/HCl acid. Add 0.25 mL of Mixed Analyte Working Solution I containing 100 µg/mL B, 10 µg/mL Sb, Sn. Swirl. Add 0.25 mL of 10 µg/mL SPEX CLMS-2 solution. Add 20 µL of 100 µg/mL Gold, Au (Spex Catalog # CLAU1-1Y or equivalent). Bring up to 10.0±0.1 g with 10% 4:1 HNO_3/HCl acid. Add falcon tube cap. Mark cap with page and sample number. Swirl for 30 seconds.

10.3.4.1.3. 0.5 µg/mL Hg, 0.2 µg/mL Au in 10% 4:1 HNO_3/HCl acid (Mercury, Hg Calibration Working Solution 1): Tare a 15 mL polypropylene falcon tube. Bring up to approximately 5 mL w/ 10% 4:1 HNO_3/HCl acid. Add 20 µL 100 µg/mL Au (Spex Catalog # CLAU1-1Y or equivalent). Add 0.5 mL of 10 µg/mL Mercury, Hg (Spex CLHG2-1AY or equivalent). Bring up to 10.0±0.1 g with 10% 4:1 HNO_3/HCl acid. Add falcon tube cap. Mark cap with page and sample number. Swirl for 30 seconds.

10.3.4.2 **Used to prepare Spiking Solutions and Independent Calibration Verification Working Solution:**

10.3.4.2.1. 10 µg/mL Hg, 0.2 µg/mL Au in 10% 4:1 HNO_3/HCl acid (Spiking Stock Solution 1): Tare a 15 mL polypropylene falcon tube. Bring up to approximately 5 mL w/ 10% 4:1 HNO3/HCl acid. Add 0.1 mL of 1000 µg/mL Inorganic Ventures, Hg, Mercury. Swirl. Add 20 µL of 100 µg/mL Gold, Au (Spex

Catalog # CLAU1-1Y or equivalent). Swirl. Bring up to 10±0.1 g w/ 10% 4:1 HNO3/HCl acid. Swirl for 30 seconds.

10.3.4.2.2. 1 µg/mL metals, 10 µg/mL Al, B, 0.2 µg/mL Hg, 0.22 µg/mL Au in 10% 4:1 HNO_3/HCl acid (Spiking Working Solution 1): Tare a 15 mL polypropylene falcon tube. Bring up to approximately 5 mL w/ 10% 4:1 HNO_3/HCl acid. Add 0.1 mL of Inorganic Ventures BMI-4 (contains 100 µg/mL: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Se, Ag, Tl, V, Zn, 1000 µg/mL Al in 2% HNO3). Swirl. Add 0.1 mL of BMI-5 (contains 1000 µg/mL B, 100 µg/mL Sb, Sn, 2% HNO3, trace HF). Swirl. Add 0.2 mL of 10 µg/mL Hg solution created above. Swirl. Add 0.020 mL of 100 µg/mL Au. Swirl. Bring up to 10±0.1 g w/ 10% 4:1 HNO_3/HCl acid. Swirl for 30 seconds.

10.3.4.2.3. 10 µg/mL metals, 100 µg/mL Al, B, 0.5 µg/mL Hg, 2 µg/mL Au, in 10% 4:1 HNO_3/HCl acid (Spiking Working Solution 2): Tare a 50 mL polypropylene Falcon tube. Add approximately 25 mL 10% 4:1 HNO_3/HCl acid. Add 2.5 mL Spiking Stock Solution 1 (contains 10 µg/mL Hg, 0.2 µg/mL Au in 10% 4:1 HNO_3/HCl acid). Add 1 mL of 100 µg/mL Au, Spex CLAU1-1Y. Add 5 mL of Inorganic Ventures BMI-4 (contains 100 µg/mL: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Se, Ag, Tl, V, Zn, 1000 µg/mL Al in 2% HNO3). Add 5 mL of Inorganic Ventures BMI-5 (contains 1000 µg/mL B, 100 µg/mL Sb, Sn, 2% HNO3, trace HF). Bring up to 50.0±0.5 g w/ 10% 4:1 HNO_3/HCl acid. Add cap. Swirl for 30 seconds.

10.3.4.2.4. 10 µg/mL metals, 100 µg/mL Al, B, 2.5 µg/mL Hg, 0.2 µg/mL Au in 10% 4:1 HNO_3/HCl acid (Spiking Working Solution 3): Tare a 50 mL polypropylene Falcon tube. Add approximately 25 mL 10% 4:1 HNO_3/HCl acid. Add 125 µL of 1000 µg/mL Hg (Inorganic Ventures CGHG-1). Add 100 µL of 100 µg/mL Au, Spex CLAU1-1Y. Add 5 mL of Inorganic Ventures BMI-4 (contains 100 µg/mL: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Se, Ag, Tl, V, Zn, 1000 µg/mL Al in 2% HNO3). Add 5 mL of Inorganic Ventures BMI-5 (contains 1000 µg/mL B, 100 µg/mL Sb, Sn, 2% HNO3, trace HF). Bring up to 50.0±0.5 g w/ 10% 4:1 HNO_3/HCl acid. Add cap. Swirl for 30 seconds.

10.3.5 **Preparation of Calibration standard solutions, Independent Calibration Verification solution, Interference Check Solution Blank, Interference Check Solution Spike:**

10.3.5.1 1.000 µg/mL metals, 10 µg/mL B, 0.000 µg/mL Hg Calibration Solution, 0.100 µg/mL I.S. in 10% 4:1 HNO_3/HCl acid (Note this standard is necessary when analyzing sludges only):
Tare a 50 mL Falcon Tube. Bring up to approximately 25 mL with 10% 4:1 HNO_3/HCl acid. Add 5.0 mL of Mixed Analyte Working Solution 1 containing 10 µg/mL Sb, Sn, 100 µg/mL B. Add 5.0 mL of 10 ug/mL SPEX CLMS-2 metals solution. Swirl. Add 0.5 mL of 10 µg/mL SPEX CLISS-1 internal standard solution. Swirl. Add 100 µL of 100 µg/mL Au (Spex Catalog # CLAU1-1Y or equivalent). Swirl. Bring up to 50.0±0.5 g w/ 10% 4:1 HNO_3/HCl acid. Add cap. Swirl for 30 seconds.

10.3.5.2 0.500 µg/mL metals, 5 µg/mL B, 0.000 µg/mL Hg Calibration Solution 0.100 µg/mL I.S in 10% 4:1 HNO_3/HCl acid (Note this standard is necessary when analyzing sludges only):
Tare a 50 mL Falcon Tube. Bring up to approximately 25 mL with 10% 4:1 HNO_3/HCl acid. Add 2.5 mL of Mixed Analyte Working Solution 1 containing 10 µg/mL Sb, Sn, 100 µg/mL B. Add 2.5 mL of 10 ug/mL SPEX CLMS-2 metals solution. Swirl. Add 0.5 mL of 10 µg/mL SPEX CLISS-1 internal standard solution. Swirl. Add 100 µL of 100 µg/mL Au (Spex Catalog # CLAU1-1Y or equivalent). Swirl. Bring up to 50.0±0.5 g w/ 10% 4:1 HNO_3/HCl acid. Add cap. Swirl for 30 seconds.

10.3.5.3 0.100 µg/mL metals, 1 µg/mL B, Calibration Solution, 0.005 µg/mL Hg 0.100 µg/mL I.S in 10% 4:1 HNO_3/HCl acid: Tare a 50 mL falcon tube. Bring up to approximately 25 mL with 10% 4:1 HNO_3/HCl acid. Add 0.5 mL of Mixed Analyte Working Solution 1 containing 10 ug/mL Sb, Sn, 100 ug/mL B. Add 0.5 mL of 10 µg/mL SPEX CLMS-2 metals solution. Swirl. Add 0.5 mL of 10 µg/mL SPEX CLISS-1 internal standard solution. Swirl. Add 100 µL of 100 µg/mL Au (Spex Catalog # CLAU1-1Y or equivalent). Swirl. Add 0.5 mL of the 0.5 µg/mL Hg Calibration Working Solution 1. Bring up to 50.0±0.5 g w/ 10% 4:1 HNO_3/HCl acid. Add cap. Swirl for 30 seconds.

10.3.5.4 0.050 µg/mL metals, 0.500 µg/mL B, 0.004 µg/mL Hg Calibration Solution, 0.100 µg/mL I.S.: Repeat steps above but add 0.250 mL of Mixed Analyte Working Solution 1 containing 10 µg/mL Sb, Sn, and 100 µg/mL B, 0.250 mL of the 10 µg/mL SPEX CLMS-2 metals, and 0.4 mL of the 0.5 µg/mL Hg Calibration Working Solution 1.

10.3.5.5 0.025 µg/mL metals, 0.250 µg/mL B, 0.100 µg/mL IS: Repeat steps above but add 0.125 mL of Mixed Analyte Working Solution 1 containing 10

µg/mL Sb, Sn, and 100 µg/mL B, 0.250 mL of the 10 µg/mL SPEX CLMS-2 metals. Do not add Hg Calibration Working Solution 1.

10.3.5.6 <u>0.010 µg/mL metals, 0.100 µg/mL B, 0.0025 µg/mL Hg Calibration Solution, 0.100 µg/mL I.S.:</u> Repeat steps above but add 0.050 mL Mixed Analyte Working Solution 1 containing 10 µg/mL Sb, Sn, and 100 µg/mL B, 0.050 mL of SPEX CLMS-2 metals solution, and 0.25 mL of the 0.5 µg/mL Hg Calibration Working Solution 1.

10.3.5.7 <u>0.005 µg/mL metals, 0.050 µg/mL B, 0.0010 µg/mL Hg Calibration Solution, 0.100 µg/mL I.S.:</u> Tare a 50 mL falcon tube. Bring up to approximately 25 mL with 10% 4:1 HNO_3/HCl acid. Add 1 mL of Working Solution 2 containing 0.25 µg/mL Sb, Sn, metals, 2.5 µg/mL B. Swirl. Add 0.5 mL of 10 µg/mL SPEX CLISS-1 internal standard solution. Swirl. Add 100 µL of 100 µg/mL Au (Spex Catalog # CLAU1-1Y or equivalent). Swirl. Add 0.100 mL of the 0.5 µg/mL Hg Calibration Working Solution 1. Bring up to 50.0±0.5 g w/ 10% 4:1 HNO_3/HCl acid. Add cap. Swirl for 30 seconds.

10.3.5.8 <u>0.001 µg/mL metals, 0.010 µg/mL B, Calibration Solution, 0.100 µg/mL I.S.:</u> Repeat steps above, but add 0.2 mL of Working Solution 2 containing 0.25 µg/mL Sb, Sn, metals , 2.5 µg/mL B, and add 0.050 mL of the 0.5 µg/mL Hg Calibration Working Solution 1.

10.3.5.9 <u>Rinse Blank (10% 4:1 HNO_3/HCl acid, 0.2 ug/mL Au):</u>
Transfer approximately 25 mL of 10% 4:1 HNO3/HCl acid to a 50 mL Falcon Tube. Add 100 µL of 100 µg/mL Gold, Au (Spex Catalog # CLAU1-1Y or equivalent). Bring up to 50±0.5 g of the made with 10% 4:1 HNO_3/HCl acid. Mark cap with page and sample number.

10.3.5.10 <u>Calibration Blank (10% 4:1 HNO_3/HCl, 0.1 µg/mL Int. Std., 0.2 µg/mL Au)</u>: Tare a 50 mL falcon tube. Bring up to approximately 25 mL with 10% 4:1 HNO_3/HCl acid. Add 0.5 mL of 10 µg/mL Spex CLISS-1 internal standard. Add 100 µL of 100 µg/mL Gold, Au (Spex Catalog # CLAU1-1Y). Assume that the density of all solutions is 1 g/mL. Bring up to 50.0 ±0.5 g with 10% 4:1 HNO3/HCl acid. Add falcon tube cap. Mark cap with page and sample number. Swirl for 30 seconds.

10.3.5.11 <u>Independent Calibration Verification Solution (0.015 µg/mL metals, 0.150 µg/mL B, Al , 0.003 µg/mL Hg</u>:
Tare a 50 mL falcon tube. Bring up to approximately 25 mL with 10% 4:1 HNO_3/HCl acid. Add 0.75 mL of Spiking Working Solution 1 containing 1 µg/mL metals, 10 µg/mL B, Al, 0.2 µg/mL Hg. Add 0.1 mL of 100 µg/mL Au. Add 0.5 mL of 10 µg/mL Spex CLISS-1 internal standard solution. Bring up to 50±0.5 g with 10% 4:1 HNO_3/HCl acid. Add cap. Swirl for 30 sec.

10.3.5.12 Interference Check Solution Blank:
Tare a 50 mL falcon tube. Bring up to approximately 25 mL with 10% 4:1 HNO_3/HCl acid. Add 5 mL Inorganic Ventures Interference Check solution 1 (BMI-ICS-1). Add 500 µL of 10 µg/mL Spex CLISS-1. Add 0.1 mL of 100 µg/mL Au. Dilute to 50 g ±0.5 g with 10% 4:1 HNO_3/HCl acid.

10.3.5.13 Interference Check Solution Spike (0.020 µg/mL metals, 0.200 µg/mL B, Al, 0.0025 µg/mL Hg):
Tare a 50 mL falcon tube. Bring up to approximately 25 mL with 10% 4:1 HNO_3/HCl acid. Add 5 mL Inorganic Ventures Interference Check solution 1 (BMI-ICS-1). Add 500 µL of 10 µg/mL Spex CLISS-1. Add 100 µL of 100 µg/mL Au. Add 100 µL of Spiking Working Solution 3(contains 10 µg/mL metals, 100 µg/mL Al, B, 2.5 µg/mL Hg, 0.2 µg/mL Au in 10% 4:1 HNO_3/HCl acid) Dilute to 50 g ±0.5 g with 10% 4:1 HNO_3/HCl acid.

11. PROCEDURE

11.1 OPERATION PARAMETERS

Instrument: HP (Agilent) 4500 ICP/MS (or equivalent)
Argon gas flow: Approx. 15 L/min
Carrier gas flow: Approx. 1.2 L/min
Nebulizer: Babington
Torch depth: 4-8 mm
Plasma power: Approx. 1300 watts
Thermoelectric cooler: Approx. 2°C
Peristaltic pump program:
Before Acquisition:
Uptake speed: 0.5 rps for 45 s
Stabilization time: Approx. 30 s
Stabilization speed: 0.1 rps
During Acquisition (Note: Set by Tune File)
Acquisition Speed: 0.1 rps
After Acquisition:
Rinse:
Uptake speed: 0.50 rps for approx. 90 s with rinse blank

Acquisition parameters
Integration time (sec) /point: 0.1000 for selected elements, 0.3300 for selected elements.
Integration time (sec)/mass: 0.3000 for selected elements, 0.9900 for selected elements.
Number of points per mass: 3
Number of repetitions: 3
Total acquisition time: 90.2700 sec

Table III - Mass Table

Element	Mass	Element	Mass	Element	Mass
Li6	6	Cu	63	Sb	121
Li7	7	Zn	66	Ba	137
Be	9	As	75	Tb	159
B	11	Int. Corr. for As*	77	Ho	165
Al	27	Se, Int. Corr. for As*	82	Hg	199, 200, 201, 202
Sc	45	Y	89	Tl	205
V	51	Int. Corr. for Cd*	106	Pb	206,207,208
Cr, Int. Corr. for V*	52	Ag	107		
Int. Corr. for V*	53	Int. Corr. for Cd*	108		
Mn	55	Cd	111		
Co	59	In	115		
Ni	60	Sn	118		

Note: Sc is used as the internal standard for all elements up to a mass of Al. Y is used as the internal standard for compounds with masses between V and Se. Tb is used as the internal standard for elements with masses from Ag to Ba. Ho is used as the internal standard for elements with masses from Tl to Pb.
*Int. Corr.: Due to interferences to certain elements, additional ion masses are measured to make corrections based on natural isotope abundance ratios and empirical relationships.

11.2 SAMPLE PREPARATION

LIQUID CHEMICAL AGENT

11.2.1 Weigh out 90-95 mg of chemical agent sample into a tared Teflon Liner. (Approximately 73 µL for HD liquid).
11.2.2 Record the exact weight to the nearest 0.1 mg. Also, calculate the density of the liquid sample. Density (g/mL)= grams agent/mL delivered.
11.2.3 Add 200 µL of 100 µg/mL Au, Spex CLAU1-1Y.
11.2.4 Add 2.23 mL HPLC Grade bottled water.
11.2.5 Add 6.0 mL concentrated nitric acid.
11.2.6 Add 1.5 mL concentrated hydrochloric acid.
11.2.7 Digest in microwave using the following program: Ramp for 15 minutes to a final temperature of 165°C and hold for 1 minute, increase temperature to 180°C over 5 minutes and hold the temperature for 10 minutes.
11.2.8 Allow the sample to cool to 50°C, and then cool for an additional 15 minutes.
11.2.9 Transfer 1 mL of the digested sample to a tared 15 mL polypropylene Falcon Tube.
11.2.10 Add 20 µL of 100 µg/mL Au.
11.2.11 Add 100 µL of a 10 µg/mL Multi-element Internal Standard solution.

11.2.12 Bring up to 10.0 ± 0.1 g with HPLC grade water. Mix well.

11.2.13 With each daily analysis batch and after every 20 samples in a daily analysis batch, the following quality assurance samples are also prepared:

11.2.13.1 Sample Duplicate: Repeat steps 11.2.1-11.2.12 using one of the samples of a batch for a second time.

11.2.13.2 Lab Control Blank: Repeat steps 11.2.1-11.2.12 but substitute 90-95 mg of CASARM HD for a sample in step 11.2.1.

11.2.13.3 Lab control spike/Lab control spike duplicate:

11.2.13.3.1. Weigh out 90-95 mg of CASARM HD into a tared Teflon liner.

11.2.13.3.2. Repeat step 11.2.2.

11.2.13.3.3. Add 500 µL of Spiking Working Solution 2 (contains 10 µg/mL metals, 100 µg/mL Al, B, 0.5 µg/mL Hg spiking working solution, 2 µg/mL Au, 10% 4:1 HNO_3/HCl acid) the solution directly to the CASARM HD chemical agent. Spike concentrations: 50 µg metals per g chemical agent, 500 µg B, Al per gram of chemical agent, 2.5 µg/g Hg per g chemical agent. Note: greater amounts of the analyte(s) may be spiked if it is determined that the sample, before spiking, already contains a high level of any of the analyte(s). It is desirable that the spiking concentration be at least equal to the amount already present in the sample.

11.2.13.3.4. Repeat step 11.2.3.

11.2.13.3.5. Add 1.73 mL HPLC Grade bottled water.

11.2.13.3.6. Repeat steps 11.2.5-11.2.12.

11.2.13.4 Method blank (also known as preparation blank):

11.2.13.4.1. Add 73 µL of HPLC Grade bottled water into a tared Teflon liner.

11.2.13.4.2. Repeat steps 11.2.2-11.2.12.

11.2.13.5 Blank Spike:

11.2.13.5.1. Add 73 µL of HPLC Grade bottled water into a tared Teflon liner.

11.2.13.5.2. Add 500 µL of Spiking Working Solution 2 (contains 10 µg/mL metals, 100 µg/mL Al, B, 0.5 µg/mL Hg spiking working solution, 2 µg/mL Au, 10% 4:1 HNO_3/HCl acid) to the water.

11.2.13.5.3. Repeat steps 11.2.3-11.2.12.

11.2.13.6 Matrix Spike/ Matrix Spike duplicate:

11.2.13.6.1. Repeat steps 11.2.1-11.2.2.

11.2.13.6.2. Add 500 µL of Spiking Working Solution 2 (contains 10 µg/mL metals, 100 µg/mL Al, B, 0.5 µg/mL Hg spiking working solution, 2 µg/mL Au, 10% 4:1 HNO_3/HCl acid) directly to the HD sample. Spike concentrations: 50 µg metals per g chemical agent, 500 µg B, Al per gram of chemical agent, 2.5 ug/g Hg per g chemical agent. Note: greater amounts of the analyte(s) may be spiked if it is determined that the sample, before spiking, already contains a high level of any of the analyte(s). It is desirable that the spiking concentration be at least equal to the amount already present in the sample.

11.2.13.6.3. Repeat step 11.2.3.

11.2.13.6.4. Add 1.73 mL of HPLC Grade bottled water.

11.2.13.6.5. Repeat steps 11.2.5 through 11.2.12.

CHEMICAL AGENT SLUDGE

11.2.14 Weigh out 90-95 mg of chemical agent sludge sample into a tared Teflon Liner.
11.2.15 Record the exact weight to the nearest 0.1 mg.
11.2.16 Add 200 µL of 100 µg/mL Au, Spex CLAU1-1Y.
11.2.17 Add 2.23 mL HPLC Grade bottled water.
11.2.18 Add 6.0 mL concentrated nitric acid.
11.2.19 Add 1.5 mL concentrated hydrochloric acid.
11.2.20 Digest in microwave using the following program: Ramp for 15 minute to a final temperature of 165°C and hold for 1 minute, increase temperature to 180°C over 5 minutes and hold the temperature for 10 minutes.
11.2.21 Allow the sample to cool to 50°C, and then cool for an additional 15 minutes.
11.2.22 Transfer 1 mL of the digested sample to a tared 15 mL polypropylene Falcon Tube.
11.2.23 Add 20 µL of 100 µg/mL Au.
11.2.24 Add 100 µL of a 10 µg/mL Multi-element Internal Standard solution.
11.2.25 Bring up to 10.0 ± 0.1 g with HPLC grade water. Mix well.
11.2.26 With each daily analysis batch and after every 20 samples in a daily analysis batch, the following quality assurance samples are also prepared:
11.2.26.1 Sample Duplicate: Repeat steps 11.2.14-11.2.25 using one of the samples of this batch for a second time.
11.2.26.2 Certified Reference Material/Certified Reference Material Duplicate: repeat steps 11.2.14-11.2.25 but substitute High Purity Standards Industrial Sludge Certified Reference Material for HD Sludge in step 11.2.14.
11.2.26.3 Method blank (also known as preparation blank):
11.2.26.3.1. Add 73 µL of HPLC Grade bottled water into a tared Teflon liner.
11.2.26.3.2. Repeat steps 11.2.15-11.2.25.
11.2.26.4 Blank Spike:
11.2.26.4.1. Add 73 µL of HPLC Grade bottled water into a tared Teflon liner.
11.2.26.4.2. Repeat step 11.2.15.
11.2.26.4.3. Add 500 µL of the Spiking Working Solution 2 (contains 10 µg/mL metals, 100 µg/mL Al, B, 0.5 µg/mL Hg, 2 µg/mL Au, 10% 4:1 HNO_3/HCl acid) standard to the water.
11.2.26.4.4. Repeat step 11.2.16
11.2.26.4.5. Add . 1.73 mL of HPLC Grade bottled water.
11.2.26.4.6. Repeat steps 11.2.18-11.2.25.
11.2.26.5 Matrix Spike/Matrix Spike duplicate:
11.2.26.5.1. Repeat steps 11.2.14-11.2.15.
11.2.26.5.2. Add 500 µL of the Spiking Working Solution 2 (contains 10 µg/mL metals, 100 µg/mL Al, B, 0.5 µg/mL Hg, 2 µg/mL Au, 10% 4:1 HNO_3/HCl acid), directly to the HD sample. Spike concentrations: 50 µg metals per g chemical agent sludge, 500 µg B, Al per gram of chemical agent, 2.5 µg/g Hg per g chemical agent. sludge Note: greater amounts of the analyte(s) may be spiked if it is determined that the sample, before spiking, already contains a high level of any

of the analyte(s). It is desirable that the spiking concentration be at least equal to the amount already present in the sample.

11.2.26.5.3. Repeat step 11.2.16

11.2.26.5.4. Add 1.73 mL of HPLC Grade bottled water.

11.2.26.5.5. Repeat steps 11.2.18-11.2.25.

11.3 SAMPLE ANALYSIS

11.3.1 Prior to sample analysis, the ICP/MS sensitivity and tune is verified, by infusing a 10 ng/ml solution of Lithium (Li), Yttrium (Y) Thallium (Tl) and Cerium (Ce) and generating a tune report. The instrument determines the mass axis, peak width and peak height. The minimum peak heights for the tuning compounds are: Lithium: 5,000 counts, Yttrium: 10,000 counts, Thallium: 10,000 counts. The RSDs for these elements must be less than 15%.

11.3.2 The instrument will be allowed at least 30 minutes to equilibrate before analyzing any samples. This will be verified by analyzing a tuning solution at least four times with relative standard deviations of ≤ 5% for the analytes contained in the tuning solution.

11.3.3 Instrument detection limits in µg/mL will be estimated by calculating the average of the standard deviations of three runs on three non-consecutive days from the analysis of a reagent blank solution with seven consecutive measurements per day. IDLs will be determined every 3 months that analyses are performed and kept with the instrument logbook.

11.3.4 The intensities of all internal standards will be monitored for every analysis. If the intensity of any internal standard in the sample falls below 30% of the intensity of the initial calibration standard, a significant matrix effect must be suspected. The following corrective procedure is performed: First, make sure the instrument has not just drifted by observing the internal standard intensities in the nearest clean matrix (calibration blank). If the low internal standard intensities are also seen in the nearest calibration blank, terminate the analysis, correct the problem, recalibrate, verify the new calibration and reanalyze the affected samples. If drift has not occurred, matrix effects need to be removed by dilution of the affected sample. The sample must be diluted five-fold and reanalyzed with the addition of the appropriate amounts of internal standards. If the first dilution does not eliminate the problem, this procedure must be repeated until the internal standard intensities rise above the 30 percent limit. Reported results must be corrected for all dilutions.

11.3.5 Dilution test (serial dilution): If the analyte concentration is within the linear dynamic range of the instrument and sufficiently high (at least a factor of 100 times the concentration of the reagent blank, an analysis of a fivefold dilution must agree within ± 10% of the original determination. If not, an interference

effect must be suspected. One dilution test must be included for each twenty samples (or less) of each matrix in a batch.

11.3.6 Post-digestion spike addition: An analyte spike added to a portion of a prepared sample, or its dilution, should be recovered to within 75 to 125% of the known value or within the laboratory derived acceptance criteria. The spike addition should be based on the indigenous concentration of each element of interest in the sample. If the spike is not recovered within the specified limits, the sample must be diluted and reanalyzed to compensate for this effect. One post-digestion spike addition must be included for each twenty samples (or less) of each matrix in a batch. While the spiking level should be based on the indigenous concentration of each element of interest in the sample, a default spiking level will be designated and modified as appropriate. The solution will be prepared as follows: Tare a 15 mL polypropylene Falcon Tube, transfer 1 mL of sample, add 0.050 mL of Spiking Working Solution 2, add 20 µL of 100 µg/mL Au, add 100 µL of a 10 µg/mL Multielement internal standard solution, bring up to 10.0 ± 0.1 g with HPLC grade water. Mix well. The spiking levels in the analyzed solution will be at 50 ng/mL metals, 500 ng/mL Al, B, 2.5 ng/mL Hg.

11.3.7 Check instrument by analyzing appropriate quality control solutions as follows:

11.3.7.1 Check instrument calibration using a calibration blank and the initial calibration verification solution.

11.3.7.2 Verify calibration with the instrument check standard and the calibration blank at a frequency of every 10 analytical samples. These samples must also be analyzed for each analyte at the beginning of the analysis and after the last sample.

11.3.7.3 The results of the initial calibration verification solution and the instrument check standard must agree within ± 10% of the expected value. If not, terminate the analysis, correct the problem and recalibrate the instrument. Any sample analyzed under an out-of-control calibration must be reanalyzed.

11.3.7.4 The results of the calibration blank must be less than 3 times the current IDL for each element. If this is not the case, the reason for the out-of-control condition must be found and corrected, and affected samples must be reanalyzed. If the laboratory consistently has concentrations greater than 3 x the IDL, the IDL may be indicative of an estimated IDL and should be re-evaluated.

11.3.7.5 Verify the magnitude of elemental and molecular-ion isobaric interferences at the beginning of the analytical run or once every twelve hours, whichever is more frequent. Do this by analyzing the interference check blank and interference check spike. The analyst should be aware that precipitation from the interference

check solution may occur with some elements, specifically silver.

11.3.7.6 Analyze one duplicate sample for every matrix in a batch at a frequency of one matrix duplicate for every 20 samples.

11.3.7.6.1. The relative percent difference between duplicate determinations must not exceed 20% for analyte values greater than 100 times the instrumental detection limit.

11.3.8 Samples are introduced into the ICP/MS by autosampler via a peristaltic pump. The sample order is calibration blank, calibration standards, calibration blank, initial calibration verification solution, interference check blank, interference check sample, and calibration blank. **NOTE:** It is not necessary to run the calibration curve daily. If the ICV agrees with the old curve to within 10%, the calibration curve does not have to be rerun. For HD Liquid the sample order continues with the calibration blank, method blank, blank spike, calibration blank, lab control blank (CASARM HD), lab control sample spike, lab control sample spike duplicate, calibration blank, sample duplicate, samples, sample matrix spike, sample matrix spike duplicate, calibration blank, blank spike, continuing calibration check (50 ng/ml metals, 4.0 ng/mL Hg, 500 ng/mL B). For HD sludge the sample order continues with the calibration blank, method blank, blank spike, calibration blank, sample duplicate, samples, sample matrix spike, sample matrix spike duplicate, certified reference material of Industrial Sludge, certified reference material of Industrial sludge duplicate, calibration blank, blank spike, continuing calibration check (50 ng/ml metals, 4.0 ng/mL Hg, 500 ng/mL B).

11.4 CORRECTIVE PROCEDURES

If the minimum values for tune verification are not achieved, the instrument must be evaluated and corrected prior to sample analysis. Corrective actions for poor tune response are to run an autotune, adjust torch position, check settings on the extraction and omega lens, check tension on the peristaltic pump and replace tubing if necessary.

If the calibration fails or the calibration check standards do not pass criteria, the samples analyzed prior to the failed check standard will be re-analyzed.

For all other instrumental problems, consult the instrument operator's manual.

12. CALCULATION, CALIBRATION AND DOCUMENTATION

12.1 CALCULATION

Concentrations and calculations of the analyte of interest will be based on a minimum five-point calibration curve. Appropriate dilution factors will be taken into account in these calculations. The analyte signal is the response at a given m/z. The analyte m/z table is shown in section 11.1.

$$\text{Concentration} = \frac{\text{Signal (analyte) / Signal (internal standard) – y intercept}}{\text{Slope of calibration curve}}$$

Final concentration =

$$\frac{\text{[C (µg/mL) from Cal. Curve] x V, final sample Vol.(mL) x[Dilution Factor]}}{\text{[W, Sample weight, g]}}$$

Example Calculation:

$$\text{Final concentration} = \frac{\text{(0.100 µg/mL) x (10 mL)x 10}}{\text{[(0.100 g)]}} = 100\ \mu\text{g Antimony /g HD}$$

V, Final Sample Volume = 10 mL
W, Sample weight = 0.100 g
Dilution Factor = 10

12.2 BLANK DETERMINATION AND CALIBRATIONS

Method and lab control sample blanks are analyzed along with each set of samples. A five-point or more calibration curve is prepared prior to analyzing samples.

12.3 QUALITATIVE ANALYSIS

Qualitative identification of compounds determined by this method is based on the signal present at the isotope masses of each given element. Interferences from other elements are either not present at these masses, or are corrected for by the appropriate use of interference equations.

12.4 STANDARDS, CONTROLS, SPIKES, AND VALIDATION PROGRAMS HD LIQUID SAMPLES

12.4.1 Blank Spike / Lab Control sample spike/ Lab Control sample spike duplicate/ Matrix Spike/ Matrix Spike Duplicate. With each daily analysis batch and after every 20 samples in a daily batch, a blank spike, lab control sample spike, lab control sample spike duplicate, matrix spike and matrix spike duplicated is analyzed. The blank spike is spiked with the target compounds at a concentration of 50 µg/g for all metals, except mercury, which is spiked at 2.5 µg/g, and boron and aluminum, which are spiked at 500 µg/g as part of the extraction procedure. The recovery of the blank spike, lab control sample spike, lab control sample duplicate spike, matrix spike/matrix spike duplicate must fall within 75 to 125% of the spiking level and relative percent differences must be within 25%. The recovery and %RSD are recorded on Edgewood C/B FAC form FR-0901 until enough

data is accumulated to calculate control limits in accordance with work instruction WI-200.

HD SLUDGE SAMPLES

12.4.2 Blank Spike /Industrial Sludge CRM / Industrial Sludge CRM Duplicate/ Matrix Spike/Matrix Spike Duplicate.

With each daily analysis batch and after every 20 samples in a daily batch, a blank spike, Industrial sludge CRM and Industrial sludge CRM duplicate is analyzed. The blank spike is spiked with the target compound at a concentration of 50 µg/g for all metals, except mercury, which is spiked at a concentration of 2.5 µg/g, and boron and aluminum, which are spiked at a concentration of 500 µg/g as part of the extraction procedure. The recovery must fall within 75 to 125% of the spiking level for the blank spike, matrix spike, and matrix spike duplicate. The relative percent difference calculated for the CRM and CRM duplicate must be within 25%. The recovery and %RSD are recorded on Edgewood C/B FAC form FR-0901 until enough data is accumulated to calculate control limits in accordance with work instruction WI-200.

12.4.3 Method Validation

12.4.3.1 MDL Study and Instrumental Detection Limit

CASARM HD

A method detection limit (MDL) was performed as described in Chapter 1 of EPA Publication SW-846 (Reference 7). The MDL was determined by multiplying the appropriate one-sided 99% t-statistic (3.14 for 7 measurements) by the standard deviation of the replicate measurements. The estimated quantitation limit (EQL) was equal to 5 to 10 times the MDL. All elements except B and Hg were spiked into CASARM HD at 10 µg/g HD while B was spiked at 100 µg/g B and Hg was spiked at 1 µg/g Hg. **NOTE**: The MDL for Al in both matrices was increased to 10 µg/g and the MDL for V in both matrices was increased to 1µg/g based on results of duplicate blank testing.

MDL = 3.14 x s.d. (n=7) or 6.965 x s.d. (n=3)
s.d. (Be, n=7) = 0.29 ng/mL
MDL (Be) = 3.14*0.29 ng/mL = 0.91 ng/mL

The MDLs for this matrix is summarized in Appendix A Table IV. The MDLs are given in ng/mL or µg metal/g HD when 100 mg of HD is diluted 100x in concentrated acid, microwave digested, and diluted a further 10x with HPLC grade water and analyzed.

HD SLUDGE

Very high native concentrations of the elements of interest precluded the determination of an MDL based on the use of HD sludge matrix spikes.

Instead, an extract of these samples was run seven times to estimate a method detection limit. The standard deviation obtained from seven replicate analyses of one sample was multiplied by 3.14 to obtain a method detection limit. The MDLs obtained are shown in Appendix A Table V below.

INSTRUMENTAL DETECTION LIMIT
An Instrumental Detection Limit was obtained by running a reagent blank sample seven times and converting the concentration standard deviation obtained into a concentration detection limit. This IDL was converted to a method equivalent instrumental detection limit in µg/g by multiplying the detection limit obtained in µg/mL by 1000. These results are shown in Appendix A Table VI.

12.4.3.2 Precision and Accuracy Study

CASARM HD
For HD liquid, a precision and accuracy study was performed by spiking metals into CASARM HD samples at four levels ranging from 0 to 100 µg/mL for all metals except mercury and boron. Mercury ranged from 0 to 5 µg/mL. Boron ranged from 0 to 1000 µg/mL. This corresponds to a concentration range (after 1000x dilution) of 0 to 100 ng/mL for all metals except mercury and boron. Mercury ranged from 0 to 5 ng/mL after 1000x dilution. Boron ranged from 0 to 1000 ng/mL after 1000x dilution. All recoveries ranged from 75-125% at all spiking concentration levels with the exception of Al, which was recovered at only 58% at the 10 µg/g level. See Appendix A Tables VII – X for the results of this study.

HD SLUDGE
The same preparation procedures and spiking levels were followed for HD Sludge. However, due to the high levels of the analytes already present in the sludge, a conventional MDL and precision and accuracy study, i.e. one determined by spiking the matrix and determining the % recovery, could not be conducted for several elements including: Aluminum, Arsenic, Chromium, Copper, Lead, Manganese, Nickel, and Zinc. Instead, an MDL was calculated after a digestion of an HD Sludge sample was analyzed 7 times. The standard deviation of these measurements was multiplied by the appropriate Student's t-factor, 3.14 for a 99% confidence level and 7 measurements, to determine the MDL. These results are shown in Appendix A Table XI. To assess the accuracy of this method with regards to sludge, a homogeneous, well characterized, Certified Reference Material of Industrial Sludge Sample was analyzed. Results are reported in Table XII. All analyte concentration values obtained using method AM-118 were comparable to the certified reference values. Recoveries between 75-125% were obtained for all certified analytes.

13. STATEMENT OF ANALYTICAL RESULT:

The results of the determination of the target analyte are reported in µg/g with a maximum of three (3) significant figures. Results of the recoveries of the matrix spike and the matrix spike duplicate are also reported. Results are reported as "nd" when no detectable signal or a signal below the MDL are obtained. The measurement uncertainty for this method was determined over a range of concentrations for each analyte and are presented in the Tables XIII and XIV.

14. REFERENCES

14.1 Army Materiel Command Treaty Laboratory Analytical Support, Standing Operating Procedure CR2-ISP002 (1997), U. S. Army Materiel Command Treaty Laboratory, Chemical and Biological Defense Command, Edgewood, MD.

14.2 Amendment One to Standing Operating Procedure CR2-ISP002, Army Materiel Command Treaty Laboratory Analytical Support (1997), U. S. Army Materiel Command Treaty Laboratory, Chemical and Biological Defense Command, Edgewood, MD.

14.3 The Army Toxic Chemical Agent Safety Program, Army Regulation 385-61 (1997), Headquarters, Department of the Army, Washington, DC.

14.4 Toxic Chemical Agent Safety Standards, Department of the Army Pamphlet 385-61 (1997), Headquarters, Department of the Army, Washington, DC.

14.5 Chemical Accident or Incident Response and assistance (CAIRA) Operations, Department of the Army Pamphlet 50-6 (1995), Headquarters, Department of the Army, Washington, DC.

14.6 Nuclear and Chemical Weapons and Materiel: Chemical Surety, Army Regulation 50-6 (1995), Headquarters, Department of the Army, Washington, DC.

14.7 U.S. EPA SW 846. Method 6020A Inductively Coupled Plasma-Mass Spectrometry

14.8 Hewlett Packard (Agilent) HP 4500 ICP/MS Standard Operation Manual

14.9 "Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction", August 8, 1994.

APPENDIX A – TABLES IV-XII

Table IV – MDLs, PQLS in CASARM HD

Element (Isotope(s) Used)	MDL (µg/g)	PQL (µg/g)	n
Aluminum (27)	10.00	50.0	7
Antimony (121)	0.63	5.00	7
Arsenic (75)	1.22	5.00	7
Barium (137)	0.43	5.00	7
Beryllium (9)	0.90	5.00	7
Boron (11)	3.74	10.00	7
Cadmium (111)	0.41	5.00	7
Chromium (52)	1.29	5.00	7
Cobalt (59)	0.27	1.00	7
Copper (63)	2.43	5.00	7
Lead (206, 207, 208)	0.41	5.00	7
Manganese (55)	0.32	1.00	7
Mercury (199, 200, 201, 202)	0.05	0.5	7
Nickel (60)	0.35	5.00	7
Selenium (82)	1.17	10.00	7
Silver (107)	0.47	5.00	7
Thallium (205)	0.98	5.00	7
Tin (118)	2.49	10.00	7
Vanadium (51)	1.00	5.00	7
Zinc (66)	3.12	10.00	7

Table V – MDLs, PQLs in HD Sludge

Element (Isotope(s) Used)	MDL (µg/g)	PQL (µg/g)	n
Aluminum (27)	10.00	50.0	7
Antimony (121)	0.13	5.00	7
Arsenic (75)	0.57	5.00	7
Barium (137)	0.04	5.00	7
Beryllium (9)	0.05	5.00	7
Boron (11)	4.00	10.00	7
Cadmium (111)	0.02	5.00	7
Chromium (52)	1.00	5.00	7
Cobalt (59)	0.12	1.00	7
Copper (63)	3.23	10.00	7
Lead (206, 207, 208)	1.89	10.00	7
Manganese (55)	3.30	10.00	7
Mercury (199, 200, 201, 202)	0.07	0.5	7
Nickel (60)	0.62	5.00	7
Selenium (82)	0.71	25.00	7
Silver (107)	0.06	5.00	7
Thallium (205)	0.33	5.00	7
Tin (118)	0.44	10.00	7
Vanadium (51)	1.00	5.00	7
Zinc (66)	2.20	10.00	7

Table VI - Method Equivalent IDL determined using Reagent Blank, n=7

Method Equivalent IDL* using Reagent Blank, n=7	
Element (Isotope(s) Used)	**IDL (µg/g)**
Aluminum (27)	1.38
Antimony (121)	0.17
Arsenic (75)	0.49
Barium (137)	0.04
Beryllium (9)	0.03
Boron (11)	3.56
Cadmium (111)	0.05
Chromium (52)	0.16
Cobalt (59)	0.03
Copper (63)	0.06
Lead (206, 207, 208)	0.03
Manganese (55)	0.04
Mercury (199, 200, 201, 202)	0.02
Nickel (60)	0.04
Selenium (82)	0.38
Silver (107)	0.03
Thallium (205)	0.06
Tin (118)	0.04
Vanadium (51)	0.11
Zinc (66)	0.05
Instrument IDL's were determined by calculating the average standard deviation of 7 replicate runs of the reagent blank (10% 4:1 HNO3/HCL) over 3 non-consecutive days and multiplying that value by 3.14 – the student's t-factor for n=7, and then a "method equivalent" IDL was determined assuming a sample weight of 0.1 g so that the results could be expressed in µg/g	

Table VII - CASARM HD P&A RESULTS: Spike Level: 0 ug/g, n=3, CASARM HD

Element (Isotope Used):	Average	Std Dev	% RSD
Aluminum (27)	13.43	7.55	56.23
Antimony (121)	N.D.	N.A.	N.A.
Arsenic (75)	N.D.	N.A.	N.A.
Barium (137)	N.D.	N.A.	N.A.
Beryllium (9)	N.D.	N.A.	N.A.
Boron (11)	N.D.	N.A.	N.A.
Cadmium (111)	N.D.	N.A.	N.A.
Chromium (52)	2.48	0.72	29.07
Cobalt (59)	N.D.	N.A.	N.A.
Copper (63)	N.D.	N.A.	N.A.
Lead (206,207,208)	N.D.	N.A.	N.A.
Manganese (55)	N.D.	N.A.	N.A.
Mercury (199,200,201,202)	N.D.	N.A.	N.A.
Nickel (60)	0.50	0.19	37.40
Selenium (82)	1.48	0.26	17.48
Silver (107)	N.D.	N.A.	N.A.
Thallium (205)	N.D.	N.A.	N.A.
Tin (118)	N.D.	N.A.	N.A.
Vanadium (51)	0.61	0.25	40.43
Zinc (66)	N.D.	N.A.	N.A.

*Note: The data presented in the nonzero concentration analyte spikes have been corrected for the matrix blank signal by subtracting the average blank signal from every individual spike measurement.

Table VIII - CASARM HD: Spike Level 10 ug/g metals, 100 ug/g B, 1 ug/g Hg, n=7

Element (Isotope Used):	Average	Std Dev	% RSD	% Recovery
Aluminum (27)	5.84	1.20	20.50	58.45
Antimony (121)	10.47	0.20	1.91	104.73
Arsenic (75)	11.06	0.39	3.52	110.61
Barium (137)	9.70	0.14	1.40	97.01
Beryllium (9)	9.06	0.29	3.16	90.62
Boron (11)	86.85	1.19	1.37	86.85
Cadmium (111)	9.95	0.13	1.32	99.50
Chromium (52)	11.07	0.41	3.71	110.70
Cobalt (59)	9.70	0.09	0.89	96.98
Copper (63)	10.25	0.78	7.57	102.47
Lead (206,207,208)	10.20	0.13	1.28	101.96
Manganese (55)	9.89	0.10	1.04	98.94
Mercury (199,200,201,202)	1.03	0.02	1.68	102.56
Nickel (60)	9.56	0.11	1.18	95.62
Selenium (82)	11.37	0.37	3.29	113.70
Silver (107)	9.83	0.15	1.51	98.30
Thallium (205)	10.49	0.31	2.97	104.90
Tin (118)	9.65	0.79	8.20	96.48
Vanadium (51)	10.14	0.16	1.58	101.37
Zinc (66)	9.99	0.99	9.96	99.90

Table IX - CASARM HD: Spike Level: 50 ug/g metals, 500 ug/g B, 2.5 ug/g Hg, n=3

Element (Isotope Used):	Average	Std Dev	% RSD	% Recovery
Aluminum (27)	44.11	12.04	27.29	88.21
Antimony (121)	50.74	0.99	1.94	101.49
Arsenic (75)	49.42	2.31	4.67	98.85
Barium (137)	45.67	2.40	5.26	91.33
Beryllium (9)	40.18	2.39	5.94	80.36
Boron (11)	417.36	2.52	0.60	83.47
Cadmium (111)	46.16	2.38	5.16	92.32
Chromium (52)	48.02	2.31	4.80	96.04
Cobalt (59)	45.04	2.67	5.93	90.07
Copper (63)	45.53	2.46	5.40	91.05
Lead (206,207,208)	47.56	2.65	5.57	95.13
Manganese (55)	46.09	2.67	5.80	92.18
Mercury (199,200,201,202)	2.62	0.03	1.15	104.70
Nickel (60)	45.06	2.55	5.65	90.12
Selenium (82)	52.05	2.68	5.14	104.11
Silver (107)	45.85	2.36	5.16	91.70
Thallium (205)	47.92	2.39	4.98	95.84
Tin (118)	46.45	0.76	1.63	92.90
Vanadium (51)	45.79	2.51	5.49	91.57
Zinc (66)	46.72	2.88	6.17	93.44

HD SLUDGE MATRIX RESULTS FOLLOW

Table XI - HD SLUDGE: Spike Level: 0 ug/g, n=7

Element (Isotope Used):	Average	Std Dev	% RSD
Aluminum (27)	43.80	0.55	1.26
Antimony (121)	0.97	0.04	4.35
Arsenic (75)	12.67	0.18	1.44
Barium (137)	0.35	0.01	3.98
Beryllium (9)	N.D.	N.A.	N.A.
Boron (11)	3.92	0.57	14.61
Cadmium (111)	0.28	0.01	2.27
Chromium (52)	54.83	0.32	0.58
Cobalt (59)	7.64	0.04	0.50
Copper (63)	302.29	1.03	0.34
Lead (206,207,208)	51.99	0.60	1.16
Manganese (55)	270.43	1.05	0.39
Mercury (199,200,201,202)	0.97	0.02	2.18
Nickel (60)	49.83	0.20	0.40
Selenium (82)	1.29	0.23	17.57
Silver (107)	N.D.	N.A.	N.A.
Thallium (205)	0.42	0.10	24.81
Tin (118)	9.56	0.14	1.48
Vanadium (51)	0.19	0.06	30.00
Zinc (66)	108.29	0.70	0.65

Table XII - High Purity Standards Certified Reference Material Metals in Industrial Sludge Results, n=3

Element (Isotope Used):	Certified Value (ug/g)	Certified Value Std Dev (ug/g)	AM-118 (This Method) Conc (ug/g)	AM-118 (This Method) Std Dev (ug/g)	AM-118 (This Method) (% Recovery)***
Aluminum (27)	6000.00	0.42	4569.77	8.04	76.16
Antimony (121)	(119.00)**	N.R.*	128.29	0.98	107.80
Arsenic (75)	141.00	27.00	128.02	0.62	90.79
Barium (137)	58.20	11.00	59.28	0.58	101.86
Beryllium (9)	(0.68)**	N.R.	0.66	0.00	97.30
Boron (11)	N.R.	N.R.	64.68	0.98	
Cadmium (111)	(0.27)**	N.R.	0.57	0.02	
Chromium (52)	111.00	9.00	91.88	3.29	82.77
Cobalt (59)	11.10	1.20	10.25	0.04	92.31
Copper (63)	398.00	12.00	324.25	0.95	81.47
Lead (206,207,208)	5.73	0.45	5.71	0.18	99.71
Manganese (55)	480.00	30.00	365.00	54.80	76.04
Mercury (199,200,201,202)	N.R.	N.R.	0.70	0.02	
Nickel (60)	195.00	14.00	171.47	0.57	87.93
Selenium (82)	(0.00)**	N.R.	3.61	0.19	
Silver (107)	(0.80)**	0.03	0.71	0.08	88.40
Thallium (205)	(0.00)**	N.R.	0.12	0.02	
Tin (118)	N.R.	N.R.	36.48	0.31	
Vanadium (51)	11.90	1.20	12.35	0.09	103.81
Zinc (66)	249.00	24.00	198.59	0.41	79.76

N.R. = Not Reported. **Values in parenthesis given for information purposes only. % Recoveries were not calculated when the metal concentration was below the method detection limit determined for CASARM HD.

Table XIII. Measurement Uncertainty for CASARM HD

	% Uncertainty		
Element (Isotope Used):	**Range 1**	**Range 2**	**Range 3**
Aluminum (27)	35	104	17
Antimony (121)	15	9	14
Arsenic (75)	10	20	10
Barium (137)	6	21	8
Beryllium (9)	14	21	14
Boron (11)	9	3	17
Cadmium (111)	6	20	9
Chromium (52)	11	20	9
Cobalt (59)	6	23	8
Copper (63)	21	21	9
Lead (206,207,208)	9	23	8
Manganese (55)	5	23	8
Mercury (199,200,201,202)	8	6	8
Nickel (60)	4	22	8
Selenium (82)*	47	25	12
Silver (107)	6	21	9
Thallium (205)	10	21	8
Tin (118)	20	7	12
Vanadium (51)	5	22	9
Zinc (66)	25	25	9

* - Efforts are ongoing to improve the uncertainty of this process.

For most metals, the ranges are as follows:
Range 1 = 0 to 10 µg/g
Range 2 = 10.1 to 50 µg/g
Range 3 = 50.1 to 100 µg/g

For B, the ranges are as follows:
Range 1 = 0 to 100 µg/g
Range 2 = 100.1 to 500 µg/g
Range 3 = 500.1 to 1000 µg/g

For Hg, the ranges are as follows:
Range 1 = 0 to 1 µg/g
Range 2 = 1.1 to 5 µg/g
Range 3 = 5.1 to 10 µg/g

Table XIV. Measurement Uncertainty for Sludge Samples
Values based on blank testing conducted using HD Sludge.

Element (Isotope Used):	Concentration (ug/g)	% Uncertainty
Aluminum (27)	50	5
Antimony (121)	5	36
Arsenic (75)	10	8
Barium (137)	5	13
Beryllium (9)	5	26
Boron (11)	5	29
Cadmium (111)	5	12
Chromium (52)	50	2
Cobalt (59)	10	5
Copper (63)	100	5
Lead (206,207,208)	50	3
Manganese (55)	100	3
Mercury (199,200,201,202)	1	12
Nickel (60)	50	1
Selenium (82)*	50	6
Silver (107)	1	30
Thallium (205)	1	46
Tin (118)	10	6
Vanadium (51)	1	60
Zinc (66)	100	4

* - Efforts are ongoing to improve the uncertainty of this process.

Revision History

Rev. No.	Description of Revision	Approval/Date
0	Original	*(08 Jan 03)* MARY F. DRUMMOND
1	Section 6.1, changed upper range for most metals from 100 to 500 ng/mL and added concentration ranges for Aluminum. Section 6.4, added references to a practical quantitation limit (PQL). Tables I, II,, IV and V, updated MDL values for Aluminum and Vanadium and added PQL's for all analytes. Section 10.3.2, added "Other Useful Analyte Solutions:" subsection, changed vendor for Interference Check Solution1 and deleted Interference Check Solution 2. Section 10.3.4.1, updated concentration values for all solutions listed in this section and added "polypropylene" in front of "falcon tube" for all solutions listed in this section. Section 10.3.4.2.1, added "polypropylene" in front of "falcon tube. Section 10.3.4.2.2, updated solution name and concentration, added "polypropylene" in front of "falcon tube" and updated units. Section 10.3.4.2.3, updated solution name and concentration, replaced the addition of the HG standard with that of "Spiking Solution 1", added the addition of Inorganic Ventures BMI-4. Added section 10.3.2.2.4 in its entirety, Added section 10.3.5.5 and renumbered remainder of section. Section 10.3.5.6, added volume of Mixed Analyte Working Solution 1. Section 10.3.5.12, changed name of interference check solution added. Section 10.3.5.13, updated solution contents and directions for making. Section 11.1, added "approx." to argon gas flow, carrier gas flow, plasma power and thermoelectric cooler parameters. Table III, added mass for L17 and deleted mass for BI. Sections 11.2.13.3.3,11.2.13.3.5, 11.2.13.6.2, 11.2.26.4.3, and 11.2.26.5.2 changed name and volume of spiking solution added. Sections 11.2.13.3.5, 11.2.13.6.4 and 11.2.26.5.4, changed volume of water added. Section 11.3.6, added the use and preparation of an default spiking level to the end of this paragraph. Section 11.3.8, updated concentration of continuing calibration check and added note regarding the frequency of running a calibration curve. Section 12.4.1 and 12.4.2, updated concentration for all metals and added aluminum with the concentration used for boron. Table VI, updated IDL values for all analytes except Zn. Tables XIII and XIV, updated uncertainty values for most analytes.	*(01-30-03)* MARY F. DRUMMOND
2	Section 11.1, Changed stabilization time to approx. 30 sec, changed uptake speed after acquisition from 30 sec to approx 90 sec, added new integration time (sec)/point of 0.1000 s for selected elements and included phrase "for selected elements" after 0.3300, added new integration time (sec)/mass of 0.3000 for selected elements and included phrase "for selected elements" after 0.9900, changed number of repetitions fron 5 to 3, changed total acquisition time from 107.0 sec to 90.2700 sec.	4-14-03 MARY F. DRUMMOND

Reviewed By:	Approved By:
for James H Newman 4/15/03	Dennis J Reutter 15 April 2003
JAMES C. PETERSON , Ph.D., Date	for LYNN D. HOFFLAND, Ph.D., Date
Laboratory Manager, Battelle	Senior Chemist, EC/BFAC
Issue Date: 15 April 2003	

1. TITLE

Determination of Bis(2-chloroethyl) sulfide (HD) Purity by Gas Chromatography Mass Spectrometry

2. AUTHORS

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3. KEYWORDS

Bis(2-chloroethyl) sulfide (HD), Gas chromatography/Mass Spectrometry, GC/MS, characterization.

4. REVISION HISTORY

Revision 0 – 02 October 2002

5. CONTACT OFFICE

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6. PURPOSE AND APPLICATION

This method is used to determine the purity of neat HD (Bis(2-chloroethyl) sulfide) by GC/MS analysis.

6.1 ANALYTE CONCENTRATION RANGE

This method can be used for determining HD purity in the range of 30% to 100%.

6.2 SAMPLE MATRICES AND INTERFERENCES

The sample matrix is neat Bis(2-chloroethyl) sulfide (HD). Preliminary analyses were conducted to insure that interference's do not exist.

6.3 THROUGHPUT

Approximately twenty (20) samples can be analyzed in an eight (8) hour period.

7. RISK AND SAFETY ASSESSMENT

Low risks to the analyst are associated with this method as long as the proper safety precautions are strictly adhered to. Personnel must wear lab coat, safety glasses and nitrile gloves when handling any sample associated with the HD agent. Solvents used in this method pose a risk to the analyst and must be handled with care inside of a well-ventilated hood. HD agent must be handled with extreme caution and only in an approved hood. Guidelines for handling solvents and agent materiel can be found in WI-090 (Sample Receipt and Handling) and in ERDECR 40-3 (Chemical Hygiene Plan).

8. SCIENTIFIC BASIS

The purity of neat HD is usually in the range of 80% to 100%, depending on initial purity and storage conditions. A neat HD sample is diluted to approximately 10 mg/mL in methylene chloride and analyzed by split injection GC/MS to separate, identify and quantitateHD. Quantitation is based onthe comparison to a calibration curve constructed using standards prepared from Chemical Agent Standard Analytical Reference Material (CASARM) HD.

9. TRAINING

The analyst must meet the qualification requirements specified in EC/BFAC operating procedure OP-180. The analyst must be trained in the handling of surety materiel and RDTE solutions. The analyst should have a thorough knowledge of operating a Hewlett Packard (Agilent) HP5890 Series II Plus GC with a 5792 Mass Selective Detector and ChemStation software. Personnel performing sample preparation activities must have completed training in Basic Chemical Sample Preparation Techniques as defined by the EC/BFAC quality system.

10. APPARATUS

10.1 INSTRUMENTATION

The instrumentation required includes a Hewlett-Packard (Agilent) 5890 Series II Plus GC equipped with a 5972-Mass Selective Detector (or equivalent). The column used is a HP-5MS fused silica column (5% Phenyl Methyl Silicone – 30 M x 0.25 mm-id x 0.25 µm film thickness) (or equivalent).

10.2 GLASSWARE, MISCELLANEOUS EQUIPMENT AND SUPPLIES

GC crimp top autoinjector vials, 2 mL (Hewlett-Packard (Agilent), Cat. No. 5181-3376) (or equivalent).
GC vial caps, 11 mm septa (Hewlett-Packard (Agilent), Cat. No. 5181-1210) (or equivalent).
Injection Port liner, mixing chamber assembly, 4 mm (Hewlett-Packard (Agilent), Cat. No. 19251-60540) (or equivalent).
Hewlett-Packard (Agilent) HP-5MS fused silica column, 30 M x 0.25 mm i.d. x .25 µm film (Hewlett-Packard (Agilent), Cat. No. 190115-433) (or equivalent).
Pasteur pipettes (VWR, Cat. No. 14673-010) (or equivalent).
Pipette, 100-1000 µL (Rainin, Cat. No. E2-1000) (or equivalent).
Pipette tips (Rainin, Cat. No. RT-200) (or equivalent).
Syringes, 10 µL, 25 µL, 50 µL, 100 µL, 250 µL, 500 µL, 1000 µL (VWR) (or equivalent).
Volumetric flask 10 mL with stopper (Kimble Glass, Co.) (or equivalent).
Vortex Genie 2 (Scientific Industries, Inc.) (or equivalent).

10.3 CHEMICALS / STANDARDS

10.3.1. Reagents

10.3.1.1. Hexane (C_6H_{14}), CAS: 110-54-3, J.T. Baker Co., Ultra Resi-Analyzed (or equivalent).
10.3.1.2. Methylene Chloride (CH_2Cl_2), CAS: 75-09-2, Burdick & Jackson, Pesticide Residue Analysis (or equivalent).

10.3.2. Standards

10.3.2.1. Bis(2-chloroethyl) sulfide (HD), $C_4H_8Cl_2S$, CAS: 505-60-2, M.W.: 158.00

10.3.3. Calibration standards:

10.3.3.1. HD Stock Solution (10 mg/mL).
Weigh out 250 mg of Bis(2-chloroethyl) sulfide in a 25 mL volumetric flask. Record weight to nearest 0.1 mg. Dilute to

volume with methylene chloride. The nominal concentration of the stock solution is 10 mg/mL.

10.3.3.2. The 10 mg/mL stock solution (nominal concentration) of HD in methylene chloride is used as the highest standard. The following standard solutions are made from the HD stock solution in volumetric flasks.

10.3.3.3. 2 mLof 10 mg/mL HD stock solution diluted to volume in a 10 mL volumetric flask with methylene chloride. Nominal concentration: 2000 µg/mL.

10.3.3.4. 4 mLof 10 mg/mL HD stock solution diluted to volume in a 10 mL volumetric flask with methylene chloride. Nominal concentration: 4000 µg/mL.

10.3.3.5. 6 mLof 10 mg/mL HD stock solution diluted to volume in a 10 mL volumetric flask with methylene chloride. Nominal concentration: 6000 µg/mL.

10.3.3.6. 8 mLof 10 mg/mL HD stock solution diluted to volume in a 10 mL volumetric flask with methylene chloride. Nominal concentration: 8000 µg/mL.

10.3.3.7. Calculate the exact concentrations.

10.3.3.8. Transfer 1 mLof each solution into a GC vial.

11. PROCEDURE

11.1 OPERATION PARAMETERS

Gas Chromatograph:

Injection volume	1 µl split injection
Column flow	1.0 mL/min (7.1 psi at 40°C.)
Split vent	open
Split vent flow	100 mL/min
Injection port temp	250°C.
Detector temp	280°C.
Oven program	90°C. hold 2 min
Rate 1	10°C/min
Final temp	120°C. hold 2 min
Rate 2	25°C/min
Final Temp.	280°C, hold 1.6 min
Run time	15.0 min

5972 Mass Spectrometer:

Transfer line temp:	180°C
Total ion scan range:	35-450 amu
Solvent delay:	3.0 min
Tune file:	DFTPP

11.2 SAMPLE PREPARATION

11.2.1. Weigh out approximately 0.10 g (record weight to nearest 0.0001g) of neat HD sample into a 10 mL volumetric flask.
11.2.2. Add approximately 5 mL of methylene chloride and mix by hand for 30 seconds.
11.2.3. Dilute to volume with methylene chloride and mix by inverting the flask for 30 seconds. The nominal concentration is 10 mg/mL.
11.2.4. Aliquot approximately 1 mL of the dilution into a GC vial.
11.2.5. Prepare a blank with methylene chloride.
11.2.6. Analyze samples by GC/MS.

11.3 SAMPLE ANALYSIS

MSD TUNE, GC COLUMN PERFORMANCE AND INJECTION PORT INERTNESS

As an instrumental quality control measure, a tune check using decafluorotriphenylphosphine (DFTPP) is performed prior to sample analysis. The resultant mass spectrum for DFTPP must meet the criteria given in the following table before sample analysis begins. When the tune is complete, save the tune file as DFTPP. The GC/MS system is evaluated for tune, column performance and injection port inertness before proceeding with calibration. A solution containing 50 ng/µLof 4,4'-DDT, pentachlorophenol, benzidine and DFTPP must be injected and evaluated (commercially available – GC/MS tuning standard).

To verify the tune, inject 1µLof the GC/MS tuning standard. Use the following GC/MS parameters:

Inlet temp:	220° C.
Detector temp:	280° C.
Initial oven temp:	125° C.
Hold	2 min
Rate 1	15° C./min.
Final temp:	250° C.
Final Hold:	5 min
Column flow:	1.0 ml/min (12.0 psi @125° C.)
Injection:	1 µLsplitless
Solvent delay:	5 min
MS mode	scan 35-450 amu; threshold 120
Tune file:	DFTPP

The MSD tune must pass the criteria defined in EPA method 8270 for DFTPP. These criteria are:

Mass	Ion Abundance Criteria
51	30-60% of mass 198
68	<2% of mass 69
70	<2% of mass 69
127	40-60% of mass 198
197	<1% of mass 198
198	Base peak, 100% relative abundance
199	5-9% of mass 198
275	10-30% of mass 198
365	>1% of mass 198
441	Present but less than mass 443
442	>40% of mass 198
443	17-23% of mass 442

The HP (Agilent) software should automatically generate a tune report. If the tune check passes, proceed to column performance and injection port inertness; if the tune check fails, repeat the DFTPP target tune and reinject the GC/MS tuning standard. If the tune check still continues to fail, clean the MSD source and retune. (See HP (Agilent) 5972 manual)

The GC/MS system must be evaluated for column performance and injection port inertness. Use the data from the same injection as for verifying the tune. Degradation of DDT to DDE and DDD should not exceed 20% (use formula below). Benzidine and pentachlorophenol should be present at their normal responses and no peak tailing should be visible. If these criteria are not met, take corrective action before proceeding with calibration.

$$\text{\% breakdown of DDT} = \frac{\text{sum of degradation peak areas (DDD + DDE)}}{\text{sum of all peak areas (DDT + DDE + DDD)}} \times 100$$

11.4 CORRECTIVE PROCEDURES

The following items should be checked if the instrument is not meeting acceptance criteria:

12.3.3 The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum.

12.4 STANDARDS, CONTROLS, SPIKES, AND VALIDATION PROGRAMS

12.4.1 Calibration standards: The use of calibration standard solutions is described in section 12.2 and their preparation in section 10.3.3. With each batch of sample analysis, one of the calibration solutions (preferably near the concentration of the samples) shall be analyzed as a calibration check standard. If the value is within 10% of the known concentration, analysis may continue.

12.4.2 Controls: With each set of samples, a HD sample of known purity shall be prepared and analyzed in the same manner as the samples to evaluate the accuracy of the method. The value must within 15% of the known value.

12.4.3 Duplicates: With each set of samples, a set of duplicate samples shall be prepared and analyzed to evaluate the precision of the method. The relative percent difference of the duplicate values must be less than or equal to 25%.

12.4.4 Method Validation: A method Precision and Accuracy (P & A) study was performed as described in Chapter 1 of EPA SW-846 (Reference 7). Seven replicate injections of one sample of the matrix (HD, Bis(2-chloroethyl)) were analyzed forinstrument precision. Also, seven replicates of the matrix (HD, Bis(2-chloroethyl)) wereweighed out, prepared and analyzed for method precision. The Precision was determined by calculating the Mean, Standard Deviation and Percent Relative Standard Deviation (%RSD) of the replicate injections. The Accuracy was determined by calculating the recovery values based on the amount of material spiked into the samples (see Table I).

TABLE I

GC/MSD DATA FOR P & A STUDY: Bis(2-chloroethyl) sulfide (HD)

Precision Test	Amount Of Matrix	Mean Purity	Mean Recovery	STD. DEV.	% RSD	N
Instrument	97.4 mg	89.2 %	97.1%	1.40	1.57%	7
Method	84.2 mg	90.3 %	99.1%	1.17	1.30%	7

Percent Purity = [Mean concentration x Dilution Volume] / [Amount of Matrix)]
Percent Purity = [8.69 mg/mL x 10 mL] / [97.4 mg] = 89.2 %

13. STATEMENT OF ANALYTICAL RESULT

The HD purity is reported in % (wt/wt) with a maximum of three (3) significant figures. The major sources contributing to measurement uncertainty are due to sample

Revision History

Rev. No.	Description of Revision	Approval/Date
0	Original	*(9/30/02)* MARY F. DRUMMOND
1	Updated Revision History. Section 11.1, updated final temperature parameter to include hold time and deleted final time. Section 12.4.1, changed acceptance on CCV from 5% to 10%. Section 12.4.3, deleted triplicate analysis and replaced with duplicate analysis. Section 13, updated uncertainty information to list calculated uncertainty versus the equation for determination of uncertainty. Section 14, added 14.7 and 14.8.	4-17-03 MARY F. DRUMMOND

Appendix B-3

EC/B FAC Method AM-100

Reviewed By:	Approved By:
for James H Newman 4/15/03	Dennis J Reutter 15 April 2003
JAMES C. PETERSON , Ph.D., Date	for LYNN D. HOFFLAND, Ph.D., Date
Laboratory Manager, Battelle	Senior Chemist, Edgewood C/B FAC
Issue Date: 15 April 2003	

1. TITLE

Determination of Selected Non-Volatile Contaminants in HD by Gas Chromatography Mass Spectrometry

2. AUTHORS

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3. KEYWORDS

Thiodiglycol (TDG), derivatization, silylation, Bis(2-chloroethyl) sulfide (HD), Gas chromatography/Mass Spectrometry, GC/MS, characterization.

4. REVISION HISTORY

Revision 0 – 09 December 2002.

5. CONTACT OFFICE

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6. PURPOSE AND APPLICATION

This method is used to determine selected non-volatile contaminants in HD by GC/MS analysis.

6.1 ANALYTE CONCENTRATION RANGE

This method can be used for determining thiodiglycol (TDG-TMS) from 0.1 µg/mL to 100 µg/mL.

6.2 SAMPLE MATRICES AND INTERFERENCES

The sample matrix is neat Bis(2-chloroethyl) sulfide (HD). Preliminary analyses were conducted to insure that interference's do not exist.

6.3 THROUGHPUT

Approximately twelve (12) samples can be analyzed in an eight (8) hour period.

6.4 DETECTION LIMIT

The method detection limit for TDG-TMS is 0.21 mg/g in HD samples.

7. RISK AND SAFETY ASSESSMENT

Low risks to the analyst are associated with this method as long as the proper safety precautions are strictly adhered to. Personnel must wear lab coat, safety glasses and nitrile gloves when handling any sample associated with the HD agent. Solvents used in this method pose a risk to the analyst and must be handled with care inside of a well-ventilated hood. HD agent must be handled with extreme caution and only in an approved hood. Guidelines for handling solvents and agent materiel can be found in WI-090 (Sample Receipt and Handling) and in ERDECR 40-3 (Chemical Hygiene Plan).

8. SCIENTIFIC BASIS

Hydrolysis of HD produces thiodiglycol (TDG) a typical breakdown product. A neat HD sample is diluted to approximately 10 mg/mL in acetonitrile, derivatized and analyzed by splitless injection GC/MSD to separate, identify and quantitate TDG.

9. TRAINING

The analyst must meet the qualification requirements specified in EC/BFAC operating procedure OP-180. The analyst must be trained in the handling of surety materiel and RDTE solutions. The analyst should have a thorough knowledge of operating a Hewlett Packard (Agilent) HP5890 Series II Plus GC with a 5792 Mass Selective Detector and ChemStation software. Personnel performing sample preparation activities must have completed training in Basic Chemical Sample Preparation Techniques as defined by the EC/BFAC quality system.

10. APPARATUS

10.1 INSTRUMENTATION

The instrumentation required includes a Hewlett-Packard (Agilent) 5890 Series II Plus GC equipped with a 5972-Mass Selective Detector (or equivalent). The column used is a HP-5MS fused silica column (5% Phenyl Methyl Silicone – 30 M x 0.25 mm-id x 0.25 µm film thickness) (or equivalent).

10.2 GLASSWARE, MISCELLANEOUS EQUIPMENT AND SUPPLIES

GC crimp top autoinjector vials, 2 mL (Hewlett-Packard (Agilent), Cat. No. 5181-3376) (or equivalent).
GC vial caps, 11 mm septa (Hewlett-Packard (Agilent), Cat. No. 5181-1210) (or equivalent).
Injection Port liner, mixing chamber assembly, 4 mm (Hewlett-Packard (Agilent), Cat. No. 19251-60540) (or equivalent).
Hewlett-Packard (Agilent) HP-5MS fused silica column, 30 M x 0.25 mm i.d. x .25 µm film (Hewlett-Packard (Agilent), Cat. No. 190115-433) (or equivalent).
Pasteur pipettes (VWR, Cat. No. 14673-010) (or equivalent).
Pipette, 100-1000 µL (Rainin, Cat. No. E2-1000) (or equivalent).
Pipette tips (Rainin, Cat. No. RT-200) (or equivalent).
Syringes, 10 µL, 25 µL, 50 µL, 100 µL, 250 µL, 500 µL, 1000 µL (VWR) (or equivalent).
Volumetric flask 10 mL with stopper (Kimble Glass, Co.) (or equivalent).
Vortex Genie 2 (Scientific Industries, Inc.) (or equivalent).

10.3 CHEMICALS / STANDARDS

10.3.1. Reagents / Chemicals

10.3.1.1. Acetonitrile (CH_3CN), CAS: 75-05-8, J.T. Baker Co., Ultra Resi-Analyzed (or equivalent).
10.3.1.2. N,O,-bis(trimethylsilyl)trifluoroacetamide with 1% trimethylchlorosilane (BSTFA with 1% TMCS) ($C_8H_{18}NOF_3Si_2$), M.W. 257, CAS: 25561-30-2 and CAS:75-77-4. Pierce (or equivalent).
10.3.1.3. Carbon Disulfide (CS_2), CAS: 75-15-0, J.T. Baker Co., Ultra Resi-Analyzed (or equivalent).
10.3.1.4. Sodium Sulfate, anhydrous powder (Na_2S0_4), CAS: 7757-82-6, J.T. Baker Co. Purity: 99+% (or equivalent).
10.3.1.5. Methyl Alcohol (CH4O), CAS: 67-56-1, J.T. Baker Co., Ultra-Resi-Analyzed or equivalent.

10.3.2. Standards / Internal Standards / Surrogates

10.3.2.1. Thiodiglycol (TDG), $C_4H_{10}O_2S$, CAS: 111-48-8, M.W. 122.00. Purity: 90%+. Aldrich (or equivalent).

10.3.2.2. Thiodiglycol-d_8 (deuterated-TDG), $C_4H_2D_8O_2S$, M.W. 130.00. Purity: 99%+. Cerilliant (or equivalent).

10.3.2.3. 1,4-Dichlorobenzene-d_4 (deuterated 1,4-DCB), $C_6D_4O_2Cl_2$, CAS: 3855-82-1, M.W. 152.04. Purity: 98%+. Aldrich (or equivalent).

10.3.2.4. Acenaphthene-d10, CAS: 15067-26-2, M.W. 164.29. Purity: 99%+. Aldrich (or equivalent).

10.3.2.5. Phenanthrene-d10, CAS: 1517-22-2, M.W. 188.32. Purity: 98%+. Aldrich (or equivalent).

10.3.3. Surrogate Standard Solution: TDG-d_8 Stock Solution (1 mg/mL). This solution is obtained directly from the vendor at 1 mg/mL in methanol.

10.3.4. Calibration standard Solutions:

10.3.4.1. TDG Stock Solution (10 mg/mL). Weigh out 100 mg of Thiodiglycol in a 10 mL volumetric flask. Record weight to nearest 0.1 mg. Dilute to volume with acetonitrile. The nominal concentration of the stock solution is 10 mg/mL.

10.3.4.2. TDG Intermediate Stock Solution (1 mg/mL). Add 5 mL of acetonitrile to a 10 mL volumetric flask. Add 1 mL of the TDG Stock solution (@ 10 mg/mL) to the flask. Mix by hand for 30 seconds. Dilute to volume with acetonitrile. The nominal concentration of the intermediate stock solution is 1 mg/mL.

10.3.4.3. 100 µL of the 10 mg/mL TDG stock solution diluted to volume in a 10 mL volumetric flask with acetonitrile. Nominal concentration: 100 µg/mL.

10.3.4.4. 50 µL of the 10 mg/mL TDG stock solution solution and 500 µL of the Stock Surrogate Solution at 1 mg/mL diluted to volume in a 10 mL volumetric flask with acetonitrile. Nominal concentration: 50 µg/mL.

10.3.4.5. 100 µL of the 1 mg/mL TDG intermediate stock solution and 100 µL of the Stock Surrogate Solution at 1 mg/mL diluted to volume in a 10 mL volumetric flask with acetonitrile. Nominal concentration: 10 µg/mL.

10.3.4.6. 50 µL of the 1 mg/mL TDG intermediate stock solution and 50 µL of the Stock Surrogate Solution at 1 mg/mL diluted to volume in a 10 mL volumetric flask with acetonitrile. Nominal concentration: 5 µg/mL.

10.3.4.7. 10 µL of the 1 mg/mL TDG intermediate stock solution and 100 µL of the Intermadiate Surrogate Solution at 100 µg/mL diluted to volume in a 10 mL volumetric flask with acetonitrile. Nominal concentration: 1 µg/mL.

10.3.4.8. 100 µL of the TDG 50 µg/mL solution and 50 µL of the Intermadiate Surrogate Solution at 100 µg/mL diluted to 10 mL in a volumetric flask with acetonitrile. Nominal concentration: 0.5 µg/mL.

10.3.4.9. 100 µL of the TDG 10 µg/mL solution and 10 µL of the Intermadiate Surrogate Solution at 100 µg/mL diluted to 10 mL in a volumetric flask with acetonitrile. Nominal concentration: 0.1 µg/mL.

10.3.4.10. Calculate the exact concentrations. Higher calibration levels may be used to accommodate field samples known to contain elevated levels of TDG.

10.3.4.11. Transfer exactly 1 mLof each solution into a GC vial, add internal standard (add 10 µL of the 4 mg/mL stock solution so that the final nominal concentration is 40 µg/mL; higher amounts may be added to accommodate high levels of target analytes) and add 200µL of the BSTFA silylation agent. Mix by hand for 30 seconds. Bake at 60^0C for 30 minutes.

10.3.5. Surrogate Intermediate Stock Solution (100 µg/mL). Add 5 mL of methanol to a 10 mL volumetric flask. Add 1 mL of the Surrogate Stock solution (@ 1 mg/mL) to the flask. Mix by hand for 30 seconds. Dilute to volume with methanol. The nominal concentration of the intermediate stock solution is 100 µg/mL.

10.3.6. Internal Standard Solution: Weigh out 40 mg each of 1,4-dichlorobenzene (d_4), acenaphthene (d_{10}) and phenanthrene (d_{10}) in a 10 mL volumetric flask. Record weight to nearest 0.1 mg. Add 2 mL of carbon disulfide. Mix by hand for 30 seconds. Dilute to volume with methylene chloride. The nominal concentration of the stock solution is 4 mg/mL.

10.3.7. Spiking Solutions

10.3.7.1 Stock Spiking Solution (10 mg/mL): Using an analytical balance, weigh out 100 mg of TDG into a 10 mL volumetric flask. Record the weight to the nearest 0.1 mg. Dilute to the mark with methanol. Mix by hand for 30 seconds. The nominal concentration is 10 mg/mL.

10.3.7.2. Intermediate Stock Spiking Solution (1 mg/mL): Add 5 mL of methanol to a 10 mL volumetric flask, transfer 1 mL of the Stock Spiking Solution and dilute to the mark with methanol. Mix by hand for 30 seconds. The nominal concentration is 1 mg/mL.

11. PROCEDURE

11.1 OPERATION PARAMETERS

Gas Chromatograph:

Injection volume	1 µl splitless injection
Column flow	1.0 mL/min (7.1 psi at 40°C.)
Split vent	closed for 1 minute
Split vent flow	50-60 mL/min
Injection port temp	250°C.
Detector temp	280°C.
Oven program	40°C. hold 1 min
Rate 1	10°C/min
Final Temp.	280°C
Final Time	10 min
Run time	35.0 min

5972 Mass Spectrometer:

Transfer line temp:	180°C
Total ion scan range:	35-450 amu
Solvent delay:	3.0 min
Tune file:	DFTPP

11.2 SAMPLE PREPARATION

11.2.1. Using an analytical balance, weigh out approximately100 mg of HD matrix into a 10 mL volumetric flask.

11.2.2. Record the weight to the nearest 0.1 mg.

11.2.3. Add 100 µL of the 1 mg/mL surrogate solution (section 10.3.4) and any target spikes (spiking levels may vary with the expected target concentrations for field samples).

11.2.4. Dilute to the mark with acetonitrile. Mix well by hand for 30 seconds.

11.2.5. Prepare a pastuer pipette by adding glass wool and sodium sulfate powder. Condition the pipette by passing 1 mL of acetonitrile through it.

11.2.6. Transfer **EXACTLY** 1.0 mL of sample to a sodium sulfate column. Allow to drain into a graduated vial (or tube). Add 1 mL of acetonitrile onto the column to completely rinse off the original sample quantitatively. Adjust the final volume in the vial or tube to 2.0 mL. Add 10 µL of the internal standard solution (@ 4 mg/mL). Mix well.

11.2.7. Take approximately 1 mL of the above solution and add to a GC vial than add 200 µL of the BSTFA silylation solution.

11.2.8. Heat at 60^{0}C for 30 min. Cool to room temperature.

11.2.9. Analyze by GC/MSD in the SCAN mode.

11.2.10. With each batch of 20 or fewer samples, the following quality assurance samples are also prepared:

11.2.10.1. Method Blank: Prepare a method blank by processing 1 mL of acetonitrile carried through the sample preparation procedure steps 11.2.4 through 11.2.6.

11.2.10.2. Matrix Silylated Blank: Prepare a HD matrix silylated blank by processing CASARM grade HD through the sample preparation procedure steps 11.2.1 through 11.2.6.

11.2.10.3. Matrix and Matrix Spike Duplicate: Prepare a matrix spike and a matrix spike duplicate by spiking a randomly selected HD sample matrix with 100 µL of the 1 mg/mL spiking solution. **Note:** Three aliquots of a randomly selected sample are processed; one is prepared and analyzed as specified in steps 11.2.1 through 11.2.6, the other two are spiked as specified above and then processed through the sample preparation procedure.

11.2.10.4. Blank Spike (Laboratory Control Sample (LCS)): Prepare a blank spike (LCS) by spiking acetonitrile with the Target compound and surrogate. Process the blank sample through the sample preparation procedure steps 11.2.4 through 11.2.6

11.2.10.5. Reagent Blank: Prepare a reagent blank by placing 1 mL of acetonitrile with internal standard into a GC-vial. Analyze by GC-MSD.

11.3 SAMPLE ANALYSIS

MSD TUNE, GC COLUMN PERFORMANCE AND INJECTION PORT INERTNESS

As an instrumental quality control measure, a tune check using decafluorotriphenylphosphine (DFTPP) is performed prior to sample analysis. The resultant mass spectrum for DFTPP must meet the criteria given in the following table before sample analysis begins. When the tune is complete, save the tune file as DFTPP. The GC/MS system is evaluated for tune, column performance and injection port inertness before proceeding with calibration. A solution containing 50 ng/µLof 4,4'-DDT, pentachlorophenol, benzidine and DFTPP must be injected and evaluated (commercially available – GC/MS tuning standard).

To verify the tune, inject 1µLof the GC/MS tuning standard. Use the following GC/MS parameters:

Inlet temp:	220° C.
Detector temp:	280° C.
Initial oven temp:	125° C.
Hold	2 min
Rate 1	15° C./min.
Final temp:	250° C.
Final Hold:	5 min
Column flow:	1.0 ml/min (12.0 psi @125 ° C.)

Injection:	1 µLsplitless
Solvent delay:	5 min
MS mode	scan 35-450 amu; threshold 120
Tune file:	DFTPP

The MSD tune must pass the criteria defined in EPA method 8270 for DFTPP. These criteria are:

Mass	Ion Abundance Criteria
51	30-60% of mass 198
68	<2% of mass 69
70	<2% of mass 69
127	40-60% of mass 198
197	<1% of mass 198
198	Base peak, 100% relative abundance
199	5-9% of mass 198
275	10-30% of mass 198
365	>1% of mass 198
441	Present but less than mass 443
442	>40% of mass 198
443	17-23% of mass 442

The HP (Agilent) software should automatically generate a tune report. If the tune check passes, proceed to column performance and injection port inertness; if the tune check fails, repeat the DFTPP target tune and re-inject the GC/MS tuning standard. If the tune check still continues to fail, clean the MSD source and retune. (See HP (Agilent) 5972 manual)

The GC/MS system must be evaluated for column performance and injection port inertness. Use the data from the same injection as for verifying the tune. Degradation of DDT to DDE and DDD should not exceed 20% (use formula below). Benzidine and pentachlorophenol should be present at their normal responses and no peak tailing should be visible. If these criteria are not met, take corrective action before proceeding with calibration.

$$\% \text{ breakdown of DDT} = \frac{\text{sum of degradation peak areas (DDD + DDE)}}{\text{sum of all peak areas (DDT + DDE + DDD)}} \times 100$$

11.4 CORRECTIVE PROCEDURES

The following items should be checked if the instrument is not meeting acceptance criteria:

- Change septum
- Change injection port liner
- Check split/splitless inlet vent flow (100 ml/min)
- Check autosampler syringe
- Check column connections
- Check autosampler rinse vials
- Check detector vacuum
- Clean MSD source
- Clip or change the column

For all other instrumental problems, consult the owner's operating manual.

12. CALCULATION, CALIBRATION AND DOCUMENTATION

12.1 CALCULATION

Concentrations and calculations of the analyte of interest will be based on a minimal five-point best-fit calibration curve forced through the origin.

$$\text{Conc. } (\mu g/g) = \frac{[C\ (\mu g/mL) \text{ from the cal. curve}] \times [V\ (mL) \text{ dilution vol.}]}{[M\ (g) \text{ weight of the sample}]}$$

where:

C = concentration determined by GC analysis
V = Final volume of diluted sample (10 mL)
M = Weight of sample (0.1 g)

12.2 BLANK DETERMINATION AND CALIBRATIONS

A method blank must be run with each batch of samples and must not have detectable amounts of HD. A minimal five-point internal standard calibration must be performed prior to sample analysis, using the best fit curve forced through the origin with equal weighting for each concentration level. The coefficient of determination (r^2) must be greater than 0.995 and each standard level must be +/- 15% of the theoretical value.

12.3 QUALITATIVE ANALYSIS

Qualitative identification of compound determined by this method is based on retention time, and on at least 2 characteristic ions in a reference mass spectrum. The following criteria must be met unless specified otherwise in Program specific documents for Test Plans:

12.3.1. The intensities of the compound's characteristic extracted ion profiles maximize in the same scan or within one scan of each other.

12.3.2. The relative retention time (RRT) of the sample component is within +/- 0.06 RRT units of the RRT of the standard component.

12.3.3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum.

12.4 STANDARDS, CONTROLS, SPIKES, AND VALIDATION PROGRAMS

12.4.1. Calibration standards: The use of calibration standard solutions is described in section 11.2 and their preparation in section 10.3.4. With each batch of sample analysis, a calibration solution shall be analyzed as a calibration check standard. If the value is within 25% of the known concentration, analysis may continue.

12.4.2 Controls: With each batch of 20 or fewer samples the following quality control samples shall be analyzed, as a minimum:

12.4.2.1. Spiked blank (LCS) see section 11.2.10.4.

12.4.2.2. Method blank see section 11.2.10.1.

12.4.2.3. Reagent blank see section 11.2.10.5.

12.4.2.4. Matrix spike and matrix spike duplicate (see section 11.2.10.3): The recovery for each spike shall be calculated and must be within 50 to 150%. The percent relative standard deviation (%RSD) between these two spike shall be calculated and must be less than or equal to 25%. These values shall be recorded on EC/BFAC form FR-0901 until enough data is tabulated to calculated control limits in accordance with EC/BFAC work instruction WI-200.

12.4.3 Method Validation: A method Precision and Accuracy (P & A) study was performed as described in Chapter 1 of EPS SW-846 (Reference 7). Seven replicates of the target compounds and appropriate surrogate solution in the matrix (HD) at 10 µg/mL were weighed out, prepared and analyzed. In addition, three samples at two higher concentration levels were weighed out, prepared and analyzed for accuracy. The Precision was determined by calculating the Mean, Standard Deviation and Percent Relative Standard Deviation (%RSD) of the replicate injections. The Accuracy was determined by

calculating the recovery and Percent Relative Standard Deviation (%RSD) of the replicate matrix samples (See Table 1). In addition, seven replicate injections of one sample of the target compounds and the appropriate surrogate solution in the matrix (HD) at 10 µg/mL were analyzed for instrument precision. (See Table 2).

TABLE 1
GC/MSD DATA FOR P & A STUDY: TDG-TMS and the Surrogate: TDG-d8

Analytical Test	Amount Spiked	Amount Measured (Mean)	STD. DEV.	% RSD	Mean (%) Recovery	N
TDG	1.04 mg/g	0.964 mg/g	0.066	6.87	92.7	7
	2.08 mg/g	1.88 mg/g	0.112	6.00	90.2	3
	4.16 mg/g	3.66 mg/g	0.125	3.42	88.0	3
TDG-d8	1.00 mg/g	1.04 mg/g	0.038	3.59	104	7
	2.00 mg/g	2.04 mg/g	0.078	3.80	102	3
	4.00 mg/g	3.97 mg/g	0.350	8.80	99.3	3

**Data based on nominal amount of matrix HD (100 mg).*
The MDL was calculated based on seven (7) separate samples that were spiked, extracted and analyzed.

MDL (TDG-TMS)= [Standard Deviation x t-statistic (N=7)]
MDL (TDG-TMS)= [0.066 mg/g x 3.14] = 0.21 mg/g

MDL (TDG-d8)= [Standard Deviation x t-statistic (N=7)]
MDL (TDG-d8)= [0.038 mg/g x 3.14] = 0.12 mg/g

TABLE 2
GC/MSD INSTRUMENTAL PRECISION STUDY: TDG-TMS and the Surrogate: TDG-d8

Analytical Test	Amount Spiked	Amount Measured (Mean)	STD. DEV.	% RSD	N
TDG-TMS	1.04 mg/g	0.970 mg/g	0.065	6.72	7
TDG-d8	1.00 mg/g	1.03 mg/g	0.010	1.03	7

Data based on nominal amount of matrix HD (100mg).
Instrumental Precision refers to one (1) MDL sample extract injected onto the GC/MSD seven (7) times.

13. STATEMENT OF ANALYTICAL RESULT

The results of the determination of TDG-TMS in the matrix (HD) are reported in µg/g (wt/wt) with a maximum of three (3) significant figures. The major sources contributing to measurement uncertainty are due to sample preparation and the repeatability of the process. The measurement uncertainty for this method was determined over a range of concentrations for each analyte and are presented in the Table 3.

Table 3
Measurement Uncertainty

ANALYTE	CONCENTRATION RANGE (mg/g)	UNCERTAINTY (%)
TDG-TMS	0 to 1.04	16
	1.05 to 2.08	24
	2.09 to 4.16	13

14. REFERENCES

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14.4. Toxic Chemical Agent Safety Standards, Department of the Army Pamphlet 385-61 (1997), Headquarters, Department of the Army, Washington, DC.

14.5. Chemical Accident or Incident Response and assistance (CAIRA) Operations, Department of the Army Pamphlet 50-6 (1995), Headquarters, Department of the Army, Washington, DC.

14.6. Nuclear and Chemical Weapons and Materiel: Chemical Surety, Army Regulation 50-6 (1995), Headquarters, Department of the Army, Washington, DC.

14.7. Test Methods for Evaluating Solid Waste Phisical/Chemical Methods, SW-846, U.S Environmental and Protection Agency, Office of Solid Waste and the National Technical Information Service (NTIS), May 1996.

14.8. Hewlett-Packard 5890 Series II and Series II Plus Operating Manual; copyright 1989, 1990, 1991, 1992, 1993 and 1994; Hewlett Packard Company, Ninth Edition, July 1994.

Revision History

Rev. No.	Description of Revision	Approval/Date
0	Original	*(12-05-02)* MARY F. DRUMMOND
1	Section 10.3.4.4 through 10.3.4.9, added the addition of the intermediate stock solution. Section 10.3.4.10, added "Higher calibration levels may be used to accommodate field samples known to contain elevated levels of TDG." Section 10.3.4.11, added "higher amounts may be added to accommodate high levels of target analytes" and changed 100 µL to 200 µL. Section 10.3.5, changed concentration of surrogate intermediate stock solutions from 1 mg/mL to 100 µg/mL. Added references 14.7 and 14.8.	4-14-03 MARY F. DRUMMOND

Appendix B-4

EC/B FAC Method AM-101

Reviewed By:	Approved By:
4/15/03	15 April 2003
for JAMES C. PETERSON , Ph.D., Date Laboratory Manager, Battelle	for LYNN D. HOFFLAND, Ph.D., Date Senior Chemist, Edgewood C/B FAC
Issue Date: 15 April 2003	

1. TITLE

Determination of Selected Volatile Contaminants in HD by Gas Chromatography Mass Spectrometry

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Bel Air, MD 21015

3. KEYWORDS

1,2-Dichloroethane, Tetrachloroethylene, 1,1,2,2-Tetrachloroethane, Bis(2-chloroethyl) sulfide (HD), Gas chromatography/Mass Spectrometry, GC/MS, characterization.

4. REVISION HISTORY

Revision 0 - 25 November 2002.
Revision 1 – 09 December 2002.

5. CONTACT OFFICE

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6. PURPOSE AND APPLICATION

This method is used to determine selected volatile contaminants in HD by GC/MS analysis.

6.1 ANALYTE CONCENTRATION RANGE

This method can be used for determining 1,2-dichloroethane (1,2-DCE), tetrachloroethylene and 1,1,2,2-tetrachloroethane from 0.5 µg/mL to 50 µg/mL.

6.2 SAMPLE MATRICES AND INTERFERENCES

The sample matrix is neat Bis(2-chloroethyl) sulfide (HD). Preliminary analyses were conducted to insure that interferences do not exist.

6.3 THROUGHPUT

Approximately twelve (12) samples can be analyzed in an eight (8) hour period.

6.4 DETECTION LIMIT

The Method Detection Limit (MDL) for 1,2 dichloroethane in HD is 0.26 mg/g, for tetrachloroethylene is 0.10 mg/g, for 1,1,2,2-tetrachloroethane is 0.15 mg/g and for 1,4- difluorobenzene (surrogate) in HD is 0.16 mg/g.

7. RISK AND SAFETY ASSESSMENT

Low risks to the analyst are associated with this method as long as the proper safety precautions are strictly adhered to. Personnel must wear lab coat, safety glasses and nitrile gloves when handling any sample associated with the HD agent. Solvents used in this method pose a risk to the analyst and must be handled with care inside of a well-ventilated hood. HD agent must be handled with extreme caution and only in an approved hood. Guidelines for handling solvents and agent materiel can be found in WI-090 (Sample Receipt and Handling) and in ERDECR 40-3 (Chemical Hygiene Plan).

8. SCIENTIFIC BASIS

A neat HD sample is diluted to approximately 10 mg/mL in hexadecane and analyzed by split injection GC/MSD to separate, identify and quantitate 1,2-DCE, tetrachloroethylene, and 1,1,2,2 tetrachloroethane by an internal standard method.

9. TRAINING

The analyst must meet the qualification requirements specified in EC/B FAC operating procedure OP-180. The analyst must be trained in the handling of surety materiel and RDTE solutions. The analyst should have a thorough knowledge of operating a Hewlett Packard (Agilent) HP5890 Series II Plus GC with a 5792 Mass Selective Detector and ChemStation software. Personnel performing sample preparation activities must have completed training in Basic Chemical Sample Preparation Techniques as defined by the EC/BFAC quality system.

10. APPARATUS

10.1 INSTRUMENTATION

The instrumentation required includes a Hewlett-Packard (Agilent) 5890 Series II Plus GC equipped with a 5972-Mass Selective Detector (or equivalent). The column used is a HP-5MS fused silica column (5% Phenyl Methyl Silicone – 30 M x 0.25 mm-id x 0.25 µm film thickness) (or equivalent).

10.2 GLASSWARE, MISCELLANEOUS EQUIPMENT AND SUPPLIES

GC crimp top autoinjector vials, 2 mL (Hewlett-Packard (Agilent), Cat. No. 5181-3376) (or equivalent).
GC vial caps, 11 mm septa (Hewlett-Packard (Agilent), Cat. No. 5181-1210) (or equivalent).
Injection Port liner, mixing chamber assembly, 4 mm (Hewlett-Packard (Agilent), Cat. No. 19251-60540) (or equivalent).
Hewlett-Packard (Agilent) HP-5MS fused silica column, 30 M x 0.25 mm i.d. x .25 µm film (Hewlett-Packard (Agilent), Cat. No. 190115-433) (or equivalent).
Pasteur pipettes (VWR, Cat. No. 14673-010) (or equivalent).
Pipette, 100-1000 µL (Rainin, Cat. No. E2-1000) (or equivalent).
Pipette tips (Rainin, Cat. No. RT-200) (or equivalent).
Syringes, 10 µL, 25 µL, 50 µL, 100 µL, 250 µL, 500 µL, 1000 µL (VWR) (or equivalent).
Volumetric flask 10 mL with stopper (Kimble Glass, Co.) (or equivalent).
Vortex Genie 2 (Scientific Industries, Inc.) (or equivalent).

10.3 CHEMICALS / STANDARDS

10.3.1. Reagents / Chemicals

10.3.1.1. Hexadecane ($C_{16}H_{34}$), CAS: 544-76-3, M.W.: 226.45. Acros Purity: 99% (or equivalent).
10.3.1.2. Dodecane ($C_{12}H_{26}$), CAS: 112-40-3, M.W.: 170.34. E.M. Science Purity: 99% (or equivalent).

10.3.2. Standards / Internal Standards / Surrogates

10.3.2.1. 1,2-Dichloroethane (1,2-DCE), $C_2H_4Cl_2$, CAS: 107-06-2, M.W. 98.96. Purity: 99%+. Aldrich (or equivalent).
10.3.2.2. 1,4-difluorobenzene (1,4-DFB), $C_6H_4F_2$, CAS: 540-36-3, M.W. 114.00. Purity: 99%+. Aldrich (or equivalent).
10.3.2.3. 1,4-Dichlorobenzene-d_4 (deuterated 1,4-DCB), $C_6D_4O_2Cl_2$, CAS: 3855-82-1, M.W. 152.04. Purity: 98%+. Aldrich (or equivalent).
10.3.2.4. Tetrachloroethane, C2Cl4, CAS: 127-18-4, M.W. 165.83, Purity: 99.9%, Aldrich (or equivalent).

10.3.2.5. 1,1,2,2-Tetrachloroethane, C2H2Cl4, CAS: 79-34-5, M.W. 167.85, Purity: 98%, Aldrich (or equivalent).

10.3.3. Surrogate Standard Solutions:

10.3.3.1 1,4-DFB Stock Solution (10 mg/mL). Weigh out 100 mg of 1,4-DFB in a 10 mL volumetric flask. Record weight to nearest 0.1 mg. Dilute to volume with dodecane. The nominal concentration of the stock solution is 10 mg/mL.

10.3.3.2 1,4-DFB Intermediate Stock Solution (1 mg/mL). Add 5 mL of dodecane to a 10 mL volumetric flask, transfer 1 mL of the 1,4-DFB Stock Solution and dilute to the mark with dodecane. Mix by hand for 30 seconds. The nominal concentration is 1 mg/mL.

10.3.4. Calibration Standard Solutions:

10.3.4.1. Target Stock Solution (10 mg/mL). Weigh out 100 mg of 1,2-DCE in a 10 mL volumetric flask. Record weight to nearest 0.1 mg. Dilute to volume with hexadecane. The nominal concentration of the stock solution is 10 mg/mL.

10.3.4.2. Follow the same procedure for tetrachloroethylene and 1,1,2,2-tetrachloroethane (10 mg/mL).

10.3.4.3. Target Intermediate Stock Solution (1 mg/mL). Add 5 mL of hexadecane to a 10 mL volumetric flask. Add 1 mL of each of the Target Stock solutions (@ 10 mg/mL) to the flask. Mix by hand for 30 seconds. Dilute to volume with hexadecane. The nominal concentration of the target intermediate stock solution is 1 mg/mL.

10.3.4.4. 100 µL of each of the 10 mg/mL target stock solutions and 100 µL of the 10 mg/mL(see section 10.3.3.1) surrogate solution diluted to volume in a 10 mL volumetric flask with hexadecane. Nominal concentration: 100 µg/mL.

10.3.4.5. 50 µL of each of the 10 mg/mL target stock solutions and 50 µL of the 10 mg/mL(see section 10.3.3.1) surrogate solution diluted to volume in a 10 mL volumetric flask with hexadecane. Nominal concentration: 50 µg/mL.

10.3.4.6. 25 µL of each of the 10 mg/mL target stock solutions and 25 µL of the 10 mg/mL (see section 10.3.3.1) surrogate solution diluted to volume in a 10 mL volumetric flask with hexadecane. Nominal concentration: 25 µg/mL.

10.3.4.7. 100 µL of the 1 mg/mL target intermediate stock solution and 100 µL of the 1 mg/mL (see section 10.3.3.2) surrogate solution diluted to volume in a 10 mL volumetric flask with hexadecane. Nominal concentration: 10 µg/mL.

10.3.4.8. 50 µL of the 1 mg/mL target intermediate stock solution and 50 µL of the 1 mg/mL(see section 10.3.3.2) surrogate solution diluted to volume in a 10 mL volumetric flask with hexadecane. Nominal concentration: 5 µg/mL.

10.3.4.9. 25 µL of the 1 mg/mL target intermediate stock solution and 25 µL of the 1 mg/mL (see section 10.3.3.2) surrogate solution diluted to volume in a 10 mL volumetric flask with hexadecane. Nominal concentration: 2.5 µg/mL.

10.3.4.10. 10 µL of the 1 mg/mL target intermediate stock solution and 10 µL of the 1 mg/mL (see section 10.3.3.2) surrogate solution diluted to volume in a 10 mL volumetric flask with hexadecane. Nominal concentration: 1 µg/mL.

10.3.4.11. 5 µL of the 1 mg/mL target intermediate stock solution and 5 µL of the 1 mg/mL (see section 10.3.3.2) surrogate solution diluted to volume in a 10 mL volumetric flask with hexadecane. Nominal concentration: 0.5 µg/mL.

10.3.4.12. Calculate the exact concentrations.

10.3.4.13. Transfer exactly 1 mLof each solution into a GC vial, add 10 µL of the internal standard solution (@4 mg/mL, so that the final concentration of internal standard is 40 µg/mL; higher amounts may be added to accommodate high levels of target analytes) and analyze by GC/MSD.

10.3.5. Internal Standard Solution: Weigh out 40 mg of 1,4-dichlorobenzene (d_4) in a 10 mL volumetric flask. Record weight to nearest 0.1 mg. Dilute to volume with hexadecane. The nominal concentration of the stock solution is 4 mg/mL.

10.3.6. Spiking Solutions:

10.3.6.1. Stock Spiking Solutions (10 mg/mL): Using an analytical balance, weigh out 100 mg of 1,2-DCE into a 10 mL volumetric flask. Record the weight to the nearest 0.1 mg. Dilute to the mark with dodecane. Mix by hand for 30 seconds. The nominal concentration is 10mg/mL.

10.3.6.2. Repeat above step for tetrachloroethylene and 1,1,2,2-tetrachloroethane (10 mg/mL).

10.3.6.3. Intermediate Stock Spiking Solution (1 mg/mL): Add 5 mL of dodecane to a 10 mL volumetric flask, transfer 1 mL of each of the Stock Spiking Solutions (@10 mg/mL) and dilute to the mark with dodecane. Mix by hand for 30 seconds. The nominal concentration is 1 mg/mL.

11. PROCEDURE

11.1 OPERATION PARAMETERS

Gas Chromatograph:

Injection volume	1 µl split injection
Column flow	1.0 mL/min (7.1 psi at 40°C.)
Split vent	open
Split vent flow	30 mL/min

Injection port temp	250°C.
Detector temp	280°C.
Oven program	40°C. hold 0.5 min
Rate 1	5°C/min
Final Temp.	90°C
Final Time	0 min
Rate 2	30°C
Final Temp.	280°C
Final Time:	10 minutes
Run time	26.83 min

5972 Mass Spectrometer:

Transfer line temp:	180°C
Total ion scan range:	35-450 amu
Solvent delay:	3.0 min
Tune file:	DFTPP

11.2 SAMPLE PREPARATION

11.2.1. Using an analytical balance, weigh out approximately 100 mg of HD into a 10 mL volumetric flask.

11.2.2. Record the weight of the sample to the nearest 0.1 mg (0.0001g)

11.2.3. Add 100 µL of the 1 mg/mL intermediate surrogate solution (section 10.3.3.1). Higher spiking amounts may be used to accommodate elevated target concentrations found in field samples.

11.2.4. Dilute to the mark with hexadecane. Mix by hand for 30 seconds.

11.2.5. To a GC-vial, add 1.0 mL of the above solution and 10 µL of the internal standard so that the final concentration of the internal standard is 40 µg/mL. Mix by hand for 30 seconds.

11.2.6. Analyze by GC/MSD in the SCAN mode.

11.2.7. Also, include matrix spikes, matrix blanks and a reagent blank.

11.2.8. With each batch of 20 or fewer samples, the following quality assurance samples are also prepared:

11.2.8.1. Method Blank: With each batch of 20 or fewer samples, prepare a method blank by processing 1 mL of hexadecane carried through the sample preparation procedure steps 11.2.4 through 11.2.5.

11.2.8.2. Matrix Blank: With each batch of 20 or fewer samples, prepare a HD matrix blank by processing 100 mg of HD through the sample preparation procedure steps 11.2.1 through 11.2.5.

11.2.8.3. Matrix and Matrix Spike Duplicate: With each batch of 20 or fewer samples, prepare a matrix spike and a matrix spike duplicate by spiking a randomly selected HD sample matrix with 100 µL of the 1 mg/mL spiking solution. Note: Three aliquots of a randomly selected sample are processed; one is prepared and analyzed as specified in steps 11.2.1 through 11.2.5, the other two are spiked as specified above and then processed through the sample preparation procedure steps 11.2.1 through 11.2.5.

11.2.8.4. Blank Spike (Laboratory Control Sample (LCS)): With each batch of 20 or fewer samples, prepare a LCS by spiking 1 mL of hexadecane with the target compounds equivalent to the mid point calibration standard and 100 µL of the 1 mg/mL intermediate surrogate solution (section 10.3.3.1). Process the LCS sample through the sample preparation procedure steps 11.2.4 through 11.2.5. Higher spiking amounts may be used to accommodate elevated target concentrations found in field samples.

11.2.8.5. Reagent Blank: With each batch of 20 or fewer samples, prepare a reagent blank by placing 1 mL of hexadecane with internal standard into a GC-vial. Analyze by GC-MSD.

11.3 SAMPLE ANALYSIS

MSD TUNE, GC COLUMN PERFORMANCE AND INJECTION PORT INERTNESS

As an instrumental quality control measure, a tune check using 4-bromofluorobenzene (BFB) is performed prior to sample analysis. The resultant mass spectrum for BFB must meet the criteria given in the following table before sample analysis begins. When the tune is complete, save the tune file as BFB.

To verify the tune, inject 1µLof the BFB standard. Use the following GC/MS parameters:

Inlet temp:	220° C.
Detector temp:	280° C.
Initial oven temp:	125° C.
Hold	2 min
Rate 1	15° C./min.
Final temp:	250° C.
Final Hold:	5 min
Column flow:	1.0 ml/min (12.0 psi @125° C.)
Injection:	1 µL splitless
Solvent delay:	5 min
MS mode	scan 35-450 amu; threshold 120
Tune file:	BFB

The MSD tune must pass the criteria defined in EPA method 8260A for BFB. These criteria are:

Mass	Ion Abundance Criteria
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	Base peak, 100% relative abundance
96	5 to 9% of mass 95
173	Less than 2% of mass 174

174	Greater than 50% of mass 95
175	5 to 9% of mass 174
176	Greater than 95% but less than 101%of mass 174
177	5 to 9% of mass 176

The HP (Agilent) software should automatically generate a tune report. If the tune check passes, proceed with method. If the tune check fails, repeat the BFB target tune and re-inject the GC/MS tuning standard. If the tune check still continues to fail, clean the MSD source and retune. (See HP (Agilent) 5972 manual).

The GC/MS system must be evaluated for column performance and injection port inertness. Use the data from the same injection as for verifying the tune. Degradation of DDT to DDE and DDD should not exceed 20% (use formula below). Benzidine and pentachlorophenol should be present at their normal responses and no peak tailing should be visible. If these criteria are not met, take corrective action before proceeding with calibration.

$$\% \text{ breakdown of DDT} = \frac{\text{sum of degradation peak areas (DDD + DDE)}}{\text{sum of all peak areas (DDT + DDE + DDD)}} \times 100$$

11.4 CORRECTIVE PROCEDURES

The following items should be checked if the instrument is not meeting acceptance criteria:

- Change septum
- Change injection port liner
- Check split/splitless inlet vent flow (100 ml/min)
- Check autosampler syringe
- Check column connections
- Check autosampler rinse vials
- Check detector vacuum
- Clean MSD source
- Clip or change the column

For all other instrumental problems, consult the owner's operating manual.

12. CALCULATION, CALIBRATION AND DOCUMENTATION

12.1 CALCULATION

Concentrations and calculations of the analyte of interest will be based on a minimal five- point calibration curve (linear curve fit forced through the origin). The calibration curve is a ratio of concentrations on the x-axis and a ratio of peak areas on the y-axis and is based on an internal standard calibration method.

$$\text{Conc. } (\mu g/g) = \frac{[C\ (\mu g/mL) \text{ from the cal. curve}] \times [V\ (mL) \text{ dilution vol.}]}{[M\ (g) \text{ weight of the matrix}]}$$

C = concentration determined by GC analysis
V = Final volume of diluted sample (10 mL)
M = Weight of sample (0.1 g)

12.2 BLANK DETERMINATION AND CALIBRATIONS

A method blank must be run with each batch of samples and must not have detectable amounts of HD. A minimal five-point internal standard calibration must be performed prior to sample analysis, using the best fit curve forced through the origin with equal weighting for each concentration level. The coefficient of determination (r^2) must be greater than 0.995 and each standard level must be +/- 15% of the theoretical value.

12.3 QUALITATIVE ANALYSIS

Qualitative identification of compound determined by this method is based on retention time, and on at least two characteristic ions in a reference mass spectrum. The following criteria must be met unless specified otherwise in Program specific documents or Test Plans:

12.3.1 The intensities of the compound's characteristic extracted ion profiles maximize in the same scan or within one scan of each other.

12.3.2 The relative retention time (RRT) of the sample component is within +/- 0.06 RRT units of the RRT of the standard component.

12.3.3 The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum.

12.4 STANDARDS, CONTROLS, SPIKES, AND VALIDATION PROGRAMS

12.4.1 Calibration standards: The use of calibration standard solutions is described in section 12.2 and their preparation in section 10.3.4. With each batch of sample analysis, a calibration solution shall be analyzed as a calibration check standard. If the value is within 15% of the known concentration, analysis may continue.

12.4.2 Controls: With each batch of 20 or fewer samples the following quality control samples shall be analyzed, as a minimum:

12.4.2.1 Spiked blank (LCS) see section 11.2.8.4.
12.4.2.2 Method blank see section 11.2.8.1.
12.4.2.3 Reagent blank see section 11.2.8.5.
12.4.2.4 Matrix spike and matrix spike duplicate (see section 11.2.8.3): The recovery for each spike shall be calculated and must be within 50 to 150%. The percent relative standard deviation (%RSD) between these two spike shall be calculated and must be less than or equal to 25%. These values shall be recorded on EC/BFAC form FR-0901 until enough data is tabulated to calculated control limits in accordance with EC/BFAC work instruction WI-200.

12.4.3 Method Validation: A method Precision and Accuracy (P & A) study was performed as described in Chapter 1 of EPS SW-846 (Reference 7). Seven replicates of the target compounds and 1,4-DFB in the matrix (HD) at 10 µg/mL were weighted out, prepared and analyzed. In addition, three samples at two higher concentration levels were weighted out, prepared and analyzed for accuracy. The Precision was determined by calculating the Mean, Standard Deviation and Percent Relative Standard Deviation (%RSD) of the replicate injections. The Accuracy was determined by calculating the recovery and Percent Relative Standard Deviation (%RSD) of the replicate matrix samples (See Table 1). In addition, seven replicate injections of one sample of the target compounds and 1,4-Difluorobenzene (1,4-DFB) in the matrix (HD) at 10 µg/mL were analyzed for instrument precision. (See Table 2).

TABLE 1
GC/MSD DATA FOR P & A STUDY: 1,2-Dichloroethane (1,2-DCE), and the Surrogate: 1,4-Difluorobenzene (1,4-DFB)

Analytical Test	Amount Spiked	Amount Measured (Mean)	STD. DEV.	% RSD	Mean (%) Recovery	N
1,2-DCE	0.973 mg/g	0.906 mg/g	0.083	9.22	93.1	7
	1.95 mg/g	1.59 mg/g	0.191	12.0	81.8	3
	3.89 mg/g	3.19 mg/g	0.156	4.89	82.1	3
TCE	1.04 mg/g	1.05 mg/g	0.032	3.06	101	7
	2.08 mg/g	1.80 mg/g	0.027	1.50	86.8	3
	4.16 mg/g	3.81 mg/g	0.063	1.66	91.8	3
1,1,2,2-TCE	1.02 mg/g	1.12 mg/g	0.049	4.35	110	7
	2.03 mg/g	1.92 mg/g	0.022	1.18	94.4	3
	4.06 mg/g	3.70 mg/g	0.135	3.66	91.1	3
1,4-DFB	0.926 mg/g	0.925 mg/g	0.052	5.57	99.9	7
	1.86 mg/g	1.68 mg/g	0.165	9.81	90.3	3
	3.72 mg/g	3.41 mg/g	0.060	1.77	91.8	3

**Data based on nominal amount of matrix HD (100 mg).*

The MDL was calculated based on seven (7) separate samples that were spiked at the lowest concentration, extracted and analyzed. Background 1,2-DCE in the sample was subtracted prior to the recovery calculation.

MDL (1,2-DCE)= [Standard Deviation x t-statistic (N=7)]
MDL (1,2-DCE)= [0.083 mg/g x 3.14] = 0.26 mg/g

MDL (TCE)= [Standard Deviation x t-statistic (N=7)]
MDL (TCE)= [0.032 mg/g x 3.14] = 0.10 mg/g

MDL (1,1,2,2-TCE)= [Standard Deviation x t-statistic (N=7)]
MDL (1,1,2,2-TCE)= [0.049 mg/g x 3.14] = 0.15 mg/g

MDL (1,4-DFB)= [Standard Deviation x t-statistic (N=7)]
MDL (1,4-DFB)= [0.052 mg/g x 3.14] = 0.16 mg/g

TABLE 2
GC/MSD INSTRUMENTAL PRECISION STUDY: 1,2-Dichloroethane (1,2-DCE), and the Surrogate: 1,4-Difluorobenzene (1,4-DFB)

Analytical Test	Amount Spiked	Amount Measured (Mean)	STD. DEV.	% RSD	N
1,2-DCE	0.973 mg/g	0.809 mg/g	0.035	4.34	7
TCE	1.03 mg/g	1.02 mg/g	0.066	6.42	7
1,1,2,2-TCE	1.02 mg/g	1.04 mg/g	0.046	4.40	7
1,4-DFB	0.929 mg/g	0.893 mg/g	0.043	4.78	7

Data based on nominal amount of matrix HD (100mg).
Instrumental Precision refers to one (1) MDL sample extract injected onto the GC/MSD seven (7) times.

13. STATEMENT OF ANALYTICAL RESULT

The results of the determination of the target analyte in the matrix (HD) are reported in µg/g (wt/wt) with a maximum of three (3) significant figures. The major sources contributing to measurement uncertainty are due to sample preparation and the repeatability of the process. The measurement uncertainty for this method was determined over a range of concentrations for each analyte and are presented in the Table 3.

Table 3
Measurement Uncertainty

ANALYTE	CONCENTRATION RANGE (mg/g)	UNCERTAINTY (%)
1,2-DCE	0 to 0.97	21
	0.98 to 1.95	42
	1.96 to 3.89	17
TCE	0 to 1.04	7
	1.05 to 2.08	6
	2.09 to 4.06	7
1,1,2,2 TCE	0 to 1.02	12
	1.03 to 2.03	5
	2.04 to 4.06	14

14. REFERENCES

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14.2. Amendment One to Standing Operating Procedure CR2-ISP002, Army Materiel Command Treaty Laboratory Analytical Support (1997), U. S. Army Materiel Command Treaty Laboratory, Chemical and Biological Defense Command, Edgewood, MD.

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14.6. Nuclear and Chemical Weapons and Materiel: Chemical Surety, Army Regulation 50-6 (1995), Headquarters, Department of the Army, Washington, DC.

14.7. Test Methods for Evaluating Solid Waste Phisical/Chemical Methods, SW-846, U.S Environmental and Protection Agency, Office of Solid Waste and the National Technical Information Service (NTIS), May 1996.

14.8. Hewlett-Packard 5890 Series II and Series II Plus Operating Manual; copyright 1989, 1990, 1991, 1992, 1993 and 1994; Hewlett Packard Company, Ninth Edition, July 1994.

Revision History

Rev. No.	*Description of Revision*	Approval/Date
0	Original	*(11-18-02)* MARY F. DRUMMOND
1	Updated section 11.3 to provided requirement to analyze a different performance standard and provided the acceptance criteria for this new standard.	*(12-5-02)* MARY F. DRUMMOND
2	Added section 10.3.4.4 and re-numbered remainder of section. Section 10.3.4.13, added "higher amounts may be added to accommodate high levels of target analytes" Section 11.2.3, changed surrogate solution added and added "Higher spiking amounts may be used to accommodate elevated target concentrations found in field samples." Added references 14.7 and 14.8.	4-14-03 MARY F. DRUMMOND

Appendix B-5

EC/B FAC Method AM-117

Reviewed By:	Approved By:
for James H Newman 4/15/03	Dennis J Reutter 15 April 2003
JAMES C. PETERSON , Ph.D., Date Laboratory Manager, Battelle	for LYNN D. HOFFLAND, Ph.D., Date Senior Chemist, Edgewood C/B FAC
Issue Date: 15 April 2003	

1. TITLE

Determination of Selected Semi-Volatile Contaminants in HD Matrix by Gas Chromatography Mass Spectrometry.

2. AUTHORS

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3. KEYWORDS

1,2-Bis(2-chloroethylthio)ethane (Q), Bis[2-(chloroethylthio)ethyl]ether (T), Hexachloroethane, Bis(2-chloroethyl) sulfide (HD), Gas chromatography/Mass Spectrometry, GC/MS, characterization.

4. REVISION HISTORY

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5. CONTACT OFFICE

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6. PURPOSE AND APPLICATION

This method is used to determine semi-volatile contaminants in HD by GC/MS analysis.

6.1 ANALYTE CONCENTRATION RANGE

This method can be used for determining the compounds of interest from 0.5 µg/mL to 500 µg/mL.

6.2 SAMPLE MATRICES AND INTERFERENCES

The sample matrix is neat Bis(2-chloroethyl) sulfide (HD). Preliminary analyses were conducted to insure that interference's do not exist.

6.3 THROUGHPUT

Approximately twelve (12) samples can be analyzed in an eight (8) hour period.

6.4 DETECTION LIMIT

The Method Detection Limit (MDL) for Q in HD is 0.05 mg/g, for T in HD is 0.07 mg/g, for and for HCE in HD is 0.08 mg/g.

7. RISK AND SAFETY ASSESSMENT

Low risks to the analyst are associated with this method as long as the proper safety precautions are strictly adhered to. Personnel must wear lab coat, safety glasses and nitrile gloves when handling any sample associated with HD agents and their contaminants. Solvents used in this method pose a risk to the analyst and must be handled with care inside of a well-ventilated hood. HD agents, as well as their contaminants, must be handled with extreme caution and only in an approved hood. Guidelines for handling solvents and agent materiel can be found in WI-090 (Sample Receipt and Handling) and in ERDECR 40-3 (Chemical Hygiene Plan).

8. SCIENTIFIC BASIS

Chemical Agent ton containers may have been contaminated with agents as they were stored over time. A neat HD sample is diluted in methylene chloride, and analyzed by splitless injection GC/MSD to separate, identify and quantitate compound of interest contaminants.

9. TRAINING

The analyst must meet the qualification requirements specified in EC/B FAC operating procedure OP-180. The analyst must be trained in the handling of surety materiel and RDTE solutions. The analyst should have a thorough knowledge of operating a Hewlett Packard (Agilent) HP5890 Series II Plus GC with a 5792 Mass Selective Detector and

ChemStation software. Personnel performing sample preparation activities must have completed training in Basic Chemical Sample Preparation Techniques as defined by the EC/B FAC quality system.

10. APPARATUS

10.1 INSTRUMENTATION

The instrumentation required includes a Hewlett-Packard (Agilent) 5890 Series II Plus GC equipped with a 5972-Mass Selective Detector (or equivalent). The column used is a HP-5MS fused silica column (5% Phenyl Methyl Silicone – 30 M x 0.25 mm-id x 0.25 µm film thickness, or equivalent).

10.2 GLASSWARE, MISCELLANEOUS EQUIPMENT AND SUPPLIES

GC crimp top auto injector vials, 2 mL (Hewlett-Packard (Agilent), Cat. No. 5181-3376) (or equivalent).
GC vial caps, 11 mm septa (Hewlett-Packard (Agilent), Cat. No. 5181-1210) (or equivalent).
Injection Port liner, mixing chamber assembly, 4 mm (Hewlett-Packard (Agilent), Cat. No. 19251-60540) (or equivalent).
Hewlett-Packard (Agilent) HP-5MS fused silica column, 30 M x 0.25 mm i.d. x .25 µm film (Hewlett-Packard (Agilent), Cat. No. 190115-433) (or equivalent).
Pasteur pipettes (VWR, Cat. No. 14673-010) (or equivalent).
Pipette, 100-1000 µL (Rainin, Cat. No. E2-1000) (or equivalent).
Pipette tips (Rainin, Cat. No. RT-200) (or equivalent).
Syringes, 10 µL, 25 µL, 50 µL, 100 µL, 250 µL, 500 µL, 1000 µL (VWR) (or equivalent).
Volumetric flask 10 mL with stopper (Kimble Glass, Co.) (or equivalent).
Vortex Genie 2 (Scientific Industries, Inc.) (or equivalent).

10.3 CHEMICALS / STANDARDS

10.3.1. Reagents / Chemicals

10.3.1.1. Methylene chloride (Burdick & Jackson, B&J Purified Plus Grade) or equivalent.
10.3.1.2. Carbon Disulfide (CS_2), CAS: 75-15-0, J.T. Baker Co., Ultra Resi-Analyzed (or equivalent).
10.3.1.3. Hexane (Burdick & Jackson, B&J Purified Plus Grade) or equivalent.

10.3.2. Standards / Internal Standards / Surrogates

10.3.2.1. 1,2-Bis(2-chloroethylthio)ethane (Q), (C6H12Cl2S2), CAS#: 003563-36-8, M.W.: 217.97.

10.3.2.2. Bis[2-(chloroethylthio)ethyl]ether (T), (C8H16Cl2OS2), CAS#: 000693-07-2, M.W.: 262.00.

10.3.2.3. Hexachloroethane, (C2Cl6), CAS#: 67-72-1, M.W.: 236.74.

10.3.2.4. 1,4-Dichlorobenzene-d_4 (deuterated 1,4-DCB), $C_6D_4O_2Cl_2$, CAS: 3855-82-1, M.W. 152.04. Purity: 98%+. Aldrich (or equivalent).

10.3.2.5. Acenaphthene-d10, CAS: 15067-26-2, M.W. 164.29. Purity: 99%+. Aldrich (or equivalent).

10.3.2.6. Phenanthrene-d10, CAS: 1517-22-2, M.W. 188.32. Purity: 98%+. Aldrich (or equivalent).

10.3.2.7. 1,4-Dithiane-d4, C4H4D4S2, M.W. 124.26. Cerilliant (or equivalent).

10.3.3 Surrogate Standard Solution: 1,4-Dithiane-d_4 Stock Solution (1 mg/mL). This solution is obtained directly from the vendor at 1 mg/mL in methanol.

10.3.4 Calibration Standard Solutions:

10.3.4.1 Target Compound Stock Solution (10 mg/mL). Weigh out 100 mg of Q in a 10 mL volumetric flask. Record weight to nearest 0.1 mg. Dilute to volume with methylene chloride. The nominal concentration of the stock solution is 10 mg/mL.

10.3.4.2 Follow the same procedure for T and Hexachloroethane (10 mg/mL).

10.3.4.3 Target Compound Intermediate Stock Solution (1 mg/mL). Add 5 mL of methylene chloride to a 10 mL volumetric flask. Add 1 mL of the Target Compound Stock solution (@ 10 mg/mL) to the flask. Mix by hand for 30 seconds. Dilute to volume with methylyne chloride. The nominal concentration of the intermediate stock solution is 1 mg/mL.

10.3.4.4 Target Compound Low Level Stock Solution (100 µg/mL). Add 5 mL of methylene chloride to a 10 mL volumetric flask. Add 1 mL of the Target Compound Intermediate Stock solution (@ 1 mg/mL) to the flask. Mix well by hand for 30 seconds. Dilute to volume with methylene chloride. The nominal concentration of the low-level stock solution is 100 µg/mL.

10.3.4.5 250 µL of the 10 mg/mL target stock solution diluted to volume in a 5 mL volumetric flask with methylene chloride. Nominal concentration: 500 µg/mL.

10.3.4.6 125 µL of the 10 mg/mL target stock solution diluted to volume in a 5 mL volumetric flask with methylene chloride. Nominal concentration: 250 µg/mL.

10.3.4.7 500 µL of the 1 mg/mL intermediate stock solution and 500 µL of the Stock Surrogate Solution at 1 mg/mL diluted to volume in a 5

mL volumetric flask with methylene chloride. Nominal concentration: 100 µg/mL.

10.3.4.8 250 µL of the 1 mg/mL intermediate stock solution and 250 µL of the Stock Surrogate Solution at 1 mg/mL diluted to volume in a 5 mL volumetric flask with methylene chloride. Nominal concentration: 50 µg/mL.

10.3.4.9 125 µL of the 1 mg/mL intermediate stock solution and 125 µL of the Stock Surrogate Solution at 1 mg/mL diluted to volume in a 5 mL volumetric flask with methylene chloride. Nominal concentration: 25 µg/mL.

10.3.4.10 50 µL of the 1 mg/mL intermediate stock solution and 50 µL of the Stock Surrogate Solution at 1 mg/mL diluted to volume in a 5 mL volumetric flask with methylene chloride. Nominal concentration: 10 µg/mL.

10.3.4.11 250 µL of the 100 µg/mL low stock solution and 25 µL of the Stock Surrogate Solution at 1 mg/mL diluted to volume in a 5 mL volumetric flask with methylene chloride. Nominal concentration: 5 µg/mL.

10.3.4.12 125 µL of the 100 µg/mL low stock solution and 12.5 µL of the Stock Surrogate Solution at 1 mg/mL diluted to volume in a 5 mL volumetric flask with methylene chloride. Nominal concentration: 2.5 µg/mL.

10.3.4.13 50 µL of the 100 µg/mL low stock solution and 5 µL of the Stock Surrogate Solution at 1 mg/mL diluted to volume in a 5 mL volumetric flask with methylene chloride. Nominal concentration: 1 µg/mL.

10.3.4.14 25 µL of the 100 µg/mL low stock solution 2.5 µL of the Stock Surrogate Solution at 1 mg/mL diluted to 10 mL in a volumetric flask with methylene chloride. Nominal concentration: 0.5 µg/mL.

10.3.4.15 Calculate the exact concentrations.

10.3.4.16 Transfer exactly 1 mL of each solution into a GC vial and add 10 µL (higher amounts may be added to accommodate high levels of target analytes) of the 4 mg/mL internal standard so that the final nominal concentration is 40 µg/mL. Mix well by hand for 30 seconds.

10.3.5 Internal Standard Solution: Weigh out 40 mg each of 1,4-dichlorobenzene (d_4), acenaphthene (d_{10}) and phenanthrene (d_{10}) in a 10 mL volumetric flask. Record weight to nearest 0.1 mg. Add 2 mL of carbon disulfide. Mix well by hand for 30 seconds. Dilute to volume with methylene chloride. The nominal concentration of the stock solution is 4 mg/mL.

10.3.6 Spiking Solutions:

10.3.6.1 Stock Spiking Solution (10 mg/mL): Using an analytical balance, weigh out 100 mg of each target compound into a 10 mL volumetric flask. Record the weight to the nearest 0.1 mg. Dilute to the mark with methylene chloride. Mix well by hand for 30 seconds. The nominal concentration is 10 mg/mL. **NOTE**: The spiking solvent should be different than the extraction solvent, if possible, depending on the compatibility of the target analytes and the solvent.

10.3.6.2 Intermediate Stock Spiking Solution (1 mg/mL): Add 5 mL of methylene chloride to a 10 mL volumetric flask, transfer 1 mL of the Stock Spiking Solution and dilute to the mark with methylene chloride. Mix well by hand for 30 seconds. The nominal concentration is 1 mg/mL.

11. PROCEDURE

11.1 OPERATION PARAMETERS

Gas Chromatograph:

Injection volume	1 µl splitless injection
Column flow	1.0 mL/min (7.1 psi at 40°C.)
Split vent	closed for 1 minute
Split vent flow	50-60 mL/min
Injection port temp	250°C.
Detector temp	280°C.
Oven program	40°C. hold 1 min
Rate 1	10°C/min
Final Temp.	280°C
Final Time	10 min
Run time	35.0 min

5972 Mass Spectrometer:

Transfer line temp:	180°C
Total ion scan range:	35-450 amu
Solvent delay:	3.0 min
Tune file:	DFTPP

11.2 SAMPLE PREPARATION

11.2.1. Using an analytical balance, weigh out approximately 100 mg of HD into a 10 mL volumetric flask. Record the weight to the nearest 0.1 mg.

11.2.2. Add 100 µL of the surrogate solution (see section 10.3.4)

11.2.3. Dilute to the mark with methylene chloride. Mix well by hand for 30 seconds.

11.2.4. To a GC-vial, add 1.0 mL of the above solution and 10 µL of the internal standard so that the final concentration of the internal standard is 40 µg/mL. Mix well by hand for 30 seconds.

11.2.5. Analyze by GC/MSD in the SCAN mode.

11.2.6. With each batch of 20 or fewer samples, the following quality assurance samples are also prepared:

11.2.6.1. Method Blank: 1 mL of methylene chloride carried through the sample preparation procedure and analyzed with Internal Standards.

11.2.6.2. Matrix Blank: HD matrix carried through the sample preparation procedure and analyzed with Internal Standards.

11.2.6.3. Matrix and Matrix Spike Duplicate: Prepare a matrix spike and a matrix spike duplicate by spiking a randomly selected HD sample matrix with 100 µL of the 1 mg/mL spiking solution (100 µL of the 10 mg/mL spiking solution may be added if the expected levels of target compounds are higher). **Note:** Three aliquots of a randomly selected sample are processed; one is prepared and analyzed as specified in steps 11.2.1 through 11.2.5, the other two are spiked as specified above and then processed through the sample preparation procedure.

11.2.6.4. Blank Spike (Laboratory Control Sample (LSC)): 1 mL of methylene chloride spiked with the target equivalent to the mid point calibration standard and 100 µL of the 1 mg/mL surrogate solution (section 10.3.3). Process the LCS sample through the sample preparation procedure steps 11.2.3 through 11.2.5.

11.2.6.5. Reagent Blank: Prepare a reagent blank by placing 1 mL of methylene chloride with internal standard into a GC-vial. Analyze by GC-MSD.

11.3 SAMPLE ANALYSIS

MSD TUNE, GC COLUMN PERFORMANCE AND INJECTION PORT INERTNESS

As an instrumental quality control measure, a tune check using decafluorotriphenylphosphine (DFTPP) is performed prior to sample analysis. The resultant mass spectrum for DFTPP must meet the criteria given in the following table before sample analysis begins. When the tune is complete, save the tune file as DFTPP. The GC/MS system is evaluated for tune, column performance and *injection port inertness before proceeding with calibration*. A solution containing 50 ng/µLof 4,4'-DDT, pentachlorophenol, benzidine and DFTPP must be injected and evaluated (commercially available – GC/MS tuning standard).

To verify the tune, inject 1µLof the GC/MS tuning standard. Use the following GC/MS parameters:

Inlet temp:	220° C.
Detector temp:	280° C.

Initial oven temp:	125° C.
Hold	2 min
Rate 1	15° C./min.
Final temp:	250° C.
Final Hold:	5 min
Column flow:	1.0 ml/min (12.0 psi @125° C.)
Injection:	1 µLsplitless
Solvent delay:	5 min
MS mode	scan 35-450 amu; threshold 120
Tune file:	DFTPP

The MSD tune must pass the criteria defined in EPA method 8270 for DFTPP. These criteria are:

Mass	Ion Abundance Criteria
51	30-60% of mass 198
68	<2% of mass 69
Mass	Ion Abundance Criteria
70	<2% of mass 69
127	40-60% of mass 198
197	<1% of mass 198
198	Base peak, 100% relative abundance
199	5-9% of mass 198
275	10-30% of mass 198
365	>1% of mass 198
441	Present but less than mass 443
442	>40% of mass 198
443	17-23% of mass 442

The HP (Agilent) software should automatically generate a tune report. If the tune check passes, proceed to column performance and injection port inertness; if the tune check fails, repeat the DFTPP target tune and reinject the GC/MS tuning standard. If the tune check still continues to fail, clean the MSD source and retune. (See HP (Agilent) 5972 manual)

The GC/MS system must be evaluated for column performance and injection port inertness. Use the data from the same injection as for verifying the tune. Degradation of DDT to DDE and DDD should not exceed 20% (use formula below).

Benzidine and pentachlorophenol should be present at their normal responses and no peak tailing should be visible. If these criteria are not met, take corrective action before proceeding with calibration.

$$\% \text{ breakdown of DDT} = \frac{\text{sum of degradation peak areas (DDD + DDE)}}{\text{sum of all peak areas (DDT + DDE + DDD)}} \times 100$$

11.4 CORRECTIVE PROCEDURES

The following items should be checked if the instrument is not meeting acceptance criteria:

- Change septum
- Change injection port liner
- Check split/splitless inlet vent flow (100 ml/min)
- Check autosampler syringe
- Check column connections
- Check autosampler rinse vials
- Check detector vacuum
- Clean MSD source
- Clip or change the column

For all other instrumental problems, consult the owner's operating manual.

12. CALCULATION, CALIBRATION AND DOCUMENTATION

12.1 CALCULATION

Concentrations and calculations of the analyte of interest will be based on a minimal five-point calibration curve (linear curve fit forced through the origin). The calibration curve is a ratio of concentrations on the x-axis and a ratio of peak areas on the y-axis and is based on a internal standard calibration method.

$$\text{Conc. } (\mu g/g) = \frac{[C\ (\mu g/mL) \text{ from the cal. curve}] \times [V\ (mL) \text{ dilution vol.}]}{[M\ (g) \text{ weight of the matrix}]}$$

C = concentration determined by GC analysis
V = Final volume of diluted sample (10 mL)
M = Weight of sample (0.1 g)

12.2 BLANK DETERMINATION AND CALIBRATIONS

A method blank must be run with each batch of samples and must not have detectable amounts of HD. A minimal five-point internal standard calibration must be performed prior to sample analysis, using a linear curve forced through the origin

(a quadratic curve can be used with six (6) points NOT passing through the origin) with equal weighting for each concentration level. The coefficient of determination (r^2) must be greater than 0.995 and each standard level must be +/- 15% of the theoretical value.

12.3 QUALITATIVE ANALYSIS

Qualitative identification of compound determined by this method is based on retention time, and on at least two characteristic ions in a reference mass spectrum. The following criteria must be met unless specified otherwise in Program specific documents or Test Plans:

12.3.1 The intensities of the compound's characteristic extracted ion profiles maximize in the same scan or within one scan of each other.

12.3.2 The relative retention time (RRT) of the sample component is within +/- 0.06 RRT units of the RRT of the standard component.

12.3.3 The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum.

12.4 STANDARDS, CONTROLS, SPIKES, AND VALIDATION PROGRAMS

12.4.1 Calibration standards: The use of calibration standard solutions is described in section 12.2 and their preparation in section 10.4. With each batch of sample analysis, a calibration solution shall be analyzed as a calibration check standard. If the value is within 25% of the known concentration, analysis may continue.

12.4.2 Controls: With each batch of 20 or fewer samples the following quality control samples shall be analyzed, as a minimum:

12.4.2.1 Spiked blank (LCS) see section 11.2.6.4.

12.4.2.2 Method blank see section 11.2.6.1.

12.4.2.3 Reagent blank see section 11.2.6.5.

12.4.2.4 Matrix spike and matrix spike duplicate (see section 11.2.6.3): The recovery for each spike shall be calculated and must be within 50 to 150%. The percent relative standard deviation (%RSD) between these two spike shall be calculated and must be less than or equal to 25%. These values shall be recorded on EC/BFAC form FR-0901 until enough data is tabulated to calculated control limits in accordance with EC/BFAC work instruction WI-200.

12.4.3 Method Validation: A method Precision and Accuracy (P & A) study was performed as described in Chapter 1 of EPA SW-846 (Reference 7). Seven replicates of the target compounds and appropriate

surrogate solution in the matrix (HD) at 10 µg/mL were weighed out, prepared and analyzed. In addition, three samples at two higher concentration levels were weighed out, prepared and analyzed for accuracy. The Precision was determined by calculating the Mean, Standard Deviation and Percent Relative Standard Deviation (%RSD) of the replicate injections. The Accuracy was determined by calculating the recovery and Percent Relative Standard Deviation (%RSD) of the replicate matrix samples (See Table 1). In addition, seven replicate injections of one sample of the target compounds and the appropriate surrogate solution in the matrix (HD) at 10 µg/mL were analyzed for instrument precision. (See Table 2).

TABLE 1
GC/MSD DATA FOR P & A STUDY: Q, T, and Hexachloroethane (HCE) and the Surrogates: DIMP-d14 and 1,4-Dithiane-d4

Analytical Test	Amount Spiked	Amount Measured (Mean)	STD. DEV.	% RSD	Mean (%) Recovery	N
Q	0.929 mg/g	1.11 mg/g	0.016	1.46	119	7
	1.86 mg/g	2.06 mg/g	0.081	3.93	111	3
	3.72 mg/g	3.93 mg/g	0.171	4.35	106	3
T	0.933 mg/g	0.918 mg/g	0.023	2.53	98.4	7
	1.87 mg/g	1.74 mg/g	0.089	5.11	93.1	3
	3.73 mg/g	3.28 mg/g	0.081	2.46	87.9	3
HCE	0.998 mg/g	1.10 mg/g	0.025	2.28	110	7
	2.00 mg/g	2.12 mg/g	0.066	3.13	106	3
	3.99 mg/g	4.17 mg/g	0.545	13.1	104	3
DIMP-d14	1.00 mg/g	1.04 mg/g	0.038	3.59	104	7
	2.00 mg/g	2.04 mg/g	0.078	3.80	102	3
	4.00 mg/g	3.97 mg/g	0.350	8.80	99.3	3
1,4-Dithiane-d4	1.00 mg/g	0.993 mg/g	0.031	3.16	99.3	7
	2.00 mg/g	1.96 mg/g	0.084	4.30	98.0	3
	4.00 mg/g	3.77 mg/g	0.382	10.1	94.2	3

**Data based on nominal amount of matrix HD (100 mg).*

The MDL was calculated based on seven (7) separate samples that were spiked, extracted and analyzed. Background Q in the sample was subtracted prior to the recovery calculation.

MDL (Q)= [Standard Deviation x t-statistic (N=7)]
MDL (Q)= [0.016 mg/g x 3.14] = 0.051 mg/g

MDL (T)= [Standard Deviation x t-statistic (N=7)]
MDL (T)= [0.023 mg/g x 3.14] = 0.07 mg/g

MDL (HCE)= [Standard Deviation x t-statistic (N=7)]
MDL (HCE)= [0.025 mg/g x 3.14] = 0.08 mg/g

MDL (DIMP-d14)= [Standard Deviation x t-statistic (N=7)]
MDL (DIMP-d14)= [0.038 mg/g x 3.14] = 0.12 mg/g

MDL (DITHIANE-d4)= [Standard Deviation x t-statistic (N=7)]
MDL (DITHIANE-d4)= [0.031 mg/g x 3.14] = 0.10 mg/g

TABLE 2
GC/MSD INSTRUMENTAL PRECISION STUDY: Q, T, and Hexachloroethane (HCE) and the Surrogates: DIMP-d14 and 1,4-Dithiane-d4

Analytical Test	Amount Spiked	Amount Measured (Mean)	STD. DEV.	% RSD	N
Q	0.929 mg/g	1.13 mg/g	0.027	2.36	7
T	0.933 mg/g	0.956 mg/g	0.018	1.90	7
HCE	0.998 mg/g	1.05 mg/g	0.015	1.47	7
DIMP-d14	1.00 mg/g	1.03 mg/g	0.010	1.03	7
Dithiane-d4	1.00 mg/g	0.995 mg/g	0.021	2.10	7

Data based on nominal amount of matrix HD (100mg).
Instrumental Precision refers to one (1) MDL sample extract injected onto the GC/MSD seven (7) times.

13. STATEMENT OF ANALYTICAL RESULT

The results of the determination of the target analyte in the matrix (HD) are reported in µg/g (wt/wt) with a maximum of three (3) significant figures. The major sources contributing to measurement uncertainty are due to sample preparation and the repeatability of the process. The measurement uncertainty for this method was determined over a range of concentrations for each analyte and are presented in the Table 3.

Table 3
Measurement Uncertainty

ANALYTE	CONCENTRATION RANGE (mg/g)	UNCERTAINTY (%)
Q	0 to 0.93	4
	0.94 to 1.86	19

ANALYTE	CONCENTRATION RANGE (mg/g)	UNCERTAINTY (%)
	1.87 to 3.72	20
T	0 to 0.93	6
	0.94 to 1.87	20
	1.88 to 3.73	9
HCE	0 to 1.00	6
	1.01 to 2.00	14
	2.01 to 3.99	59

14. REFERENCES

14.1. Army Materiel Command Treaty Laboratory Analytical Support, Standing Operating Procedure CR2-ISP002 (1997), U. S. Army Materiel Command Treaty Laboratory, Chemical and Biological Defense Command, Edgewood, MD.

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14.3. The Army Toxic Chemical Agent Safety Program, Army Regulation 385-61 (1997), Headquarters, Department of the Army, Washington, DC.

14.4. Toxic Chemical Agent Safety Standards, Department of the Army Pamphlet 385-61 (1997), Headquarters, Department of the Army, Washington, DC.

14.5. Chemical Accident or Incident Response and assistance (CAIRA) Operations, Department of the Army Pamphlet 50-6 (1995), Headquarters, Department of the Army, Washington, DC.

14.6. Nuclear and Chemical Weapons and Materiel: Chemical Surety, Army Regulation 50-6 (1995), Headquarters, Department of the Army, Washington, DC.

14.7. Test Methods for Evaluating Solid Waste Phisical/Chemical Methods, SW-846, U.S Environmental and Protection Agency, Office of Solid Waste and the National Technical Information Service (NTIS), May 1996.

14.8. Hewlett-Packard 5890 Series II and Series II Plus Operating Manual; copyright 1989, 1990, 1991, 1992, 1993 and 1994; Hewlett Packard Company, Ninth Edition, July 1994.

Revision History

Rev. No.	Description of Revision	Approval/Date
0	Original	*(12-05-02)* MARY F. DRUMMOND
1	Section 6.1, changed concentration range from "0.5 µg/mL to 50 µg/mL" to "0.5 µg/mL to 500 µg/mL". Section 10.3.2, deleted "Diisopropyl methylphosphonate" and re-numbered remainder of section. Section 10.3.3, deleted DIMP stock surrogate solution. Section 10.3.4.5, changed concentration from 50 to 500. Added sections 10.3.4.6 and 10.3.4.7. Section 10.3.4.8, added "250 µL of the 1 mg/ml intermediate stock solution" to the first sentence. Section 10.3.4.9, changed "target stock solution" to "intermediate stock solution". Sections 10.3.4.11, 10.3.4.12 and 10.3.4.13, changed "intermediate stock solution" to "low stock solution". Section 10.3.4.14, added "low stock solution". Section 10.3.4.16, added "(higher amounts may be added to accommodate high levels of target analytes)". Section 10.3.6.1, added NOTE. Section 11.2.2, deleted "appropriate". Section 11.2.6.3, added "(100 µL of the 10 mg/mL spiking solution may be added if the expected levels of target compounds are higher)". Section 11.2.6.4, deleted "appropriate". Section 12.2, changed "best-fit" to "linear" and added "(a quadratic curve can be used with six (6) points NOT passing through the origin)". Added references 14.7 and 14.8.	4-14-03 MARY F. DRUMMOND

Appendix B-6

EC/B FAC Method AM-126

Reviewed By:	Approved By:
for James H Newman 4/15/03	Dennis J Reutter 15 April 2003
JAMES C. PETERSON , Ph.D., Date	for LYNN D. HOFFLAND, Ph.D., Date
Laboratory Manager, Battelle	Senior Chemist, Edgewood C/B FAC
Issue Date: 15 April 2003	

1. TITLE

Determination of chemical agent Lewisite (L) in neat chemical agent Mustard (HD) matrix by Gas Chromatography Mass Spectrometry.

2. AUTHORS

Thomas F. Rusek, Battelle Memorial Institute, Edgewood Operations.

3. KEYWORDS

HD, Lewisite, L, Dichloro(2-chlorovinyl)arsine, 1,3-propanedithiol, Gas chromatography/Mass Spectrometry, GC/MS, quantitative

4. REVISION HISTORY

Revision 0 – 20 December 2002
Revision 1 – 23 January 2003
Revision 2 – 12 February 2003

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6. PURPOSE AND APPLICATION

This method is used to detect and quantitate Lewisite (dichloro (2-chlorovinyl)arsine), chlorovinyl arsenous acid, and lewisite oxide in their derivatized form chlorovinylarsenous acid-propanedithiol (CVAA-PDT) in neat HD (mustard) matrix by GC/MS analysis.

6.1. ANALYTE CONCENTRATION RANGE The five (5) point calibration curve for SIM analysis ranges from 50 ng/mL to 2000 ng/mL.

6.2. SAMPLE MATRICES AND INTERFERENCES The sample matrix is agent HD. Analyses with HD indicated no interferences for the internal standards or the target compound.

6.3. THROUGHPUT Approximately twenty (20) samples can be analyzed in an eight (8) hour period.

6.4. DETECTION LIMIT The method detection limit for Lewisite is 1.95 µg/g in neat HD.

7. RISK AND SAFETY ASSESSMENT

Lewisite (L), containing arsenic, acts as a systemic poison, causing pulmonary edema, diarrhea, restlessness, weakness, subnormal temperature, and low blood pressure. Liquid L causes an immediate searing sensation in the eye and permanent loss of sight if not flushed within one (1) minute with large amounts of water. Lewisite also causes an immediate burning sensation at the point of skin contact.

Low risks to the analyst are associated with this method as long as the proper safety precautions are strictly followed. Wearing of lab coat, safety glasses and nitrile gloves is required when handling any sample associated with the L and HD agents. Solvents used in this method pose a risk to the analyst and must be handled with care inside of a well-ventilated hood. L and HD agents must be handled with extreme caution and only in an approved hood. Guidelines for handling solvents and agent materiel can be found in WI-090 (Sample Receipt and Handling) and in ERDECR 40-3 (Chemical Hygiene Plan).

8. SCIENTIFIC BASIS

A neat HD sample is diluted to approximately 10 mg/mL in methylene chloride. The sample is derivatized with 1,3-propanedithiol (1,3-PDT). The sample is analyzed by GC/MS in the selected ion monitoring SIM mode to detect and quantitate derivatized Lewisite.

9. TRAINING

The analyst must meet the qualification requirements specified in EC/B FAC operating procedure OP-180. The analyst should have a thorough knowledge of operating a Hewlett Packard (Agilent) HP5890 Series II Plus GC with a 5792 Mass Selective Detector and ChemStation software. Personnel performing sample preparation activities must have completed training in Basic Chemical Sample Preparation Techniques as defined by the EC/B FAC quality system.

10. APPARATUS

10.1. INSTRUMENTATION

The instrumentation required includes a Hewlett-Packard (Agilent) 5890 Series II Plus GC equipped with a 5972-Mass Selective Detector (or equivalent). The column used is a HP-5 fused silica column (5% Phenyl Methyl Silicone – 30 M x 0.25 mm-id x 0.25 µm film thickness) (or equivalent)

10.2. GLASSWARE, MISCELLANEOUS EQUIPMENT AND SUPPLIES

GC crimp top autoinjector vials, 2 mL (Hewlett-Packard (Agilent), Cat. No. 5181-3376 or equivalent)
GC vial caps, 11 mm septa (Hewlett-Packard (Agilent), Cat. No. 5181-1210)
Injection Port liner, deactivated single taper, 4 mm (Hewlett-Packard (Agilent), Cat. No. 5062-3587 or equivalent)
Hewlett-Packard (Agilent) HP-5MS fused silica column, 30 M x 0.25 mm i.d. x .25 µm film (Hewlett-Packard (Agilent), Cat. No. 190115-433 or equivalent)
Pasteur pipettes (VWR, Cat. No. 14673-010 or equivalent)
Pipette, 100-1000 µL (Rainin, Cat. No. E2-1000 or equivalent)
Pipette tips (Rainin, Cat. No. RT-200 or equivalent)
Syringes, 10 µL, 25 µL, 50 µL, 100 µL, 250 µL, 500 µL, 1000 µL (VWR or equivalent)
Volumetric flask 10 mL with stopper (Kimble Glass, Co or equivalent)
Vortex Genie 2 (Scientific Industries, Inc. or equivalent)

10.3. CHEMICALS / STANDARDS

10.3.1. Reagents / Chemicals

Hexane (C_6H_{14}), CAS: 110-54-3, J.T. Baker Co., Ultra-Resi-Analyzed (or equivalent).
Methylene Chloride (CH_2Cl_2), CAS: 75-09-2, Burdick & Jackson, Pesticide Residue Analysis (or equivalent).
Carbon Disulfide (CS_2), CAS: 75-15-0, Aldrich, Acs, 99.9% (or equivalent)
1,3-Propanedithiol ($C_3H_8S_2$), CAS: 109-80-8, Aldrich, 99% (or equivalent)

10.3.2. Standards

Dichloro(2-chlorovinyl)arsine (L) ($C_2H_2AsCl_3$), CAS: 541-25-3, M.W.: 206.00, CASARM grade
1,4-Dichlorobenzene-d_4 (deuterated 1,4-DCB), $C_6D_4O_2Cl_2$, CAS: 3855-82-1, M.W. 152.04. Purity: 98%+. Aldrich.
Deuterated acenaphthene ($C_{12}D_{10}$), CAS: 15067-26-2, M.W.: 164.29, Aldrich, 99% (or equivalent)
Deuterated phenanthrene ($C_{14}D_{10}$), CAS: 1517-22-2, M.W.: 188.32, Aldrich, 99% (or equivalent)

10.3.3. Internal standard solution:

10.3.3.1. Weigh out 40 mg of each internal standard compound (acenaphthene-d10, 1,4-dichlorobenzene-d4 and phenanthrene-d10) into a 10 mL volumetric flask.
10.3.3.2. Add 2 mL of carbon disulfide to dissolve.
10.3.3.3. Dilute to volume with methylene chloride. The concentration is 4 mg/mL.
10.3.3.4. Add 250 uL of the 4 mg/mL solution to a 10 mL volumetric flask.
10.3.3.5. Dilute to volume with methylene chloride. The concentration is 100 µg/mL.
10.3.3.6. Transfer to appropriate size containers.

10.3.4. Lewisite Calibration Solutions:

10.3.4.1. Lewisite Stock Solution: 1000 µg/mL: weigh out 10 mg of L in a 10 mL volumetric flask. Add 50 µL of a 10 % solution of 1,3-PDT (made up in hexane). Dilute to volume with methylene chloride and mix by hand for 30 seconds. This solution expires in six months or upon the expiration of the lewisite standard, whichever is earliest.

10.3.4.2. Lewisite Intermediate Calibration Solution: 10 µg/mL: transfer 100 µL of the L Stock Solution to a 10 mL volumetric flask and dilute to volume with methylene chloride.

10.3.5. Calibration standards:

10.3.5.1. 2000 ng/mL: add 2 mL of the L-Intermediate Calibration Solution (L) to a 10 mL volumetric flask and dilute to volume with methylene chloride.
10.3.5.2. 1000 ng/mL: add 1 mL of the L-Intermediate Calibration Solution (L) to a 10 mL volumetric flask and dilute to volume with methylene chloride.
10.3.5.3. 500 ng/mL: add 500 µL of the L-Intermediate Calibration Solution (L) to a 10 mL volumetric flask and dilute to volume with methylene chloride.
10.3.5.4. 250 ng/ml: add 250 µL of the L-Intermediate Calibration Solution (L) to a 10 mL volumetric flask and dilute to volume with methylene chloride.
10.3.5.5. 100 ng/ml: add 1 mL of the 1000 ng/mL Calibration Solution (L) to a 10 mL volumetric flask and dilute to volume with methylene chloride.
10.3.5.6. 50 ng/ml: add 1 mL of the 500 ng/mL Calibration Solution (L) to a 10 mL volumetric flask and dilute to volume with methylene chloride.
10.3.5.7. Remove 1.0 mL from each calibration solution and place in GC vials.
10.3.5.8. Add 10 µL of the internal standard mix (100 µg/mL d_4-1, 4-dichlorobenzene, d_{10}- acenaphthene, d_{10}-phenanthrene) to each vial.
10.3.5.9. Add 10 µL of neat 1,3-propanedithiol.

10.3.6. Matrix spike solution:

10.3.6.1. Lewisite Stock Spiking Solution: 1 mg/mL: weigh out 10 mg of L into a 10 mL volumetric flask and dilute to volume with hexane.

10.3.6.2. Lewisite Intermediate Spiking Solution: 10 µg/mL: transfer 100 µL of the Lewisite Stock Spiking Solution to a 10 mL volumetric flask and dilute to volume with hexane.

11. PROCEDURE

11.1. OPERATION PARAMETERS

Gas Chromatograph:

Injection volume	1 µL splitless injection
Column flow	1.0 mL/min (7.1 psi at 40°C.), vacuum comp. on
Split vent	closed for 1.00 min.
Split vent flow	55 mL/min
Injection port temp	250°C.
Detector temp	280°C.
Oven program	40°C. hold 1.0 min
Rate 1	10°C./min
Final temp	280°C.
Final hold	10.0 min
Run time	35 min
Carrier gas	helium

5972 Mass Spectrometer:

Transfer line temp:	280°C
Total ion scan range:	35-560 amu

Compound	Quant-Ion	Qualifier-Ions
CVAA-PDT	242	181, 149, 107

Internal Standards

1,4-Dichlorobenzene (d4)	150	None
Acenapthene (10)	164	None
Phenanthrene (10)	188	None

11.2. SAMPLE PREPARATION

11.2.1. Weigh out 100 mg of HD sample into a 10 mL volumetric flask. Record the exact weight to the nearest 0.1 mg.
11.2.2. Add 50 µL of 10% 1,3-propanedithiol derivatizing agent.
11.2.3. Dilute to volume with methylene chloride.
11.2.4. Aliquot exactly 1.0 ml of the dilution into a GC vial.
11.2.5. Add 10 µL of the Internal Standard Solution (I.S. @ 1 µg/mL).
11.2.6. Add 10 µL of neat 1,3-propanedithiol.
11.2.7. Analyze by GC/MSD/SIM.

11.2.8. With each batch of 20 or fewer samples or with each daily analysis batch, whichever is more frequent, the following quality assurance samples are also prepared:

11.2.8.1. Matrix Blank: With each batch of 20 or fewer samples, prepare a matrix blank by processing 100 mg of HD through the sample preparation procedure steps 11.2.3 through 11.2.6.

11.2.8.2. Method Blank: Methylene chloride carried through the sample preparation procedure and analyzed with Internal Standards.

11.2.8.3. Matrix and Matrix Spike Duplicate: A 100 mg aliquot of HD matrix is weighed into a 10 mL volumetric flask. Record the exact weight to the nearest 0.1 mg. The matrix is spiked directly with 100 µL (more may be added to accommodate high levels of Lewisite in the samples) of the 10 µg/mL Lewisite spiking solution, and then carried through the sample preparation procedure of steps 11.2.2 through 11.2.7 and analyzed by GC/MSD/SIM. Note: Three aliquots of a randomly selected sample are processed; one is prepared and analyzed as specified in steps 11.2.2 through 11.2.7, the other two are spiked as specified above and then processed through the sample preparation procedure steps 11.2.2 through 11.2.7.

11.2.8.4. Blank Spike (Laboratory Control Sample (LCS)): With each batch of 20 or fewer samples, prepare a LCS by spiking 1 mL of methylene chloride with the target compounds. Process the LCS sample through the sample preparation procedure steps 11.2.2 through 11.2.7.

11.2.8.5. Reagent Blank: Methylene chloride analyzed with Internal Standards.

11.3. SAMPLE ANALYSIS

A 1.0 µL sample is analyzed using a Hewlett-Packard (Agilent) 5890 Series II Plus Gas Chromatograph equipped with an autoinjector and a Mass Selective Detector. The analysis is conducted in the selected ion monitoring (SIM) mode according to the instrument conditions described in Section 11.1.

11.4. CORRECTIVE PROCEDURES

If the minimal five-point calibration fails or the calibration check standards do not pass criteria, the samples analyzed prior to the failed check standard will be re-analyzed. For all other instrumental problems, address the owner's operating manual.

12. CALCULATION, CALIBRATION AND DOCUMENTATION

12.1. CALCULATION

Concentrations and calculations of the analyte of interest were based on a 5-point calibration curve with internal standards. Appropriate dilution factors were taken into account in these calculations.

$$\text{Relative Response Factor} = \frac{\text{Area (compound) x Concentration (IS)}}{\text{Area (IS) x Concentration (Compound)}}$$

$$\text{Concentration} = \frac{\text{Area (compound) x Concentration (IS)}}{\text{Area (IS) x Relative Response Factor}}$$

$$\text{Final concentration} = \frac{\text{[C (ng/mL) from the cal. Curve] x [Final Volume (10 mL)]}}{\text{[M (weight or volume of the matrix)]}}$$

Example Calculation:

$$\text{Final concentration} = \frac{\text{(7.23 ng/mL) x (10 mL)}}{\text{[(0.10 g)]}} = 723 \text{ ng/g} = 0.723 \ \mu\text{g/g in neat HD}$$

V = Final volume of solution (10 mL)
M = Mass of the sample (0.10 g)
IS = Internal Standard

12.2. BLANK DETERMINATION AND CALIBRATIONS

Reagent and matrix blanks are analyzed along with each set of samples. A minimal five-point calibration curve is prepared prior to analyzing samples. The origin (point 0,0) is included in the calibration curve. A quadratic curve may be used with six (6) points NOT passing through the origin. The curve must have a correlation coefficient of 0.995 or greater to be considered acceptable.

12.3. QUALITATIVE ANALYSIS

12.3.1. Qualitative identification of compound determined by this method is based on retention time, and on comparison of the characteristic ion ratios of the analyte in the sample. The following criteria must be met unless otherwise specified in Program Specific Documents or the Test Plan:

12.3.1.1. The intensities of the compound's characteristic extracted ion profiles maximize in the same scan or within one scan of each other.
12.3.1.2. The relative retention time (RRT) of the sample component is within +/-0.06 RRT units of the RRT of the standard component.
12.3.1.3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum.

12.4. STANDARDS, CONTROLS, SPIKES, AND VALIDATION PROGRAMS

12.4.1. GC/MSD Tune check

As an instrumental quality control measure, prior to each day's analysis a 1 µL injection of decafluorotriphenolphosphine (DFTPP) at 50 ng/µL is performed. The resultant mass spectrum for DFTPP must meet the criteria given in the following table before sample analysis begins.

DFTPP KEY IONS AND ION ABUNDANCES CRITERIA

Mass	Ion Abundance Criteria
51	30-60% of mass 198
68	<2% of mass 69
70	<2% of mass 69
127	40-60% of mass 198
197	<1% of mass 198
198	Base peak, 100% relative abundance
199	5-9% of mass 198
275	10-30% of mass 198
365	>1% of mass 198
441	Present but less than mass 443
442	>40% of mass 198
443	17-23% of mass 442

12.4.2. Column performance mix analysis

A GC/MS standard solution containing 50 µg/mL each of benzidine, 4,4'-DDT, decafluorotriphenylphosphine, and pentachlorophenol is injected on to the instrument to verify injection port inertness and column performance. Degradation of DDT to DDE and DDD should not exceed 20%. Benzidine and pentachlorophenol should be present at their normal responses, and no peak tailing should be visible. If degradation is excessive and/or poor chromatography is noted, the injection port may require cleaning. It may also be necessary to break off the first 6-12 inches of the capillary column.

12.4.3. Internal standards

A mixture of d_4-1,4-dichlorobenzene, d_{10}-acenaphthene and d_{10}-phenanthrene is used as the internal standard. A stock solution of nominal concentration of 4000 µg/mL is prepared in methylene chloride. From this, the spiking solution is made up at 100 ug/mL and 10µL (or more, if necessary) is added to each GC vial containing 1.0 ml of sample or standard prior to analysis.

12.4.4 Controls

With each batch of 20 or fewer samples the following quality control samples shall be analyzed, as a minimum:

12.4.4.1 Spiked blank (LCS) see section 11.2.7.4.
12.4.4.2 Matrix Blank see section 11.2.7.1.
12.4.4.3 Method blank see section 11.2.7.2.
12.4.4.4 Reagent blank see section 11.2.7.5.
12.4.4.5 Matrix spike and matrix spike duplicate (see section 11.2.7.3): The recovery for each spike shall be calculated and must be within 50 to 150%. The percent relative standard deviation (%RSD) between these two spikes shall be calculated and must be less than or equal to 25%. These values shall be recorded on EC/BFAC form FR-0901 until enough data is tabulated to calculated control limits in accordance with EC/BFAC work instruction WI-200.

12.4.5 Method Validation

A method Precision and Accuracy (P & A) study was performed as described in Chapter 1 of EPA SW-846 (Reference 7). Seven replicates of the target compound in the matrix (HD) at 100 ng/mL were weighed out, prepared and analyzed. In addition, three samples at two higher concentration levels were weighed out, prepared and analyzed for accuracy. The Precision and Accuracy was determined by calculating the recovery and Percent Relative Standard Deviation (%RSD) of the replicate matrix samples (See Table 1). In addition, seven replicate injections of one sample of the target compound in the matrix (HD) at 10 µg/mL were analyzed for instrument precision. (See Table 2).

TABLE 1
GC/MSD DATA FOR P & A STUDY: Lewisite

Analytical Test	Amount Spiked	Amount Measured (Mean)	STD. DEV.	% RSD	Mean (%) Recovery	N
Lewisite	8.23 µg/g	7.23 µg/g	0.62	8.58	87.9	7
Lewisite	16.4 µg/g	12.1 µg/g	0.50	4.13	73.7	3
Lewisite	32.9 µg/g	24.4 µg/g	1.46	6.00	74.3	3

**Data based on nominal amount of matrix HD (100 mg).*
The MDL was calculated based on seven (7) separate samples that were spiked at the lowest concentration, extracted and analyzed.

MDL (Lewiste)= [Standard Deviation x t-statistic (N=7)]
MDL (Lewisite)= [0.62 µg/g x 3.14] = 1.95 µg/g

TABLE 2
GC/MSD INSTRUMENTAL PRECISION STUDY: Lewisite

Analytical Test	Amount Spiked	Amount Measured (Mean)	STD. DEV.	% RSD	N
Lewisite	8.23 µg/g	7.06 µg/g	0.583	8.26	7

Data based on nominal amount of matrix HD (100mg).
Instrumental Precision refers to one (1) MDL sample extract injected onto the GC/MSD seven (7) times.

13. STATEMENT OF ANALYTICAL RESULT

The results of the determination of the target analyte in the matrix (HD) are reported in µg/g (wt/wt) with a maximum of three (3) significant figures. The major sources contributing to measurement uncertainty are due to sample preparation and the repeatability of the process. The measurement uncertainty for this method was determined over a range of concentrations for each analyte and are presented in the Table 3.

Table 3
Measurement Uncertainty

ANALYTE	CONCENTRATION RANGE (µg/g)	UNCERTAINTY (%)
Lewisite	0 to 8.2	44
	8.3 to 16.4	20
	16.5 to 32.9	21

14. REFERENCES

14.1. Army Materiel Command Treaty Laboratory Analytical Support, Standing Operating Procedure CR2-ISP002 (1997), U. S. Army Materiel Command Treaty Laboratory, Chemical and Biological Defense Command, Edgewood, MD.

14.2. Amendment One to Standing Operating Procedure CR2-ISP002, Army Materiel Command Treaty Laboratory Analytical Support (1997), U. S. Army Materiel Command Treaty Laboratory, Chemical and Biological Defense Command, Edgewood, MD.

14.3. The Army Toxic Chemical Agent Safety Program, Army Regulation 385-61 (1997), Headquarters, Department of the Army, Washington, DC.

14.4. Toxic Chemical Agent Safety Standards, Department of the Army Pamphlet 385-61 (1997), Headquarters, Department of the Army, Washington, DC.

14.5. Chemical Accident or Incident Response and assistance (CAIRA) Operations, Department of the Army Pamphlet 50-6 (1995), Headquarters, Department of the Army, Washington, DC.

14.6. Nuclear and Chemical Weapons and Materiel: Chemical Surety, Army Regulation 50-6 (1995), Headquarters, Department of the Army, Washington, DC.

14.7. Test Methods for Evaluating Solid Waste, Phyical/Chemical Methods, 3rd Edition including Update III, U.S. EPA SW 846, December 1996.

14.8. Test Methods for Evaluating Solid Waste Phisical/Chemical Methods, SW-846, U.S Environmental and Protection Agency, Office of Solid Waste and the National Technical Information Service (NTIS), May 1996.

14.9. Hewlett-Packard 5890 Series II and Series II Plus Operating Manual; copyright 1989, 1990, 1991, 1992, 1993 and 1994; Hewlett Packard Company, Ninth Edition, July 1994.

Revision History

Rev. No.	Description of Revision	Approval/Date
0	Original	*(12/20/02)* MARY F. DRUMMOND
1	Section 3.: Replaced "qualitative" with "quantitative". Section 4.: Added information for revision 0. Section 6.: Added "and quantitate" to the first sentence. Section 8.: Added "and quantitate" to the second sentence. Section 12.1: Changed "Sludge" to "in neat HD" in example of final calculation. Section 12.2: Added last sentence that specifies the acceptance criteria for the calibration curve. Section 12.4.5: Added third sentence regarding higher challenges made during P&A study. Table 1: Added data for 16.4 and 32.9 µg/g challenges and removed sentence regarding background subtraction. Section 13.: Changed to allow for reporting values, added uncertainty statement and Table 3.	*(01-16-03)* MARY F. DRUMMOND
2	Updated Revision History. Section 6.1, changed upper concentration limit from 2000 to 1000 ng/mL. Section 10.3.5, deleted 2000 ng/mL calibration standard preparation procedure. Section 11.1, added carrier gas information to GC parameter list. Section 11.2.2, added 1% in front of "1,3-propanedithiol".	*(1-30-03)* MARY F. DRUMMOND
3	Section 6.1, changed concentration range from "50 ng/mL to 1000 ng/mL" to 50 ng/mL to 2000 ng/mL". Section 10.3.4.1, changed "1,3 PDT" to "a 10 % solution of 1,3-PDT (made up in hexane)". Added sections 10.3.5.1 and 10.3.5.9. Section 10.3.6.2, added "intermediate". Section 11.2.2, changed "40µL of" to "50 µL of 10%". Added section 11.2.6. Section 11.2.8.3, added "(more may be added to accommodate high levels of Lewisite in the samples)". Section 12.2, added "A quadratic curve may be used with six (6) points NOT passing through the origin". Section 12.4.3, added "(or more, if necessary)" to the third sentence. Added references 14.8 and 14.9.	4-17-03 MARY F. DRUMMOND

Appendix C

Laboratory Analytical Reports

Appendix C-1

Analytical Test Report
Sample Set #1

U.S. Army Research, Development and Engineering Command
Edgewood Chemical Biological Center
ATTN: Edgewood Chemical Biological
Forensic Analytical Center
Aberdeen Proving Ground, MD 21010-5424
Phone: (410) 436-8600
Fax: (410) 436-3384

ANALYTICAL TEST REPORT

Report Date: 13 November 2003

Project/Event Title: Analysis of HD Sample Collected From Ton Containers Stored at the Deseret Chemical Depot – Sample Set 1

Project/Event Number: 97P-0033-46

Report Number: 0033-46-111303B1

EG&G Defense Materials Division
Attn.: Mr. Don Milton
11600 Stark Rd
Tooele, UT 84074

NOTE: This report replaces Analytical Test Report Numbered 0033-46-061103B1.

This report shall not be reproduced except in full, without the written approval of the laboratory. Test results reported herein refer only to samples tested.

CASE NARRATIVE

Tooele Samples (Set 1)
Project/Event # 97P-0033-46

Receiving Notes

All sample containers were visually checked and compared to sample transfer form 1911. The containers were noted to be in satisfactory condition. There were two obvious typographical errors found on the transfer form received with the samples. A sample number on the form was listed as 23-03-004 when it should have been listed as 21-03-004. In another instance, the customer sample number was typed twice by mistake. The form was corrected.

Sample Preparatory Notes

Liquid sample number 21-03-007d contained two separate liquid layers. Shaking did not result in a mixing of the layers. An aliquot was taken from the bottom (organic) layer for analysis.

When sample number 21-03-019, a non-cohesive solid sample, was opened, it was noticed that the threads of the vial were broken. The entire sample was transferred to another vial and the sample relabeled.

Three non-cohesive samples (sample numbers 21-03-014b, 21-03-002, and 21-03-005) were unconsolidated and a pipette instead of a spatula was used to pull aliquots for sampling.

Analytical Notes

VOLATILES

The Volatile Organic Compounds (VOCs) were prepared and analyzed on 06-Feb-03 by Method AM-101. Results showed that target compounds were not detected in either the Method or the Reagent Blanks. The VOC analyses met the 28-day holding time.

The bromofluorobenzene (BFB) tune, the tune evaluation, and performance standard met the acceptance criteria.

The calibration curves for the target compounds and the surrogate had correlation coefficients (r^2) of 1.000 for linear / (0, 0) curve fits. The calibration standards had percent recoveries (%R) for the target compounds that met the limit of ±15%. The Continuing Calibration Verification (CCV) standards met the criteria (±25%). The % recoveries exceeded 90% in all cases. The Surrogate (1,4-difluorobenzene) % recoveries met the criteria (50%-150%).

The Matrix Spike (MS) and Matrix Spike Duplicate (MSD) met the % recovery criteria (50%-150%). The Relative Percent Difference (RPD) for the MS/MSD met the criteria (< 25%) for the target compounds. The RPD results were < 5%.

The Blank Spike (BS) and Blank Spike Duplicate (BSD), also known as the Laboratory Control Samples (LCS), met the % recoveries criteria (50%-150%).

Concentrations of 1,2-dichloroethane (1,2-DCE) were expected to exceed the standard curve originally validated by Method AM-101 (0.5 –50 µg/mL). A curve containing five points but at higher levels was analyzed. The higher curve (5-500 µg/mL) was linear. The highest Method Detection Limit (MDL) value for the method was 1,2-dichloroethane at 2.6 µg/mL, therefore the Practical Quantitation Limit (PQL) was set at 5.0 µg/mL.

The RPD for sample duplicates did not meet specification in AM-101 of < 25%. The 1,2-DCE had a percent difference value of 26.4%. All other quality control parameters were within method specification, therefore the data is not affected. Several samples had TCE values above the MDL but below the PQL.

SEMI-VOLATILES

The Semi-Volatile Organic Compounds (SVOCs) were prepared on 06-Feb-03 and analyzed on 07-Feb-03 by Method AM-117. The target compounds were not detected in the Method Blank or the Reagent Blank. The 28-day holding time was met for the SVOC analyses.

The decafluorotriphenylphosphine (DFTPP) tune, the tune evaluation, and performance standard passed the acceptance criteria. The calibration curves for the target compounds and the surrogate had correlation coefficients (r^2) of 0.999 (Hexachloroethane and Q) and 1.000 (1,4-dithiane-d4 and T) for Linear / (0, 0) curve fits for all compounds.

Concentrations of Q were expected to exceed the standard curve originally validated by Method AM-117 (0.5 –100 µg/mL). A curve containing five points at higher levels from 2.5 to 500 µg/mL was analyzed and was linear. The recoveries of the 25 µg/mL and the 50 µg/mL calibration standards for Q were 122% and 120% of the known concentrations, respectively, which was outside the test plan requirement of ±15%. The recoveries of the 100 µg/mL, 250 µg/mL and 500 µg/mL standards were within the test plan requirement. The concentrations of Q in the samples ranged from 144 µg/mL to 453 µg/mL. The correlation coefficient of the calibration curve for Q was within the acceptable limits and the concentrations at these levels will not significantly change with a calibration curve modification, therefore there was no corrective action taken.

Due to the non-linearity of T at low levels, the original PQL value of 2.5 µg/mL was revised to 25 µg/mL and the samples recalculated. The new calibration curve resulted in the calibration standards for T having recoveries that were between 98% and 113%. The correlation coefficient of the calibration curve for T was within the acceptable limits (r^2=0.999).

The MS/MSD % recoveries for Q were 62.5% and 14.6% and the RPD was 124%. Approximately, 250 µg/mL existed in the sample prior to spiking. The spiking level was 70 µg/mL. The spiking level for Q was insufficient compared to the amount of Q in the original samples. No corrective action was taken.

The MS/MSD % recoveries for T were 22.0% and 22.8% and the RSD was 3.6%. The BS/BSD % recoveries were 110% and 88%. The BS/BSD % recoveries data for the other compounds met the criteria (50%-150%).

The duplicate samples RPDs for HCE and Q met the criteria of ± 25% for the target compounds. The RPD for T was 25.6%

The CCV standards met the criteria (±25%) for the target compounds.

NON-VOLATILES

The target compound for Method AM-100 was thiodiglycol (TDG). The Non-volatiles were prepared on 06-Feb-03 and analyzed on 10-Feb-03 by Method AM-100. TDG was not detected in the Method Blank or the Reagent Blank. The TDG analyses met the 28-day holding time.

The DFTPP tune, the tune evaluation, and performance standard met the acceptance criteria. The calibration curves for TDG and the surrogate had correlation coefficients (r^2) of 1.000 for linear / (0, 0) curve fits. The calibration standards % recoveries met the criteria (±15%) with the exception of the 2.5 µg/mL calibration standard for TDG, which was 125%. There was no corrective action taken since TDG was not detected in any of the samples. The recoveries for the CCV standards met the criteria (±25%).

The sample/sample duplicate RPD was above 25%. However, these recoveries are based on values below the MDL. Therefore, since the surrogate was within criteria, the sample was acceptable.

The MS/MSD % recoveries for the target compound and the surrogate were from 92% to 105%. The MS/MSD RPD was <2% for TDG.

The BS/BSD % recoveries for the target compound and surrogate were from 94% to 112%.

LEWISITE

Lewisite samples were prepared on 26-Feb-03 and analyzed on 07-Mar-03 by Method AM-126. The 28-day holding time was not met for the Lewisite analyses. Samples were collected starting 1/22/03 and ending 1/29/03. The samples were initially analyzed on 2/20/03. Problems were encountered with low % recoveries for matrix spikes and CCV standards (50% to 60%). It was determined that an insufficient amount of derivatization agent [1,3-Propanedithiol (1,3-PDT)] was being added. The procedure was modified to add 10µL of neat 1,3-PDT to each sample just prior to GC/MS analysis. Samples were re-extracted and analyzed on 3/7/03, which exceeded the holding time. CCV and matrix spike recoveries improved dramatically to 84 to 95% and 99.6 to 104%, respectively.

The DFTPP tune, the tune evaluation, and performance standard met the criteria. The calibration curve for Lewisite had a correlation coefficient (r^2) of 1.000 for a Quadratic (not forced through 0, 0) curve fit. After investigation, it was decided that a quadratic curve best represented the existing data. Six concentration levels were used in the calibration curve. This meets the minimal requirements specified in EPA SW846, Method 8000B. The calibration standards % recoveries ranged from 98% to 108%, which meets the criteria (±15%). The CCV standards % recoveries met the criteria (±25%).

The Lewisite MS/MSD % recoveries ranged from 99.6% to 104%. The Lewisite MS/MSD RPD met the criteria (±25%). The BS/BSD % recoveries were 105% and 116%.

When initially analyzed, the concentration of sample 030004-01406 (21-03-007a) was above the highest point of the calibration curve. It was diluted an additional 100 fold and re-analyzed.

PURITY

Samples for purity were originally prepared and analyzed on 06-Feb-03; however, due to concerns about the data, some of the samples were re-extracted (along with Sample Set #6) and analyzed on 21-May-03 and reported. The re-extracted samples were 030004-01403 (21-03-030), 030004-01410 (21-03-015), 030004-01411 (21-03-018), 030004-01412 (21-03-021), 030004-

01413 (21-03-024), 030004-01414 (21-03-027) and 030004-01427 (21-03-011). Since samples 030004-01424 (21-03-001) and 030004-01425 (21-03-004) had been combined with sample 21-03-010 to form a composite stability sample study, they could not be re-extracted so the original data was reported. The re-extracted samples were, therefore, analyzed past the 28-day holding time.

The decafluorotriphenylphosphine (DFTPP) tune passed acceptance criteria. The calibration curves for the target compound (HD) resulted in a coefficient of determination (r^2) of 0.998 for the original extracts and 1.000 for the re-extracted samples for a Linear / (0, 0) curve fit. All individual points of the curve were between 88% and 104% for the original extractions and between 98% and 111% for the re-extracted samples.

The CASARM grade (HD) Laboratory Control Sample (LCS) purity for the original extraction was 107% of its true value and 103% for the re-extracted samples.

When duplicate samples were analyzed, the RPD for the purity was less than 1% for the original extracts and 7.1% for the re-extracted samples. Both RPDs were within the method criteria of ±25%.

The recoveries of HD for the calibration checks (CCV's) met the quality control criteria for both sets of extracted samples.

Results showed that HD was not detected in either the Method or the Reagent Blanks for both sets of extracted samples.

METALS

Liquids

The liquid samples were analyzed for metals on 12-Feb-03 by Method AM-118. The liquid samples metals analyses met the 28-day hold time.

Aluminum fell just outside the acceptance criteria of ± 10% deviation from the original calibration curve concentration. The CCVs averaged -11.1% deviation. The aluminum values reported will be slightly underestimated. Boron deviated by –26.4%. The boron values reported will be slightly underestimated. Beryllium deviated by –8.4%. On average, thallium deviated by less than 10%, although one of the CCVs deviated by –10.2%. No corrective actions were taken for the failed CCV's due to the native concentrations for those elements not being above the practical quantiation limits. This will be the procedure followed for future sample sets as well.

The initial analyses for mercury resulted in cross contamination. The samples were reanalyzed for mercury on 13-Feb-03, with those samples outside the mercury calibration range being diluted before reanalysis.

The recovery values for the MS/MSD met the criteria with the exception of boron, which was less than 75%. MS/MSD recoveries for boron were 67.2% and 66.2%. The MS/MSD RPD met the criteria for the target metals.

The recovery data for the CASARM HD Lab Control Sample met the criteria with the exception of boron, which was less than 75%.

Copper, the only element that had a result above 100 times the Instrument Detection Limit (IDL) had an acceptable RPD for the sample duplicate. The criteria for the sample/sample duplicate RPD is ≤20% for any elements at a level of at least 100 times the IDL.

Non-Cohesive Solids

The non-cohesive solid samples were analyzed for metals on 12-Feb-03 and 13-Feb-03, and 20-Feb-03 by Method AM-118.

Boron fell just outside the acceptance criteria of ±10% on the original calibration curve. The CCV's averaged –18.8% deviation. The boron values reported will be slightly underestimated. No corrective actions were taken for the failed CCV's due to the native concentrations for those elements not being above the practical quantiation limits. This will be the procedure followed for future sample sets as well.

Cadmium was detected in all the reagent blanks (maximum contamination = 0.3 μg/g) at a level above the MDL (0.02 μg/g) but below the PQL (5 μg/g). Cadmium levels reported at levels of 0.3 μg/g or below may be considered to be due to sample contamination. Mercury was detected in the reagent blanks after samples high in mercury were run. The samples were rerun for mercury.

All diluted samples were analyzed on 13-Feb-03. Undiluted samples with low values for mercury were also reanalyzed on 13-Feb-03: specifically samples 030004-01401, 3540,030004-01419, 01422, 01430, 01432, 01434, 01436 and 01438. Samples 030004-01436 and 01438 were reanalyzed for mercury on 20-Feb-03.

The BS was high for mercury (138% recovery). It was reanalyzed on the following day and the recovery was an acceptable 117%. The BS was low for boron (74.2%) when analyzed on 12-Feb-03.

Copper, lead, manganese, nickel, and zinc had an acceptable RPD for the sample duplicate.

The recovery value for the MS met the criteria for all elements. The recovery value for the MSD data exceeded the criteria for boron and tin. The recovery value for tin was 74.5% and boron was 60.9%.

The method blank analyzed on 12-Feb-03 was positive for mercury and the samples were rerun on 13-Feb-03. All other method blanks where less than the PQL.

All non-cohesive solid samples for metals met the 28-day hold time.

Solids

The metals in solid samples were analyzed on 13-Feb-03, 20-Feb-03, 10-Mar-03 by Method AM-118.

Initially, on 13-Feb-03 the solid samples were diluted 20 fold and analyzed for all elements. The interference check verification (ICV) sample was outside the ±10% range for selenium (+16.7%) and silver (+10.6%). The CCV that ran after the 8th sample indicated that the element silver was outside of the ±10% limits (+20%). No corrective actions were taken for the failed CCV's due to the native concentrations for those elements not being above the practical quantiation limits. This will be the procedure followed for future sample sets as well.
The reagent blank showed a positive level of cadmium (0.26 μg/g) at at a level above the MDL (0.02 μg/g) but below the PQL (5 μg/g). The method blank showed a positive level of cadmium at 0.23 μg/g and barium (0.046μg/g) at level above the MDL (0.04 μg/g) but below the PQL (5 μg/g). As with the non-cohesive solids, cadmium reported at levels of 0.3 μg/g or below may be considered to be due to sample contamination.

Arsenic, chromium, cobalt, copper, lead, manganese, nickel, and zinc failed to meet the acceptable criteria for the RPD for the sample duplicate.

The solid samples were not homogeneous; therefore, the sample and sample duplicate concentrations varied. The MS/MSD also varied for the same reason. The certified reference material quality control sample used in this method is a homogeneous sample and passed its quality control parameters.

The recovery data for the MS did not meet the criteria for arsenic, copper, lead, manganese, mercury, tin and zinc. The recovery values for the MSD did not meet the criteria for arsenic, barium, cadmium, copper, lead, manganese, mercury, nickel, silver, thallium, tin and zinc. The MS/MSD RPD was greater than 25% for arsenic, barium, cadmium, copper, lead, manganese, mercury, nickel, silver, thallium and zinc.

The post digestion spike sample (PDSA) analyzed on 20-Feb-03 indicated that manganese, copper, and zinc were not recovered from the sample within acceptable limits. An aliquot of the sample was re-spiked and re-analyzed on 10-Mar-03 and acceptable recoveries were obtained i.e. 80% recovery was obtained for copper, 84% recovery was obtained for manganese, and 105% recovery was obtained for zinc.

All the solid samples were initially analyzed within the 28-day hold time; however, due to reanalysis of diluted samples, the final analysis was past the hold time of 28-days for several of the metals for each sample.

Analyst(s) of Record Thomas Rusek (Signature) 12-17-03 (Date) **Thomas Rusek** **Principal Investigator, Battelle Memorial Institute**	**Analyst(s) of Record** [illegible] (Signature) 12/17/03 (Date) **Brian L. Boyd** **Researcher, Battelle Memorial Institute**
Analyst(s) of Record Robert L. Calloway (Signature) 17 Dec 03 (Date) **Robert L. Calloway** **Physical Science Technican, Edgewood Chemical & Biological Forensic Analytical Center**	**Analyst(s) of Record** James H. Newman (Signature) 12-17-03 (Date) for **Stephen S. Houck** **Researcher, Battelle Memorial Institute**
Analyst(s) of Record James H. Newman (Signature) 12-17-03 (Date) for **Doug S. Nichols** **Researcher, Battelle Memorial Institute**	**Analyst(s) of Record** James H. Newman (Signature) 12-17-03 (Date) for **Stanley A. Ostaszeski, Ph. D.** **Senior Research Scientist, Battelle Memorial Institute**
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Report Reviewed by

Robert L. Calloway (Signature)

17 Dec 03 (Date)

Robert L. Calloway

Designated Authority, Edgewood C/B Forensic Analytical Center

Report Approved by

Dennis J. Reutter (Signature)

15 Dec 03 (Date)

Dennis J. Reutter, Ph.D.

Chief, Edgewood C/B Forensic Analytical Center

Appendix A

LIMS DATA REPORT

This appendix contains the 72-page data report produced from the LIMS system. It contains a summary of sample numbers, sample results, method blank results and results of QC samples analyzed. Since the report is generated by the LIMS, the page numbers will begin again at 1, but each page has been identified as part of the appendix so that it may be distinguishable from the main report.

ECB Forensic Analytical Center
Edgewood Chemical and Biological Center
Aberdeen Proving Ground, MD 21010-5424
(410) 436-8600

ANALYTICAL RESULTS

Report Date: 11/13/2003

Work Order: Tooele HD/TC 2/5/2003

Deliver To: Don Milton
EG&G Defense Materials Div.
11600 Stark Road
Tooele, UT 84074

James Newman
Project Manager

The following represents qualifications to the associated analytical reports.

1. These descriptors will help identify the specific sample and clarify the report.

   DUP - Matrix Duplicate
   MS - Matrix Spike
   MSD - Matrix Spike Duplicate
   RPD - Relative Percent Difference
   PQL - Practical Quantitiation Limit
   MDL - Method Detection Limit
   ND - Not Detected at the PQL
   * - Indicates a limit was exceeded

   Surrogate - Organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromotography, but which are not normally found in the samples.

2. Qualifier keys - These descriptors will follow individual results for a specific sample and a specific analyte and will help qualify the data.

   J - Indicates an estimated value between the PQL and MDL

NOTE: This document is included as part of the Analytical Report for the above referenced and should be retained as a permanent record thereof.

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Aberdeen Proving Ground, MD 21010-5424
(410) 436-8600

Report of Analysis

Client
EG&G Defense Materials Division

Work ID
Tooele HD/TC 2/5/2003

Workorder Sample Summary

Lab ID	*Sample ID*	*Matrix*	*Collect Date/Time*	*Receive Date/Time*
030004-01403	21-03-030	Liquid	1/29/2003 16:27	2/5/2003 16:25
030004-01406	21-03-007a	Liquid	1/27/2003 16:27	2/5/2003 16:25
030004-01407	21-03-007b	Liquid	1/27/2003 16:27	2/5/2003 16:25
030004-01408	21-03-007c	Liquid	1/27/2003 16:27	2/5/2003 16:25
030004-01409	21-03-007d	Liquid	1/27/2003 16:27	2/5/2003 16:25
030004-01410	21-03-015	Liquid	1/23/2003 16:27	2/5/2003 16:25
030004-01411	21-03-018	Liquid	1/24/2003 16:27	2/5/2003 16:25
030004-01412	21-03-021	Liquid	1/24/2003 16:27	2/5/2003 16:25
030004-01413	21-03-024	Liquid	1/28/2003 16:27	2/5/2003 16:25
030004-01414	21-03-027	Liquid	1/28/2003 16:27	2/5/2003 16:25
030004-01424	21-03-001	Liquid	1/22/2003 17:22	2/5/2003 17:21
030004-01425	21-03-004	Liquid	1/22/2003 16:27	2/5/2003 16:25
030004-01427	21-03-011	Liquid	1/23/2003 16:27	2/5/2003 16:25
030004-01401	21-03-028	Non-cohesive Solid	1/28/2003 16:27	2/5/2003 16:25
030004-01404	21-03-031	Non-cohesive Solid	1/29/2003 16:27	2/5/2003 16:25
030004-01419	21-03-019	Non-cohesive Solid	1/24/2003 16:27	2/5/2003 16:25
030004-01422	21-03-025	Non-cohesive Solid	1/28/2003 16:27	2/5/2003 16:25
030004-01428	21-03-014a	Non-cohesive Solid	1/23/2003 16:27	2/5/2003 16:25
030004-01429	21-03-014b	Non-cohesive Solid	1/23/2003 16:27	2/5/2003 16:25
030004-01430	21-03-014c	Non-cohesive Solid	1/23/2003 16:27	2/5/2003 16:25
030004-01431	21-03-022	Non-cohesive Solid	1/24/2003 16:27	2/5/2003 16:25
030004-01432	21-03-002	Non-cohesive Solid	1/22/2003 16:27	2/5/2003 16:25
030004-01434	21-03-005	Non-cohesive Solid	1/22/2003 16:27	2/5/2003 16:25
030004-01436	21-03-012	Non-cohesive Solid	1/23/2003 16:27	2/5/2003 16:25
030004-01438	21-03-016	Non-cohesive Solid	1/23/2003 16:27	2/5/2003 16:25
030004-01402	21-03-029	Solid	1/28/2003 16:27	2/5/2003 16:25
030004-01405	21-03-032	Solid	1/29/2003 16:27	2/5/2003 16:25
030004-01416	21-03-009a	Solid	1/27/2003 16:27	2/5/2003 16:25
030004-01417	21-03-009b	Solid	1/27/2003 16:27	2/5/2003 16:25
030004-01418	21-03-009c	Solid	1/27/2003 16:27	2/5/2003 16:25
030004-01420	21-03-020	Solid	1/24/2003 16:27	2/5/2003 16:25
030004-01421	21-03-023	Solid	1/24/2003 16:27	2/5/2003 16:25
030004-01423	21-03-026	Solid	1/28/2003 16:27	2/5/2003 16:25
030004-01433	21-03-003	Solid	1/22/2003 16:27	2/5/2003 16:25
030004-01435	21-03-006	Solid	1/22/2003 16:27	2/5/2003 16:25
030004-01437	21-03-013	Solid	1/23/2003 16:27	2/5/2003 16:25
030004-01439	21-03-017	Solid	1/23/2003 16:27	2/5/2003 16:25

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01403	21-03-030	1/29/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
5/20/2003 08:22	7502	AM098 HD Purity by GC	1	5/21/2003 18:59	tfr	7602

Parameter	*Result*	*MDL*	*PQL*	*Units*
bis-(2-Chloroethyl)sulfide	84.1			%

AM100 Non-Vols in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/11/2003 18:58	snc	3903

Parameter	*Result*	*MDL*	*PQL*	*Units*
Thiodiglycol (TDG)	ND	183	218	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
Thiodiglycol-d8 (TDG-d8)	873	880 ug/g	101	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 12:45	3701	AM101 Vols in Liquid HD by GC	1	2/6/2003 19:51	ssh	3906

Parameter	*Result*	*MDL*	*PQL*	*Units*
1,2-Dichloroethane	4180	245	472	ug/g
Tetrachloroethylene	ND	94.3	472	ug/g
1,1,2,2-Tetrachloroethane	ND	142	472	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Difluorobenzene	19500	18300 ug/g	93.5	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.3	51.4	ug/g
Antimony	ND	0.647	5.14	ug/g
Arsenic	ND	1.25	5.14	ug/g
Barium	ND	0.442	5.14	ug/g
Beryllium	ND	0.925	5.14	ug/g
Boron	5.38 J	3.84	10.3	ug/g
Cadmium	ND	0.421	5.14	ug/g
Chromium	ND	1.33	5.14	ug/g
Cobalt	ND	0.277	1.03	ug/g
Copper	9.43	2.50	5.14	ug/g
Lead	ND	0.421	5.14	ug/g
Manganese	3.76	0.329	1.03	ug/g
Mercury	ND	0.0514	0.514	ug/g
Nickel	1.61 J	0.360	5.14	ug/g
Selenium	ND	1.20	10.3	ug/g
Silver	ND	0.483	5.14	ug/g

Report of Analysis

Thallium	ND	1.01	5.14	ug/g
Tin	ND	2.56	10.3	ug/g
Vanadium	ND	1.03	5.14	ug/g
Zinc	ND	3.21	10.3	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 0:00	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	559 J	74.1	2650	ug/g
Q	26400	54.0	2650	ug/g
Hexachloroethane	ND	84.7	2650	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1060	1050 ug/g	99.1	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:22	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.80	4.61	ug/g

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01406	21-03-007a	1/27/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/6/2003 15:34	ssh	3706

Parameter	*Result*	*MDL*	*PQL*	*Units*
bis-(2-Chloroethyl)sulfide	49.2			%

AM100 Non-Vols in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/11/2003 20:13	snc	3903

Parameter	*Result*	*MDL*	*PQL*	*Units*
Thiodiglycol (TDG)	ND	244	290	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
Thiodiglycol-d8 (TDG-d8)	1160	1200 ug/g	103	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/6/2003 21:01	ssh	3906

Parameter	*Result*	*MDL*	*PQL*	*Units*
1,2-Dichloroethane	5180	266	511	ug/g
Tetrachloroethylene	ND	102	511	ug/g
1,1,2,2-Tetrachloroethane	ND	153	511	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Difluorobenzene	21200	19000 ug/g	90	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.0	50.2	ug/g
Antimony	ND	0.633	5.02	ug/g
Arsenic	1920	1.22	5.02	ug/g
Barium	ND	0.432	5.02	ug/g
Beryllium	ND	0.904	5.02	ug/g
Boron	ND	3.76	10.0	ug/g
Cadmium	ND	0.412	5.02	ug/g
Chromium	ND	1.30	5.02	ug/g
Cobalt	ND	0.271	1.00	ug/g
Copper	85.1	2.44	5.02	ug/g
Lead	ND	0.412	5.02	ug/g
Manganese	1.20	0.321	1.00	ug/g
Mercury	0.0715 J	0.0502	0.502	ug/g
Nickel	5.05	0.351	5.02	ug/g
Selenium	ND	1.17	10.0	ug/g
Silver	ND	0.472	5.02	ug/g

Report of Analysis

Thallium	ND	0.984	5.02	ug/g
Tin	ND	2.50	10.0	ug/g
Vanadium	ND	1.00	5.02	ug/g
Zinc	3.15 J	3.13	10.0	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 0:00	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	448 J	66.2	2360	ug/g
Q	31800	48.2	2360	ug/g
Hexachloroethane	ND	75.6	2360	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	945	969 ug/g	103	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	100	3/7/2003 13:22	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	5150	196	504	ug/g

Comments: For AM118L, Sample was diluted an additional 5 fold because Arsenic was higher than the highest cal curve point.
For AM126, this sample was diluted 100 fold.

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Edgewood Chemical and Biological Center
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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01407	21-03-007b	1/27/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/6/2003 15:34	ssh	3706

Parameter	*Result*	*MDL*	*PQL*	*Units*
bis-(2-Chloroethyl)sulfide	50.6			%

AM100 Non-Vols in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/11/2003 20:51	snc	3903

Parameter	*Result*	*MDL*	*PQL*	*Units*
Thiodiglycol (TDG)	ND	215	255	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
Thiodiglycol-d8 (TDG-d8)	1020	1060 ug/g	104	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/6/2003 21:36	ssh	3906

Parameter	*Result*	*MDL*	*PQL*	*Units*
1,2-Dichloroethane	4470	271	521	ug/g
Tetrachloroethylene	235 J	104	521	ug/g
1,1,2,2-Tetrachloroethane	ND	156	521	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Difluorobenzene	21600	19600 ug/g	90.9	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	42.5 J	11.6	57.9	ug/g
Antimony	ND	0.729	5.79	ug/g
Arsenic	9.77	1.41	5.79	ug/g
Barium	ND	0.498	5.79	ug/g
Beryllium	ND	1.04	5.79	ug/g
Boron	7.96 J	4.33	11.6	ug/g
Cadmium	ND	0.475	5.79	ug/g
Chromium	ND	1.49	5.79	ug/g
Cobalt	ND	0.313	1.16	ug/g
Copper	60.9	2.81	5.79	ug/g
Lead	64.7	0.475	5.79	ug/g
Manganese	ND	0.370	1.16	ug/g
Mercury	95.5	0.0579	0.579	ug/g
Nickel	0.405 J	0.405	5.79	ug/g
Selenium	ND	1.35	11.6	ug/g
Silver	ND	0.544	5.79	ug/g

Report of Analysis

Thallium	ND	1.13	5.79	ug/g
Tin	ND	2.88	11.6	ug/g
Vanadium	ND	1.16	5.79	ug/g
Zinc	ND	3.61	11.6	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 0:00	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	520 J	70.2	2510	ug/g
Q	34100	51.2	2510	ug/g
Hexachloroethane	ND	80.2	2510	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1000	1040 ug/g	103	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:22	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	2.05	5.26	ug/g

Comments: For AM118L, sample was diluted an additional 16 2/3 fold because Mercury was higher than the highest cal curve point.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01408	21-03-007c	1/27/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/6/2003 15:41	ssh	3706

Parameter	*Result*	*MDL*	*PQL*	*Units*
bis-(2-Chloroethyl)sulfide	48.8			%

AM100 Non-Vols in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/11/2003 21:29	snc	3903

Parameter	*Result*	*MDL*	*PQL*	*Units*
Thiodiglycol (TDG)	ND	211	251	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
Thiodiglycol-d8 (TDG-d8)	1000	1010 ug/g	100	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/6/2003 22:11	ssh	3906

Parameter	*Result*	*MDL*	*PQL*	*Units*
1,2-Dichloroethane	5010	265	510	ug/g
Tetrachloroethylene	298 J	102	510	ug/g
1,1,2,2-Tetrachloroethane	ND	153	510	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Difluorobenzene	21100	19900 ug/g	94.6	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	11.1	55.4	ug/g
Antimony	ND	0.698	5.54	ug/g
Arsenic	16.5	1.35	5.54	ug/g
Barium	ND	0.476	5.54	ug/g
Beryllium	ND	0.997	5.54	ug/g
Boron	ND	4.14	11.1	ug/g
Cadmium	ND	0.454	5.54	ug/g
Chromium	ND	1.43	5.54	ug/g
Cobalt	ND	0.299	1.11	ug/g
Copper	56.9	2.69	5.54	ug/g
Lead	72.0	0.454	5.54	ug/g
Manganese	ND	0.354	1.11	ug/g
Mercury	84.3	0.0554	0.554	ug/g
Nickel	1.14 J	0.388	5.54	ug/g
Selenium	ND	1.30	11.1	ug/g
Silver	ND	0.520	5.54	ug/g

Report of Analysis

Thallium	ND	1.09	5.54	ug/g
Tin	ND	2.76	11.1	ug/g
Vanadium	ND	1.11	5.54	ug/g
Zinc	ND	3.46	11.1	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 0:00	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	476 J	75.5	2700	ug/g
Q	33300	55.0	2700	ug/g
Hexachloroethane	ND	86.3	2700	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1080	1100 ug/g	102	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:22	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	2.06	5.29	ug/g

Comments: For AM118L, sample was diluted an additional 16 2/3 fold because Mercury was higher than the highest cal curve point.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01409	21-03-007d	1/27/2003 16:27	2/5/2003 16:25	6/11/2003 12:33	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/6/2003 15:41	ssh	3706

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	42.4			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/11/2003 22:07	snc	3903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	210	250	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	998	994 ug/g	99.6	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/6/2003 22:46	ssh	3906

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	4250	254	488	ug/g
Tetrachloroethylene	275 J	97.6	488	ug/g
1,1,2,2-Tetrachloroethane	ND	146	488	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	20200	17400 ug/g	86	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	Result	MDL	PQL	Units
Aluminum	17.9 J	10.5	52.6	ug/g
Antimony	ND	0.662	5.26	ug/g
Arsenic	21.8	1.28	5.26	ug/g
Barium	ND	0.452	5.26	ug/g
Beryllium	ND	0.946	5.26	ug/g
Boron	ND	3.93	10.5	ug/g
Cadmium	ND	0.431	5.26	ug/g
Chromium	ND	1.36	5.26	ug/g
Cobalt	ND	0.284	1.05	ug/g
Copper	9.73	2.56	5.26	ug/g
Lead	215	0.431	5.26	ug/g
Manganese	ND	0.336	1.05	ug/g
Mercury	495	0.0526	0.526	ug/g
Nickel	0.394 J	0.368	5.26	ug/g
Selenium	ND	1.23	10.5	ug/g
Silver	ND	0.494	5.26	ug/g

Report of Analysis

Thallium	ND	1.03	5.26	ug/g
Tin	ND	2.62	10.5	ug/g
Vanadium	ND	1.05	5.26	ug/g
Zinc	ND	3.28	10.5	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 0:00	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	501 J	69.1	2470	ug/g
Q	32800	50.3	2470	ug/g
Hexachloroethane	188 J	79.0	2470	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	987	981 ug/g	99.4	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:22	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.96	5.02	ug/g

Comments: Mercury was higher than the highest calibration curve point. This sample was diluted and additional 100 fold.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01410	21-03-015	1/23/2003 16:27	2/5/2003 16:25	6/11/2003 12:33	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 08:22	7502	AM098 HD Purity by GC	1	5/21/2003 19:18	tfr	7602

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	91.3			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/11/2003 22:44	snc	3903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	219	260	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1040	935 ug/g	89.9	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/6/2003 23:21	ssh	3906

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	4480	300	576	ug/g
Tetrachloroethylene	ND	115	576	ug/g
1,1,2,2-Tetrachloroethane	ND	173	576	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	23800	22200 ug/g	93.1	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	11.0	55.1	ug/g
Antimony	ND	0.694	5.51	ug/g
Arsenic	ND	1.34	5.51	ug/g
Barium	ND	0.474	5.51	ug/g
Beryllium	ND	0.991	5.51	ug/g
Boron	ND	4.12	11.0	ug/g
Cadmium	ND	0.452	5.51	ug/g
Chromium	1.83 J	1.42	5.51	ug/g
Cobalt	ND	0.297	1.10	ug/g
Copper	55.1	2.68	5.51	ug/g
Lead	ND	0.452	5.51	ug/g
Manganese	ND	0.352	1.10	ug/g
Mercury	ND	0.0551	0.551	ug/g
Nickel	ND	0.385	5.51	ug/g
Selenium	ND	1.29	11.0	ug/g
Silver	ND	0.518	5.51	ug/g

Report of Analysis

Thallium	ND	1.08	5.51	ug/g
Tin	ND	2.74	11.0	ug/g
Vanadium	ND	1.10	5.51	ug/g
Zinc	ND	3.44	11.0	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 0:00	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	ND	76.8	2740	ug/g
Q	15800	55.9	2740	ug/g
Hexachloroethane	ND	87.7	2740	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1100	1160 ug/g	106	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:22	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	2.40	6.14	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01411	21-03-018	1/24/2003 16:27	2/5/2003 16:25	6/11/2003 12:33	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 08:22	7502	AM098 HD Purity by GC	1	5/21/2003 19:37	tfr	7602

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	92.1			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/11/2003 23:22	snc	3903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	243	290	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1160	1230 ug/g	106	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/6/2003 23:56	ssh	3906

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6460	304	585	ug/g
Tetrachloroethylene	ND	117	585	ug/g
1,1,2,2-Tetrachloroethane	ND	176	585	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	24200	23200 ug/g	95.9	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	Result	MDL	PQL	Units
Aluminum	14.1 J	10.3	51.4	ug/g
Antimony	ND	0.647	5.14	ug/g
Arsenic	ND	1.25	5.14	ug/g
Barium	ND	0.442	5.14	ug/g
Beryllium	ND	0.925	5.14	ug/g
Boron	ND	3.84	10.3	ug/g
Cadmium	ND	0.421	5.14	ug/g
Chromium	1.45 J	1.33	5.14	ug/g
Cobalt	ND	0.277	1.03	ug/g
Copper	40.8	2.50	5.14	ug/g
Lead	ND	0.421	5.14	ug/g
Manganese	ND	0.329	1.03	ug/g
Mercury	ND	0.0514	0.514	ug/g
Nickel	ND	0.360	5.14	ug/g
Selenium	ND	1.20	10.3	ug/g
Silver	ND	0.483	5.14	ug/g

Report of Analysis

Thallium	ND	1.01	5.14	ug/g
Tin	ND	2.56	10.3	ug/g
Vanadium	ND	1.03	5.14	ug/g
Zinc	ND	3.21	10.3	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:17	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 0:00	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	726 J	72.2	2580	ug/g
Q	46700	52.6	2580	ug/g
Hexachloroethane	ND	82.5	2580	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1030	1140 ug/g	111	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:22	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.97	5.06	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01412	21-03-021	1/24/2003 16:27	2/5/2003 16:25	6/11/2003 12:33	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 08:22	7502	AM098 HD Purity by GC	1	5/21/2003 19:56	tfr	7602

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	86.9			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/12/2003 0:00	snc	3903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	238	283	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1130	1050 ug/g	92.8	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/7/2003 12:32	ssh	3906

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	8010	252	485	ug/g
Tetrachloroethylene	ND	97.1	485	ug/g
1,1,2,2-Tetrachloroethane	ND	146	485	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	20100	20200 ug/g	101	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.5	52.5	ug/g
Antimony	ND	0.662	5.25	ug/g
Arsenic	38.9	1.28	5.25	ug/g
Barium	ND	0.452	5.25	ug/g
Beryllium	ND	0.945	5.25	ug/g
Boron	ND	3.93	10.5	ug/g
Cadmium	ND	0.431	5.25	ug/g
Chromium	2.65 J	1.36	5.25	ug/g
Cobalt	ND	0.284	1.05	ug/g
Copper	32.2	2.55	5.25	ug/g
Lead	ND	0.431	5.25	ug/g
Manganese	3.47	0.336	1.05	ug/g
Mercury	24.5	0.0525	0.525	ug/g
Nickel	0.907 J	0.368	5.25	ug/g
Selenium	ND	1.23	10.5	ug/g
Silver	ND	0.494	5.25	ug/g

Report of Analysis

Thallium	ND	1.03	5.25	ug/g
Tin	ND	2.62	10.5	ug/g
Vanadium	ND	1.05	5.25	ug/g
Zinc	ND	3.28	10.5	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:17	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 0:00	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	1420 J	71.4	2550	ug/g
Q	33700	52.0	2550	ug/g
Hexachloroethane	ND	81.6	2550	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1020	1100 ug/g	108	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:22	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	5.44	1.98	5.08	ug/g

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01413	21-03-024	1/28/2003 16:27	2/5/2003 16:25	6/11/2003 12:33	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
5/20/2003 08:22	7502	AM098 HD Purity by GC	1	5/21/2003 20:15	tfr	7602

Parameter	*Result*	*MDL*	*PQL*	*Units*
bis-(2-Chloroethyl)sulfide	83.9			%

AM100 Non-Vols in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/12/2003 0:38	snc	3903

Parameter	*Result*	*MDL*	*PQL*	*Units*
Thiodiglycol (TDG)	ND	200	238	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
Thiodiglycol-d8 (TDG-d8)	952	964 ug/g	101	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/7/2003 1:06	ssh	3906

Parameter	*Result*	*MDL*	*PQL*	*Units*
1,2-Dichloroethane	5410	277	534	ug/g
Tetrachloroethylene	ND	107	534	ug/g
1,1,2,2-Tetrachloroethane	ND	160	534	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Difluorobenzene	22100	22000 ug/g	99.5	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.4	52.0	ug/g
Antimony	ND	0.656	5.20	ug/g
Arsenic	ND	1.27	5.20	ug/g
Barium	ND	0.447	5.20	ug/g
Beryllium	ND	0.937	5.20	ug/g
Boron	ND	3.89	10.4	ug/g
Cadmium	ND	0.427	5.20	ug/g
Chromium	1.37 J	1.34	5.20	ug/g
Cobalt	ND	0.281	1.04	ug/g
Copper	9.56	2.53	5.20	ug/g
Lead	ND	0.427	5.20	ug/g
Manganese	2.89	0.333	1.04	ug/g
Mercury	0.182 J	0.0520	0.520	ug/g
Nickel	2.04 J	0.364	5.20	ug/g
Selenium	ND	1.22	10.4	ug/g
Silver	ND	0.489	5.20	ug/g

Report of Analysis

Thallium	ND	1.02	5.20	ug/g
Tin	ND	2.59	10.4	ug/g
Vanadium	ND	1.04	5.20	ug/g
Zinc	4.38 J	3.25	10.4	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:17	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 0:00	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	789 J	69.8	2490	ug/g
Q	28300	50.8	2490	ug/g
Hexachloroethane	ND	79.8	2490	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	997	1050 ug/g	106	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:22	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.98	5.08	ug/g

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01414	21-03-027	1/28/2003 16:27	2/5/2003 16:25	6/11/2003 12:33	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
5/20/2003 08:22	7502	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7602

Parameter	*Result*	*MDL*	*PQL*	*Units*
bis-(2-Chloroethyl)sulfide	92.7			%

AM100 Non-Vols in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/12/2003 0:00	snc	3903

Parameter	*Result*	*MDL*	*PQL*	*Units*
Thiodiglycol (TDG)	ND	204	243	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
Thiodiglycol-d8 (TDG-d8)	971	1000 ug/g	103	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/7/2003 1:41	ssh	3906

Parameter	*Result*	*MDL*	*PQL*	*Units*
1,2-Dichloroethane	5320	306	588	ug/g
Tetrachloroethylene	356 J	118	588	ug/g
1,1,2,2-Tetrachloroethane	ND	176	588	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Difluorobenzene	24300	26400 ug/g	108	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17.04	blb	4001

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.5	52.7	ug/g
Antimony	ND	0.665	5.27	ug/g
Arsenic	ND	1.29	5.27	ug/g
Barium	ND	0.454	5.27	ug/g
Beryllium	ND	0.949	5.27	ug/g
Boron	ND	3.95	10.5	ug/g
Cadmium	ND	0.432	5.27	ug/g
Chromium	1.43 J	1.36	5.27	ug/g
Cobalt	ND	0.285	1.05	ug/g
Copper	43.9	2.56	5.27	ug/g
Lead	ND	0.432	5.27	ug/g
Manganese	ND	0.338	1.05	ug/g
Mercury	0.0864 J	0.0527	0.527	ug/g
Nickel	ND	0.369	5.27	ug/g
Selenium	ND	1.23	10.5	ug/g
Silver	ND	0.496	5.27	ug/g

Report of Analysis

Thallium	ND	1.03	5.27	ug/g
Tin	ND	2.63	10.5	ug/g
Vanadium	ND	1.05	5.27	ug/g
Zinc	ND	3.29	10.5	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:17	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 10:45	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	700 J	71.2	2540	ug/g
Q	39500	51.9	2540	ug/g
Hexachloroethane	ND	81.4	2540	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1020	1070 ug/g	105	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:22	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.97	5.05	ug/g

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01424	21-03-001	1/22/2003 17:22	2/5/2003 17:21	11/13/2003 16:09	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:17	3702	AM117 Semi-Vols Liq HD by GC	1	2/7/2003 10:37	ssh	3706

Parameter	*Result*	*MDL*	*PQL*	*Units*
bis-(2-Chloroethyl)sulfide	80.1			%

AM100 Non-Vols in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/12/2003 0:00	snc	3903

Parameter	*Result*	*MDL*	*PQL*	*Units*
Thiodiglycol (TDG)	ND	215	256	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
Thiodiglycol-d8 (TDG-d8)	1020	1050 ug/g	102	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/7/2003 5:47	ssh	3906

Parameter	*Result*	*MDL*	*PQL*	*Units*
1,2-Dichloroethane	6060	293	564	ug/g
Tetrachloroethylene	ND	113	564	ug/g
1,1,2,2-Tetrachloroethane	ND	169	564	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Difluorobenzene	23300	22600 ug/g	96.8	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	23.0 J	10.3	51.5	ug/g
Antimony	ND	0.649	5.15	ug/g
Arsenic	4.30 J	1.26	5.15	ug/g
Barium	ND	0.443	5.15	ug/g
Beryllium	ND	0.927	5.15	ug/g
Boron	ND	3.85	10.3	ug/g
Cadmium	ND	0.422	5.15	ug/g
Chromium	ND	1.33	5.15	ug/g
Cobalt	ND	0.278	1.03	ug/g
Copper	84.3	2.50	5.15	ug/g
Lead	ND	0.422	5.15	ug/g
Manganese	1.37	0.330	1.03	ug/g
Mercury	ND	0.0515	0.515	ug/g
Nickel	2.61 J	0.360	5.15	ug/g
Selenium	ND	1.20	10.3	ug/g
Silver	ND	0.484	5.15	ug/g

Report of Analysis

Thallium	ND	1.01	5.15	ug/g
Tin	ND	2.56	10.3	ug/g
Vanadium	ND	1.03	5.15	ug/g
Zinc	ND	3.21	10.3	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:17	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 13:18	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	701 J	75.5	2700	ug/g
Q	44100	55.0	2700	ug/g
Hexachloroethane	ND	86.3	2700	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1080	1110 ug/g	103	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:27	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.93	4.95	ug/g

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01425	21-03-004	1/22/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:17	3702	AM117 Semi-Vols Liq HD by GC	1	2/7/2003 10:37	ssh	3706

Parameter	*Result*	*MDL*	*PQL*	*Units*
bis-(2-Chloroethyl)sulfide	79.7			%

AM100 Non-Vols in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/12/2003 0:00	snc	3903

Parameter	*Result*	*MDL*	*PQL*	*Units*
Thiodiglycol (TDG)	ND	235	280	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
Thiodiglycol-d8 (TDG-d8)	1120	1150 ug/g	103	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/7/2003 4:01	ssh	3906

Parameter	*Result*	*MDL*	*PQL*	*Units*
1,2-Dichloroethane	5640	282	543	ug/g
Tetrachloroethylene	ND	109	543	ug/g
1,1,2,2-Tetrachloroethane	ND	163	543	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Difluorobenzene	22500	22500 ug/g	100	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.5	52.5	ug/g
Antimony	ND	0.662	5.25	ug/g
Arsenic	3.77 J	1.28	5.25	ug/g
Barium	ND	0.452	5.25	ug/g
Beryllium	ND	0.945	5.25	ug/g
Boron	ND	3.93	10.5	ug/g
Cadmium	ND	0.431	5.25	ug/g
Chromium	1.66 J	1.36	5.25	ug/g
Cobalt	ND	0.284	1.05	ug/g
Copper	84.8	2.55	5.25	ug/g
Lead	ND	0.431	5.25	ug/g
Manganese	1.50	0.336	1.05	ug/g
Mercury	0.0537 J	0.0525	0.525	ug/g
Nickel	2.50 J	0.368	5.25	ug/g
Selenium	ND	1.23	10.5	ug/g
Silver	ND	0.494	5.25	ug/g

Report of Analysis

Thallium	ND	1.03	5.25	ug/g
Tin	ND	2.62	10.5	ug/g
Vanadium	ND	1.05	5.25	ug/g
Zinc	ND	3.28	10.5	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:17	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 11:23	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	727 J	72.1	2570	ug/g
Q	44400	52.5	2570	ug/g
Hexachloroethane	ND	82.4	2570	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1030	1100 ug/g	107	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:27	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.94	4.97	ug/g

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01427	21-03-011	1/23/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
5/20/2003 08:22	7502	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7602

Parameter	*Result*	*MDL*	*PQL*	*Units*
bis-(2-Chloroethyl)sulfide	87.9			%

AM100 Non-Vols in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/12/2003 0:00	snc	3903

Parameter	*Result*	*MDL*	*PQL*	*Units*
Thiodiglycol (TDG)	ND	228	271	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
Thiodiglycol-d8 (TDG-d8)	1080	1040 ug/g	96	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 12:45		AM101 Vols in Liquid HD by GC	1	2/7/2003 5:12	ssh	3906

Parameter	*Result*	*MDL*	*PQL*	*Units*
1,2-Dichloroethane	5270	294	565	ug/g
Tetrachloroethylene	127 J	113	565	ug/g
1,1,2,2-Tetrachloroethane	ND	169	565	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Difluorobenzene	23400	23500 ug/g	101	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.3	51.5	ug/g
Antimony	ND	0.649	5.15	ug/g
Arsenic	ND	1.26	5.15	ug/g
Barium	ND	0.443	5.15	ug/g
Beryllium	ND	0.928	5.15	ug/g
Boron	ND	3.86	10.3	ug/g
Cadmium	ND	0.423	5.15	ug/g
Chromium	1.35 J	1.33	5.15	ug/g
Cobalt	ND	0.278	1.03	ug/g
Copper	53.9	2.51	5.15	ug/g
Lead	ND	0.423	5.15	ug/g
Manganese	ND	0.330	1.03	ug/g
Mercury	ND	0.0515	0.515	ug/g
Nickel	0.544 J	0.361	5.15	ug/g
Selenium	ND	1.21	10.3	ug/g
Silver	ND	0.485	5.15	ug/g

Report of Analysis

Thallium	ND	1.01	5.15	ug/g
Tin	ND	2.57	10.3	ug/g
Vanadium	ND	1.03	5.15	ug/g
Zinc	ND	3.22	10.3	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:17	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 12:40	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	508 J	68.1	2430	ug/g
Q	39400	49.6	2430	ug/g
Hexachloroethane	ND	77.8	2430	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	973	1010 ug/g	104	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:27	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.90	4.88	ug/g

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01401	21-03-028	1/28/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.0	50.0	ug/g
Antimony	0.280 J	0.130	5.00	ug/g
Arsenic	33.0	0.570	5.00	ug/g
Barium	0.811 J	0.0400	5.00	ug/g
Beryllium	0.630 J	0.0500	5.00	ug/g
Boron	5.30 J	4.00	10.0	ug/g
Cadmium	0.958 J	0.0200	5.00	ug/g
Chromium	5.91	1.00	5.00	ug/g
Cobalt	1.63	0.120	1.00	ug/g
Copper	39.8	3.23	10.0	ug/g
Lead	4.87 J	1.89	10.0	ug/g
Manganese	56.1	3.30	10.0	ug/g
Mercury	0.965	0.0700	0.500	ug/g
Nickel	6.47	0.620	5.00	ug/g
Selenium	ND	0.710	25.0	ug/g
Silver	0.731 J	0.0600	5.00	ug/g
Thallium	0.984 J	0.330	5.00	ug/g
Tin	1.08 J	0.440	10.0	ug/g
Vanadium	1.48 J	1.00	5.00	ug/g
Zinc	29.0	2.20	10.0	ug/g

Comments: Mercury results obtained from sample analyzed on 2/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01404	21-03-031	1/29/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	14.1 J	9.74	48.7	ug/g
Antimony	1.31 J	0.127	4.87	ug/g
Arsenic	13.5	0.555	4.87	ug/g
Barium	0.453 J	0.0389	4.87	ug/g
Beryllium	0.204 J	0.0487	4.87	ug/g
Boron	ND	3.89	9.74	ug/g
Cadmium	0.430 J	0.0195	4.87	ug/g
Chromium	34.2	0.974	4.87	ug/g
Cobalt	7.97	0.117	0.974	ug/g
Copper	12.7	3.15	9.74	ug/g
Lead	30.1	1.84	9.74	ug/g
Manganese	502	3.21	9.74	ug/g
Mercury	0.834	0.0682	0.487	ug/g
Nickel	35.7	0.604	4.87	ug/g
Selenium	ND	0.691	24.3	ug/g
Silver	0.220 J	0.0584	4.87	ug/g
Thallium	0.336 J	0.321	4.87	ug/g
Tin	6.32 J	0.428	9.74	ug/g
Vanadium	1.39 J	0.974	4.87	ug/g
Zinc	5.17 J	2.14	9.74	ug/g

Comments: Sample was diluted an additional 1.111 fold because Manganese was higher than the highest cal curve point.
Mercury result obtained from sample analyzed on 2/13/03

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01419	21-03-019	1/24/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.2	50.9	ug/g
Antimony	ND	0.132	5.09	ug/g
Arsenic	15.4	0.580	5.09	ug/g
Barium	0.0506 J	0.0407	5.09	ug/g
Beryllium	ND	0.0509	5.09	ug/g
Boron	ND	4.07	10.2	ug/g
Cadmium	0.246 J	0.0204	5.09	ug/g
Chromium	12.3	1.02	5.09	ug/g
Cobalt	2.05	0.122	1.02	ug/g
Copper	63.2	3.29	10.2	ug/g
Lead	7.53 J	1.92	10.2	ug/g
Manganese	136	3.36	10.2	ug/g
Mercury	0.592	0.0713	0.509	ug/g
Nickel	32.5	0.631	5.09	ug/g
Selenium	ND	0.723	25.5	ug/g
Silver	ND	0.0611	5.09	ug/g
Thallium	ND	0.336	5.09	ug/g
Tin	2.10 J	0.448	10.2	ug/g
Vanadium	ND	1.02	5.09	ug/g
Zinc	55.8	2.24	10.2	ug/g

Comments: Mercury result obtained from sample analyzed on 2/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01422	21-03-025	1/28/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	9.49	47.4	ug/g
Antimony	1.43 J	0.123	4.74	ug/g
Arsenic	11.4	0.541	4.74	ug/g
Barium	0.0495 J	0.0380	4.74	ug/g
Beryllium	ND	0.0474	4.74	ug/g
Boron	ND	3.80	9.49	ug/g
Cadmium	0.213 J	0.0190	4.74	ug/g
Chromium	56.5	0.949	4.74	ug/g
Cobalt	11.3	0.114	0.949	ug/g
Copper	12.8	3.06	9.49	ug/g
Lead	46.7	1.79	9.49	ug/g
Manganese	766	3.13	9.49	ug/g
Mercury	0.911	0.0664	0.474	ug/g
Nickel	152	0.588	4.74	ug/g
Selenium	ND	0.674	23.7	ug/g
Silver	ND	0.0569	4.74	ug/g
Thallium	ND	0.313	4.74	ug/g
Tin	15.4	0.417	9.49	ug/g
Vanadium	1.25 J	0.949	4.74	ug/g
Zinc	2.49 J	2.09	9.49	ug/g

Comments: Sample was diluted an additional 1.428 fold because Manganese was higher than the highest cal curve point.
Mercury result obtained from sample analyzed on 2/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01428	21-03-014a	1/23/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.3	51.3	ug/g
Antimony	0.251 J	0.133	5.13	ug/g
Arsenic	319	0.585	5.13	ug/g
Barium	ND	0.0410	5.13	ug/g
Beryllium	ND	0.0513	5.13	ug/g
Boron	ND	4.10	10.3	ug/g
Cadmium	0.273 J	0.0205	5.13	ug/g
Chromium	19.0	1.03	5.13	ug/g
Cobalt	3.59	0.123	1.03	ug/g
Copper	58.7	3.31	10.3	ug/g
Lead	551	1.94	10.3	ug/g
Manganese	210	3.38	10.3	ug/g
Mercury	1630	0.0718	0.513	ug/g
Nickel	18.8	0.636	5.13	ug/g
Selenium	ND	0.728	25.6	ug/g
Silver	ND	0.0615	5.13	ug/g
Thallium	ND	0.338	5.13	ug/g
Tin	3.67 J	0.451	10.3	ug/g
Vanadium	ND	1.03	5.13	ug/g
Zinc	93.0	2.26	10.3	ug/g

Comments: Lead higher than highest cal curve point - sample was not diluted and rerun for Lead in an attempt to avoid contaminating the instrument with high levels of Mercury, original value was reported.
Mercury higher than highest cal curve point - sample was diluted an additional 333.3 fold. Analyzed 2/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01429	21-03-014b	1/23/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	9.52	47.6	ug/g
Antimony	0.655 J	0.124	4.76	ug/g
Arsenic	2710	0.543	4.76	ug/g
Barium	0.137 J	0.0381	4.76	ug/g
Beryllium	ND	0.0476	4.76	ug/g
Boron	ND	3.81	9.52	ug/g
Cadmium	0.268 J	0.0190	4.76	ug/g
Chromium	16.9	0.952	4.76	ug/g
Cobalt	3.96	0.114	0.952	ug/g
Copper	69.0	3.08	9.52	ug/g
Lead	8880	1.80	9.52	ug/g
Manganese	181	3.14	9.52	ug/g
Mercury	6900	0.0667	0.476	ug/g
Nickel	20.6	0.590	4.76	ug/g
Selenium	ND	0.676	23.8	ug/g
Silver	ND	0.0571	4.76	ug/g
Thallium	ND	0.314	4.76	ug/g
Tin	5.27 J	0.419	9.52	ug/g
Vanadium	ND	0.952	4.76	ug/g
Zinc	120	2.10	9.52	ug/g

Comments: Lead and Arsenic higher than highest cal curve point - sample was not diluted and rerun for Lead in an attempt to avoid contaminating the instrument with high levels of Mercury, original value was reported.
Mercury higher that highest cal curve point - sample was diluted an additional 2000 fold. Analyzed 2/13/03

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01430	21-03-014c	1/23/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	11.0	54.8	ug/g
Antimony	ND	0.143	5.48	ug/g
Arsenic	81.5	0.625	5.48	ug/g
Barium	0.172 J	0.0439	5.48	ug/g
Beryllium	ND	0.0548	5.48	ug/g
Boron	ND	4.39	11.0	ug/g
Cadmium	0.265 J	0.0219	5.48	ug/g
Chromium	14.4	1.10	5.48	ug/g
Cobalt	2.96	0.132	1.10	ug/g
Copper	64.6	3.54	11.0	ug/g
Lead	12.1	2.07	11.0	ug/g
Manganese	193	3.62	11.0	ug/g
Mercury	0.361 J	0.0768	0.548	ug/g
Nickel	18.5	0.680	5.48	ug/g
Selenium	ND	0.779	27.4	ug/g
Silver	ND	0.0658	5.48	ug/g
Thallium	ND	0.362	5.48	ug/g
Tin	2.58 J	0.482	11.0	ug/g
Vanadium	ND	1.10	5.48	ug/g
Zinc	64.9	2.41	11.0	ug/g

Comments: Mercury result obtained sample analyzed on 02/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01431	21-03-022	1/24/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.1	50.3	ug/g
Antimony	3.81 J	0.131	5.03	ug/g
Arsenic	3330	0.573	5.03	ug/g
Barium	0.112 J	0.0402	5.03	ug/g
Beryllium	ND	0.0503	5.03	ug/g
Boron	ND	4.02	10.1	ug/g
Cadmium	0.254 J	0.0201	5.03	ug/g
Chromium	47.3	1.01	5.03	ug/g
Cobalt	4.87	0.121	1.01	ug/g
Copper	31.9	3.25	10.1	ug/g
Lead	27.0	1.90	10.1	ug/g
Manganese	320	3.32	10.1	ug/g
Mercury	2830	0.0704	0.503	ug/g
Nickel	33.5	0.623	5.03	ug/g
Selenium	ND	0.714	25.1	ug/g
Silver	ND	0.0603	5.03	ug/g
Thallium	ND	0.332	5.03	ug/g
Tin	11.7	0.442	10.1	ug/g
Vanadium	ND	1.01	5.03	ug/g
Zinc	43.9	2.21	10.1	ug/g

Comments: Lead, Arsenic higher than highest cal curve point - sample was not diluted and rerun for Lead in an attempt to avoid contaminating the instrument with high levels of Mercury, original value was reported.
Mercury higher than highest cal curve point - sample was diluted an additional 500 fold. Analyzed 2/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01432	21-03-002	1/22/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	27.9 J	10.5	52.7	ug/g
Antimony	0.200 J	0.137	5.27	ug/g
Arsenic	128	0.601	5.27	ug/g
Barium	0.393 J	0.0421	5.27	ug/g
Beryllium	ND	0.0527	5.27	ug/g
Boron	ND	4.21	10.5	ug/g
Cadmium	0.269 J	0.0211	5.27	ug/g
Chromium	17.1	1.05	5.27	ug/g
Cobalt	2.16	0.126	1.05	ug/g
Copper	105	3.40	10.5	ug/g
Lead	7.58 J	1.99	10.5	ug/g
Manganese	88.2	3.48	10.5	ug/g
Mercury	0.117 J	0.0738	0.527	ug/g
Nickel	75.7	0.653	5.27	ug/g
Selenium	ND	0.748	26.3	ug/g
Silver	ND	0.0632	5.27	ug/g
Thallium	ND	0.348	5.27	ug/g
Tin	1.66 J	0.464	10.5	ug/g
Vanadium	ND	1.05	5.27	ug/g
Zinc	41.7	2.32	10.5	ug/g

Comments: Mercury result obtained from sample analyzed on 2/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01434	21-03-005	1/22/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	11.0	54.8	ug/g
Antimony	ND	0.142	5.48	ug/g
Arsenic	131	0.624	5.48	ug/g
Barium	0.124 J	0.0438	5.48	ug/g
Beryllium	ND	0.0548	5.48	ug/g
Boron	ND	4.38	11.0	ug/g
Cadmium	0.299 J	0.0219	5.48	ug/g
Chromium	8.61	1.10	5.48	ug/g
Cobalt	2.39	0.131	1.10	ug/g
Copper	58.1	3.54	11.0	ug/g
Lead	8.23 J	2.07	11.0	ug/g
Manganese	83.5	3.61	11.0	ug/g
Mercury	ND	0.0767	0.548	ug/g
Nickel	32.4	0.679	5.48	ug/g
Selenium	ND	0.778	27.4	ug/g
Silver	ND	0.0657	5.48	ug/g
Thallium	ND	0.361	5.48	ug/g
Tin	1.64 J	0.482	11.0	ug/g
Vanadium	ND	1.10	5.48	ug/g
Zinc	55.1	2.41	11.0	ug/g

Comments: Mercury result obtained from sample analyzed on 2/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01436	21-03-012	1/23/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	11.0	55.1	ug/g
Antimony	ND	0.143	5.51	ug/g
Arsenic	59.3	0.628	5.51	ug/g
Barium	0.0965 J	0.0441	5.51	ug/g
Beryllium	ND	0.0551	5.51	ug/g
Boron	ND	4.41	11.0	ug/g
Cadmium	0.292 J	0.0220	5.51	ug/g
Chromium	11.3	1.10	5.51	ug/g
Cobalt	2.37	0.132	1.10	ug/g
Copper	61.0	3.56	11.0	ug/g
Lead	7.93 J	2.08	11.0	ug/g
Manganese	157	3.63	11.0	ug/g
Mercury	0.290 J	0.0771	0.551	ug/g
Nickel	14.4	0.683	5.51	ug/g
Selenium	ND	0.782	27.5	ug/g
Silver	ND	0.0661	5.51	ug/g
Thallium	ND	0.363	5.51	ug/g
Tin	2.20 J	0.485	11.0	ug/g
Vanadium	ND	1.10	5.51	ug/g
Zinc	52.1	2.42	11.0	ug/g

Comments: Sample was reanalyzed for Mercury on 2/20/2003

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01438	21-03-016	1/23/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	9.32	46.6	ug/g
Antimony	ND	0.121	4.66	ug/g
Arsenic	289	0.531	4.66	ug/g
Barium	0.0377 J	0.0373	4.66	ug/g
Beryllium	ND	0.0466	4.66	ug/g
Boron	ND	3.73	9.32	ug/g
Cadmium	0.269 J	0.0186	4.66	ug/g
Chromium	19.5	0.932	4.66	ug/g
Cobalt	3.67	0.112	0.932	ug/g
Copper	82.8	3.01	9.32	ug/g
Lead	12.4	1.76	9.32	ug/g
Manganese	206	3.08	9.32	ug/g
Mercury	ND	0.0652	0.466	ug/g
Nickel	8.70	0.578	4.66	ug/g
Selenium	ND	0.662	23.3	ug/g
Silver	ND	0.0559	4.66	ug/g
Thallium	ND	0.308	4.66	ug/g
Tin	1.12 J	0.410	9.32	ug/g
Vanadium	ND	0.932	4.66	ug/g
Zinc	122	2.05	9.32	ug/g

Comments: Sample was reanalyzed for Mercury on 2/20/2003

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01402	21-03-029	1/28/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	9.97	49.9	ug/g
Antimony	0.855 J	0.130	4.99	ug/g
Arsenic	62.1	0.568	4.99	ug/g
Barium	0.111 J	0.0399	4.99	ug/g
Beryllium	ND	0.0499	4.99	ug/g
Boron	ND	3.99	9.97	ug/g
Cadmium	0.349 J	0.0199	4.99	ug/g
Chromium	20.3	0.997	4.99	ug/g
Cobalt	3.84	0.120	0.997	ug/g
Copper	328	3.22	9.97	ug/g
Lead	42.2	1.88	9.97	ug/g
Manganese	261	3.29	9.97	ug/g
Mercury	0.179 J	0.0698	0.499	ug/g
Nickel	32.0	0.618	4.99	ug/g
Selenium	ND	0.708	24.9	ug/g
Silver	ND	0.0598	4.99	ug/g
Thallium	ND	0.329	4.99	ug/g
Tin	1.53 J	0.439	9.97	ug/g
Vanadium	ND	0.997	4.99	ug/g
Zinc	148	2.19	9.97	ug/g

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01405	21-03-032	1/29/2003 16:27	2/5/2003 16:25	5/14/2003 14:40	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	29.2 J	10.6	53.2	ug/g
Antimony	2.47 J	0.138	5.32	ug/g
Arsenic	12.6	0.607	5.32	ug/g
Barium	0.206 J	0.0426	5.32	ug/g
Beryllium	ND	0.0532	5.32	ug/g
Boron	ND	4.26	10.6	ug/g
Cadmium	0.261 J	0.0213	5.32	ug/g
Chromium	60.8	1.06	5.32	ug/g
Cobalt	8.82	0.128	1.06	ug/g
Copper	15.4	3.44	10.6	ug/g
Lead	56.9	2.01	10.6	ug/g
Manganese	661	3.51	10.6	ug/g
Mercury	0.322 J	0.0745	0.532	ug/g
Nickel	36.2	0.660	5.32	ug/g
Selenium	ND	0.756	26.6	ug/g
Silver	ND	0.0639	5.32	ug/g
Thallium	ND	0.351	5.32	ug/g
Tin	7.80 J	0.469	10.6	ug/g
Vanadium	ND	1.06	5.32	ug/g
Zinc	3.59 J	2.34	10.6	ug/g

Comments: Manganese result based on an additional 20 fold dilution of samples which had originally been analyzed on 02/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01416	21-03-009a	1/27/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	17.1 J	9.75	48.7	ug/g
Antimony	2.28 J	0.127	4.87	ug/g
Arsenic	951	0.556	4.87	ug/g
Barium	2.23 J	0.0390	4.87	ug/g
Beryllium	ND	0.0487	4.87	ug/g
Boron	4.36 J	3.90	9.75	ug/g
Cadmium	1.48 J	0.0195	4.87	ug/g
Chromium	29.6	0.975	4.87	ug/g
Cobalt	9.75	0.117	0.975	ug/g
Copper	1100	3.15	9.75	ug/g
Lead	1040	1.84	9.75	ug/g
Manganese	329	3.22	9.75	ug/g
Mercury	575	0.0682	0.487	ug/g
Nickel	39.5	0.604	4.87	ug/g
Selenium	1.60 J	0.692	24.4	ug/g
Silver	0.192 J	0.0585	4.87	ug/g
Thallium	ND	0.322	4.87	ug/g
Tin	18.1	0.429	9.75	ug/g
Vanadium	ND	0.975	4.87	ug/g
Zinc	2160	2.14	9.75	ug/g

Comments: Arsenic, Lead, Copper and Zinc higher than the highest cal curve point - sample was diluted an additional 20 fold. Sample was diluted an additional 200 fold for the determination of Mercury.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01417	21-03-009b	1/27/2003 16:27	2/5/2003 16:25	11/13/2003 16:09	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.95	49.8	ug/g
Antimony	2.12 J	0.129	4.98	ug/g
Arsenic	2940	0.567	4.98	ug/g
Barium	0.225 J	0.0398	4.98	ug/g
Beryllium	ND	0.0498	4.98	ug/g
Boron	ND	3.98	9.95	ug/g
Cadmium	0.647 J	0.0199	4.98	ug/g
Chromium	53.4	0.995	4.98	ug/g
Cobalt	21.6	0.119	0.995	ug/g
Copper	424	3.21	9.95	ug/g
Lead	1720	1.88	9.95	ug/g
Manganese	615	3.28	9.95	ug/g
Mercury	2780	0.0697	0.498	ug/g
Nickel	15.7	0.617	4.98	ug/g
Selenium	1.25 J	0.706	24.9	ug/g
Silver	0.0610 J	0.0597	4.98	ug/g
Thallium	ND	0.328	4.98	ug/g
Tin	14.6	0.438	9.95	ug/g
Vanadium	ND	0.995	4.98	ug/g
Zinc	1280	2.19	9.95	ug/g

Comments: Arsenic, Lead, Manganese and Zinc higher than the highest cal curve point - sample was diluted an additional 20 fold. Sample was diluted an additional 1000 fold for the determination of Mercury.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01418	21-03-009c	1/27/2003 16:27	2/5/2003 16:25	5/14/2003 14:40	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	Result	MDL	PQL	Units
Aluminum	13.0 J	10.1	50.5	ug/g
Antimony	2.00 J	0.131	5.05	ug/g
Arsenic	241	0.576	5.05	ug/g
Barium	0.349 J	0.0404	5.05	ug/g
Beryllium	ND	0.0505	5.05	ug/g
Boron	ND	4.04	10.1	ug/g
Cadmium	0.359 J	0.0202	5.05	ug/g
Chromium	20.6	1.01	5.05	ug/g
Cobalt	9.18	0.121	1.01	ug/g
Copper	142	3.26	10.1	ug/g
Lead	14.4	1.91	10.1	ug/g
Manganese	423	3.33	10.1	ug/g
Mercury	0.430 J	0.0707	0.505	ug/g
Nickel	30.3	0.626	5.05	ug/g
Selenium	0.790 J	0.717	25.3	ug/g
Silver	ND	0.0606	5.05	ug/g
Thallium	ND	0.333	5.05	ug/g
Tin	8.72 J	0.444	10.1	ug/g
Vanadium	ND	1.01	5.05	ug/g
Zinc	176	2.22	10.1	ug/g

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01420	21-03-020	1/24/2003 16:27	2/5/2003 16:25	5/14/2003 14:40	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	16.5 J	11.0	55.1	ug/g
Antimony	0.576 J	0.143	5.51	ug/g
Arsenic	13.2	0.628	5.51	ug/g
Barium	0.221 J	0.0441	5.51	ug/g
Beryllium	ND	0.0551	5.51	ug/g
Boron	ND	4.41	11.0	ug/g
Cadmium	0.450 J	0.0220	5.51	ug/g
Chromium	16.2	1.10	5.51	ug/g
Cobalt	6.12	0.132	1.10	ug/g
Copper	280	3.56	11.0	ug/g
Lead	29.6	2.08	11.0	ug/g
Manganese	500	3.63	11.0	ug/g
Mercury	0.142 J	0.0771	0.551	ug/g
Nickel	39.0	0.683	5.51	ug/g
Selenium	ND	0.782	27.5	ug/g
Silver	ND	0.0661	5.51	ug/g
Thallium	ND	0.363	5.51	ug/g
Tin	3.01 J	0.485	11.0	ug/g
Vanadium	ND	1.10	5.51	ug/g
Zinc	251	2.42	11.0	ug/g

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01421	21-03-023	1/24/2003 16:27	2/5/2003 16:25	5/14/2003 14:40	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	26.8 J	10.1	50.3	ug/g
Antimony	64.6	0.131	5.03	ug/g
Arsenic	3540	0.573	5.03	ug/g
Barium	0.631 J	0.0402	5.03	ug/g
Beryllium	ND	0.0503	5.03	ug/g
Boron	5.68 J	4.02	10.1	ug/g
Cadmium	0.994 J	0.0201	5.03	ug/g
Chromium	97.1	1.01	5.03	ug/g
Cobalt	11.2	0.121	1.01	ug/g
Copper	771	3.25	10.1	ug/g
Lead	219	1.90	10.1	ug/g
Manganese	555	3.32	10.1	ug/g
Mercury	1680	0.0704	0.503	ug/g
Nickel	158	0.624	5.03	ug/g
Selenium	1.49 J	0.714	25.2	ug/g
Silver	0.154 J	0.0604	5.03	ug/g
Thallium	ND	0.332	5.03	ug/g
Tin	88.8	0.443	10.1	ug/g
Vanadium	ND	1.01	5.03	ug/g
Zinc	1280	2.21	10.1	ug/g

Comments: Arsenic, Manganese, Copper and Zinc results based on an additional 20 fold dilution of samples which had originally been analyzed on 02/13/03.
Sample was diluted an additional 500 fold for the determination of Mercury.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01423	21-03-026	1/28/2003 16:27	2/5/2003 16:25	5/14/2003 14:40	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	90.9	9.37	46.9	ug/g
Antimony	1.98 J	0.122	4.69	ug/g
Arsenic	10.2	0.534	4.69	ug/g
Barium	2.71 J	0.0375	4.69	ug/g
Beryllium	ND	0.0469	4.69	ug/g
Boron	ND	3.75	9.37	ug/g
Cadmium	0.209 J	0.0187	4.69	ug/g
Chromium	74.2	0.937	4.69	ug/g
Cobalt	10.0	0.112	0.937	ug/g
Copper	17.8	3.03	9.37	ug/g
Lead	69.8	1.77	9.37	ug/g
Manganese	433	3.09	9.37	ug/g
Mercury	0.481	0.0656	0.469	ug/g
Nickel	162	0.581	4.69	ug/g
Selenium	ND	0.665	23.4	ug/g
Silver	ND	0.0562	4.69	ug/g
Thallium	ND	0.309	4.69	ug/g
Tin	15.4	0.412	9.37	ug/g
Vanadium	ND	0.937	4.69	ug/g
Zinc	3.36 J	2.06	9.37	ug/g

Comments: Manganese result based on an additional 20 fold dilution of samples which had originally been analyzed on 02/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01433	21-03-003	1/22/2003 16:27	2/5/2003 16:25	5/14/2003 14:40	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	21.3 J	10.2	51.1	ug/g
Antimony	1.90 J	0.133	5.11	ug/g
Arsenic	338	0.583	5.11	ug/g
Barium	0.788 J	0.0409	5.11	ug/g
Beryllium	ND	0.0511	5.11	ug/g
Boron	4.56 J	4.09	10.2	ug/g
Cadmium	1.32 J	0.0204	5.11	ug/g
Chromium	26.3	1.02	5.11	ug/g
Cobalt	9.65	0.123	1.02	ug/g
Copper	1310	3.30	10.2	ug/g
Lead	127	1.93	10.2	ug/g
Manganese	355	3.37	10.2	ug/g
Mercury	0.759	0.0716	0.511	ug/g
Nickel	49.8	0.634	5.11	ug/g
Selenium	1.02 J	0.726	25.6	ug/g
Silver	0.212 J	0.0613	5.11	ug/g
Thallium	ND	0.337	5.11	ug/g
Tin	10.4	0.450	10.2	ug/g
Vanadium	ND	1.02	5.11	ug/g
Zinc	2110	2.25	10.2	ug/g

Comments: Copper and Zinc results based on an additional 20 fold dilution of samples which had originally been analyzed on 02/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01435	21-03-006	1/22/2003 16:27	2/5/2003 16:25	5/14/2003 14:40	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	86.0	9.40	47.0	ug/g
Antimony	1.84 J	0.122	4.70	ug/g
Arsenic	413	0.536	4.70	ug/g
Barium	0.677 J	0.0376	4.70	ug/g
Beryllium	ND	0.0470	4.70	ug/g
Boron	ND	3.76	9.40	ug/g
Cadmium	0.658 J	0.0188	4.70	ug/g
Chromium	27.2	0.940	4.70	ug/g
Cobalt	9.49	0.113	0.940	ug/g
Copper	568	3.04	9.40	ug/g
Lead	75.8	1.78	9.40	ug/g
Manganese	323	3.10	9.40	ug/g
Mercury	0.256 J	0.0658	0.470	ug/g
Nickel	43.0	0.583	4.70	ug/g
Selenium	1.28 J	0.667	23.5	ug/g
Silver	0.133 J	0.0564	4.70	ug/g
Thallium	ND	0.310	4.70	ug/g
Tin	13.6	0.414	9.40	ug/g
Vanadium	ND	0.940	4.70	ug/g
Zinc	1190	2.07	9.40	ug/g

Comments: Copper and Zinc results based on an additional 20 fold dilution of samples which had originally been analyzed on 02/13/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01437	21-03-013	1/23/2003 16:27	2/5/2003 16:25	5/14/2003 14:40	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	19.3 J	10.1	50.3	ug/g
Antimony	0.496 J	0.131	5.03	ug/g
Arsenic	38.9	0.573	5.03	ug/g
Barium	0.509 J	0.0402	5.03	ug/g
Beryllium	ND	0.0503	5.03	ug/g
Boron	ND	4.02	10.1	ug/g
Cadmium	0.266 J	0.0201	5.03	ug/g
Chromium	11.7	1.01	5.03	ug/g
Cobalt	3.32	0.121	1.01	ug/g
Copper	190	3.25	10.1	ug/g
Lead	10.1	1.90	10.1	ug/g
Manganese	260	3.32	10.1	ug/g
Mercury	0.327 J	0.0704	0.503	ug/g
Nickel	22.1	0.623	5.03	ug/g
Selenium	1.09 J	0.714	25.1	ug/g
Silver	ND	0.0603	5.03	ug/g
Thallium	ND	0.332	5.03	ug/g
Tin	6.26 J	0.442	10.1	ug/g
Vanadium	ND	1.01	5.03	ug/g
Zinc	82.4	2.21	10.1	ug/g

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01439	21-03-017	1/23/2003 16:27	2/5/2003 16:25	5/14/2003 14:40	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	9.51	47.6	ug/g
Antimony	ND	0.124	4.76	ug/g
Arsenic	43.4	0.542	4.76	ug/g
Barium	0.0671 J	0.0381	4.76	ug/g
Beryllium	ND	0.0476	4.76	ug/g
Boron	ND	3.81	9.51	ug/g
Cadmium	0.247 J	0.0190	4.76	ug/g
Chromium	29.8	0.951	4.76	ug/g
Cobalt	3.96	0.114	0.951	ug/g
Copper	231	3.07	9.51	ug/g
Lead	40.0	1.80	9.51	ug/g
Manganese	258	3.14	9.51	ug/g
Mercury	ND	0.0666	0.476	ug/g
Nickel	17.3	0.590	4.76	ug/g
Selenium	1.13 J	0.676	23.8	ug/g
Silver	ND	0.0571	4.76	ug/g
Thallium	ND	0.314	4.76	ug/g
Tin	2.17 J	0.419	9.51	ug/g
Vanadium	ND	0.951	4.76	ug/g
Zinc	97.1	2.09	9.51	ug/g

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Report of Analysis

Method Blank

Lab ID	Sample ID	Reported
3493	MB for HBN 3702 [PREP/1402] *(Results reported on a wet weight basis)*	3/5/2003 17:00

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 0:34	ssh	3705

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	10	10.8 ug/mL	108	50 - 150

Method Blank

Lab ID	Sample ID	Reported
3500	MB for HBN 3703 [PREP/1403] *(Results reported on a wet weight basis)*	3/5/2003 17:00

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/11/2003 17:42	snc	3903

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	1090 ug/mL	107	50 - 150

Method Blank

Lab ID	Sample ID	Reported
3487	MB for HBN 3701 [PREP/1401] *(Results reported on a wet weight basis)*	3/5/2003 17:00

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/6/2003 12:14	3701	AM101 Vols in Liquid HD by GC	1	2/6/2003 18:41	ssh	3906

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	207	192 ug/mL	92.7	50 - 150

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Method Blank

Lab ID	*Sample ID*	*Reported*
3493	MB for HBN 3702 [PREP/1402] *(Results reported on a wet weight basis)*	3/5/2003 17:00

AM098 HD Purity by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/6/2003 15:34	ssh	3706

Parameter	*Result*	*MDL*	*PQL*	*Units*
bis-(2-Chloroethyl)sulfide	0.00			%

Method Blank

Lab ID	*Sample ID*	*Reported*
3742	MB for HBN 4202 [PREP/1417] *(Results reported on a wet weight basis)*	3/5/2003 17:00

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:08	4202	AM126 Lewisite in HD by GC	1	3/7/2003 13:20	ssh	4204

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.95	5.00	ug/g

Method Blank

Lab ID	*Sample ID*	*Reported*
4392	MB for HBN 7502 [PREP/1452] *(Results reported on a wet weight basis)*	3/5/2003 17:00

AM098 HD Purity by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
5/20/2003 08:22	7502	AM098 HD Purity by GC	1	5/21/2003 13:15	tfr	7602

Parameter	*Result*	*MDL*	*PQL*	*Units*
bis-(2-Chloroethyl)sulfide	0.00			%

Report of Analysis

Method Blank

Lab ID	Sample ID	Reported
3530	MB for HBN 3707 [PREP/1404]	3/5/2003 17:00
	(Results reported on a wet weight basis)	

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/7/2003 13:20	3707	AM118 Metals in Liq HD by ICP	1	2/12/2003 17:04	blb	4001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.0	50.0	ug/g
Antimony	ND	0.630	5.00	ug/g
Arsenic	ND	1.22	5.00	ug/g
Barium	ND	0.430	5.00	ug/g
Beryllium	ND	0.900	5.00	ug/g
Boron	ND	3.74	10.0	ug/g
Cadmium	ND	0.410	5.00	ug/g
Chromium	ND	1.29	5.00	ug/g
Cobalt	ND	0.270	1.00	ug/g
Copper	ND	2.43	5.00	ug/g
Lead	ND	0.410	5.00	ug/g
Manganese	ND	0.320	1.00	ug/g
Mercury	ND	0.0500	0.500	ug/g
Nickel	ND	0.350	5.00	ug/g
Selenium	ND	1.17	10.0	ug/g
Silver	ND	0.470	5.00	ug/g
Thallium	ND	0.980	5.00	ug/g
Tin	ND	2.49	10.0	ug/g
Vanadium	ND	1.00	5.00	ug/g
Zinc	ND	3.12	10.0	ug/g

Method Blank

Lab ID	Sample ID	Reported
3538	MB for HBN 3801 [PREP/1405]	3/5/2003 17:00
	(Results reported on a wet weight basis)	

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/10/2003 16:00	3801	AM118 Metals in Sld HD by ICP	1	2/12/2003 10:47	blb	4009

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.0	50.0	ug/g
Antimony	ND	0.130	5.00	ug/g
Arsenic	ND	0.570	5.00	ug/g
Barium	ND	0.0400	5.00	ug/g
Beryllium	ND	0.0500	5.00	ug/g
Boron	ND	4.00	10.0	ug/g
Cadmium	0.211 J	0.0200	5.00	ug/g
Chromium	ND	1.00	5.00	ug/g
Cobalt	ND	0.120	1.00	ug/g
Copper	ND	3.23	10.0	ug/g

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3801 4009 Method Blank

Lead	ND	1.89	10.0	ug/g
Manganese	ND	3.30	10.0	ug/g
Mercury	0.825	0.0700	0.500	ug/g
Nickel	ND	0.620	5.00	ug/g
Selenium	ND	0.710	25.0	ug/g
Silver	ND	0.0600	5.00	ug/g
Thallium	ND	0.330	5.00	ug/g
Tin	ND	0.440	10.0	ug/g
Vanadium	ND	1.00	5.00	ug/g
Zinc	ND	2.20	10.0	ug/g

Method Blank

Lab ID	*Sample ID*	*Reported*
3567	MB for HBN 3904 [PREP/1408]	3/5/2003 17:00
	(Results reported on a wet weight basis)	

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/11/2003 13:08	3904	AM118 Metals in Sld HD by ICP	1	2/20/2003 8:46	blb	4301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.0	50.0	ug/g
Antimony	ND	0.130	5.00	ug/g
Arsenic	ND	0.570	5.00	ug/g
Barium	0.0459 J	0.0400	5.00	ug/g
Beryllium	ND	0.0500	5.00	ug/g
Boron	ND	4.00	10.0	ug/g
Cadmium	0.234 J	0.0200	5.00	ug/g
Chromium	ND	1.00	5.00	ug/g
Cobalt	ND	0.120	1.00	ug/g
Copper	ND	3.23	10.0	ug/g
Lead	ND	1.89	10.0	ug/g
Manganese	ND	3.30	10.0	ug/g
Mercury	ND	0.0700	0.500	ug/g
Nickel	ND	0.620	5.00	ug/g
Selenium	ND	0.710	25.0	ug/g
Silver	ND	0.0600	5.00	ug/g
Thallium	ND	0.330	5.00	ug/g
Tin	ND	0.440	10.0	ug/g
Vanadium	ND	1.00	5.00	ug/g
Zinc	ND	2.20	10.0	ug/g

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Lab ID	*Sample ID*	*Reported*
3500	MB for HBN 3703 [PREP/1403] *(Results reported on a wet weight basis)*	3/5/2003 17:00

AM100 Non-Vols in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/10/2003 15:54	3703	AM100 Non-Vols in HD by GC	1	2/11/2003 17:42	snc	3903

Parameter	*Result*	*MDL*	*PQL*	*Units*
Thiodiglycol (TDG)	ND	210	250	ug/g

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Method Blank

Lab ID	*Sample ID*	*Reported*
3493	MB for HBN 3702 [PREP/1402] ***(Results reported on a wet weight basis)***	3/5/2003 17:00

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 15:14	3702	AM117 Semi-Vols Liq HD by GC	1	2/8/2003 0:34	ssh	3705

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	ND	70.0	2500	ug/g
Q	ND	51.0	2500	ug/g
Hexachloroethane	ND	80.0	2500	ug/g

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Lab ID	*Sample ID*	*Reported*
3487	MB for HBN 3701 [PREP/1401] *(Results reported on a wet weight basis)*	3/5/2003 17:00

AM101 Vols in Liquid HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/6/2003 12:14	3701	AM101 Vols in Liquid HD by GC	1	2/6/2003 18:41	ssh	3906

Parameter	*Result*	*MDL*	*PQL*	*Units*
1,2-Dichloroethane	ND	260	500	ug/g
Tetrachloroethylene	ND	100	500	ug/g
1,1,2,2-Tetrachloroethane	ND	150	500	ug/g

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Report of Analysis

QC Summary

LCS Lab ID: 3495 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 3702 — **Analytical:** 3706

AM098 HD Purity by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*
bis-(2-Chloroethyl)sulfide	98.4 %	105	107	85 - 115

LCS Lab ID: 3743 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 4202 — **Analytical:** 4204

AM126 Lewisite in HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*
Lewisite	25.2 ug/g	29.2	116	50 - 150

DUP Lab ID: 3744 — **Original Lab ID:** 030004-01403 — **Matrix:** Liquid — **Prep Batch:** 4202 — **Analytical:** 4204

AM126 Lewisite in HD by GC	*Original Result*	*Result*	*RPD*	*RPD Limits*
Lewisite	0	0	0	0 - 25

MS Lab ID: 3745 — **Original Lab ID:** 030004-01403 — **Matrix:** Liquid — **Prep Batch:** 4202 — **Analytical:** 4204

AM126 Lewisite in HD by GC	*Original Result*	*Expected*	*Result*	*Recovery*	*Rec Limits*
Lewisite	0	24.7 ug/g	25.8	104	50 - 150

MSD Lab ID: 3746 — **Original Lab ID:** 030004-01403 — **Matrix:** Liquid — **Prep Batch:** 4202 — **Analytical:** 4204

AM126 Lewisite in HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*	*RPD*	*RPD Limits*
Lewisite	26.1 ug/g	25.9	99.6	50 - 150	4.32	0 - 25

LCS Lab ID: 3747 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 4202 — **Analytical:** 4204

AM126 Lewisite in HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*
Lewisite	25.2 ug/g	26.6	105	50 - 150

LCS Lab ID: 4393 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 7502 — **Analytical:** 7602

AM098 HD Purity by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*
bis-(2-Chloroethyl)sulfide	98.4 %	101	103	85 - 115

DUP Lab ID: 4394 — **Original Lab ID:** 03-0004-050-01 — **Matrix:** Liquid — **Prep Batch:** 7502 — **Analytical:** 7602

AM098 HD Purity by GC	*Original Result*	*Result*	*RPD*	*RPD Limits*
bis-(2-Chloroethyl)sulfide	89	95.6	7.12	0 - 25

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QC Summary

LCS Lab ID: 3531 | Original Lab ID: | Prep Batch: 3707
Matrix: Liquid | Analytical: 4001

AM118 Metals in Liq HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	500 ug/g	470	94	75 - 125
Antimony	50 ug/g	50.7	101	75 - 125
Arsenic	50 ug/g	50.1	100	75 - 125
Barium	50 ug/g	51.5	103	75 - 125
Beryllium	50 ug/g	48.1	96.2	75 - 125
Boron	500 ug/g	446	89.2	75 - 125
Cadmium	50 ug/g	52.9	106	75 - 125
Chromium	50 ug/g	47.2	94.4	75 - 125
Cobalt	50 ug/g	47.1	94.2	75 - 125
Copper	50 ug/g	57	114	75 - 125
Lead	50 ug/g	48.2	96.4	75 - 125
Manganese	50 ug/g	47	94	75 - 125
Mercury	2.5 ug/g	2.74	110	75 - 125
Nickel	50 ug/g	47.2	94.4	75 - 125
Selenium	50 ug/g	49.9	99.8	75 - 125
Silver	50 ug/g	54.1	108	75 - 125
Thallium	50 ug/g	47	94	75 - 125
Tin	50 ug/g	51.4	103	75 - 125
Vanadium	50 ug/g	46.3	92.6	75 - 125
Zinc	50 ug/g	50.6	101	75 - 125

DUP Lab ID: 3532 | Original Lab ID: 030004-01403 | Prep Batch: 3707
Matrix: Liquid | Analytical: 4001

AM118 Metals in Liq HD by ICP	Original Result	Result	RPD	RPD Limits
Aluminum	4.56	8.67	62.1 *	0 - 20
Antimony	0	0	0	0 - 20
Arsenic	0	0.0749	200 *	0 - 20
Barium	0.0702	0.21	99.8 *	0 - 20
Beryllium	0.00795	0.0113	35.2 *	0 - 20
Boron	5.38	2.54	71.7 *	0 - 20
Cadmium	0.248	0.293	16.8	0 - 20
Chromium	0.969	1.18	19.6	0 - 20
Cobalt	0.0527	0.064	19.4	0 - 20
Copper	9.43	9.27	1.77	0 - 20
Lead	0.206	0.202	1.62	0 - 20
Manganese	3.76	3.65	2.96	0 - 20
Mercury	0.0265	0.0181	37.8 *	0 - 20
Nickel	1.61	1.83	12.6	0 - 20
Selenium	0	0	0	0 - 20
Silver	0.00858	0.009	4.76	0 - 20
Thallium	0.216	0.0845	87.5 *	0 - 20
Tin	0.063	0.0837	28.2 *	0 - 20
Vanadium	0.466	0.425	9.18	0 - 20
Zinc	1.22	2.2	57.2 *	0 - 20

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Report of Analysis

MS Lab ID: 3533 | Original Lab ID: 030004-01403 | Prep Batch: 3707
Matrix: Liquid | Analytical: 4001

AM118 Metals in Liq HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Aluminum	4.56	514 ug/g	469	90.3	75 - 125
Antimony	0	51.4 ug/g	50.5	98.2	75 - 125
Arsenic	0	51.4 ug/g	56.1	109	50 - 150
Barium	0.0702	51.4 ug/g	50.4	97.9	75 - 125
Beryllium	0.00795	51.4 ug/g	42.1	82	75 - 125
Boron	5.38	514 ug/g	350	67.2 *	75 - 125
Cadmium	0.248	51.4 ug/g	51.3	99.3	75 - 125
Chromium	0.969	51.4 ug/g	52.3	99.9	75 - 125
Cobalt	0.0527	51.4 ug/g	49.2	95.7	75 - 125
Copper	9.43	51.4 ug/g	61.4	101	75 - 125
Lead	0.206	51.4 ug/g	48	93	75 - 125
Manganese	3.76	51.4 ug/g	54.9	99.5	75 - 125
Mercury	0.0265	2.57 ug/g	2.8	108	50 - 150
Nickel	1.61	51.4 ug/g	52.1	98.3	75 - 125
Selenium	0	51.4 ug/g	53.3	104	50 - 150
Silver	0.00858	51.4 ug/g	49.7	96.8	50 - 150
Thallium	0.216	51.4 ug/g	47.2	91.4	75 - 125
Tin	0.063	51.4 ug/g	49.5	96.3	75 - 125
Vanadium	0.466	51.4 ug/g	50.4	97.1	75 - 125
Zinc	1.22	51.4 ug/g	57.7	110	50 - 150

MSD Lab ID: 3534 | Original Lab ID: 030004-01403 | Prep Batch: 3707
Matrix: Liquid | Analytical: 4001

AM118 Metals in Liq HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	519 ug/g	467	89.1	75 - 125	1.34	0 - 25
Antimony	51.9 ug/g	50.1	96.6	75 - 125	1.64	0 - 25
Arsenic	51.9 ug/g	55.1	106	50 - 150	2.79	0 - 25
Barium	51.9 ug/g	49.3	94.9	75 - 125	3.11	0 - 25
Beryllium	51.9 ug/g	42.3	81.6	75 - 125	0.489	0 - 25
Boron	519 ug/g	349	66.2 *	75 - 125	1.5	0 - 25
Cadmium	51.9 ug/g	50.1	96.1	75 - 125	3.28	0 - 25
Chromium	51.9 ug/g	51.6	97.5	75 - 125	2.43	0 - 25
Cobalt	51.9 ug/g	48	92.5	75 - 125	3.4	0 - 25
Copper	51.9 ug/g	59.5	96.6	75 - 125	4.45	0 - 25
Lead	51.9 ug/g	47	90.2	75 - 125	3.06	0 - 25
Manganese	51.9 ug/g	53.9	96.7	75 - 125	2.85	0 - 25
Mercury	2.59 ug/g	2.81	107	50 - 150	0.93	0 - 25
Nickel	51.9 ug/g	50.1	93.5	75 - 125	5.01	0 - 25
Selenium	51.9 ug/g	52.8	102	50 - 150	1.94	0 - 25
Silver	51.9 ug/g	48.9	94.2	50 - 150	2.72	0 - 25
Thallium	51.9 ug/g	46.3	88.8	75 - 125	2.89	0 - 25
Tin	51.9 ug/g	49.1	94.5	75 - 125	1.89	0 - 25
Vanadium	51.9 ug/g	50	95.5	75 - 125	1.66	0 - 25
Zinc	51.9 ug/g	55	104	50 - 150	5.61	0 - 25

LCS Lab ID: 3539 | Original Lab ID: | Prep Batch: 3801
Matrix: Non-cohesive Solid | Analytical: 4009

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LCS Lab ID: 3539 | **Original Lab ID:** | **Prep Batch:** 3801
Matrix: Non-cohesive Solid | **Analytical:** 4009

AM118 Metals in NCS HD by ICP	*Expected*	*Result*	*Recovery*	*Rec Limits*
Aluminum	500 ug/g	480	96	75 - 125
Antimony	50 ug/g	49.8	99.6	75 - 125
Arsenic	50 ug/g	56.4	113	75 - 125
Barium	50 ug/g	49.8	99.6	75 - 125
Beryllium	50 ug/g	45.2	90.4	75 - 125
Boron	500 ug/g	371	74.2 *	75 - 125
Cadmium	50 ug/g	50	100	75 - 125
Chromium	50 ug/g	51.3	103	75 - 125
Cobalt	50 ug/g	49.7	99.4	75 - 125
Copper	50 ug/g	51.5	103	75 - 125
Lead	50 ug/g	47.8	95.6	75 - 125
Manganese	50 ug/g	51.9	104	75 - 125
Mercury	2.5 ug/g	2.92	117	75 - 125
Nickel	50 ug/g	49.8	99.6	75 - 125
Selenium	50 ug/g	51.4	103	75 - 125
Silver	50 ug/g	48.9	97.8	75 - 125
Thallium	50 ug/g	47.4	94.8	75 - 125
Tin	50 ug/g	48.5	97	75 - 125
Vanadium	50 ug/g	50.8	102	75 - 125
Zinc	50 ug/g	57.8	116	75 - 125

DUP Lab ID: 3540 | **Original Lab ID:** 030004-01401 | **Prep Batch:** 3801
Matrix: Non-cohesive Solid | **Analytical:** 4009

AM118 Metals in NCS HD by ICP	*Original Result*	*Result*	*RPD*	*RPD Limits*
Aluminum	9.44	7.44	23.7 *	0 - 20
Antimony	0.28	0	200 *	0 - 20
Arsenic	33	33.1	0.235	0 - 20
Barium	0.811	0.399	68.1 *	0 - 20
Beryllium	0.63	0.304	69.8 *	0 - 20
Boron	5.3	1.4	116 *	0 - 20
Cadmium	0.958	0.563	52 *	0 - 20
Chromium	5.91	6.14	3.75	0 - 20
Cobalt	1.63	1.29	23 *	0 - 20
Copper	39.8	42	5.37	0 - 20
Lead	4.87	4.8	1.38	0 - 20
Manganese	56.1	58.4	4	0 - 20
Mercury	0.965	0.767	22.9 *	0 - 20
Nickel	6.47	6.25	3.44	0 - 20
Selenium	0	0	0	0 - 20
Silver	0.731	0.341	72.7 *	0 - 20
Thallium	0.984	0.46	72.5 *	0 - 20
Tin	1.08	0.724	39.5 *	0 - 20
Vanadium	1.48	1.09	30.1 *	0 - 20
Zinc	29	30.1	3.74	0 - 20

MS Lab ID: 3541 | **Original Lab ID:** 030004-01401 | **Prep Batch:** 3801
Matrix: Non-cohesive Solid | **Analytical:** 4009

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MS Lab ID: 3541 | Original Lab ID: 030004-01401 | Prep Batch: 3801
Matrix: Non-cohesive Solid | Analytical: 4009

AM118 Metals in NCS HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Aluminum	9.44	556 ug/g	531	93.9	75 - 125
Antimony	0.28	55.6 ug/g	52.9	94.7	75 - 125
Arsenic	33	55.6 ug/g	97.9	117	50 - 150
Barium	0.811	55.6 ug/g	54.1	95.9	75 - 125
Beryllium	0.63	55.6 ug/g	49.4	87.9	75 - 125
Boron	5.3	556 ug/g	427	75.8	75 - 125
Cadmium	0.958	55.6 ug/g	52.9	93.5	75 - 125
Chromium	5.91	55.6 ug/g	63.1	103	75 - 125
Cobalt	1.63	55.6 ug/g	55.8	97.5	75 - 125
Copper	39.8	55.6 ug/g	98.3	105	75 - 125
Lead	4.87	55.6 ug/g	58.6	96.6	75 - 125
Manganese	56.1	55.6 ug/g	124	123	75 - 125
Mercury	0.965	2.78 ug/g	3.22	81.3	50 - 150
Nickel	6.47	55.6 ug/g	60.7	97.6	75 - 125
Selenium	0	55.6 ug/g	57.2	103	50 - 150
Silver	0.731	55.6 ug/g	51.4	91.3	50 - 150
Thallium	0.984	55.6 ug/g	52	91.8	75 - 125
Tin	1.08	55.6 ug/g	52.6	92.7	75 - 125
Vanadium	1.48	55.6 ug/g	57.9	102	75 - 125
Zinc	29	55.6 ug/g	90.1	110	50 - 150

MSD Lab ID: 3542 | Original Lab ID: 030004-01401 | Prep Batch: 3801
Matrix: Non-cohesive Solid | Analytical: 4009

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	583 ug/g	534	90	75 - 125	4.24	0 - 25
Antimony	58.3 ug/g	44.8	76.3	75 - 125	21.5	0 - 25
Arsenic	58.3 ug/g	90.8	99.2	50 - 150	16.5	0 - 25
Barium	58.3 ug/g	54.4	92	75 - 125	4.15	0 - 25
Beryllium	58.3 ug/g	50.2	85.1	75 - 125	3.24	0 - 25
Boron	583 ug/g	360	60.9 *	75 - 125	21.8	0 - 25
Cadmium	58.3 ug/g	53.1	89.6	75 - 125	4.26	0 - 25
Chromium	58.3 ug/g	63.4	98.7	75 - 125	4.26	0 - 25
Cobalt	58.3 ug/g	56.9	94.8	75 - 125	2.81	0 - 25
Copper	58.3 ug/g	95.6	95.7	75 - 125	9.27	0 - 25
Lead	58.3 ug/g	56.8	89	75 - 125	8.19	0 - 25
Manganese	58.3 ug/g	116	102	75 - 125	18.7	0 - 25
Mercury	2.91 ug/g	3.28	79.3	50 - 150	2.49	0 - 25
Nickel	58.3 ug/g	61.2	93.9	75 - 125	3.86	0 - 25
Selenium	58.3 ug/g	60	103	50 - 150	0	0 - 25
Silver	58.3 ug/g	51.5	87.1	50 - 150	4.71	0 - 25
Thallium	58.3 ug/g	52.4	88.3	75 - 125	3.89	0 - 25
Tin	58.3 ug/g	44.5	74.5 *	75 - 125	21.8	0 - 25
Vanadium	58.3 ug/g	58.3	97.5	75 - 125	4.51	0 - 25
Zinc	58.3 ug/g	87.2	99.8	50 - 150	9.72	0 - 25

LCS Lab ID: 3543 | Original Lab ID: | Prep Batch: 3801
Matrix: Solid | Analytical: 4009

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Report of Analysis

LCS Lab ID: 3543 **Original Lab ID:** **Prep Batch:** 3801
Matrix: Solid **Analytical:** 4009

AM118 Metals in NCS HD by ICP	*Expected*	*Result*	*Recovery*	*Rec Limits*
Aluminum	6000 ug/g	4610	76.9	75 - 125
Arsenic	141 ug/g	149	105	75 - 125
Barium	58.2 ug/g	56.3	96.7	75 - 125
Chromium	111 ug/g	105	95	75 - 125
Cobalt	11.1 ug/g	10.7	96.7	75 - 125
Copper	398 ug/g	352	88.4	75 - 125
Lead	5.73 ug/g	6.32	110	75 - 125
Manganese	480 ug/g	444	92.5	75 - 125
Nickel	195 ug/g	181	92.9	75 - 125
Vanadium	11.9 ug/g	12.8	108	75 - 125
Zinc	249 ug/g	232	93.2	75 - 125

LCSD Lab ID: 3544 **Original Lab ID:** **Prep Batch:** 3801
Matrix: Non-cohesive Solid **Analytical:** 4009

AM118 Metals in NCS HD by ICP	*Expected*	*Result*	*Recovery*	*Rec Limits*	*RPD*	*RPD Limits*
Aluminum	6000 ug/g	4660	77.6	75 - 125	0.906	0 - 25
Arsenic	141 ug/g	147	104	75 - 125	0.957	0 - 25
Barium	58.2 ug/g	57.1	98.1	75 - 125	1.44	0 - 25
Chromium	111 ug/g	102	92.2	75 - 125	2.99	0 - 25
Cobalt	11.1 ug/g	10.7	96.6	75 - 125	0.103	0 - 25
Copper	398 ug/g	350	87.9	75 - 125	0.567	0 - 25
Lead	5.73 ug/g	5.61	98	75 - 125	11.5	0 - 25
Manganese	480 ug/g	441	91.8	75 - 125	0.76	0 - 25
Nickel	195 ug/g	180	92.5	75 - 125	0.431	0 - 25
Vanadium	11.9 ug/g	12.9	108	75 - 125	0	0 - 25
Zinc	249 ug/g	234	93.9	75 - 125	0.748	0 - 25

LCS Lab ID: 3568 **Original Lab ID:** **Prep Batch:** 3904
Matrix: Solid **Analytical:** 4301

AM118 Metals in Sld HD by ICP	*Expected*	*Result*	*Recovery*	*Rec Limits*
Aluminum	500 ug/g	511	102	75 - 125
Antimony	50 ug/g	45.4	90.8	75 - 125
Arsenic	50 ug/g	51.7	103	75 - 125
Barium	50 ug/g	50.8	102	75 - 125
Beryllium	50 ug/g	49	98	75 - 125
Boron	500 ug/g	436	87.2	75 - 125
Cadmium	50 ug/g	51.7	103	75 - 125
Chromium	50 ug/g	50.4	101	75 - 125
Cobalt	50 ug/g	50.2	100	75 - 125
Copper	50 ug/g	51.8	104	75 - 125
Lead	50 ug/g	54.4	109	75 - 125
Manganese	50 ug/g	50.4	101	75 - 125
Mercury	2.5 ug/g	3.05	122	75 - 125
Nickel	50 ug/g	49.8	99.6	75 - 125
Selenium	50 ug/g	52.8	106	75 - 125
Silver	50 ug/g	61.3	123	75 - 125

Report of Analysis

LCS Lab ID: 3568 | Original Lab ID: | Prep Batch: 3904
Matrix: Solid | Analytical: 4301

AM118 Metals in Sld HD by ICP	*Expected*	*Result*	*Recovery*	*Rec Limits*
Thallium	50 ug/g	52.3	105	75 - 125
Tin	50 ug/g	49.4	98.8	75 - 125
Vanadium	50 ug/g	49.5	99	75 - 125
Zinc	50 ug/g	52.1	104	75 - 125

DUP Lab ID: 3569 | Original Lab ID: 030004-01402 | Prep Batch: 3904
Matrix: Solid | Analytical: 4301

AM118 Metals in Sld HD by ICP	*Original Result*	*Result*	*RPD*	*RPD Limits*
Aluminum	9.57	11.1	14.6	0 - 20
Antimony	0.855	1.06	21.2 *	0 - 20
Arsenic	62.1	119	62.6 *	0 - 20
Barium	0.111	0.223	67.2 *	0 - 20
Beryllium	0	0.00485	200 *	0 - 20
Boron	0.795	0.678	15.9	0 - 20
Cadmium	0.349	0.607	54 *	0 - 20
Chromium	20.3	25.5	22.7 *	0 - 20
Cobalt	3.84	5.05	27.3 *	0 - 20
Copper	328	440	29.2 *	0 - 20
Lead	42.2	112	90.4 *	0 - 20
Manganese	261	386	38.6 *	0 - 20
Mercury	0.179	0.264	38.3 *	0 - 20
Nickel	32	46.4	36.7 *	0 - 20
Selenium	0.633	0.882	32.9 *	0 - 20
Silver	0.0373	0.0505	30.1 *	0 - 20
Thallium	0	0	0	0 - 20
Tin	1.53	2.58	51.5 *	0 - 20
Vanadium	0.422	0.478	12.5	0 - 20
Zinc	148	409	94 *	0 - 20

MS Lab ID: 3570 | Original Lab ID: 030004-01402 | Prep Batch: 3904
Matrix: Solid | Analytical: 4301

AM118 Metals in Sld HD by ICP	*Original Result*	*Expected*	*Result*	*Recovery*	*Rec Limits*
Aluminum	9.57	464 ug/g	501	106	75 - 125
Antimony	0.855	46.4 ug/g	58.1	123	75 - 125
Arsenic	62.1	46.4 ug/g	137	162 *	50 - 150
Barium	0.111	46.4 ug/g	48.8	105	75 - 125
Beryllium	0	46.4 ug/g	44.8	96.6	75 - 125
Boron	0.795	464 ug/g	510	110	75 - 125
Cadmium	0.349	46.4 ug/g	49.9	107	75 - 125
Chromium	20.3	46.4 ug/g	61.6	88.8	75 - 125
Cobalt	3.84	46.4 ug/g	47.4	93.9	75 - 125
Copper	328	46.4 ug/g	348	43.5 *	75 - 125
Lead	42.2	46.4 ug/g	120	167 *	75 - 125
Manganese	261	46.4 ug/g	293	69.3 *	75 - 125
Mercury	0.179	2.32 ug/g	3.7	151 *	50 - 150
Nickel	32	46.4 ug/g	74.6	91.7	75 - 125

Report of Analysis

MS Lab ID: 3570 | Original Lab ID: 030004-01402 | Prep Batch: 3904
Matrix: Solid | Analytical: 4301

AM118 Metals in Sld HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Selenium	0.633	46.4 ug/g	48.3	103	50 - 150
Silver	0.0373	46.4 ug/g	57.8	125	50 - 150
Thallium	0	46.4 ug/g	49.4	106	75 - 125
Tin	1.53	46.4 ug/g	60.4	127 *	75 - 125
Vanadium	0.422	46.4 ug/g	45.1	96.3	75 - 125
Zinc	148	46.4 ug/g	231	180 *	50 - 150

MSD Lab ID: 3571 | Original Lab ID: 030004-01402 | Prep Batch: 3904
Matrix: Solid | Analytical: 4301

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	487 ug/g	600	121	75 - 125	13.2	0 - 25
Antimony	48.7 ug/g	61.2	124	75 - 125	0.81	0 - 25
Arsenic	48.7 ug/g	188	259 *	50 - 150	46.1 *	0 - 25
Barium	48.7 ug/g	61.6	126 *	75 - 125	18.2	0 - 25
Beryllium	48.7 ug/g	58.7	120	75 - 125	21.6	0 - 25
Boron	487 ug/g	536	110	75 - 125	0	0 - 25
Cadmium	48.7 ug/g	65.2	133 *	75 - 125	21.7	0 - 25
Chromium	48.7 ug/g	80.2	123	75 - 125	32.3 *	0 - 25
Cobalt	48.7 ug/g	63.3	122	75 - 125	26 *	0 - 25
Copper	48.7 ug/g	459	269 *	75 - 125	144 *	0 - 25
Lead	48.7 ug/g	154	229 *	75 - 125	31.3 *	0 - 25
Manganese	48.7 ug/g	414	314 *	75 - 125	128 *	0 - 25
Mercury	2.44 ug/g	3.88	152 *	50 - 150	0.66	0 - 25
Nickel	48.7 ug/g	100	140 *	75 - 125	41.7 *	0 - 25
Selenium	48.7 ug/g	64.9	132	50 - 150	24.7	0 - 25
Silver	48.7 ug/g	74.9	154 *	50 - 150	20.8	0 - 25
Thallium	48.7 ug/g	65.6	135 *	75 - 125	24.1	0 - 25
Tin	48.7 ug/g	64	128 *	75 - 125	0.784	0 - 25
Vanadium	48.7 ug/g	59.5	121	75 - 125	22.7	0 - 25
Zinc	48.7 ug/g	326	365 *	50 - 150	67.9 *	0 - 25

LCS Lab ID: 3572 | Original Lab ID: | Prep Batch: 3904
Matrix: Solid | Analytical: 4301

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	6000 ug/g	4490	74.9 *	75 - 125
Arsenic	141 ug/g	130	92	75 - 125
Barium	58.2 ug/g	52.5	90.2	75 - 125
Chromium	111 ug/g	93.4	84.2	75 - 125
Cobalt	11.1 ug/g	9.54	86	75 - 125
Copper	398 ug/g	331	83.2	75 - 125
Lead	5.73 ug/g	5.47	95.4	75 - 125
Manganese	480 ug/g	397	82.7	75 - 125
Nickel	195 ug/g	163	83.7	75 - 125
Vanadium	11.9 ug/g	11.3	94.6	75 - 125
Zinc	249 ug/g	212	85.1	75 - 125

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Report of Analysis

LCSD Lab ID: 3573 | **Original Lab ID:** | **Prep Batch:** 3904
Matrix: Solid | **Analytical:** 4301

AM118 Metals in Sld HD by ICP	*Expected*	*Result*	*Recovery*	*Rec Limits*	*RPD*	*RPD Limits*
Aluminum	6000 ug/g	4450	74.2 *	75 - 125	0.939	0 - 25
Arsenic	141 ug/g	128	91.1	75 - 125	0.983	0 - 25
Barium	58.2 ug/g	51.5	88.5	75 - 125	1.9	0 - 25
Chromium	111 ug/g	92.4	83.2	75 - 125	1.19	0 - 25
Cobalt	11.1 ug/g	9.4	84.7	75 - 125	1.52	0 - 25
Copper	398 ug/g	331	83.3	75 - 125	0.12	0 - 25
Lead	5.73 ug/g	5.48	95.7	75 - 125	0.314	0 - 25
Manganese	480 ug/g	385	80.3	75 - 125	2.94	0 - 25
Nickel	195 ug/g	161	82.6	75 - 125	1.32	0 - 25
Vanadium	11.9 ug/g	11.2	93.9	75 - 125	0.743	0 - 25
Zinc	249 ug/g	208	83.4	75 - 125	2.02	0 - 25

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Report of Analysis

QC Summary

LCS Lab ID: 3501 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 3703 — **Analytical:** 3903

AM100 Non-Vols in HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*
Thiodiglycol (TDG)	9700 ug/g	9350	96.3	50 - 150

DUP Lab ID: 3502 — **Original Lab ID:** 030004-01403 — **Matrix:** Liquid — **Prep Batch:** 3703 — **Analytical:** 3903

AM100 Non-Vols in HD by GC	*Original Result*	*Result*	*RPD*	*RPD Limits*
Thiodiglycol (TDG)	8.73	5.98	37.3 *	0 - 25

MS Lab ID: 3503 — **Original Lab ID:** 030004-01403 — **Matrix:** Liquid — **Prep Batch:** 3703 — **Analytical:** 3903

AM100 Non-Vols in HD by GC	*Original Result*	*Expected*	*Result*	*Recovery*	*Rec Limits*
Thiodiglycol (TDG)	8.73	8670 ug/g	8040	92.6	50 - 150

MSD Lab ID: 3504 — **Original Lab ID:** 030004-01403 — **Matrix:** Liquid — **Prep Batch:** 3703 — **Analytical:** 3903

AM100 Non-Vols in HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*	*RPD*	*RPD Limits*
Thiodiglycol (TDG)	10200 ug/g	9370	92	50 - 150	0.65	0 - 25

LCS Lab ID: 3505 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 3703 — **Analytical:** 3903

AM100 Non-Vols in HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*
Thiodiglycol (TDG)	9700 ug/g	9190	94.7	50 - 150

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Report of Analysis

QC Summary

LCS Lab ID: 3494 — **Original Lab ID:** — **Prep Batch:** 3702
Matrix: Liquid — **Analytical:** 3705

AM117 Semi-Vols Liq HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*
T	10300 ug/g	11300	110	50 - 150
Q	7180 ug/g	8320	116	50 - 150
Hexachloroethane	10800 ug/g	10800	99.9	50 - 150

DUP Lab ID: 3496 — **Original Lab ID:** 030004-01403 — **Prep Batch:** 3702
Matrix: Liquid — **Analytical:** 3705

AM117 Semi-Vols Liq HD by GC	*Original Result*	*Result*	*RPD*	*RPD Limits*
T	559	432	25.6 *	0 - 25
Q	26400	25300	4.14	0 - 25
Hexachloroethane	0	0	0	0 - 25

MS Lab ID: 3497 — **Original Lab ID:** 030004-01403 — **Prep Batch:** 3702
Matrix: Liquid — **Analytical:** 3705

AM117 Semi-Vols Liq HD by GC	*Original Result*	*Expected*	*Result*	*Recovery*	*Rec Limits*
T	559	11200 ug/g	3020	22 *	50 - 150
Q	26400	7800 ug/g	31300	62.5	50 - 150
Hexachloroethane	0	11700 ug/g	11500	97.9	50 - 150

MSD Lab ID: 3498 — **Original Lab ID:** 030004-01403 — **Prep Batch:** 3702
Matrix: Liquid — **Analytical:** 3705

AM117 Semi-Vols Liq HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*	*RPD*	*RPD Limits*
T	10200 ug/g	2890	22.8 *	50 - 150	3.57	0 - 25
Q	7150 ug/g	27500	14.6 *	50 - 150	124 *	0 - 25
Hexachloroethane	10700 ug/g	10600	98.7	50 - 150	0.814	0 - 25

LCS Lab ID: 3499 — **Original Lab ID:** — **Prep Batch:** 3702
Matrix: Liquid — **Analytical:** 3705

AM117 Semi-Vols Liq HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*
T	10300 ug/g	9000	87.5	50 - 150
Q	7180 ug/g	7020	97.7	50 - 150
Hexachloroethane	10800 ug/g	10500	97.3	50 - 150

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Report of Analysis

QC Summary

LCS Lab ID: 3488 — **Original Lab ID:** — **Prep Batch:** 3701
Matrix: Liquid — **Analytical:** 3906

AM101 Vols in Liquid HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*
1,2-Dichloroethane	19800 ug/g	18300	92.4	50 - 150
Tetrachloroethylene	20300 ug/g	19100	94	50 - 150
1,1,2,2-Tetrachloroethane	20700 ug/g	19400	93.8	50 - 150

DUP Lab ID: 3489 — **Original Lab ID:** 030004-01403 — **Prep Batch:** 3701
Matrix: Liquid — **Analytical:** 3906

AM101 Vols in Liquid HD by GC	*Original Result*	*Result*	*RPD*	*RPD Limits*
1,2-Dichloroethane	4180	5450	26.4 *	0 - 25
Tetrachloroethylene	0	29	200 *	0 - 25
1,1,2,2-Tetrachloroethane	0	0	0	0 - 25

MS Lab ID: 3490 — **Original Lab ID:** 030004-01403 — **Prep Batch:**
Matrix: Liquid — **Analytical:** 3906

AM101 Vols in Liquid HD by GC	*Original Result*	*Expected*	*Result*	*Recovery*	*Rec Limits*
1,2-Dichloroethane	4180	20600 ug/g	23000	91.2	50 - 150
Tetrachloroethylene	0	21200 ug/g	19400	91.8	50 - 150
1,1,2,2-Tetrachloroethane	0	21600 ug/g	19500	90	50 - 150

MSD Lab ID: 3491 — **Original Lab ID:** 030004-01403 — **Prep Batch:**
Matrix: Liquid — **Analytical:** 3906

AM101 Vols in Liquid HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*	*RPD*	*RPD Limits*
1,2-Dichloroethane	18600 ug/g	21700	94.4	50 - 150	3.45	0 - 25
Tetrachloroethylene	19100 ug/g	18300	95.8	50 - 150	4.26	0 - 25
1,1,2,2-Tetrachloroethane	19500 ug/g	18300	93.7	50 - 150	4.03	0 - 25

LCS Lab ID: 3492 — **Original Lab ID:** — **Prep Batch:** 3701
Matrix: Liquid — **Analytical:** 3906

AM101 Vols in Liquid HD by GC	*Expected*	*Result*	*Recovery*	*Rec Limits*
1,2-Dichloroethane	19800 ug/g	17300	87.4	50 - 150
Tetrachloroethylene	20300 ug/g	18600	91.8	50 - 150
1,1,2,2-Tetrachloroethane	20700 ug/g	18600	89.8	50 - 150

Appendix C-2

Analytical Test Report
Sample Set #2

U.S. Army Research, Devlopment and Engineering Command
Edgewood Chemical Biological Center
ATTN: Edgewood Chemical Biological
Forensic Analytical Center
Aberdeen Proving Ground, MD 21010-5424
Phone: (410) 436-8600
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ANALYTICAL TEST REPORT

Report Date: 13 November 2003

Project/Event Title: Analysis of HD Sample Collected From Ton Containers Stored at the Deseret Chemical Depot – Sample Set 2

Project/Event Number: 97P-0033-46

Report Number: 0033-46-111303B2

Report Prepared for:

EG&G Defense Materials Division
Attn.: Mr. Don Milton
11600 Stark Rd
Tooele, UT 84074

NOTE: This report replaces Analytical Test Report Numbered 0033-46-060403B2.

This report shall not be reproduced except in full, without the written approval of the laboratory. Test results reported herein refer only to samples tested.

CASE NARRATIVE
Tooele Samples (Set 2)
Project/Event # 97P-0033-46

Receiving Notes

All sample containers were visually checked and compared to Department of Army sample transfer record DD Form 1911. The containers were noted to be in satisfactory condition and all samples were received intact.

Sample Preparatory Notes

No discrepancies.

Analytical Notes:

Analysis for Organic Compounds

VOLATILE ORGANIC COMPOUNDS

The Volatile Organic Compounds (VOCs) were extracted on 27-Feb-03 and analyzed on 28-Feb through 01-Mar-03 by method AM-101. The target compounds were not detected in the Method Blank or the Reagent Blank.

The bromofluorobenzene (BFB) tune, the tune evaluation, and performance standard passed the acceptance criteria.

The calibration curves for the target compounds and the surrogate had correlation coefficients (r^2) of 1.000 for a linear / (0, 0) curve fits. The target compounds calibration standards had calculated percent Recoveries (%R) that met acceptance criteria of ±15%. The Continuing Calibration Verification (CCV) samples were all within acceptance criteria (±25%). Recoveries exceeded 90% in all cases. The Surrogate (1,4-difluorobenzene) %R ranged from 96% to 110%.

The Matrix Spike (MS) and Matrix Spike Duplicate (MSD) %R ranged from 93% to 103%, which met the criteria (50%-150%) for the target compounds. The MS/MSD Relative Percent Difference (RPD) ranged from 6% and 10%, which met the criteria (±25%) for the target compounds.

The recovery values for the surrogates, Blank Spike (BS) and Blank Spike Duplicate (BSD) ranged from 98% to 107%, which met the criteria (50%-150%).
The BS/BSD are identified in the report as the Laboratory Control Sample (LCS).

The sample duplicates RPD values were less than 25% for analytes that were present above the PQL.

Samples 030004-01602 through 01603 did not meet the 28-day holding time. These samples were collected between 29-Jan-03 and 30-Jan-03 and analyzed on 28-Feb-03. The 28th was 2 days past the holding time.

SEMI-VOLATILES ORGANIC COMPOUNDS

The Semi-Volatile Organic Compounds (SVOCs) were extracted on 21-Feb-03 and analyzed on 06 through 07-Mar-03 by method AM-117. The target compounds were not detected in the Method Blank or the Reagent Blank.

The decafluorotriphenylphosphine (DFTPP) tune, the tune evaluation, and performance standard passed the acceptance criteria. The calibration curves for the target compounds and the surrogate had correlation coefficients (r^2) of 1.000.

Due to non-linearity for Q, the Practical Quantitation Limit (PQL) was revised to 25.0 µg/mL. The new five-point calibration curve for Q ranged from 25 µg/mL to 500 µg/mL and had a correlation coefficient (r^2) of 1.000. The CCV standards for Q ranged from 86% to 101%.

Due to the non-linearity of Compound T at low levels, the PQL of 2.5 µg/mL was revised to 25.0 µg/mL and the samples recalculated. All calibration standards were between 97.7% and 103%. The CCV standards were between 83.5% and 102.8% and the correlation coefficient of the calibration curve for T was 1.000.

The T recovery values for the MS/MSD were 35.2% and 37.5%. The T MS/MSD RPD was 6.33%. This data was generated at spike levels equivalent to 10 µg/mL, which was below the PQL.

The recovery values for the MS/MSD for the surrogate, Q (89.7% / 95.1%), and Hexachloroethane (HCE) (117% / 119%) met the criteria (50% to 150%). The RPD for the surrogate, Q (5.84), and HCE (1.69%) met the criteria (< 25%).

The recovery values for the BS/BSD data met the criteria (50%-150%) for all analytes except T. The BS/BSD spikes for T were below the PQL based on the re-processing of the data to the new calibration curve.

The target compounds RPD for the duplicate samples met the criteria of < 25%.

The sample holding time of 28 days was not met for samples 030004-01602 through 01614. Samples were collected starting 29-Jan-03 and ending 6-Feb-03. The samples were analyzed on 7-Mar-03, which was 9 days past the holding time for samples collected on 29-Jan-03.

NON-VOLATILE ORGANIC COMPOUNDS

The target compound for Method AM-100 was thiodiglycol (TDG). The non-volatiles were extracted 21-Feb-03 and analyzed on 26-Feb-03 by Method AM-100. The target compounds were not detected in the Method Blank or the Reagent Blank. The non-volatile sample analyses met the 28-day holding time.

The DFTPP tune, the tune evaluation, and performance standard passed the acceptance criteria. The TDG and surrogate (TDG_{d8}) calibration curves had correlation coefficients (r^2) of 0.999 and 0.997, respectively for linear / (0, 0) curve fits.

The recoveries of the two lowest calibration standards (2.5 µg/mL and 5.0 µg/mL) for TDG were 125% and 130% of the known concentrations, respectively. The test plan specifies that the standards to be between 85% and 115%. There was no corrective action taken since there was no TDG detected in any of the samples and the error would be on the high side (125% and 130% vs. 115%).

All Continuing Calibration Verification (CCV) samples passed acceptance criteria of ±25% for TDG and the surrogate.

The MS/MSD %R ranged from 112% to 116%. The MS/MSD RPD was <4%.

The recovery values for the BS/BSD ranged from 117% to 118%.

The RPD of the sample/sample duplicate for TDG was outside the 25% criteria. However, the values compared were below the MDL.

LEWISITE

The Lewisite samples were extracted on 26-Feb-03 and analyzed on 17 through 18-Mar-03 by Method AM-126. The 28-day holding time was not met for the Lewisite analyses. Problems were encountered with low %R for matrix spikes and CCV standards (50% to 60%). It was determined that an insufficient amount of derivatization agent [1,3-Propanedithiol (1,3-PDT)] was being added. The procedure was modified to add 10µL of neat 1,3-PDT to each sample just prior to GC/MS analysis. Samples were analyzed on 17-Mar-03, which was 19 days past the holding time for samples collected on 29-Jan-03. Lewisite was not detected in the Method Blank or the Reagent Blank.

The DFTPP tune, the tune evaluation, and performance standard passed the acceptance criteria. The Lewisite calibration curve had a correlation coefficient (r^2) of 1.000 for a Quadratic (not forced through 0, 0) curve fit. After investigation, it was decided that a quadratic curve best represented the existing data. Six concentration levels were used in this determination. This meets the minimal requirements specified in EPA SW846 Method 8000B. The calibration standards had calculated recoveries ranging from 87% to 104%, which meets the acceptance criteria of ±15% except for the 250 ng/mL calibration standard, which was not within the limits with a recovery of 56%. Results showed that any detected Lewisite in the samples were below the PQL (50 ng/mL), therefore the recovery did not affect the data. The CCV samples %R met criteria (±25%).

The recovery values for the Lewisite MS/MSD met the criteria (50%-150%). The Lewisite MS/MSD RPD was 65%. Lewisite was not detected above the PQL. Therefore, the Lewisite data was not affected by the RPD.

The recovery values for the BS/BSD were 112% and 128%.

PURITY

Samples for purity were extracted on 21-Feb-03 and analyzed on 25 through 26-Feb-03 by Method AM-098. However, due to some concerns with the results, all of the samples were re-prepared and analyzed 21-May-03 through 22-May-03. The 28-day holding time was not met due to the reanalysis in May.

The DFTPP tune passed the acceptance criteria. The calibration curve for the target compound *Bis*(2-Chloroethyl)sulfide (HD) had a correlation coefficient (r^2) of 1.000 for a linear / (0, 0) curve fit. The recovery values for the calibration standards were all between 98% and 111%.

The method blank showed a response of 38%. The sample was yellow in color that indicated a problem with the sample preparation. A new method blank was prepared and analyzed on 22-May-03. It was acceptable.

The recovery value for the CASARM grade (HD) Laboratory Control Sample (LCS) was 96.6%.

The duplicate samples RPD for the purity was 3.0%, which met the criteria (<25%).

Analysis for Metals

LIQUID SAMPLES

The liquid samples were analyzed following Method AM-118 on 25-Feb-03. Samples that needed to be diluted were analyzed on 27-Feb-03. The 28-day holding time for analyses of the liquid samples was met.

The CCV recovery values for Boron were of 84.2% and 86.6% for the run on 25-Feb-03. The boron values reported will be slightly underestimated. All other elements were within the acceptance criteria.

Mercury samples 030004-01608 and 01610 were diluted and reanalyzed on 27-Feb-03.

Chromium was detected in the last reagent blank at a level above the Method Detection Limit (MDL), but below the PQL. No corrective action was taken. Selenium was detected in the method blank at a level above the MDL, but below the PQL. No corrective action was taken.

The recovery values for the MS (3723), MSD (3724), and Post Digestion Spike Addition (PDSA) indicated that all elements met the criteria of ± 25%. The RPDs for the MS/MSD met the criteria. The sample duplicates RPD for chromium did not meet the criteria. The recovery value BS %R for boron did not meet the criteria.

Copper, the only element that had a result above 100 times the Instrument Detection Limit (IDL) had an acceptable RPD for the sample duplicate. The criteria for the sample/sample duplicate RPD is ≤20% for any elements at a level of at least 100 times the IDL.

NON-COHESIVE-SOLID SAMPLES

The Non-Cohesive Solid samples were analyzed by Method AM-118 on 25-Feb-03. Samples that needed to be diluted and re-run were analyzed on 27-Feb-03, 14-Mar-03, and 18-Mar-03.

Boron had a recovery of 87.6% on the first CCV run on 25-Feb-03. The Boron values reported will be slightly underestimated. Antimony, chromium, cobalt, copper, manganese, silver and vanadium were outside the acceptance limits for the 2nd CCV on the initial run on 25-Feb-03 for samples 030004-01705 through 01713. Samples 030004-01705 through 01713 were reanalyzed for these elements on either 14 or 18-March-03. These elements were within the acceptance limits for the CCV on reanalysis. Mercury was outside the acceptance limits for the 1st CCV run on 25-Feb-03. All samples were reanalyzed for mercury on 27-Feb-03. Upon reanalysis, the mercury CCV's on 27-Feb-03 passed.

Samples 030004-01701, 01703, 01708 were diluted for mercury and reanalyzed on 27-Feb-03. Sample 030004-01701 was diluted for arsenic and reanalyzed on 27-Feb-03. Sample 030004-01623 was diluted for arsenic and reanalyzed on 14-Mar-03. 030004-01621 was diluted and reanalyzed for arsenic and manganese on 18-Mar-03. Samples 030004-01702 and 01705 were diluted for manganese and reanalyzed on 14-Mar-03. Sample 030004-01707 was diluted for manganese and analyzed on 27-Feb-03.

Cadmium and barium were detected in all reagent blanks at a level above the MDL, but below the PQL. No corrective action was taken. Mercury was detected at a level above PQL in the first reagent blank after samples high in mercury were analyzed. Mercury contamination was seen as a carryover. Corrective action was to reanalyze samples and dilutions on 27-Feb-03. Mercury was not detected in any reagent blanks. Cadmium and barium were detected in the method blank at a level above the MDL but below the PQL. No corrective action was taken.

The recovery data for the sample duplicate and blank spike was within the acceptable limits for all elements.

The native sample used for the MS (3694) and MSD (3695) had high levels of arsenic and manganese. Because the spike level was insufficient when compared to the native sample, the MS/MSD could not be evaluated for those elements. The recovery data for the MS indicated that manganese (228% recovery) was outside the acceptable limit. The recovery value for the MSD for manganese (147%) did not meet the limit. Reanalysis on 27-Feb-03 gave results for arsenic and manganese similar to the results from the analysis on 25-Feb-03. The MS/MSD RPD was >25% for manganese and arsenic. The mercury recovery values for the MS/MSD were high on 25-Feb-03 due to carryover. The samples were reanalyzed on 27-Feb-03 with acceptable results. Manganese and arsenic were outside the 25% limit for RPD on reanalysis. The MS/MSD recovery values and RPDs for the remaining elements were acceptable.

The recovery data for the post digestion spike indicated that mercury (150%), arsenic (154%), manganese (142%), and silver (51%) were outside the 25% limit on the analysis of 25-Feb-03. Mercury was initially over the acceptable limit due to carryover. Upon reanalysis on 27-Feb-03, mercury was within the acceptable limit. Manganese (140%), arsenic (158%), and silver (44%) were still outside acceptable limits. The post digestion spike was re-prepared and analyzed on 18-Mar-03 and the above elements were within acceptable limits. Along with the PDSA being re-prepared, the non-spiked sample and its duplicate were re-prepared for evaluation. All elements gave acceptable recoveries for the PDSA.

Arsenic, copper, lead, manganese, nickel, tin, and zinc had an acceptable RPD for the sample duplicate.

All samples were initially run within 28 day holding time; however, due to reanalysis of samples and dilution of samples, the final analysis was past the holding time for arsenic (030004-01621 and 01623), manganese (030004-01621, 01702 and 01705), mercury (030004-01621), and the post digestion spike for arsenic, manganese, and silver.

SOLID SAMPLES

The solid samples were analyzed by Method AM-118 on 25-Feb-03. Sample that needed to be diluted and re-runs were analyzed on 14-Mar-03, 18-Mar-03, and 19-Mar-03.

Tin had a recovery of 111% on the 2nd CCV analyzed on 25-Feb-03. Mercury had a recovery of 87% on 1st CCV analyzed on 14-Mar-03. Samples 030004-01724, 01725 and 030004-01801 through 01807 will be slightly overestimated for Tin. Samples 030004-01715, 01718 will be slightly underestimated for Mercury. Antimony, chromium, cobalt, copper, manganese, mercury, nickel, silver, and vanadium were outside of the acceptance criteria for the 1st and 2nd CCV on the initial run on 25-Feb-03, therefore, the samples were reanalyzed for those elements. Cadmium and zinc were outside the acceptance criteria for the 2nd CCV so samples 030004-01724,01725, 01801 through 01807 needed to be reanalyzed. Samples 030004-01715 through 01718, 01723, 01724, 01803, and 01805 through 01807 were reanalyzed for antimony, chromium, cobalt, copper, manganese, nickel, silver, and vanadium on 14-Mar-03. Due to instrument failure, samples 030004-01714, 01719-01722, 01725, 01801-01802, and 01804 were reanalyzed for antimony, chromium, cobalt, copper, manganese, nickel, silver, and vanadium on 18-Mar-03. Samples 030004-01724, 01803, and 01805 through 01807 were reanalyzed for cadmium and zinc on 14-Mar-03. Due to instrument failure samples 030004-01725, 01801, 01802, 01804, and 01714 were reanalyzed for cadmium on 18-Mar-03. Sample 030004-01802 was reanalyzed for zinc on 18-Mar-03. Due to contamination of a reagent blank preceding a CCV run on 18-Mar-03, samples 030004-01725, 01801, 01804, and 01714 were reanalyzed for zinc on 19-Mar-03. Samples 030004-01723, 01724, 01803, 01806, 01807, and 01715 through 01718 were reanalyzed for mercury on 14-Mar-03. Samples 030004-01714, 01719 through 01722, 01725, 01801, 01802, and 01804 were reanalyzed for mercury on 19-Mar-03. All elements in samples being reanalyzed met the acceptance criteria of the CCVs associated with them.

Samples 030004-01724, 01725, and 01801 through 01807 were analyzed for tin with the final CCV at 111%. The initial CCV met the acceptance criteria of ±10%. Samples 030004-01724, 01801, 01804, and 01805 were the only samples with tin detected above the PQL. No corrective action was taken for those samples.

Samples 030004-01715 through 01718 were analyzed for mercury with the initial CCV at 87%. The second CCV met the acceptance criteria of ± 10%. Sample 030004-01716 had mercury detected above the PQL. No corrective action was taken for these samples.

Sample 030004-01714 along with its duplicate and the MS/MSD were diluted for arsenic and reanalyzed on 14-Mar-03. Samples 030004-01720 and 01722 were diluted for arsenic and reanalyzed on 18-Mar-03. Samples 030004-01720, 01722, and 01802 were diluted for mercury and reanalyzed on 19-Mar-03. Samples 030004-01719, 01721, 01725, and 01801 were diluted for manganese and reanalyzed on 14-Mar-03. Samples 030004-01722 and 01804 were diluted for manganese and reanalyzed on 18-Mar-03. Samples 030004-01725 and 01801 were diluted for nickel and reanalyzed on 14-Mar-03.

Cadmium, barium, zinc and arsenic were detected in all reagent blanks at a level above the MDL, but below the PQL on analysis date of 25-Feb-03. Corrective action taken was to rerun samples that failed CCV criteria. These elements included cadmium, zinc, and arsenic. Mercury was detected at a level above the PQL in reagent blanks after samples high in mercury were analyzed. Mercury contamination was seen as a carryover problem. Corrective action was to rerun samples and dilutions on 14-Mar-03 and 19-Mar-03. The reagent blank was free of mercury in later runs. Arsenic was detected at levels above the MDL in reagent blanks on analysis date of 25-Feb-03 due to carryover from samples high in arsenic. No arsenic was found in reagent blanks on reruns. Cadmium and barium were detected in all reagent blanks at a level above the MDL, but below the PQL on analysis date of 14-Mar-03. No corrective action was taken. Zinc was found at a level above the PQL on analysis date of 14-Mar-03. Corrective action was to reanalyze the reagent blank on a later date. No zinc found in the reagent blank. Contamination was due to carryover after samples high in zinc were analyzed. Cadmium, barium, zinc, tin, and aluminum were detected in the method blank at a level above the MDL, but below the PQL on analysis date of 26-Feb-03. The corrective action taken was to rerun the method blank on 14-Mar-03. Cadmium, barium, and zinc were found at levels above the MDL but below the PQL. Contamination was suspected. No corrective action taken after reanalysis. Aluminum was not found in method blank on the reanalysis of the sample (NOTE: The LIMS report contains the value obtained from the 14-Mar-03 re-analysis). Contamination was due to high aluminum in samples earlier in the analytical run.

The recovery data for the sample duplicate and blank spike were within the acceptable limits for all elements.

The native sample used for the MS (3660) and MSD (3661) had high levels of arsenic and manganese. Since the spike level was less than the original levels in the sample, the MS/MSD could not be evaluated for those elements. The original sample, sample duplicate and both matrix spikes were over the calibration curve limit for arsenic, thus these samples were diluted and reanalyzed. The recovery data of the MS indicated that arsenic (1010% recovery) and manganese (195% recovery) were outside the acceptable limit. The recovery data for the MSD indicated that arsenic (420% recovery) was outside the acceptable limit. The RPD was outside the acceptable limit of 25% for arsenic (82.5%) and manganese (56.6%). Mercury had high recoveries for the MS and MSD on 25-Feb-03 due to carryover, but was reanalyzed and gave acceptable results on 19-Mar-03. Manganese gave high results and, along with arsenic, was outside the 25% limit for RPD on the reanalysis. The RPDs recovery data for all other elements were acceptable for the MS and MSD.

On the 25-Feb-03 run, the recovery data for the post digestion spike indicated that mercury (181%), arsenic (160%), manganese (156%), zinc (126%), and copper (128%) were outside the acceptable limit of 25%. When reanalyzed on 14-Mar-03, mercury, copper, and manganese were within the acceptable limit. The problem with mercury was due to carryover. Zinc (136%) and arsenic (138%) were still outside acceptable limits. The post digestion spike was re-prepared and analyzed on 18-Mar-03 and the above elements, except for silver (62%), were within acceptable limits. In addition to the PDSA being re-prepared, the non-spiked sample and its duplicate were re-prepared for evaluation. The problem with silver was due to its falling out of the spiking solution. Arsenic required dilution in the sample used for the PDSA. The values for arsenic analyzed on 14-Mar-03 were retained.

Arsenic, chromium, colbalt, copper, lead, manganese, nickel, tin, zinc had an acceptable RPD for the sample duplicate.

All the solid samples were initially analyzed within the 28-day holding time; however, due to reanalysis of sample and diluted samples, all of the final analyses were past the 28-day hold time for antimony, chromium, cobalt, copper, manganese, mercury, nickel, silver, and vanadium for all samples. Zinc and cadmium were analyzed after the hold time for samples 030004-01714, 01724, 01725, and 01801 through 01807. Arsenic was analyzed after the holding time for samples 030004-01720, 01722, and 01714.

Analyst(s) of Record (Signature) 12-17-03 (Date) **Thomas Rusek** **Principal Investigator, Battelle Memorial Institute**	**Analyst(s) of Record** (Signature) 12/17/03 (Date) **Brian L. Boyd** **Researcher, Battelle Memorial Institute**
Analyst(s) of Record (Signature) 17 Dec 03 (Date) **Robert L. Calloway** **Physical Science Technican, Edgewood Chemical & Biological Forensic Analytical Center**	**Analyst(s) of Record** (Signature) 12-17-03 (Date) for **Stephen S. Honck** **Researcher, Battelle Memorial Institute**
Analyst(s) of Record (Signature) 12-17-03 (Date) for **Doug S. Nichols** **Researcher, Battelle Memorial Institute**	**Analyst(s) of Record** (Signature) 12-17-03 (Date) for **Stanley A. Ostrowski, Ph. D.** **Senior Research Scientist, Battelle Memorial Institute**
Analyst(s) of Record (Signature) 12-17-03 (Date) **James Roelke** **Researcher, Battelle Memorial Institute**	**Analyst(s) of Record** (Signature) 12-17-03 (Date) **Michael W. Wensing, Ph.D.** **Principal Research Scientist, Battelle Memorial Institute**
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Report Reviewed by

(Signature)

17 Dec 03 (Date)

Robert L. Calloway

Designated Authority, Edgewood C/B Forensic Analytical Center

Report Approved by

(Signature)

18 Dec 03 (Date)

Dennis J. Reutter, Ph.D.

Chief, Edgewood C/B Forensic Analytical Center

Appendix A

LIMS DATA REPORT

This appendix contains the 99-page data report produced from the LIMS system. It contains a summary of sample numbers, sample results, method blank results and results of QC samples analyzed. Since the report is generated by the LIMS, the page numbers will begin again at 1, but each page has been identified as part of the appendix so that it may be distinguishable from the main report.

ECB Forensic Analytical Center
Edgewood Chemical and Biological Center
Aberdeen Proving Ground, MD 21010-5424
(410) 436-8600

ANALYTICAL RESULTS

Report Date: 11/13/2003

Work Order: Tooele HD/TC 2/20/03

Deliver To: Don Milton
EG&G Defense Materials Div.
11600 Stark Road
Tooele, UT 84074

James Newman
Project Manager

The following represents qualifications to the associated analytical reports.

1. These descriptors will help identify the specific sample and clarify the report.

   DUP - Matrix Duplicate
   MS - Matrix Spike
   MSD - Matrix Spike Duplicate
   RPD - Relative Percent Difference
   PQL - Practical Quantitiation Limit
   MDL - Method Detection Limit
   ND - Not Detected at the PQL
   * - Indicates a limit was exceeded

   Surrogate - Organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromotography, but which are not normally found in the samples.

2. Qualifier keys - These descriptors will follow individual results for a specific sample and a specific analyte and will help qualify the data.

   J - Indicates an estimated value between the PQL and MDL

NOTE: This document is included as part of the Analytical Report for the above referenced and should be retained as a permanent record thereof.

ECB Forensic Analytical Center
Edgewood Chemical and Biological Center
Aberdeen Proving Ground, MD 21010-5424
(410) 436-8600

Report of Analysis

Client
EG&G Defense Materials Division

Work ID
Tooele HD/TC 2/20/03

Workorder Sample Summary

Lab ID	Sample ID	Matrix	Collect Date/Time	Receive Date/Time
030004-01602	21-03-033	Liquid	1/29/2003 17:09	2/20/2003 17:06
030004-01603	21-03-036	Liquid	1/30/2003 17:09	2/20/2003 17:06
030004-01604	21-03-039	Liquid	1/31/2003 17:09	2/20/2003 17:06
030004-01605	21-03-042	Liquid	1/31/2003 17:31	2/20/2003 17:30
030004-01606	21-03-045	Liquid	2/3/2003 7:24	2/20/2003 7:23
030004-01607	21-03-048	Liquid	2/3/2003 7:24	2/20/2003 7:23
030004-01608	21-03-051	Liquid	2/4/2003 7:24	2/20/2003 7:23
030004-01609	21-03-054	Liquid	2/4/2003 7:24	2/20/2003 7:23
030004-01610	21-03-057	Liquid	2/5/2003 7:24	2/20/2003 7:23
030004-01611	21-03-060	Liquid	2/5/2003 7:24	2/20/2003 7:23
030004-01612	21-03-063	Liquid	2/6/2003 7:24	2/20/2003 7:23
030004-01613	21-03-066	Liquid	2/6/2003 7:24	2/20/2003 7:23
030004-01614	21-03-069D	Liquid	2/6/2003 7:24	2/20/2003 7:23
030004-01615	21-03-072	Liquid	2/7/2003 7:24	2/20/2003 7:23
030004-01616	21-03-075	Liquid	2/8/2003 7:24	2/20/2003 7:23
030004-01617	21-03-078	Liquid	2/8/2003 7:24	2/20/2003 7:23
030004-01618	21-03-081	Liquid	2/8/2003 7:24	2/20/2003 7:23
030004-01619	21-03-084	Liquid	2/10/2003 7:24	2/20/2003 7:23
030004-01620	21-03-087	Liquid	2/10/2003 7:24	2/20/2003 7:23
030004-01621	21-03-034	Non-cohesive Solid	1/29/2003 7:24	2/20/2003 7:23
030004-01622	21-03-037	Non-cohesive Solid	1/30/2003 7:24	2/20/2003 7:23
030004-01623	21-03-040	Non-cohesive Solid	1/31/2003 7:24	2/20/2003 7:23
030004-01624	21-03-043	Non-cohesive Solid	1/31/2003 7:24	2/20/2003 7:23
030004-01625	21-03-046	Non-cohesive Solid	2/3/2003 7:24	2/20/2003 7:23
030004-01626	21-03-049	Non-cohesive Solid	2/3/2003 7:24	2/20/2003 7:23
030004-01701	21-03-052	Non-cohesive Solid	2/4/2003 7:24	2/20/2003 7:23
030004-01702	21-03-055	Non-cohesive Solid	2/4/2003 7:24	2/20/2003 7:23
030004-01703	21-03-058	Non-cohesive Solid	2/5/2003 7:24	2/20/2003 7:23
030004-01704	21-03-061	Non-cohesive Solid	2/5/2003 7:24	2/20/2003 7:23
030004-01705	21-03-064	Non-cohesive Solid	2/6/2003 7:24	2/20/2003 7:23
030004-01706	21-03-067	Non-cohesive Solid	2/6/2003 7:24	2/20/2003 7:23
030004-01707	21-03-070D	Non-cohesive Solid	2/6/2003 7:24	2/20/2003 7:23
030004-01708	21-03-073	Non-cohesive Solid	2/7/2003 7:24	2/20/2003 7:23
030004-01709	21-03-076	Non-cohesive Solid	2/8/2003 7:24	2/20/2003 7:23
030004-01710	21-03-079	Non-cohesive Solid	2/8/2003 7:24	2/20/2003 7:23
030004-01711	21-03-082	Non-cohesive Solid	2/8/2003 7:24	2/20/2003 7:23
030004-01712	21-03-085	Non-cohesive Solid	2/10/2003 7:24	2/20/2003 7:23
030004-01713	21-03-088	Non-cohesive Solid	2/10/2003 7:24	2/20/2003 7:23
030004-01714	21-03-035	Solid	1/29/2003 7:24	2/20/2003 7:23
030004-01715	21-03-038	Solid	1/30/2003 7:24	2/20/2003 7:23
030004-01716	21-03-041	Solid	1/31/2003 7:24	2/20/2003 7:23
030004-01717	21-03-044	Solid	1/31/2003 7:24	2/20/2003 7:23
030004-01718	21-03-047	Solid	2/3/2003 7:24	2/20/2003 7:23
030004-01719	21-03-050	Solid	2/3/2003 7:24	2/20/2003 7:23
030004-01720	21-03-053	Solid	2/4/2003 7:24	2/20/2003 7:23

Report of Analysis

030004-01721	21-03-056	Solid	2/4/2003 7:24	2/20/2003 7:23
030004-01722	21-03-059	Solid	2/5/2003 7:24	2/20/2003 7:23
030004-01723	21-03-062	Solid	2/5/2003 7:24	2/20/2003 7:23
030004-01724	21-03-065	Solid	2/6/2003 7:24	2/20/2003 7:23
030004-01725	21-03-068	Solid	2/7/2003 7:24	2/20/2003 7:23
030004-01801	21-03-071D	Solid	2/7/2003 7:24	2/20/2003 7:23
030004-01802	21-03-074	Solid	2/7/2003 7:24	2/20/2003 7:23
030004-01803	21-03-077	Solid	2/8/2003 7:24	2/20/2003 7:23
030004-01804	21-03-080	Solid	2/8/2003 7:24	2/20/2003 7:23
030004-01805	21-03-083	Solid	2/8/2003 7:24	2/20/2003 7:23
030004-01806	21-03-086	Solid	2/10/2003 7:24	2/20/2003 7:23
030004-01807	21-03-089	Solid	2/10/2003 7:24	2/20/2003 7:23

ECB Forensic Analytical Center
Edgewood Chemical and Biological Center
Aberdeen Proving Ground, MD 21010-5424
(410) 436-8600

Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01602	21-03-033	1/29/2003 17:09	2/20/2003 17:06	11/13/2003 10:24	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/21/2003 22:29	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	88.2			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/26/2003 19:20	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	210	250	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1000	1100 ug/g	110	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	2/28/2003 20:34	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	4650	259	498	ug/g
Tetrachloroethylene	ND	99.6	498	ug/g
1,1,2,2-Tetrachloroethane	ND	149	498	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10300	11300 ug/g	110	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.4	52.0	ug/g
Antimony	1.24 J	0.656	5.20	ug/g
Arsenic	ND	1.27	5.20	ug/g
Barium	ND	0.447	5.20	ug/g
Beryllium	ND	0.937	5.20	ug/g
Boron	5.22 J	3.89	10.4	ug/g
Cadmium	ND	0.427	5.20	ug/g
Chromium	10.9	1.34	5.20	ug/g
Cobalt	ND	0.281	1.04	ug/g
Copper	20.4	2.53	5.20	ug/g
Lead	ND	0.427	5.20	ug/g
Manganese	ND	0.333	1.04	ug/g
Mercury	0.365 J	0.0520	0.520	ug/g
Nickel	1.52 J	0.364	5.20	ug/g
Selenium	ND	1.22	10.4	ug/g
Silver	ND	0.489	5.20	ug/g

Report of Analysis

Thallium	ND	1.02	5.20	ug/g
Tin	ND	2.59	10.4	ug/g
Vanadium	ND	1.04	5.20	ug/g
Zinc	ND	3.25	10.4	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 0:00	ssh	4102

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	2170 J	67.8	2420	ug/g
Q	29200	49.4	2420	ug/g
Hexachloroethane	ND	77.5	2420	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	969	1060 ug/g	109	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/17/2003 22:57	ssh	4203

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.99	5.11	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01603	21-03-036	1/30/2003 17:09	2/20/2003 17:06	11/13/2003 10:24	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/21/2003 23:07	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	91.5			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/26/2003 20:47	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	213	254	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	1060 ug/g	104	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	2/28/2003 21:44	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	5320	262	503	ug/g
Tetrachloroethylene	ND	101	503	ug/g
1,1,2,2-Tetrachloroethane	ND	151	503	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10400	10100 ug/g	97	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.7	53.3	ug/g
Antimony	ND	0.672	5.33	ug/g
Arsenic	3.14 J	1.30	5.33	ug/g
Barium	ND	0.458	5.33	ug/g
Beryllium	ND	0.959	5.33	ug/g
Boron	4.43 J	3.99	10.7	ug/g
Cadmium	ND	0.437	5.33	ug/g
Chromium	5.31 J	1.38	5.33	ug/g
Cobalt	ND	0.288	1.07	ug/g
Copper	47.5	2.59	5.33	ug/g
Lead	ND	0.437	5.33	ug/g
Manganese	0.728 J	0.341	1.07	ug/g
Mercury	0.319 J	0.0533	0.533	ug/g
Nickel	0.725 J	0.373	5.33	ug/g
Selenium	ND	1.25	10.7	ug/g
Silver	ND	0.501	5.33	ug/g

Report of Analysis

Thallium	ND	1.04	5.33	ug/g
Tin	ND	2.65	10.7	ug/g
Vanadium	1.26 J	1.07	5.33	ug/g
Zinc	ND	3.33	10.7	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 0:00	ssh	4102

Parameter	Result	MDL	PQL	Units
T	1970 J	72.4	2590	ug/g
Q	43700	52.7	2590	ug/g
Hexachloroethane	ND	82.7	2590	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1030	1150 ug/g	111	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:08	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.00	5.13	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01604	21-03-039	1/31/2003 17:09	2/20/2003 17:06	11/13/2003 10:24	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/21/2003 23:26	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	84.8			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/26/2003 21:30	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	222	264	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1050	1290 ug/g	122	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	2/28/2003 22:19	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	4040	277	533	ug/g
Tetrachloroethylene	ND	107	533	ug/g
1,1,2,2-Tetrachloroethane	ND	160	533	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	11000	10800 ug/g	97.7	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	12.7 J	10.8	53.8	ug/g
Antimony	ND	0.678	5.38	ug/g
Arsenic	22.8	1.31	5.38	ug/g
Barium	ND	0.463	5.38	ug/g
Beryllium	ND	0.969	5.38	ug/g
Boron	4.99 J	4.03	10.8	ug/g
Cadmium	ND	0.441	5.38	ug/g
Chromium	4.27 J	1.39	5.38	ug/g
Cobalt	ND	0.291	1.08	ug/g
Copper	5.60	2.62	5.38	ug/g
Lead	ND	0.441	5.38	ug/g
Manganese	0.737 J	0.344	1.08	ug/g
Mercury	0.270 J	0.0538	0.538	ug/g
Nickel	1.12 J	0.377	5.38	ug/g
Selenium	ND	1.26	10.8	ug/g
Silver	ND	0.506	5.38	ug/g

Report of Analysis

Thallium	ND	1.05	5.38	ug/g
Tin	ND	2.68	10.8	ug/g
Vanadium	1.10 J	1.08	5.38	ug/g
Zinc	ND	3.36	10.8	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 0:00	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2000 J	74.4	2660	ug/g
Q	33300	54.2	2660	ug/g
Hexachloroethane	ND	85.0	2660	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1060	1150 ug/g	108	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:44	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.09	5.37	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01605	21-03-042	1/31/2003 17:31	2/20/2003 17:30	11/13/2003 10:24	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/21/2003 23:45	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	87.6			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/26/2003 22:14	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	213	254	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	1080 ug/g	106	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	2/28/2003 22:54	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	5960	258	496	ug/g
Tetrachloroethylene	ND	99.2	496	ug/g
1,1,2,2-Tetrachloroethane	ND	149	496	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10300	11000 ug/g	107	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.7	53.3	ug/g
Antimony	ND	0.672	5.33	ug/g
Arsenic	ND	1.30	5.33	ug/g
Barium	ND	0.458	5.33	ug/g
Beryllium	ND	0.959	5.33	ug/g
Boron	ND	3.99	10.7	ug/g
Cadmium	ND	0.437	5.33	ug/g
Chromium	4.79 J	1.38	5.33	ug/g
Cobalt	ND	0.288	1.07	ug/g
Copper	25.6	2.59	5.33	ug/g
Lead	ND	0.437	5.33	ug/g
Manganese	3.90	0.341	1.07	ug/g
Mercury	0.248 J	0.0533	0.533	ug/g
Nickel	0.669 J	0.373	5.33	ug/g
Selenium	ND	1.25	10.7	ug/g
Silver	ND	0.501	5.33	ug/g

Report of Analysis

Thallium	ND	1.04	5.33	ug/g
Tin	ND	2.65	10.7	ug/g
Vanadium	ND	1.07	5.33	ug/g
Zinc	ND	3.33	10.7	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 0:00	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2150 J	74.9	2680	ug/g
Q	29100	54.6	2680	ug/g
Hexachloroethane	ND	85.7	2680	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1070	1180 ug/g	110	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.99	5.10	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01606	21-03-045	2/3/2003 07:24	2/20/2003 07:23	11/13/2003 10:24	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:04	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	84.6			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/26/2003 22:57	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	204	242	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	970	1010 ug/g	104	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	2/28/2003 23:29	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	5580	259	499	ug/g
Tetrachloroethylene	ND	99.8	499	ug/g
1,1,2,2-Tetrachloroethane	ND	150	499	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10300	11100 ug/g	107	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.87	49.4	ug/g
Antimony	ND	0.622	4.94	ug/g
Arsenic	ND	1.20	4.94	ug/g
Barium	ND	0.424	4.94	ug/g
Beryllium	ND	0.888	4.94	ug/g
Boron	ND	3.69	9.87	ug/g
Cadmium	ND	0.405	4.94	ug/g
Chromium	3.74 J	1.27	4.94	ug/g
Cobalt	ND	0.267	0.987	ug/g
Copper	29.1	2.40	4.94	ug/g
Lead	ND	0.405	4.94	ug/g
Manganese	2.38	0.316	0.987	ug/g
Mercury	0.249 J	0.0494	0.494	ug/g
Nickel	ND	0.346	4.94	ug/g
Selenium	ND	1.15	9.87	ug/g
Silver	ND	0.464	4.94	ug/g

Report of Analysis

Thallium	ND	0.967	4.94	ug/g
Tin	ND	2.46	9.87	ug/g
Vanadium	ND	0.987	4.94	ug/g
Zinc	ND	3.08	9.87	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 0:00	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2120 J	75.7	2700	ug/g
Q	28800	55.1	2700	ug/g
Hexachloroethane	ND	86.5	2700	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1080	1170 ug/g	108	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.95	5.01	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01607	21-03-048	2/3/2003 07:24	2/20/2003 07:23	11/13/2003 10:24	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:23	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	88.6			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/26/2003 23:40	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	215	256	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1030	1120 ug/g	109	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:04	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	5900	277	533	ug/g
Tetrachloroethylene	595	107	533	ug/g
1,1,2,2-Tetrachloroethane	ND	160	533	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	11000	11300 ug/g	103	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.2	51.0	ug/g
Antimony	ND	0.642	5.10	ug/g
Arsenic	ND	1.24	5.10	ug/g
Barium	ND	0.438	5.10	ug/g
Beryllium	ND	0.917	5.10	ug/g
Boron	ND	3.81	10.2	ug/g
Cadmium	ND	0.418	5.10	ug/g
Chromium	4.21 J	1.31	5.10	ug/g
Cobalt	ND	0.275	1.02	ug/g
Copper	63.6	2.48	5.10	ug/g
Lead	ND	0.418	5.10	ug/g
Manganese	ND	0.326	1.02	ug/g
Mercury	0.161 J	0.0510	0.510	ug/g
Nickel	ND	0.357	5.10	ug/g
Selenium	ND	1.19	10.2	ug/g
Silver	ND	0.479	5.10	ug/g

Report of Analysis

Thallium	ND	0.999	5.10	ug/g
Tin	ND	2.54	10.2	ug/g
Vanadium	ND	1.02	5.10	ug/g
Zinc	11.4	3.18	10.2	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 0:00	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2190 J	82.2	2930	ug/g
Q	49100	59.9	2930	ug/g
Hexachloroethane	ND	93.9	2930	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1170	1250 ug/g	107	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.98	5.07	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01608	21-03-051	2/4/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:42	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	86.3			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 0:24	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	226	269	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1080	1130 ug/g	105	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:39	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	9020	274	527	ug/g
Tetrachloroethylene	ND	105	527	ug/g
1,1,2,2-Tetrachloroethane	ND	158	527	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10900	11700 ug/g	108	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.26	46.3	ug/g
Antimony	ND	0.583	4.63	ug/g
Arsenic	16.0	1.13	4.63	ug/g
Barium	ND	0.398	4.63	ug/g
Beryllium	ND	0.833	4.63	ug/g
Boron	ND	3.46	9.26	ug/g
Cadmium	ND	0.380	4.63	ug/g
Chromium	4.28 J	1.19	4.63	ug/g
Cobalt	ND	0.250	0.926	ug/g
Copper	33.8	2.25	4.63	ug/g
Lead	ND	0.380	4.63	ug/g
Manganese	3.33	0.296	0.926	ug/g
Mercury	41.1	0.0463	0.463	ug/g
Nickel	0.694 J	0.324	4.63	ug/g
Selenium	ND	1.08	9.26	ug/g
Silver	ND	0.435	4.63	ug/g

Report of Analysis

Thallium	ND	0.907	4.63	ug/g
Tin	ND	2.31	9.26	ug/g
Vanadium	0.935 J	0.926	4.63	ug/g
Zinc	ND	2.89	9.26	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 0:00	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2270 J	71.2	2540	ug/g
Q	26800	51.9	2540	ug/g
Hexachloroethane	ND	81.4	2540	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1020	1080 ug/g	106	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	3.61 J	1.91	4.89	ug/g

Comments: Sample was diluted an additional 10 fold for Mercury and was run on 02/27/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01609	21-03-054	2/4/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	83.9			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 0:00	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	204	243	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	973	982 ug/g	101	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	4680	260	501	ug/g
Tetrachloroethylene	ND	100	501	ug/g
1,1,2,2-Tetrachloroethane	ND	150	501	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10400	11400 ug/g	110	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.71	48.5	ug/g
Antimony	ND	0.612	4.85	ug/g
Arsenic	ND	1.18	4.85	ug/g
Barium	ND	0.417	4.85	ug/g
Beryllium	ND	0.874	4.85	ug/g
Boron	ND	3.63	9.71	ug/g
Cadmium	ND	0.398	4.85	ug/g
Chromium	4.45 J	1.25	4.85	ug/g
Cobalt	ND	0.262	0.971	ug/g
Copper	6.09	2.36	4.85	ug/g
Lead	0.556 J	0.398	4.85	ug/g
Manganese	5.54	0.311	0.971	ug/g
Mercury	0.472 J	0.0485	0.485	ug/g
Nickel	ND	0.340	4.85	ug/g
Selenium	ND	1.14	9.71	ug/g
Silver	ND	0.456	4.85	ug/g

Report of Analysis

Thallium	ND	0.951	4.85	ug/g
Tin	ND	2.42	9.71	ug/g
Vanadium	1.08 J	0.971	4.85	ug/g
Zinc	ND	3.03	9.71	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 0:00	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2220 J	77.4	2770	ug/g
Q	28200	56.4	2770	ug/g
Hexachloroethane	ND	88.5	2770	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1110	1210 ug/g	109	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.95	5.01	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01610	21-03-057	2/5/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	87.8			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 0:00	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	207	246	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	984	1030 ug/g	105	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	8690	266	512	ug/g
Tetrachloroethylene	ND	102	512	ug/g
1,1,2,2-Tetrachloroethane	ND	154	512	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10600	11500 ug/g	108	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	11.1	55.7	ug/g
Antimony	ND	0.702	5.57	ug/g
Arsenic	7.68	1.36	5.57	ug/g
Barium	ND	0.479	5.57	ug/g
Beryllium	ND	1.00	5.57	ug/g
Boron	ND	4.16	11.1	ug/g
Cadmium	ND	0.457	5.57	ug/g
Chromium	5.27 J	1.44	5.57	ug/g
Cobalt	ND	0.301	1.11	ug/g
Copper	39.5	2.71	5.57	ug/g
Lead	ND	0.457	5.57	ug/g
Manganese	0.398 J	0.356	1.11	ug/g
Mercury	17.8	0.0557	0.557	ug/g
Nickel	0.429 J	0.390	5.57	ug/g
Selenium	ND	1.30	11.1	ug/g
Silver	ND	0.523	5.57	ug/g

Report of Analysis

Thallium	ND	1.09	5.57	ug/g
Tin	ND	2.77	11.1	ug/g
Vanadium	1.31 J	1.11	5.57	ug/g
Zinc	ND	3.47	11.1	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 0:00	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2090 J	74.5	2660	ug/g
Q	33200	54.3	2660	ug/g
Hexachloroethane	ND	85.2	2660	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1060	1150 ug/g	108	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.97	5.04	ug/g

Comments: Sample was diluted an additional 5 fold for Mercury and was run on 02/27/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01611	21-03-060	2/5/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	86.2			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 0:00	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	232	276	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1100	1070 ug/g	97	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6630	281	540	ug/g
Tetrachloroethylene	ND	108	540	ug/g
1,1,2,2-Tetrachloroethane	ND	162	540	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	11200	12100 ug/g	108	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	14.7 J	10.0	50.2	ug/g
Antimony	ND	0.632	5.02	ug/g
Arsenic	ND	1.22	5.02	ug/g
Barium	ND	0.431	5.02	ug/g
Beryllium	ND	0.903	5.02	ug/g
Boron	3.99 J	3.75	10.0	ug/g
Cadmium	ND	0.411	5.02	ug/g
Chromium	12.1	1.29	5.02	ug/g
Cobalt	ND	0.271	1.00	ug/g
Copper	39.3	2.44	5.02	ug/g
Lead	ND	0.411	5.02	ug/g
Manganese	1.72	0.321	1.00	ug/g
Mercury	0.282 J	0.0502	0.502	ug/g
Nickel	2.50 J	0.351	5.02	ug/g
Selenium	ND	1.17	10.0	ug/g
Silver	ND	0.471	5.02	ug/g

Report of Analysis

Thallium	ND	0.983	5.02	ug/g
Tin	ND	2.50	10.0	ug/g
Vanadium	1.26 J	1.00	5.02	ug/g
Zinc	ND	3.13	10.0	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 0:00	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2040 J	71.9	2570	ug/g
Q	35000	52.4	2570	ug/g
Hexachloroethane	ND	82.1	2570	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1030	1120 ug/g	109	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.99	5.11	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01612	21-03-063	2/6/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	88.6			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 0:00	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	208	247	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	989	992 ug/g	100	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	4750	281	541	ug/g
Tetrachloroethylene	ND	108	541	ug/g
1,1,2,2-Tetrachloroethane	ND	162	541	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	11200	11100 ug/g	99.4	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	18.2 J	9.69	48.4	ug/g
Antimony	ND	0.610	4.84	ug/g
Arsenic	ND	1.18	4.84	ug/g
Barium	ND	0.417	4.84	ug/g
Beryllium	ND	0.872	4.84	ug/g
Boron	7.23 J	3.62	9.69	ug/g
Cadmium	ND	0.397	4.84	ug/g
Chromium	4.44 J	1.25	4.84	ug/g
Cobalt	ND	0.262	0.969	ug/g
Copper	17.9	2.35	4.84	ug/g
Lead	ND	0.397	4.84	ug/g
Manganese	2.11	0.310	0.969	ug/g
Mercury	0.190 J	0.0484	0.484	ug/g
Nickel	ND	0.339	4.84	ug/g
Selenium	ND	1.13	9.69	ug/g
Silver	ND	0.455	4.84	ug/g

Report of Analysis

Thallium	ND	0.950	4.84	ug/g
Tin	ND	2.41	9.69	ug/g
Vanadium	1.23 J	0.969	4.84	ug/g
Zinc	ND	3.02	9.69	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 0:00	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2320 J	75.1	2680	ug/g
Q	28200	54.7	2680	ug/g
Hexachloroethane	ND	85.8	2680	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1070	1180 ug/g	110	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.01	5.15	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01613	21-03-066	2/6/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	89.3			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 0:00	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	207	247	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	987	918 ug/g	93	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	4460	266	512	ug/g
Tetrachloroethylene	ND	102	512	ug/g
1,1,2,2-Tetrachloroethane	ND	154	512	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10600	11700 ug/g	110	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	18.7 J	9.54	47.7	ug/g
Antimony	ND	0.601	4.77	ug/g
Arsenic	ND	1.16	4.77	ug/g
Barium	0.437 J	0.410	4.77	ug/g
Beryllium	ND	0.859	4.77	ug/g
Boron	5.11 J	3.57	9.54	ug/g
Cadmium	ND	0.391	4.77	ug/g
Chromium	5.30	1.23	4.77	ug/g
Cobalt	ND	0.258	0.954	ug/g
Copper	4.48 J	2.32	4.77	ug/g
Lead	ND	0.391	4.77	ug/g
Manganese	0.573 J	0.305	0.954	ug/g
Mercury	0.149 J	0.0477	0.477	ug/g
Nickel	0.358 J	0.334	4.77	ug/g
Selenium	1.19 J	1.12	9.54	ug/g
Silver	ND	0.448	4.77	ug/g

Report of Analysis

Thallium	ND	0.935	4.77	ug/g
Tin	ND	2.38	9.54	ug/g
Vanadium	1.32 J	0.954	4.77	ug/g
Zinc	ND	2.98	9.54	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 10:28	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2730	73.0	2610	ug/g
Q	26600	53.2	2610	ug/g
Hexachloroethane	ND	83.4	2610	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1040	1140 ug/g	110	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.01	5.15	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01614	21-03-069D	2/6/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	90.3			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 0:00	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	211	251	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1000	1060 ug/g	106	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	4230	260	500	ug/g
Tetrachloroethylene	ND	99.9	500	ug/g
1,1,2,2-Tetrachloroethane	ND	150	500	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10300	10800 ug/g	105	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.5	52.4	ug/g
Antimony	ND	0.660	5.24	ug/g
Arsenic	1.45 J	1.28	5.24	ug/g
Barium	ND	0.451	5.24	ug/g
Beryllium	ND	0.943	5.24	ug/g
Boron	ND	3.92	10.5	ug/g
Cadmium	ND	0.430	5.24	ug/g
Chromium	5.00 J	1.35	5.24	ug/g
Cobalt	ND	0.283	1.05	ug/g
Copper	4.78 J	2.55	5.24	ug/g
Lead	ND	0.430	5.24	ug/g
Manganese	0.357 J	0.335	1.05	ug/g
Mercury	0.113 J	0.0524	0.524	ug/g
Nickel	0.503 J	0.367	5.24	ug/g
Selenium	ND	1.23	10.5	ug/g
Silver	ND	0.493	5.24	ug/g

Report of Analysis

Thallium	ND	1.03	5.24	ug/g
Tin	ND	2.61	10.5	ug/g
Vanadium	1.15 J	1.05	5.24	ug/g
Zinc	ND	3.27	10.5	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 11:05	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2790	74.8	2670	ug/g
Q	27400	54.5	2670	ug/g
Hexachloroethane	ND	85.5	2670	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1070	1160 ug/g	109	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.00	5.12	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01615	21-03-072	2/7/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	86.5			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 0:00	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	215	256	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	1100 ug/g	107	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7860	259	498	ug/g
Tetrachloroethylene	ND	99.6	498	ug/g
1,1,2,2-Tetrachloroethane	ND	149	498	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10300	11100 ug/g	108	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.40	47.0	ug/g
Antimony	ND	0.592	4.70	ug/g
Arsenic	6.33	1.15	4.70	ug/g
Barium	ND	0.404	4.70	ug/g
Beryllium	ND	0.846	4.70	ug/g
Boron	ND	3.52	9.40	ug/g
Cadmium	ND	0.385	4.70	ug/g
Chromium	5.83	1.21	4.70	ug/g
Cobalt	ND	0.254	0.940	ug/g
Copper	40.9	2.28	4.70	ug/g
Lead	ND	0.385	4.70	ug/g
Manganese	4.01	0.301	0.940	ug/g
Mercury	26.3	0.0470	0.470	ug/g
Nickel	1.53 J	0.329	4.70	ug/g
Selenium	ND	1.10	9.40	ug/g
Silver	ND	0.442	4.70	ug/g

Report of Analysis

Thallium	ND	0.921	4.70	ug/g
Tin	ND	2.34	9.40	ug/g
Vanadium	1.19 J	0.940	4.70	ug/g
Zinc	ND	2.93	9.40	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 11:44	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2330 J	75.4	2690	ug/g
Q	24700	55.0	2690	ug/g
Hexachloroethane	ND	86.2	2690	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1080	1110 ug/g	103	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.91	4.89	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01616	21-03-075	2/8/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	88.4			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 0:00	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	213	254	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1010	1140 ug/g	112	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7080	277	532	ug/g
Tetrachloroethylene	ND	106	532	ug/g
1,1,2,2-Tetrachloroethane	ND	160	532	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	11000	12100 ug/g	109	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	13.8 J	9.90	49.5	ug/g
Antimony	ND	0.624	4.95	ug/g
Arsenic	ND	1.21	4.95	ug/g
Barium	ND	0.426	4.95	ug/g
Beryllium	ND	0.891	4.95	ug/g
Boron	3.97 J	3.70	9.90	ug/g
Cadmium	ND	0.406	4.95	ug/g
Chromium	5.15	1.28	4.95	ug/g
Cobalt	ND	0.267	0.990	ug/g
Copper	48.2	2.41	4.95	ug/g
Lead	ND	0.406	4.95	ug/g
Manganese	0.591 J	0.317	0.990	ug/g
Mercury	0.245 J	0.0495	0.495	ug/g
Nickel	0.673 J	0.347	4.95	ug/g
Selenium	ND	1.16	9.90	ug/g
Silver	ND	0.465	4.95	ug/g

Report of Analysis

Thallium	ND	0.970	4.95	ug/g
Tin	ND	2.47	9.90	ug/g
Vanadium	1.21 J	0.990	4.95	ug/g
Zinc	ND	3.09	9.90	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 12:21	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2050 J	76.4	2730	ug/g
Q	45000	55.7	2730	ug/g
Hexachloroethane	ND	87.3	2730	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1090	1180 ug/g	108	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 0:00	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.98	5.08	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01617	21-03-078	2/8/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	85.3			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 0:00	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	211	252	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1010	1090 ug/g	108	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6110	271	522	ug/g
Tetrachloroethylene	ND	104	522	ug/g
1,1,2,2-Tetrachloroethane	ND	157	522	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10800	10400 ug/g	96.2	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	32.4 J	9.87	49.4	ug/g
Antimony	ND	0.622	4.94	ug/g
Arsenic	ND	1.20	4.94	ug/g
Barium	ND	0.424	4.94	ug/g
Beryllium	ND	0.888	4.94	ug/g
Boron	7.09 J	3.69	9.87	ug/g
Cadmium	ND	0.405	4.94	ug/g
Chromium	9.19	1.27	4.94	ug/g
Cobalt	ND	0.267	0.987	ug/g
Copper	25.9	2.40	4.94	ug/g
Lead	0.889 J	0.405	4.94	ug/g
Manganese	1.15	0.316	0.987	ug/g
Mercury	0.322 J	0.0494	0.494	ug/g
Nickel	1.62 J	0.346	4.94	ug/g
Selenium	ND	1.15	9.87	ug/g
Silver	ND	0.464	4.94	ug/g

Report of Analysis

Thallium	ND	0.967	4.94	ug/g
Tin	ND	2.46	9.87	ug/g
Vanadium	1.47 J	0.987	4.94	ug/g
Zinc	ND	3.08	9.87	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 13:00	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2270 J	73.1	2610	ug/g
Q	28200	53.2	2610	ug/g
Hexachloroethane	ND	83.5	2610	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1040	1150 ug/g	111	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 10:06	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.99	5.11	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01618	21-03-081	2/8/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	86.6			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 0:00	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	209	249	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	996	991 ug/g	99.5	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7180	271	522	ug/g
Tetrachloroethylene	ND	104	522	ug/g
1,1,2,2-Tetrachloroethane	ND	157	522	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10800	11800 ug/g	109	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.2	51.0	ug/g
Antimony	ND	0.643	5.10	ug/g
Arsenic	ND	1.24	5.10	ug/g
Barium	ND	0.439	5.10	ug/g
Beryllium	ND	0.918	5.10	ug/g
Boron	ND	3.82	10.2	ug/g
Cadmium	ND	0.418	5.10	ug/g
Chromium	5.94	1.32	5.10	ug/g
Cobalt	ND	0.276	1.02	ug/g
Copper	70.3	2.48	5.10	ug/g
Lead	ND	0.418	5.10	ug/g
Manganese	0.349 J	0.327	1.02	ug/g
Mercury	0.0906 J	0.0510	0.510	ug/g
Nickel	0.837 J	0.357	5.10	ug/g
Selenium	ND	1.19	10.2	ug/g
Silver	ND	0.480	5.10	ug/g

Report of Analysis

Thallium	ND	1.00	5.10	ug/g
Tin	ND	2.54	10.2	ug/g
Vanadium	1.33 J	1.02	5.10	ug/g
Zinc	ND	3.18	10.2	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 13:38	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2050 J	75.8	2710	ug/g
Q	39600	55.3	2710	ug/g
Hexachloroethane	ND	86.7	2710	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1080	1160 ug/g	107	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 10:42	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.04	5.22	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01619	21-03-084	2/10/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	89.2			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 10:32	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	233	278	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1110	1070 ug/g	96.6	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6550	281	540	ug/g
Tetrachloroethylene	ND	108	540	ug/g
1,1,2,2-Tetrachloroethane	ND	162	540	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	11200	11600 ug/g	104	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.3	51.4	ug/g
Antimony	ND	0.648	5.14	ug/g
Arsenic	1.47 J	1.26	5.14	ug/g
Barium	ND	0.442	5.14	ug/g
Beryllium	ND	0.926	5.14	ug/g
Boron	ND	3.85	10.3	ug/g
Cadmium	ND	0.422	5.14	ug/g
Chromium	5.36	1.33	5.14	ug/g
Cobalt	ND	0.278	1.03	ug/g
Copper	48.3	2.50	5.14	ug/g
Lead	ND	0.422	5.14	ug/g
Manganese	0.575 J	0.329	1.03	ug/g
Mercury	0.0582 J	0.0514	0.514	ug/g
Nickel	5.56	0.360	5.14	ug/g
Selenium	ND	1.20	10.3	ug/g
Silver	ND	0.484	5.14	ug/g

Report of Analysis

Thallium	ND	1.01	5.14	ug/g
Tin	ND	2.56	10.3	ug/g
Vanadium	1.24 J	1.03	5.14	ug/g
Zinc	ND	3.21	10.3	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 14:16	ssh	4102

Parameter	Result	MDL	PQL	Units
T	2150 J	74.5	2660	ug/g
Q	36800	54.3	2660	ug/g
Hexachloroethane	ND	85.1	2660	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1060	1150 ug/g	108	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 11:19	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.07	5.31	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01620	21-03-087	2/10/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 0:00	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	89.5			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/27/2003 11:16	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	208	248	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	992	807 ug/g	81.3	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	3/1/2003 0:00	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	5810	263	506	ug/g
Tetrachloroethylene	ND	101	506	ug/g
1,1,2,2-Tetrachloroethane	ND	152	506	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10500	10600 ug/g	101	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.4	51.9	ug/g
Antimony	ND	0.654	5.19	ug/g
Arsenic	12.1	1.27	5.19	ug/g
Barium	ND	0.447	5.19	ug/g
Beryllium	ND	0.935	5.19	ug/g
Boron	ND	3.88	10.4	ug/g
Cadmium	ND	0.426	5.19	ug/g
Chromium	4.18 J	1.34	5.19	ug/g
Cobalt	ND	0.280	1.04	ug/g
Copper	70.5	2.52	5.19	ug/g
Lead	ND	0.426	5.19	ug/g
Manganese	0.569 J	0.332	1.04	ug/g
Mercury	ND	0.0519	0.519	ug/g
Nickel	1.60 J	0.363	5.19	ug/g
Selenium	ND	1.21	10.4	ug/g
Silver	ND	0.488	5.19	ug/g

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Thallium	ND	1.02	5.19	ug/g
Tin	ND	2.59	10.4	ug/g
Vanadium	ND	1.04	5.19	ug/g
Zinc	ND	3.24	10.4	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/7/2003 14:54	ssh	4102

Parameter	Result	MDL	PQL	Units
T	1660 J	70.0	2500	ug/g
Q	31100	51.0	2500	ug/g
Hexachloroethane	ND	80.0	2500	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1000	1060 ug/g	106	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/18/2003 11:55	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.04	5.23	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01621	21-03-034	1/29/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.44	47.2	ug/g
Antimony	0.750 J	0.123	4.72	ug/g
Arsenic	381	0.538	4.72	ug/g
Barium	0.0992 J	0.0378	4.72	ug/g
Beryllium	ND	0.0472	4.72	ug/g
Boron	4.91 J	3.78	9.44	ug/g
Cadmium	0.663 J	0.0189	4.72	ug/g
Chromium	14.1	0.944	4.72	ug/g
Cobalt	2.36	0.113	0.944	ug/g
Copper	49.6	3.05	9.44	ug/g
Lead	6.26 J	1.78	9.44	ug/g
Manganese	163	3.12	9.44	ug/g
Mercury	0.289 J	0.0661	0.472	ug/g
Nickel	12.6	0.585	4.72	ug/g
Selenium	ND	0.670	23.6	ug/g
Silver	0.328 J	0.0567	4.72	ug/g
Thallium	ND	0.312	4.72	ug/g
Tin	11.9	0.415	9.44	ug/g
Vanadium	0.982 J	0.944	4.72	ug/g
Zinc	46.1	2.08	9.44	ug/g

Comments: Arsenic and Manganese were reanalyzed on 03/18/03.
Mercury was reanalyzed on 02/27/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01622	21-03-037	1/30/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	13.7 J	10.0	50.2	ug/g
Antimony	1.68 J	0.130	5.02	ug/g
Arsenic	5.50	0.572	5.02	ug/g
Barium	1.68 J	0.0401	5.02	ug/g
Beryllium	ND	0.0502	5.02	ug/g
Boron	4.21 J	4.01	10.0	ug/g
Cadmium	0.390 J	0.0201	5.02	ug/g
Chromium	47.8	1.00	5.02	ug/g
Cobalt	10.2	0.120	1.00	ug/g
Copper	29.5	3.24	10.0	ug/g
Lead	15.7	1.90	10.0	ug/g
Manganese	248	3.31	10.0	ug/g
Mercury	0.130 J	0.0702	0.502	ug/g
Nickel	52.6	0.622	5.02	ug/g
Selenium	ND	0.712	25.1	ug/g
Silver	ND	0.0602	5.02	ug/g
Thallium	ND	0.331	5.02	ug/g
Tin	5.97 J	0.441	10.0	ug/g
Vanadium	1.31 J	1.00	5.02	ug/g
Zinc	83.2	2.21	10.0	ug/g

Comments: Mercury was reanalyzed on 02/27/03.

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01623	21-03-040	1/31/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.8	54.2	ug/g
Antimony	3.60 J	0.141	5.42	ug/g
Arsenic	583	0.618	5.42	ug/g
Barium	0.0655 J	0.0433	5.42	ug/g
Beryllium	ND	0.0542	5.42	ug/g
Boron	ND	4.33	10.8	ug/g
Cadmium	0.400 J	0.0217	5.42	ug/g
Chromium	30.4	1.08	5.42	ug/g
Cobalt	6.21	0.130	1.08	ug/g
Copper	16.9	3.50	10.8	ug/g
Lead	23.6	2.05	10.8	ug/g
Manganese	369	3.58	10.8	ug/g
Mercury	3.56	0.0758	0.542	ug/g
Nickel	32.0	0.672	5.42	ug/g
Selenium	ND	0.769	27.1	ug/g
Silver	0.0870 J	0.0650	5.42	ug/g
Thallium	ND	0.358	5.42	ug/g
Tin	5.04 J	0.477	10.8	ug/g
Vanadium	1.53 J	1.08	5.42	ug/g
Zinc	43.6	2.38	10.8	ug/g

Comments: Mercury was reanalyzed on 02/27/03.
Sample was diluted an additional 2 fold for Arsenic and was reanalyzed on 03/14/03

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01624	21-03-043	1/31/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	27.9 J	11.0	55.2	ug/g
Antimony	0.779 J	0.143	5.52	ug/g
Arsenic	5.52	0.629	5.52	ug/g
Barium	0.552 J	0.0442	5.52	ug/g
Beryllium	ND	0.0552	5.52	ug/g
Boron	ND	4.42	11.0	ug/g
Cadmium	0.404 J	0.0221	5.52	ug/g
Chromium	29.0	1.10	5.52	ug/g
Cobalt	5.96	0.132	1.10	ug/g
Copper	27.5	3.57	11.0	ug/g
Lead	16.3	2.09	11.0	ug/g
Manganese	365	3.64	11.0	ug/g
Mercury	0.402 J	0.0773	0.552	ug/g
Nickel	19.9	0.684	5.52	ug/g
Selenium	ND	0.784	27.6	ug/g
Silver	ND	0.0662	5.52	ug/g
Thallium	ND	0.364	5.52	ug/g
Tin	2.38 J	0.486	11.0	ug/g
Vanadium	1.56 J	1.10	5.52	ug/g
Zinc	83.3	2.43	11.0	ug/g

Comments: Mercury was reanalyzed on 02/27/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01625	21-03-046	2/3/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	14.2 J	10.6	53.1	ug/g
Antimony	0.897 J	0.138	5.31	ug/g
Arsenic	4.11 J	0.605	5.31	ug/g
Barium	0.296 J	0.0425	5.31	ug/g
Beryllium	ND	0.0531	5.31	ug/g
Boron	ND	4.25	10.6	ug/g
Cadmium	0.351 J	0.0212	5.31	ug/g
Chromium	106	1.06	5.31	ug/g
Cobalt	6.07	0.127	1.06	ug/g
Copper	24.9	3.43	10.6	ug/g
Lead	7.78 J	2.01	10.6	ug/g
Manganese	220	3.50	10.6	ug/g
Mercury	0.324 J	0.0743	0.531	ug/g
Nickel	46.1	0.658	5.31	ug/g
Selenium	ND	0.754	26.5	ug/g
Silver	ND	0.0637	5.31	ug/g
Thallium	ND	0.350	5.31	ug/g
Tin	6.37 J	0.467	10.6	ug/g
Vanadium	1.11 J	1.06	5.31	ug/g
Zinc	53.1	2.34	10.6	ug/g

Comments: Mercury was reanalyzed on 02/27/03.

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01626	21-03-049	2/3/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.45	47.3	ug/g
Antimony	0.688 J	0.123	4.73	ug/g
Arsenic	16.5	0.539	4.73	ug/g
Barium	ND	0.0378	4.73	ug/g
Beryllium	ND	0.0473	4.73	ug/g
Boron	ND	3.78	9.45	ug/g
Cadmium	0.343 J	0.0189	4.73	ug/g
Chromium	14.6	0.945	4.73	ug/g
Cobalt	2.84	0.113	0.945	ug/g
Copper	63.6	3.05	9.45	ug/g
Lead	6.96 J	1.79	9.45	ug/g
Manganese	165	3.12	9.45	ug/g
Mercury	0.225 J	0.0662	0.473	ug/g
Nickel	15.1	0.586	4.73	ug/g
Selenium	ND	0.671	23.6	ug/g
Silver	ND	0.0567	4.73	ug/g
Thallium	ND	0.312	4.73	ug/g
Tin	3.69 J	0.416	9.45	ug/g
Vanadium	1.00 J	0.945	4.73	ug/g
Zinc	73.0	2.08	9.45	ug/g

Comments: Mercury was reanalyzed on 02/27/03.

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Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01701	21-03-052	2/4/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.2	51.2	ug/g
Antimony	0.877 J	0.133	5.12	ug/g
Arsenic	670	0.584	5.12	ug/g
Barium	0.142 J	0.0410	5.12	ug/g
Beryllium	ND	0.0512	5.12	ug/g
Boron	ND	4.10	10.2	ug/g
Cadmium	0.353 J	0.0205	5.12	ug/g
Chromium	23.0	1.02	5.12	ug/g
Cobalt	3.18	0.123	1.02	ug/g
Copper	27.9	3.31	10.2	ug/g
Lead	11.0	1.94	10.2	ug/g
Manganese	234	3.38	10.2	ug/g
Mercury	1450	0.0717	0.512	ug/g
Nickel	21.0	0.635	5.12	ug/g
Selenium	ND	0.727	25.6	ug/g
Silver	ND	0.0615	5.12	ug/g
Thallium	ND	0.338	5.12	ug/g
Tin	3.24 J	0.451	10.2	ug/g
Vanadium	ND	1.02	5.12	ug/g
Zinc	36.5	2.25	10.2	ug/g

Comments: Sample was diluted an additional 2 fold for Arsenic and an addition 500 fold for Mercury. Both were reanalyzed on 02/27/03

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01702	21-03-055	2/4/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	15.9 J	9.92	49.6	ug/g
Antimony	1.25 J	0.129	4.96	ug/g
Arsenic	10.2	0.565	4.96	ug/g
Barium	0.182 J	0.0397	4.96	ug/g
Beryllium	ND	0.0496	4.96	ug/g
Boron	ND	3.97	9.92	ug/g
Cadmium	0.637 J	0.0198	4.96	ug/g
Chromium	65.2	0.992	4.96	ug/g
Cobalt	8.92	0.119	0.992	ug/g
Copper	7.80 J	3.20	9.92	ug/g
Lead	111	1.88	9.92	ug/g
Manganese	490	3.27	9.92	ug/g
Mercury	2.54	0.0694	0.496	ug/g
Nickel	49.1	0.615	4.96	ug/g
Selenium	ND	0.704	24.8	ug/g
Silver	ND	0.0595	4.96	ug/g
Thallium	ND	0.327	4.96	ug/g
Tin	3.81 J	0.437	9.92	ug/g
Vanadium	1.05 J	0.992	4.96	ug/g
Zinc	7.41 J	2.18	9.92	ug/g

Comments: Sample was diluted an addition 2 fold for Manganese and was reanalyzed on 03/14/03
Mercury was reanalyzed on 2/27/03.

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01703	21-03-058	2/5/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	13.5 J	10.3	51.7	ug/g
Antimony	0.162 J	0.134	5.17	ug/g
Arsenic	133	0.589	5.17	ug/g
Barium	0.129 J	0.0414	5.17	ug/g
Beryllium	ND	0.0517	5.17	ug/g
Boron	ND	4.14	10.3	ug/g
Cadmium	0.341 J	0.0207	5.17	ug/g
Chromium	12.2	1.03	5.17	ug/g
Cobalt	1.37	0.124	1.03	ug/g
Copper	57.0	3.34	10.3	ug/g
Lead	5.38 J	1.95	10.3	ug/g
Manganese	80.9	3.41	10.3	ug/g
Mercury	861	0.0724	0.517	ug/g
Nickel	16.3	0.641	5.17	ug/g
Selenium	ND	0.734	25.9	ug/g
Silver	ND	0.0620	5.17	ug/g
Thallium	ND	0.341	5.17	ug/g
Tin	0.855 J	0.455	10.3	ug/g
Vanadium	ND	1.03	5.17	ug/g
Zinc	22.3	2.28	10.3	ug/g

Comments: Sample diluted an additional 250 fold and was analyzed on 02/27/03 for Mercury.

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01704	21-03-061	2/5/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	12.0 J	11.2	56.1	ug/g
Antimony	ND	0.146	5.61	ug/g
Arsenic	3.63 J	0.639	5.61	ug/g
Barium	0.137 J	0.0448	5.61	ug/g
Beryllium	ND	0.0561	5.61	ug/g
Boron	ND	4.48	11.2	ug/g
Cadmium	0.396 J	0.0224	5.61	ug/g
Chromium	8.36	1.12	5.61	ug/g
Cobalt	1.24	0.135	1.12	ug/g
Copper	54.0	3.62	11.2	ug/g
Lead	5.90 J	2.12	11.2	ug/g
Manganese	74.0	3.70	11.2	ug/g
Mercury	0.246 J	0.0785	0.561	ug/g
Nickel	7.57	0.695	5.61	ug/g
Selenium	ND	0.796	28.0	ug/g
Silver	ND	0.0673	5.61	ug/g
Thallium	ND	0.370	5.61	ug/g
Tin	0.948 J	0.493	11.2	ug/g
Vanadium	ND	1.12	5.61	ug/g
Zinc	46.0	2.47	11.2	ug/g

Comments: Mercury was reanalyzed on 02/27/03.

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Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01705	21-03-064	2/6/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	29.5 J	10.5	52.6	ug/g
Antimony	2.09 J	0.137	5.26	ug/g
Arsenic	10.9	0.599	5.26	ug/g
Barium	3.77 J	0.0421	5.26	ug/g
Beryllium	ND	0.0526	5.26	ug/g
Boron	7.56 J	4.21	10.5	ug/g
Cadmium	0.720 J	0.0210	5.26	ug/g
Chromium	53.3	1.05	5.26	ug/g
Cobalt	9.46	0.126	1.05	ug/g
Copper	22.8	3.40	10.5	ug/g
Lead	85.7	1.99	10.5	ug/g
Manganese	545	3.47	10.5	ug/g
Mercury	1.66	0.0736	0.526	ug/g
Nickel	216	0.652	5.26	ug/g
Selenium	ND	0.747	26.3	ug/g
Silver	ND	0.0631	5.26	ug/g
Thallium	ND	0.347	5.26	ug/g
Tin	26.3	0.463	10.5	ug/g
Vanadium	ND	1.05	5.26	ug/g
Zinc	110	2.31	10.5	ug/g

Comments: Sample was diluted an additional 2 fold for Manganese an was reanalyzed on 03/14/03.
Antimony, Chromium, Cobalt, Copper, Mercury, Nickel, Silver, and Vanadium were reanalyzed on 02/27/03.

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01706	21-03-067	2/6/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.3	51.4	ug/g
Antimony	ND	0.134	5.14	ug/g
Arsenic	ND	0.586	5.14	ug/g
Barium	0.0993 J	0.0411	5.14	ug/g
Beryllium	ND	0.0514	5.14	ug/g
Boron	ND	4.11	10.3	ug/g
Cadmium	0.343 J	0.0206	5.14	ug/g
Chromium	1.08 J	1.03	5.14	ug/g
Cobalt	ND	0.123	1.03	ug/g
Copper	ND	3.32	10.3	ug/g
Lead	ND	1.94	10.3	ug/g
Manganese	ND	3.39	10.3	ug/g
Mercury	0.199 J	0.0719	0.514	ug/g
Nickel	ND	0.637	5.14	ug/g
Selenium	ND	0.730	25.7	ug/g
Silver	ND	0.0617	5.14	ug/g
Thallium	ND	0.339	5.14	ug/g
Tin	ND	0.452	10.3	ug/g
Vanadium	ND	1.03	5.14	ug/g
Zinc	ND	2.26	10.3	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Silver, and Vanadium were reanalyzed on 02/27/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01707	21-03-070D	2/6/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	35.8 J	10.1	50.5	ug/g
Antimony	2.04 J	0.131	5.05	ug/g
Arsenic	4.22 J	0.575	5.05	ug/g
Barium	1.09 J	0.0404	5.05	ug/g
Beryllium	ND	0.0505	5.05	ug/g
Boron	ND	4.04	10.1	ug/g
Cadmium	0.397 J	0.0202	5.05	ug/g
Chromium	432	1.01	5.05	ug/g
Cobalt	25.1	0.121	1.01	ug/g
Copper	39.2	3.26	10.1	ug/g
Lead	144	1.91	10.1	ug/g
Manganese	835	3.33	10.1	ug/g
Mercury	4.53	0.0706	0.505	ug/g
Nickel	453	0.626	5.05	ug/g
Selenium	ND	0.716	25.2	ug/g
Silver	ND	0.0605	5.05	ug/g
Thallium	ND	0.333	5.05	ug/g
Tin	15.3	0.444	10.1	ug/g
Vanadium	ND	1.01	5.05	ug/g
Zinc	32.0	2.22	10.1	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Mercury, Nickel, Silver, and Vanadium were reanalyzed on 02/27/03. Sample was diluted an additional 4 fold for Manganese and was reanalyzed on 02/27/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01708	21-03-073	2/7/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	18.1 J	10.2	50.9	ug/g
Antimony	2.88 J	0.132	5.09	ug/g
Arsenic	499	0.580	5.09	ug/g
Barium	0.260 J	0.0407	5.09	ug/g
Beryllium	ND	0.0509	5.09	ug/g
Boron	ND	4.07	10.2	ug/g
Cadmium	0.375 J	0.0204	5.09	ug/g
Chromium	39.5	1.02	5.09	ug/g
Cobalt	7.44	0.122	1.02	ug/g
Copper	50.1	3.29	10.2	ug/g
Lead	18.0	1.92	10.2	ug/g
Manganese	466	3.36	10.2	ug/g
Mercury	2120	0.0713	0.509	ug/g
Nickel	83.9	0.631	5.09	ug/g
Selenium	ND	0.723	25.5	ug/g
Silver	ND	0.0611	5.09	ug/g
Thallium	ND	0.336	5.09	ug/g
Tin	10.5	0.448	10.2	ug/g
Vanadium	ND	1.02	5.09	ug/g
Zinc	56.3	2.24	10.2	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Nickel, Silver, and Vanadium were reanalyzed on 02/27/03. Sample was diluted an additional 500 fold for Mercury and was reanalyzed on 02/27/03

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01709	21-03-076	2/8/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	17.1 J	10.3	51.5	ug/g
Antimony	0.396 J	0.134	5.15	ug/g
Arsenic	6.30	0.587	5.15	ug/g
Barium	6.82	0.0412	5.15	ug/g
Beryllium	ND	0.0515	5.15	ug/g
Boron	ND	4.12	10.3	ug/g
Cadmium	0.373 J	0.0206	5.15	ug/g
Chromium	23.3	1.03	5.15	ug/g
Cobalt	3.84	0.124	1.03	ug/g
Copper	46.7	3.33	10.3	ug/g
Lead	25.4	1.95	10.3	ug/g
Manganese	288	3.40	10.3	ug/g
Mercury	1.52	0.0721	0.515	ug/g
Nickel	18.5	0.639	5.15	ug/g
Selenium	ND	0.731	25.7	ug/g
Silver	ND	0.0618	5.15	ug/g
Thallium	ND	0.340	5.15	ug/g
Tin	1.16 J	0.453	10.3	ug/g
Vanadium	ND	1.03	5.15	ug/g
Zinc	111	2.27	10.3	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Silver, and Vanadium were reanalyzed on 02/27/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01710	21-03-079	2/8/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	21.2 J	10.1	50.7	ug/g
Antimony	0.937 J	0.132	5.07	ug/g
Arsenic	8.30	0.578	5.07	ug/g
Barium	0.185 J	0.0405	5.07	ug/g
Beryllium	ND	0.0507	5.07	ug/g
Boron	ND	4.05	10.1	ug/g
Cadmium	0.361 J	0.0203	5.07	ug/g
Chromium	17.4	1.01	5.07	ug/g
Cobalt	5.60	0.122	1.01	ug/g
Copper	27.7	3.27	10.1	ug/g
Lead	12.0	1.91	10.1	ug/g
Manganese	313	3.34	10.1	ug/g
Mercury	0.469 J	0.0709	0.507	ug/g
Nickel	37.1	0.628	5.07	ug/g
Selenium	ND	0.719	25.3	ug/g
Silver	ND	0.0608	5.07	ug/g
Thallium	ND	0.334	5.07	ug/g
Tin	9.35 J	0.446	10.1	ug/g
Vanadium	ND	1.01	5.07	ug/g
Zinc	71.9	2.23	10.1	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Silver, and Vanadium were reanalyzed on 02/27/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01711	21-03-082	2/8/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	19.4 J	9.73	48.6	ug/g
Antimony	0.463 J	0.126	4.86	ug/g
Arsenic	78.0	0.554	4.86	ug/g
Barium	0.114 J	0.0389	4.86	ug/g
Beryllium	ND	0.0486	4.86	ug/g
Boron	ND	3.89	9.73	ug/g
Cadmium	0.369 J	0.0195	4.86	ug/g
Chromium	11.1	0.973	4.86	ug/g
Cobalt	1.87	0.117	0.973	ug/g
Copper	65.9	3.14	9.73	ug/g
Lead	3.72 J	1.84	9.73	ug/g
Manganese	119	3.21	9.73	ug/g
Mercury	0.231 J	0.0681	0.486	ug/g
Nickel	9.66	0.603	4.86	ug/g
Selenium	ND	0.691	24.3	ug/g
Silver	ND	0.0584	4.86	ug/g
Thallium	ND	0.321	4.86	ug/g
Tin	6.61 J	0.428	9.73	ug/g
Vanadium	ND	0.973	4.86	ug/g
Zinc	44.6	2.14	9.73	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Silver, and Vanadium were reanalyzed on 02/27/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01712	21-03-085	2/10/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	14.6 J	9.90	49.5	ug/g
Antimony	0.804 J	0.129	4.95	ug/g
Arsenic	156	0.564	4.95	ug/g
Barium	0.224 J	0.0396	4.95	ug/g
Beryllium	ND	0.0495	4.95	ug/g
Boron	ND	3.96	9.90	ug/g
Cadmium	0.358 J	0.0198	4.95	ug/g
Chromium	10.5	0.990	4.95	ug/g
Cobalt	2.46	0.119	0.990	ug/g
Copper	45.6	3.20	9.90	ug/g
Lead	7.11 J	1.87	9.90	ug/g
Manganese	139	3.27	9.90	ug/g
Mercury	0.582	0.0693	0.495	ug/g
Nickel	18.6	0.614	4.95	ug/g
Selenium	ND	0.703	24.8	ug/g
Silver	ND	0.0594	4.95	ug/g
Thallium	ND	0.327	4.95	ug/g
Tin	3.29 J	0.436	9.90	ug/g
Vanadium	ND	0.990	4.95	ug/g
Zinc	36.3	2.18	9.90	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Silver, and Vanadium were reanalyzed on 02/27/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01713	21-03-088	2/10/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	14.8 J	10.1	50.5	ug/g
Antimony	0.173 J	0.131	5.05	ug/g
Arsenic	307	0.576	5.05	ug/g
Barium	0.651 J	0.0404	5.05	ug/g
Beryllium	ND	0.0505	5.05	ug/g
Boron	ND	4.04	10.1	ug/g
Cadmium	0.374 J	0.0202	5.05	ug/g
Chromium	14.1	1.01	5.05	ug/g
Cobalt	2.58	0.121	1.01	ug/g
Copper	79.6	3.26	10.1	ug/g
Lead	9.69 J	1.91	10.1	ug/g
Manganese	146	3.33	10.1	ug/g
Mercury	0.258 J	0.0707	0.505	ug/g
Nickel	22.5	0.626	5.05	ug/g
Selenium	ND	0.717	25.3	ug/g
Silver	ND	0.0606	5.05	ug/g
Thallium	ND	0.333	5.05	ug/g
Tin	1.84 J	0.444	10.1	ug/g
Vanadium	ND	1.01	5.05	ug/g
Zinc	73.4	2.22	10.1	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Silver, and Vanadium were reanalyzed on 02/27/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01714	21-03-035	1/29/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	10.8 J	9.85	49.3	ug/g
Antimony	1.11 J	0.128	4.93	ug/g
Arsenic	1520	0.562	4.93	ug/g
Barium	0.370 J	0.0394	4.93	ug/g
Beryllium	ND	0.0493	4.93	ug/g
Boron	3.99 J	3.94	9.85	ug/g
Cadmium	1.50 J	0.0197	4.93	ug/g
Chromium	23.0	0.985	4.93	ug/g
Cobalt	4.29	0.118	0.985	ug/g
Copper	129	3.27	9.85	ug/g
Lead	35.5	1.86	9.85	ug/g
Manganese	319	3.25	9.85	ug/g
Mercury	0.392 J	0.0690	0.493	ug/g
Nickel	29.7	0.611	4.93	ug/g
Selenium	ND	0.700	24.6	ug/g
Silver	0.930 J	0.0591	4.93	ug/g
Thallium	ND	0.325	4.93	ug/g
Tin	29.1	0.433	9.85	ug/g
Vanadium	ND	0.985	4.93	ug/g
Zinc	118	2.17	9.85	ug/g

Comments: Antimony, Cadmium, Chromium, Cobalt, Copper, Manganese, Nickel, Silver, and Vanadium were reanalyzed on 03/18/03.
Mercury and Zinc were reanalyzed on 03/19/03.
Sample was diluted an additional 5 fold for Arsenic and was reanalyzed 03/14/03.

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Report of Analysis

Lab ID	*Sample ID*	*Collected*	*Received*	*Reported*	*Matrix*
030004-01715	21-03-038	1/30/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	20.9 J	10.5	52.5	ug/g
Antimony	0.184 J	0.137	5.25	ug/g
Arsenic	4.04 J	0.599	5.25	ug/g
Barium	4.55 J	0.0420	5.25	ug/g
Beryllium	ND	0.0525	5.25	ug/g
Boron	4.34 J	4.20	10.5	ug/g
Cadmium	0.460 J	0.0210	5.25	ug/g
Chromium	16.1	1.05	5.25	ug/g
Cobalt	4.04	0.126	1.05	ug/g
Copper	33.4	3.49	10.5	ug/g
Lead	16.6	1.99	10.5	ug/g
Manganese	108	3.47	10.5	ug/g
Mercury	ND	0.0735	0.525	ug/g
Nickel	20.8	0.651	5.25	ug/g
Selenium	ND	0.746	26.3	ug/g
Silver	ND	0.0630	5.25	ug/g
Thallium	ND	0.347	5.25	ug/g
Tin	2.73 J	0.462	10.5	ug/g
Vanadium	ND	1.05	5.25	ug/g
Zinc	47.2	2.31	10.5	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Nickel, Silver, and Vanadium were reanalyzed on 03/14/03. Mercury was reanalyzed on 03/19/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01716	21-03-041	1/31/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.0	50.2	ug/g
Antimony	1.67 J	0.131	5.02	ug/g
Arsenic	252	0.572	5.02	ug/g
Barium	0.159 J	0.0402	5.02	ug/g
Beryllium	ND	0.0502	5.02	ug/g
Boron	ND	4.02	10.0	ug/g
Cadmium	0.434 J	0.0201	5.02	ug/g
Chromium	24.9	1.00	5.02	ug/g
Cobalt	5.55	0.120	1.00	ug/g
Copper	39.2	3.33	10.0	ug/g
Lead	37.0	1.90	10.0	ug/g
Manganese	370	3.31	10.0	ug/g
Mercury	1.62	0.0703	0.502	ug/g
Nickel	18.0	0.622	5.02	ug/g
Selenium	ND	0.713	25.1	ug/g
Silver	ND	0.0602	5.02	ug/g
Thallium	ND	0.331	5.02	ug/g
Tin	3.36 J	0.442	10.0	ug/g
Vanadium	ND	1.00	5.02	ug/g
Zinc	51.3	2.21	10.0	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Nickel, Silver, and Vanadium were reanalyzed on 03/14/03. Mercury was reanalyzed on 03/19/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01717	21-03-044	1/31/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	16.2 J	10.6	53.0	ug/g
Antimony	0.546 J	0.138	5.30	ug/g
Arsenic	8.32	0.604	5.30	ug/g
Barium	2.71 J	0.0424	5.30	ug/g
Beryllium	ND	0.0530	5.30	ug/g
Boron	ND	4.24	10.6	ug/g
Cadmium	0.500 J	0.0212	5.30	ug/g
Chromium	29.6	1.06	5.30	ug/g
Cobalt	7.72	0.127	1.06	ug/g
Copper	43.0	3.52	10.6	ug/g
Lead	22.5	2.00	10.6	ug/g
Manganese	428	3.50	10.6	ug/g
Mercury	0.299 J	0.0742	0.530	ug/g
Nickel	25.4	0.657	5.30	ug/g
Selenium	ND	0.752	26.5	ug/g
Silver	ND	0.0636	5.30	ug/g
Thallium	ND	0.350	5.30	ug/g
Tin	3.20 J	0.466	10.6	ug/g
Vanadium	1.11 J	1.06	5.30	ug/g
Zinc	120	2.33	10.6	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Nickel, Silver, and Vanadium were reanalyzed on 03/14/03. Mercury was reanalyzed on 03/19/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01718	21-03-047	2/3/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	28.4 J	10.7	53.4	ug/g
Antimony	2.57 J	0.139	5.34	ug/g
Arsenic	5.82	0.609	5.34	ug/g
Barium	1.66 J	0.0427	5.34	ug/g
Beryllium	ND	0.0534	5.34	ug/g
Boron	ND	4.27	10.7	ug/g
Cadmium	0.484 J	0.0214	5.34	ug/g
Chromium	189	1.07	5.34	ug/g
Cobalt	10.5	0.128	1.07	ug/g
Copper	38.9	3.55	10.7	ug/g
Lead	14.5	2.02	10.7	ug/g
Manganese	359	3.53	10.7	ug/g
Mercury	0.405 J	0.0748	0.534	ug/g
Nickel	20.7	0.662	5.34	ug/g
Selenium	ND	0.759	26.7	ug/g
Silver	ND	0.0641	5.34	ug/g
Thallium	ND	0.353	5.34	ug/g
Tin	15.3	0.470	10.7	ug/g
Vanadium	2.71 J	1.07	5.34	ug/g
Zinc	84.4	2.35	10.7	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Nickel, Silver, and Vanadium were reanalyzed on 03/14/03. Mercury was reanalyzed on 03/19/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01719	21-03-050	2/3/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	12.8 J	9.60	48.0	ug/g
Antimony	4.91	0.125	4.80	ug/g
Arsenic	79.6	0.547	4.80	ug/g
Barium	0.272 J	0.0384	4.80	ug/g
Beryllium	ND	0.0480	4.80	ug/g
Boron	ND	3.84	9.60	ug/g
Cadmium	0.523 J	0.0192	4.80	ug/g
Chromium	37.1	0.960	4.80	ug/g
Cobalt	9.59	0.115	0.960	ug/g
Copper	155	3.10	9.60	ug/g
Lead	31.6	1.81	9.60	ug/g
Manganese	516	3.17	9.60	ug/g
Mercury	0.322 J	0.0672	0.480	ug/g
Nickel	36.1	0.595	4.80	ug/g
Selenium	ND	0.681	24.0	ug/g
Silver	0.0657 J	0.0576	4.80	ug/g
Thallium	ND	0.317	4.80	ug/g
Tin	30.3	0.422	9.60	ug/g
Vanadium	1.01 J	0.960	4.80	ug/g
Zinc	306	2.11	9.60	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Nickel, Silver, and Vanadium were reanalyzed on 03/18/03.
Mercury was reanalyzed on 03/19/03.
Sample was diluted an additional 2 fold for Manganese and was reanalyzed on 03/14/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01720	21-03-053	2/4/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	13.5 J	10.1	50.6	ug/g
Antimony	0.509 J	0.131	5.06	ug/g
Arsenic	882	0.576	5.06	ug/g
Barium	0.168 J	0.0404	5.06	ug/g
Beryllium	ND	0.0506	5.06	ug/g
Boron	ND	4.04	10.1	ug/g
Cadmium	0.446 J	0.0202	5.06	ug/g
Chromium	18.5	1.01	5.06	ug/g
Cobalt	3.47	0.121	1.01	ug/g
Copper	62.7	3.36	10.1	ug/g
Lead	9.07 J	1.91	10.1	ug/g
Manganese	277	3.34	10.1	ug/g
Mercury	2440	0.0708	0.506	ug/g
Nickel	21.0	0.627	5.06	ug/g
Selenium	ND	0.718	25.3	ug/g
Silver	ND	0.0607	5.06	ug/g
Thallium	ND	0.334	5.06	ug/g
Tin	2.92 J	0.445	10.1	ug/g
Vanadium	ND	1.01	5.06	ug/g
Zinc	56.8	2.22	10.1	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Nickel, Silver, and Vanadium were reanalyzed on 03/18/03.
Sample was diluted an additional 4 fold for Arsenic and was reanalyzed on 03/18/03.
Sample was diluted an additional 500 fold for Mercury and was reanalyzed on 03/19/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01721	21-03-056	2/4/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.64	48.2	ug/g
Antimony	0.766 J	0.125	4.82	ug/g
Arsenic	8.80	0.550	4.82	ug/g
Barium	0.165 J	0.0386	4.82	ug/g
Beryllium	ND	0.0482	4.82	ug/g
Boron	ND	3.86	9.64	ug/g
Cadmium	0.405 J	0.0193	4.82	ug/g
Chromium	29.9	0.964	4.82	ug/g
Cobalt	7.13	0.116	0.964	ug/g
Copper	4.13 J	3.20	9.64	ug/g
Lead	38.6	1.82	9.64	ug/g
Manganese	438	3.18	9.64	ug/g
Mercury	1.55	0.0675	0.482	ug/g
Nickel	22.9	0.598	4.82	ug/g
Selenium	ND	0.685	24.1	ug/g
Silver	ND	0.0579	4.82	ug/g
Thallium	ND	0.318	4.82	ug/g
Tin	5.00 J	0.424	9.64	ug/g
Vanadium	ND	0.964	4.82	ug/g
Zinc	5.76 J	2.12	9.64	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Nickel, Silver, and Vanadium were reanalyzed on 03/18/03.
Mercury was reanalyzed on 03/19/03.
Sample was diluted an additional 2 fold for Manganese and was reanalyzed on 03/14/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01722	21-03-059	2/5/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	11.1 J	9.53	47.7	ug/g
Antimony	1.86 J	0.124	4.77	ug/g
Arsenic	3270	0.543	4.77	ug/g
Barium	0.419 J	0.0381	4.77	ug/g
Beryllium	ND	0.0477	4.77	ug/g
Boron	ND	3.81	9.53	ug/g
Cadmium	0.576 J	0.0191	4.77	ug/g
Chromium	47.8	0.953	4.77	ug/g
Cobalt	9.43	0.114	0.953	ug/g
Copper	154	3.16	9.53	ug/g
Lead	37.2	1.80	9.53	ug/g
Manganese	539	3.15	9.53	ug/g
Mercury	10300	0.0667	0.477	ug/g
Nickel	23.7	0.591	4.77	ug/g
Selenium	ND	0.677	23.8	ug/g
Silver	ND	0.0572	4.77	ug/g
Thallium	ND	0.315	4.77	ug/g
Tin	11.5	0.419	9.53	ug/g
Vanadium	ND	0.953	4.77	ug/g
Zinc	450	2.10	9.53	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Nickel, Silver, and Vanadium were reanalyzed on 03/18/03.
Sample was diluted an additional 10 fold for Arsenic and Manganese and was reanalyzed on 03/18/03.
Sample was diluted an additional 2000 fold for Mercury and was reanalyzed on 03/19/03
Sample was analyzed a second time for Mercury on 04/01/02 to confirm the result when the sample was analyzed the first time.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01723	21-03-062	2/5/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	31.4 J	9.97	49.9	ug/g
Antimony	0.696 J	0.130	4.99	ug/g
Arsenic	6.34	0.568	4.99	ug/g
Barium	0.853 J	0.0399	4.99	ug/g
Beryllium	ND	0.0499	4.99	ug/g
Boron	ND	3.99	9.97	ug/g
Cadmium	0.461 J	0.0199	4.99	ug/g
Chromium	23.3	0.997	4.99	ug/g
Cobalt	3.50	0.120	0.997	ug/g
Copper	95.7	3.31	9.97	ug/g
Lead	12.6	1.88	9.97	ug/g
Manganese	207	3.29	9.97	ug/g
Mercury	0.221 J	0.0698	0.499	ug/g
Nickel	24.5	0.618	4.99	ug/g
Selenium	ND	0.708	24.9	ug/g
Silver	ND	0.0598	4.99	ug/g
Thallium	ND	0.329	4.99	ug/g
Tin	4.30 J	0.439	9.97	ug/g
Vanadium	ND	0.997	4.99	ug/g
Zinc	80.5	2.19	9.97	ug/g

Comments: Antimony, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Silver, and Vanadium were reanalyzed on 03/14/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01724	21-03-065	2/6/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	160	9.98	49.9	ug/g
Antimony	1.07 J	0.130	4.99	ug/g
Arsenic	6.26	0.569	4.99	ug/g
Barium	0.411 J	0.0399	4.99	ug/g
Beryllium	ND	0.0499	4.99	ug/g
Boron	5.80 J	3.99	9.98	ug/g
Cadmium	0.518 J	0.0200	4.99	ug/g
Chromium	30.2	0.998	4.99	ug/g
Cobalt	4.30	0.120	0.998	ug/g
Copper	25.6	3.31	9.98	ug/g
Lead	22.6	1.89	9.98	ug/g
Manganese	308	3.29	9.98	ug/g
Mercury	0.860	0.0699	0.499	ug/g
Nickel	124	0.619	4.99	ug/g
Selenium	ND	0.709	25.0	ug/g
Silver	ND	0.0599	4.99	ug/g
Thallium	ND	0.329	4.99	ug/g
Tin	13.0	0.439	9.98	ug/g
Vanadium	ND	0.998	4.99	ug/g
Zinc	58.8	2.20	9.98	ug/g

Comments: Antimony, Cadmium, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Silver, Vanadium, and Zinc were reanalyzed on 03/14/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01725	21-03-068	2/7/2003 07:24	2/20/2003 07:23	3/6/2003 07:24	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	17.8 J	10.1	50.4	ug/g
Antimony	1.41 J	0.131	5.04	ug/g
Arsenic	3.07 J	0.575	5.04	ug/g
Barium	2.68 J	0.0403	5.04	ug/g
Beryllium	ND	0.0504	5.04	ug/g
Boron	ND	4.03	10.1	ug/g
Cadmium	0.338 J	0.0202	5.04	ug/g
Chromium	188	1.01	5.04	ug/g
Cobalt	19.1	0.121	1.01	ug/g
Copper	29.4	3.35	10.1	ug/g
Lead	122	1.91	10.1	ug/g
Manganese	790	3.33	10.1	ug/g
Mercury	3.37	0.0706	0.504	ug/g
Nickel	685	0.625	5.04	ug/g
Selenium	ND	0.716	25.2	ug/g
Silver	ND	0.0605	5.04	ug/g
Thallium	ND	0.333	5.04	ug/g
Tin	9.77 J	0.444	10.1	ug/g
Vanadium	ND	1.01	5.04	ug/g
Zinc	29.7	2.22	10.1	ug/g

Comments: Antimony, Cadmium, Chromium, Cobalt, Copper, Silver, and Vanadium were reanalyzed on 03/18/03.
Mercury and Zinc were reanalyzed on 03/19/03
Sample was diluted an additional 4 fold for Nickel and Manganese and was reanalyzed on 03/14/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01801	21-03-071D	2/7/2003 07:24	2/20/2003 07:23	3/6/2003 07:24	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	15.4 J	9.72	48.6	ug/g
Antimony	1.64 J	0.126	4.86	ug/g
Arsenic	3.38 J	0.554	4.86	ug/g
Barium	2.93 J	0.0389	4.86	ug/g
Beryllium	ND	0.0486	4.86	ug/g
Boron	ND	3.89	9.72	ug/g
Cadmium	0.204 J	0.0194	4.86	ug/g
Chromium	216	0.972	4.86	ug/g
Cobalt	20.5	0.117	0.972	ug/g
Copper	34.3	3.14	9.72	ug/g
Lead	146	1.84	9.72	ug/g
Manganese	815	3.21	9.72	ug/g
Mercury	3.65	0.0680	0.486	ug/g
Nickel	626	0.603	4.86	ug/g
Selenium	ND	0.690	24.3	ug/g
Silver	ND	0.0583	4.86	ug/g
Thallium	ND	0.321	4.86	ug/g
Tin	10.8	0.428	9.72	ug/g
Vanadium	ND	0.972	4.86	ug/g
Zinc	38.9	2.14	9.72	ug/g

Comments: Antimony, Cadmium, Chromium, Cobalt, Copper, Silver, and Vanadium were reanalyzed on 03/19/03.
Mercury and Zinc were reanalyzed on 03/19/03.
Sample was diluted an additional 4 fold for Nickel and Manganese and was reanalyzed on 03/14/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01802	21-03-074	2/7/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	12.8 J	10.6	53.1	ug/g
Antimony	2.24 J	0.138	5.31	ug/g
Arsenic	394	0.606	5.31	ug/g
Barium	0.147 J	0.0425	5.31	ug/g
Beryllium	ND	0.0531	5.31	ug/g
Boron	ND	4.25	10.6	ug/g
Cadmium	0.326 J	0.0213	5.31	ug/g
Chromium	49.7	1.06	5.31	ug/g
Cobalt	5.60	0.128	1.06	ug/g
Copper	76.5	3.53	10.6	ug/g
Lead	17.2	2.01	10.6	ug/g
Manganese	370	3.51	10.6	ug/g
Mercury	2140	0.0744	0.531	ug/g
Nickel	96.6	0.659	5.31	ug/g
Selenium	ND	0.755	26.6	ug/g
Silver	ND	0.0638	5.31	ug/g
Thallium	ND	0.351	5.31	ug/g
Tin	9.32 J	0.468	10.6	ug/g
Vanadium	ND	1.06	5.31	ug/g
Zinc	49.5	2.34	10.6	ug/g

Comments: Antimony, Cadmium, Chromium, Cobalt, Copper, Manganese, Nickel, Silver, Vanadium, and Zinc were reanalyzed on 03/18/03. Sample was diluted an additional 500 fold for Mercury and was reanalyzed on 03/19/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01803	21-03-077	2/8/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.6	53.0	ug/g
Antimony	0.914 J	0.138	5.30	ug/g
Arsenic	5.28 J	0.604	5.30	ug/g
Barium	2.52 J	0.0424	5.30	ug/g
Beryllium	ND	0.0530	5.30	ug/g
Boron	ND	4.24	10.6	ug/g
Cadmium	0.406 J	0.0212	5.30	ug/g
Chromium	27.5	1.06	5.30	ug/g
Cobalt	5.38	0.127	1.06	ug/g
Copper	199	3.52	10.6	ug/g
Lead	18.6	2.00	10.6	ug/g
Manganese	460	3.50	10.6	ug/g
Mercury	1.62	0.0742	0.530	ug/g
Nickel	21.4	0.657	5.30	ug/g
Selenium	ND	0.752	26.5	ug/g
Silver	ND	0.0636	5.30	ug/g
Thallium	ND	0.350	5.30	ug/g
Tin	1.99 J	0.466	10.6	ug/g
Vanadium	ND	1.06	5.30	ug/g
Zinc	219	2.33	10.6	ug/g

Comments: Antimony, Cadmium, Chromium, Cobalt, Copper, Manganese, Nickel, Mercury, Silver, Vanadium and Zinc were reanalyzed on 3/14/03

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01804	21-03-080	2/8/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.0	50.2	ug/g
Antimony	1.47 J	0.131	5.02	ug/g
Arsenic	12.7	0.572	5.02	ug/g
Barium	0.149 J	0.0402	5.02	ug/g
Beryllium	ND	0.0502	5.02	ug/g
Boron	ND	4.02	10.0	ug/g
Cadmium	0.335 J	0.0201	5.02	ug/g
Chromium	19.1	1.00	5.02	ug/g
Cobalt	6.36	0.120	1.00	ug/g
Copper	40.4	3.24	10.0	ug/g
Lead	21.3	1.90	10.0	ug/g
Manganese	434	3.31	10.0	ug/g
Mercury	0.336 J	0.0703	0.502	ug/g
Nickel	44.2	0.622	5.02	ug/g
Selenium	ND	0.713	25.1	ug/g
Silver	ND	0.0602	5.02	ug/g
Thallium	ND	0.331	5.02	ug/g
Tin	11.2	0.442	10.0	ug/g
Vanadium	ND	1.00	5.02	ug/g
Zinc	96.8	2.21	10.0	ug/g

Comments: Antimony, Cadmium, Chromium, Cobalt, Copper, Nickel, Silver, and Vanadium were reanalyzed on 03/18/03.
Mercury and Zinc were reanalyzed on 03/19/03.
Sample was diluted an additional 2 fold for Manganese and was reanalyzed om 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01805	21-03-083	2/8/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	28.3 J	10.9	54.6	ug/g
Antimony	1.70 J	0.142	5.46	ug/g
Arsenic	384	0.622	5.46	ug/g
Barium	0.781 J	0.0437	5.46	ug/g
Beryllium	ND	0.0546	5.46	ug/g
Boron	ND	4.37	10.9	ug/g
Cadmium	0.389 J	0.0218	5.46	ug/g
Chromium	38.6	1.09	5.46	ug/g
Cobalt	5.66	0.131	1.09	ug/g
Copper	114	3.62	10.9	ug/g
Lead	19.0	2.06	10.9	ug/g
Manganese	370	3.60	10.9	ug/g
Mercury	0.489 J	0.0764	0.546	ug/g
Nickel	16.9	0.677	5.46	ug/g
Selenium	ND	0.775	27.3	ug/g
Silver	ND	0.0655	5.46	ug/g
Thallium	ND	0.360	5.46	ug/g
Tin	52.2	0.480	10.9	ug/g
Vanadium	1.41 J	1.09	5.46	ug/g
Zinc	147	2.40	10.9	ug/g

Comments: Antimony, Cadmium, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Silver, Vanadium and Zinc were reanalyzed on 03/14/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01806	21-03-086	2/10/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.70	48.5	ug/g
Antimony	2.41 J	0.126	4.85	ug/g
Arsenic	42.0	0.553	4.85	ug/g
Barium	0.0753 J	0.0388	4.85	ug/g
Beryllium	ND	0.0485	4.85	ug/g
Boron	ND	3.88	9.70	ug/g
Cadmium	0.378 J	0.0194	4.85	ug/g
Chromium	9.50	0.970	4.85	ug/g
Cobalt	4.93	0.116	0.970	ug/g
Copper	218	3.22	9.70	ug/g
Lead	86.0	1.83	9.70	ug/g
Manganese	349	3.20	9.70	ug/g
Mercury	2.23	0.0679	0.485	ug/g
Nickel	56.2	0.601	4.85	ug/g
Selenium	ND	0.689	24.2	ug/g
Silver	0.0625 J	0.0582	4.85	ug/g
Thallium	ND	0.320	4.85	ug/g
Tin	3.08 J	0.427	9.70	ug/g
Vanadium	ND	0.970	4.85	ug/g
Zinc	115	2.13	9.70	ug/g

Comments: Antimony, Cadmium, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Silver, Vanadium and Zinc were reanalyzed on 03/14/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-01807	21-03-089	2/10/2003 07:24	2/20/2003 07:23	11/13/2003 10:25	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	Result	MDL	PQL	Units
Aluminum	14.1 J	9.67	48.4	ug/g
Antimony	ND	0.126	4.84	ug/g
Arsenic	39.7	0.551	4.84	ug/g
Barium	0.316 J	0.0387	4.84	ug/g
Beryllium	ND	0.0484	4.84	ug/g
Boron	ND	3.87	9.67	ug/g
Cadmium	0.371 J	0.0193	4.84	ug/g
Chromium	16.1	0.967	4.84	ug/g
Cobalt	3.69	0.116	0.967	ug/g
Copper	290	3.21	9.67	ug/g
Lead	35.4	1.83	9.67	ug/g
Manganese	290	3.19	9.67	ug/g
Mercury	0.141 J	0.0677	0.484	ug/g
Nickel	32.9	0.600	4.84	ug/g
Selenium	ND	0.687	24.2	ug/g
Silver	ND	0.0580	4.84	ug/g
Thallium	ND	0.319	4.84	ug/g
Tin	1.10 J	0.426	9.67	ug/g
Vanadium	1.11 J	0.967	4.84	ug/g
Zinc	220	2.13	9.67	ug/g

Comments: Antimony, Cadmium, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Silver, Vanadium and Zinc were reanalyzed on 03/14/03.

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Report of Analysis

Method Blank

Lab ID	Sample ID	Reported
3677	MB for HBN 4006 [PREP/1413] *(Results reported on a wet weight basis)*	3/20/2003 17:00

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/26/2003 17:53	ssh	4101

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	10.2	12.5 ug/mL	123	50 - 150

Method Blank

Lab ID	Sample ID	Reported
3664	MB for HBN 4004 [PREP/1411] *(Results reported on a wet weight basis)*	3/20/2003 17:00

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/6/2003 23:45	ssh	4102

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	10	10.8 ug/mL	108	50 - 150

Method Blank

Lab ID	Sample ID	Reported
3736	MB for HBN 4201 [PREP/1416] *(Results reported on a wet weight basis)*	3/20/2003 17:00

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	2/28/2003 19:24	ssh	4702

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	103	107 ug/mL	104	50 - 150

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Report of Analysis

Method Blank

Lab ID	Sample ID	Reported
3671	MB for HBN 4005 [PREP/1412] *(Results reported on a wet weight basis)*	3/20/2003 17:00

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/26/2003 13:10	4005	AM126 Lewisite in HD by GC	1	3/17/2003 21:45	ssh	4203

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.95	5.00	ug/g

Method Blank

Lab ID	Sample ID	Reported
4415	MB for HBN 7505 [PREP/1454] *(Results reported on a wet weight basis)*	3/20/2003 17:00

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
5/20/2003 10:48	7505	AM098 HD Purity by GC	1	5/22/2003 11:15	tfr	7604

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	0.00			%

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Report of Analysis

Method Blank

Lab ID	Sample ID	Reported
3720	MB for HBN 4103 [PREP/1415]	3/20/2003 17:00

(Results reported on a wet weight basis)

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/25/2003 12:45	4103	AM118 Metals in Liq HD by ICP	1	2/25/2003 19:32	blb	5001

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.0	50.0	ug/g
Antimony	ND	0.630	5.00	ug/g
Arsenic	ND	1.22	5.00	ug/g
Barium	ND	0.430	5.00	ug/g
Beryllium	ND	0.900	5.00	ug/g
Boron	ND	3.74	10.0	ug/g
Cadmium	ND	0.410	5.00	ug/g
Chromium	ND	1.29	5.00	ug/g
Cobalt	ND	0.270	1.00	ug/g
Copper	ND	2.43	5.00	ug/g
Lead	ND	0.410	5.00	ug/g
Manganese	ND	0.320	1.00	ug/g
Mercury	ND	0.0500	0.500	ug/g
Nickel	ND	0.350	5.00	ug/g
Selenium	3.51 J	1.17	10.0	ug/g
Silver	ND	0.470	5.00	ug/g
Thallium	ND	0.980	5.00	ug/g
Tin	ND	2.49	10.0	ug/g
Vanadium	ND	1.00	5.00	ug/g
Zinc	ND	3.12	10.0	ug/g

Method Blank

Lab ID	Sample ID	Reported
3691	MB for HBN 4008 [PREP/1414]	3/21/2003 17:00

(Results reported on a wet weight basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/24/2003 13:22	4008	AM118 Metals in Sld HD by ICP	1	2/25/2003 23:53	blb	5208

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.0	50.0	ug/g
Antimony	ND	0.130	5.00	ug/g
Arsenic	ND	0.570	5.00	ug/g
Barium	0.0424 J	0.0400	5.00	ug/g
Beryllium	ND	0.0500	5.00	ug/g
Boron	ND	4.00	10.0	ug/g
Cadmium	0.294 J	0.0200	5.00	ug/g
Chromium	ND	1.00	5.00	ug/g
Cobalt	ND	0.120	1.00	ug/g
Copper	ND	3.23	10.0	ug/g

Report of Analysis

Method Blank

Lead	ND	1.89	10.0	ug/g
Manganese	ND	3.30	10.0	ug/g
Mercury	ND	0.0700	0.500	ug/g
Nickel	ND	0.620	5.00	ug/g
Selenium	ND	0.710	25.0	ug/g
Silver	ND	0.0600	5.00	ug/g
Thallium	ND	0.330	5.00	ug/g
Tin	ND	0.440	10.0	ug/g
Vanadium	ND	1.00	5.00	ug/g
Zinc	ND	2.20	10.0	ug/g

Method Blank

Lab ID	*Sample ID*	*Reported*
3657	MB for HBN 4003 [PREP/1410]	3/21/2003 17:00
	(Results reported on a wet weight basis)	

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
2/21/2003 14:57	4003	AM118 Metals in Sld HD by ICP	1	2/26/2003 2:26	blb	5301

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.0	50.0	ug/g
Antimony	ND	0.130	5.00	ug/g
Arsenic	ND	0.570	5.00	ug/g
Barium	0.213 J	0.0400	5.00	ug/g
Beryllium	ND	0.0500	5.00	ug/g
Boron	ND	4.00	10.0	ug/g
Cadmium	0.346 J	0.0200	5.00	ug/g
Chromium	ND	1.00	5.00	ug/g
Cobalt	ND	0.120	1.00	ug/g
Copper	ND	3.32	10.0	ug/g
Lead	ND	1.89	10.0	ug/g
Manganese	ND	3.30	10.0	ug/g
Mercury	ND	0.0700	0.500	ug/g
Nickel	ND	0.620	5.00	ug/g
Selenium	ND	0.710	25.0	ug/g
Silver	ND	0.0600	5.00	ug/g
Thallium	ND	0.330	5.00	ug/g
Tin	0.704 J	0.440	10.0	ug/g
Vanadium	ND	1.00	5.00	ug/g
Zinc	3.28 J	2.20	10.0	ug/g

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Method Blank

Lab ID	Sample ID	Reported
3677	MB for HBN 4006 [PREP/1413] *(Results reported on a wet weight basis)*	3/20/2003 17:00

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:11	4006	AM100 Non-Vols in HD by GC	1	2/26/2003 17:53	ssh	4101

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	210	250	ug/g

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Method Blank

Lab ID	Sample ID	Reported
3664	MB for HBN 4004 [PREP/1411] *(Results reported on a wet weight basis)*	3/20/2003 17:00

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/21/2003 10:34	4004	AM117 Semi-Vols Liq HD by GC	1	3/6/2003 23:45	ssh	4102

Parameter	Result	MDL	PQL	Units
T	ND	70.0	2500	ug/g
Q	ND	51.0	2500	ug/g
Hexachloroethane	ND	80.0	2500	ug/g

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Lab ID	Sample ID	Reported
3736	MB for HBN 4201 [PREP/1416] *(Results reported on a wet weight basis)*	3/20/2003 17:00

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
2/27/2003 12:26	4201	AM101 Vols in Liquid HD by GC	1	2/28/2003 19:24	ssh	4702

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	ND	260	500	ug/g
Tetrachloroethylene	ND	100	500	ug/g
1,1,2,2-Tetrachloroethane	ND	150	500	ug/g

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Report of Analysis

QC Summary

LCS Lab ID: 3672 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 4005 — **Analytical:** 4203

AM126 Lewisite in HD by GC	Expected	Result	Recovery	Rec Limits
Lewisite	25.2 ug/g	28.3	112	50 - 150

DUP Lab ID: 3673 — **Original Lab ID:** 030004-01602 — **Matrix:** Liquid — **Prep Batch:** 4005 — **Analytical:** 4203

AM126 Lewisite in HD by GC	Original Result	Result	RPD	RPD Limits
Lewisite	0	0	0	0 - 25

MS Lab ID: 3674 — **Original Lab ID:** 030004-01602 — **Matrix:** Liquid — **Prep Batch:** 4005 — **Analytical:** 4203

AM126 Lewisite in HD by GC	Original Result	Expected	Result	Recovery	Rec Limits
Lewisite	0	26.1 ug/g	38.4	148	50 - 150

MSD Lab ID: 3675 — **Original Lab ID:** 030004-01602 — **Matrix:** Liquid — **Prep Batch:** 4005 — **Analytical:** 4203

AM126 Lewisite in HD by GC	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Lewisite	26.8 ug/g	20.2	75.5	50 - 150	64.9 *	0 - 25

LCS Lab ID: 3676 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 4005 — **Analytical:** 4203

AM126 Lewisite in HD by GC	Expected	Result	Recovery	Rec Limits
Lewisite	25.2 ug/g	32.3	128	50 - 150

LCS Lab ID: 4416 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 7505 — **Analytical:** 7604

AM098 HD Purity by GC	Expected	Result	Recovery	Rec Limits
bis-(2-Chloroethyl)sulfide	98.4 %	95	96.6	85 - 115

DUP Lab ID: 4417 — **Original Lab ID:** 030004-01602 — **Matrix:** Liquid — **Prep Batch:** 7505 — **Analytical:** 7604

AM098 HD Purity by GC	Original Result	Result	RPD	RPD Limits
bis-(2-Chloroethyl)sulfide	88.2	85.6	3	0 - 25

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Report of Analysis

QC Summary

LCS Lab ID: 3721 | Original Lab ID: | Prep Batch: 4103
Matrix: Liquid | Analytical: 5001

AM118 Metals in Liq HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	500 ug/g	489	97.8	75 - 125
Antimony	50 ug/g	44.2	88.4	75 - 125
Arsenic	50 ug/g	51.7	103	75 - 125
Barium	50 ug/g	49.4	98.8	75 - 125
Beryllium	50 ug/g	47.1	94.2	75 - 125
Boron	500 ug/g	388	77.6	75 - 125
Cadmium	50 ug/g	50.7	101	75 - 125
Chromium	50 ug/g	49.5	99	75 - 125
Cobalt	50 ug/g	47.8	95.6	75 - 125
Copper	50 ug/g	49.7	99.4	75 - 125
Lead	50 ug/g	49.1	98.2	75 - 125
Manganese	50 ug/g	49.2	98.4	75 - 125
Mercury	2.5 ug/g	2.67	107	75 - 125
Nickel	50 ug/g	48	96	75 - 125
Selenium	50 ug/g	51.4	103	75 - 125
Silver	50 ug/g	49.7	99.4	75 - 125
Thallium	50 ug/g	47.3	94.6	75 - 125
Tin	50 ug/g	48.7	97.4	75 - 125
Vanadium	50 ug/g	47.6	95.2	75 - 125
Zinc	50 ug/g	52.1	104	75 - 125

DUP Lab ID: 3722 | Original Lab ID: 030004-01602 | Prep Batch: 4103
Matrix: Liquid | Analytical: 5001

AM118 Metals In Liq HD by ICP	Original Result	Result	RPD	RPD Limits
Aluminum	5.14	2.97	53.5 *	0 - 20
Antimony	1.24	0.264	130 *	0 - 20
Arsenic	0.145	0.677	130 *	0 - 20
Barium	0.0923	0.0187	133 *	0 - 20
Beryllium	0.0137	0.0131	4.91	0 - 20
Boron	5.22	3.09	51.4 *	0 - 20
Cadmium	0.302	0.275	9.17	0 - 20
Chromium	10.9	4.85	77.1 *	0 - 20
Cobalt	0.0316	0.0149	71.7 *	0 - 20
Copper	20.4	20.3	0.688	0 - 20
Lead	0.212	0.166	24.4 *	0 - 20
Manganese	0.319	0.0859	115 *	0 - 20
Mercury	0.365	0.315	14.9	0 - 20
Nickel	1.52	0.057	186 *	0 - 20
Selenium	0.572	0.846	38.5 *	0 - 20
Silver	0.0239	0.0147	47.5 *	0 - 20
Thallium	0.219	0.0885	84.7 *	0 - 20
Tin	0.0708	0.0423	50.4 *	0 - 20
Vanadium	1.03	1.29	22.1 *	0 - 20
Zinc	1.95	1.62	18.1	0 - 20

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Report of Analysis

MS Lab ID: 3723 | Original Lab ID: 030004-01602 | Prep Batch: 4103
Matrix: Liquid | Analytical: 5001

AM118 Metals in Liq HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Aluminum	5.14	500 ug/g	532	105	75 - 125
Antimony	1.24	50 ug/g	51.2	99.9	75 - 125
Arsenic	0.145	50 ug/g	52.8	105	50 - 150
Barium	0.0923	50 ug/g	52.3	104	75 - 125
Beryllium	0.0137	50 ug/g	48.5	97	75 - 125
Boron	5.22	500 ug/g	428	84.6	75 - 125
Cadmium	0.302	50 ug/g	51.6	103	75 - 125
Chromium	10.9	50 ug/g	60.9	99.9	75 - 125
Cobalt	0.0316	50 ug/g	53	106	75 - 125
Copper	20.4	50 ug/g	79.2	118	75 - 125
Lead	0.212	50 ug/g	52.4	104	75 - 125
Manganese	0.319	50 ug/g	54.2	108	75 - 125
Mercury	0.365	2.5 ug/g	2.68	92.6	50 - 150
Nickel	1.52	50 ug/g	53.5	104	75 - 125
Selenium	0.572	50 ug/g	52.6	104	50 - 150
Silver	0.0239	50 ug/g	53.6	107	50 - 150
Thallium	0.219	50 ug/g	51.8	103	75 - 125
Tin	0.0708	50 ug/g	51.8	103	75 - 125
Vanadium	1.03	50 ug/g	55.2	108	75 - 125
Zinc	1.95	50 ug/g	52.7	102	50 - 150

MSD Lab ID: 3724 | Original Lab ID: 030004-01602 | Prep Batch: 4103
Matrix: Liquid | Analytical: 5001

AM118 Metals in Liq HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	505 ug/g	480	94.2	75 - 125	10.8	0 - 25
Antimony	50.5 ug/g	49.7	96.1	75 - 125	3.88	0 - 25
Arsenic	50.5 ug/g	52.2	103	50 - 150	1.92	0 - 25
Barium	50.5 ug/g	50.4	99.6	75 - 125	4.32	0 - 25
Beryllium	50.5 ug/g	48.2	95.6	75 - 125	1.45	0 - 25
Boron	505 ug/g	419	82	75 - 125	3.12	0 - 25
Cadmium	50.5 ug/g	50.2	98.8	75 - 125	4.16	0 - 25
Chromium	50.5 ug/g	59.6	96.5	75 - 125	3.46	0 - 25
Cobalt	50.5 ug/g	51.3	102	75 - 125	3.85	0 - 25
Copper	50.5 ug/g	74	106	75 - 125	10.7	0 - 25
Lead	50.5 ug/g	51	101	75 - 125	2.93	0 - 25
Manganese	50.5 ug/g	53	104	75 - 125	3.77	0 - 25
Mercury	2.52 ug/g	2.67	91.5	50 - 150	1.2	0 - 25
Nickel	50.5 ug/g	51.7	99.4	75 - 125	4.52	0 - 25
Selenium	50.5 ug/g	52	102	50 - 150	1.94	0 - 25
Silver	50.5 ug/g	52.2	103	50 - 150	3.81	0 - 25
Thallium	50.5 ug/g	50.4	99.4	75 - 125	3.56	0 - 25
Tin	50.5 ug/g	51	101	75 - 125	1.96	0 - 25
Vanadium	50.5 ug/g	54.1	105	75 - 125	2.82	0 - 25
Zinc	50.5 ug/g	51.1	97.3	50 - 150	4.72	0 - 25

LCS Lab ID: 3692 | Original Lab ID: | Prep Batch: 4008
Matrix: Solid | Analytical: 5208

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LCS Lab ID: 3692 | Original Lab ID: | Prep Batch: 4008
Matrix: Solid | Analytical: 5208

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	500 ug/g	475	95	75 - 125
Antimony	50 ug/g	56.1	112	75 - 125
Arsenic	50 ug/g	52	104	75 - 125
Barium	50 ug/g	50.5	101	75 - 125
Beryllium	50 ug/g	50.2	100	75 - 125
Boron	500 ug/g	422	84.4	75 - 125
Cadmium	50 ug/g	52.6	105	75 - 125
Chromium	50 ug/g	52.2	104	75 - 125
Cobalt	50 ug/g	50.5	101	75 - 125
Copper	50 ug/g	51.9	104	75 - 125
Lead	50 ug/g	51	102	75 - 125
Manganese	50 ug/g	51.8	104	75 - 125
Mercury	2.5 ug/g	2.79	112	75 - 125
Nickel	50 ug/g	49.8	99.6	75 - 125
Selenium	50 ug/g	51.3	103	75 - 125
Silver	50 ug/g	51.5	103	75 - 125
Thallium	50 ug/g	49.5	99	75 - 125
Tin	50 ug/g	51.4	103	75 - 125
Vanadium	50 ug/g	50.5	101	75 - 125
Zinc	50 ug/g	53.9	108	75 - 125

DUP Lab ID: 3693 | Original Lab ID: 030004-01621 | Prep Batch: 4008
Matrix: Non-cohesive Solid | Analytical: 5208

AM118 Metals in NCS HD by ICP	Original Result	Result	RPD	RPD Limits
Aluminum	8.43	10.1	17.9	0 - 20
Antimony	0.75	0.666	11.8	0 - 20
Arsenic	381	316	18.7	0 - 20
Barium	0.0992	0.0684	36.7 *	0 - 20
Beryllium	0.0425	0.0162	89.4 *	0 - 20
Boron	4.91	3.54	32.3 *	0 - 20
Cadmium	0.663	0.648	2.32	0 - 20
Chromium	14.1	13	7.94	0 - 20
Cobalt	2.36	2.09	12.1	0 - 20
Copper	49.6	46.4	6.63	0 - 20
Lead	6.26	5.98	4.59	0 - 20
Manganese	163	144	12.3	0 - 20
Mercury	0.289	0.291	0.799	0 - 20
Nickel	12.6	11.2	11.7	0 - 20
Selenium	0	0	0	0 - 20
Silver	0.328	0.297	9.89	0 - 20
Thallium	0.292	0.108	92.2 *	0 - 20
Tin	11.9	12.3	3.19	0 - 20
Vanadium	0.982	0.92	6.55	0 - 20
Zinc	46.1	42.5	8	0 - 20

MS Lab ID: 3694 | Original Lab ID: 030004-01621 | Prep Batch: 4008
Matrix: Non-cohesive Solid | Analytical: 5208

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MS Lab ID: 3694 | Original Lab ID: 030004-01621 | Prep Batch: 4008
Matrix: Non-cohesive Solid | Analytical: 5208

AM118 Metals in NCS HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Aluminum	8.43	508 ug/g	466	90.1	75 - 125
Antimony	0.75	50.8 ug/g	51.9	101	75 - 125
Arsenic	381	50.8 ug/g	448	130	50 - 150
Barium	0.0992	50.8 ug/g	49.1	96.6	75 - 125
Beryllium	0.0425	50.8 ug/g	48.7	95.9	75 - 125
Boron	4.91	508 ug/g	452	88	75 - 125
Cadmium	0.663	50.8 ug/g	52.7	102	75 - 125
Chromium	14.1	50.8 ug/g	65.4	101	75 - 125
Cobalt	2.36	50.8 ug/g	53.2	100	75 - 125
Copper	49.6	50.8 ug/g	102	102	75 - 125
Lead	6.26	50.8 ug/g	54.7	95.5	75 - 125
Manganese	163	50.8 ug/g	279	228 *	75 - 125
Mercury	0.289	2.54 ug/g	3.25	117	50 - 150
Nickel	12.6	50.8 ug/g	62.4	98.3	75 - 125
Selenium	0	50.8 ug/g	52.5	103	50 - 150
Silver	0.328	50.8 ug/g	44	86	50 - 150
Thallium	0.292	50.8 ug/g	47.2	92.4	75 - 125
Tin	11.9	50.8 ug/g	71.3	117	75 - 125
Vanadium	0.982	50.8 ug/g	51.9	100	75 - 125
Zinc	46.1	50.8 ug/g	110	125	50 - 150

MSD Lab ID: 3695 | Original Lab ID: 030004-01621 | Prep Batch: 4008
Matrix: Non-cohesive Solid | Analytical: 5208

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	503 ug/g	510	99.7	75 - 125	10.1	0 - 25
Antimony	50.3 ug/g	50.4	98.7	75 - 125	2.3	0 - 25
Arsenic	50.3 ug/g	420	75.6	50 - 150	52.9 *	0 - 25
Barium	50.3 ug/g	53	105	75 - 125	8.33	0 - 25
Beryllium	50.3 ug/g	52.9	105	75 - 125	9.06	0 - 25
Boron	503 ug/g	437	85.8	75 - 125	2.53	0 - 25
Cadmium	50.3 ug/g	57	112	75 - 125	9.35	0 - 25
Chromium	50.3 ug/g	68.3	108	75 - 125	6.7	0 - 25
Cobalt	50.3 ug/g	56.2	107	75 - 125	6.76	0 - 25
Copper	50.3 ug/g	107	113	75 - 125	10.2	0 - 25
Lead	50.3 ug/g	57.4	102	75 - 125	6.58	0 - 25
Manganese	50.3 ug/g	237	147 *	75 - 125	43.2 *	0 - 25
Mercury	2.52 ug/g	3.17	115	50 - 150	1.72	0 - 25
Nickel	50.3 ug/g	67.7	110	75 - 125	11.2	0 - 25
Selenium	50.3 ug/g	55	109	50 - 150	5.66	0 - 25
Silver	50.3 ug/g	47.9	94.5	50 - 150	9.42	0 - 25
Thallium	50.3 ug/g	51.1	101	75 - 125	8.89	0 - 25
Tin	50.3 ug/g	65.8	107	75 - 125	8.93	0 - 25
Vanadium	50.3 ug/g	55.4	108	75 - 125	7.69	0 - 25
Zinc	50.3 ug/g	104	114	50 - 150	9.21	0 - 25

LCS Lab ID: 3696 | Original Lab ID: | Prep Batch: 4008
Matrix: Solid | Analytical: 5208

Report of Analysis

LCS Lab ID: 3696 | Original Lab ID: | Prep Batch: 4008
Matrix: Solid | Analytical: 5208

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	6000 ug/g	6260	104	75 - 125
Arsenic	141 ug/g	168	119	75 - 125
Barium	58.2 ug/g	71.4	123	75 - 125
Chromium	111 ug/g	130	117	75 - 125
Cobalt	11.1 ug/g	13.2	119	75 - 125
Copper	398 ug/g	421	106	75 - 125
Lead	5.73 ug/g	8.3	145 *	75 - 125
Manganese	480 ug/g	555	116	75 - 125
Nickel	195 ug/g	225	115	75 - 125
Vanadium	11.9 ug/g	15.7	132 *	75 - 125
Zinc	249 ug/g	267	107	75 - 125

LCSD Lab ID: 3697 | Original Lab ID: | Prep Batch: 4008
Matrix: Solid | Analytical: 5208

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	6000 ug/g	5800	96.6	75 - 125	7.38	0 - 25
Arsenic	141 ug/g	151	107	75 - 125	10.6	0 - 25
Barium	58.2 ug/g	63	108	75 - 125	13	0 - 25
Chromium	111 ug/g	117	105	75 - 125	10.8	0 - 25
Cobalt	11.1 ug/g	11.9	107	75 - 125	10.6	0 - 25
Copper	398 ug/g	377	94.8	75 - 125	11.2	0 - 25
Lead	5.73 ug/g	5.74	100	75 - 125	36.7 *	0 - 25
Manganese	480 ug/g	486	101	75 - 125	13.8	0 - 25
Nickel	195 ug/g	201	103	75 - 125	11	0 - 25
Vanadium	11.9 ug/g	14.5	122	75 - 125	7.87	0 - 25
Zinc	249 ug/g	244	98.1	75 - 125	8.68	0 - 25

LCS Lab ID: 3658 | Original Lab ID: 3657 | Prep Batch: 4003
Matrix: Solid | Analytical: 5301

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	500 ug/g	491	96.4	75 - 125
Antimony	50 ug/g	50.3	101	75 - 125
Arsenic	50 ug/g	54.4	109	75 - 125
Barium	50 ug/g	52.2	104	75 - 125
Beryllium	50 ug/g	51.6	103	75 - 125
Boron	500 ug/g	443	88.2	75 - 125
Cadmium	50 ug/g	56.3	112	75 - 125
Chromium	50 ug/g	49.5	97.4	75 - 125
Cobalt	50 ug/g	47.2	94.4	75 - 125
Copper	50 ug/g	50.1	99.7	75 - 125
Lead	50 ug/g	49.9	99.7	75 - 125
Manganese	50 ug/g	48.6	96.8	75 - 125
Mercury	2.5 ug/g	2.66	105	75 - 125
Nickel	50 ug/g	47.7	95.4	75 - 125
Selenium	50 ug/g	53.3	107	75 - 125
Silver	50 ug/g	47.6	95.2	75 - 125

Report of Analysis

LCS Lab ID: 3658 | Original Lab ID: 3657 | Matrix: Solid | Prep Batch: 4003 | Analytical: 5301

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits
Thallium	50 ug/g	48.8	97.5	75 - 125
Tin	50 ug/g	52.9	104	75 - 125
Vanadium	50 ug/g	48.7	97.2	75 - 125
Zinc	50 ug/g	56.6	107	75 - 125

DUP Lab ID: 3659 | Original Lab ID: 030004-01714 | Matrix: Solid | Prep Batch: 4003 | Analytical: 5301

AM118 Metals in Sld HD by ICP	Original Result	Result	RPD	RPD Limits
Aluminum	10.8	6.05	56.8 *	0 - 20
Antimony	1.11	1.07	3.51	0 - 20
Arsenic	1520	1340	12.7	0 - 20
Barium	0.37	0.301	20.8 *	0 - 20
Beryllium	0.0131	0.00451	97.6 *	0 - 20
Boron	3.99	1.49	91.3 *	0 - 20
Cadmium	1.5	1.23	19.4	0 - 20
Chromium	23	22.5	2.07	0 - 20
Cobalt	4.29	4.06	5.33	0 - 20
Copper	129	126	2.22	0 - 20
Lead	35.5	28.1	23.2 *	0 - 20
Manganese	319	304	4.96	0 - 20
Mercury	0.392	0.325	18.6	0 - 20
Nickel	29.7	29.1	1.91	0 - 20
Selenium	0	0	0	0 - 20
Silver	0.93	0.961	3.23	0 - 20
Thallium	0.224	0.0738	101 *	0 - 20
Tin	29.1	30	3.1	0 - 20
Vanadium	0.232	0.294	23.7 *	0 - 20
Zinc	118	99.6	17.1	0 - 20

MS Lab ID: 3660 | Original Lab ID: 030004-01714 | Matrix: Solid | Prep Batch: 4003 | Analytical: 5301

AM118 Metals in Sld HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Aluminum	10.8	497 ug/g	572	113	75 - 125
Antimony	1.11	49.7 ug/g	54.2	107	75 - 125
Arsenic	1520	49.7 ug/g	2020	1010 *	50 - 150
Barium	0.37	49.7 ug/g	51.4	103	75 - 125
Beryllium	0.0131	49.7 ug/g	54	109	75 - 125
Boron	3.99	497 ug/g	402	80.2	75 - 125
Cadmium	1.5	49.7 ug/g	53.9	106	75 - 125
Chromium	23	49.7 ug/g	74.4	104	75 - 125
Cobalt	4.29	49.7 ug/g	53	98.2	75 - 125
Copper	129	49.7 ug/g	181	104	75 - 125
Lead	35.5	49.7 ug/g	95.3	121	75 - 125
Manganese	319	49.7 ug/g	416	195 *	75 - 125
Mercury	0.392	2.48 ug/g	3.38	120	50 - 150
Nickel	29.7	49.7 ug/g	82.5	106	75 - 125

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MS Lab ID: 3660 | Original Lab ID: 030004-01714 | Matrix: Solid | Prep Batch: 4003 | Analytical: 5301

AM118 Metals in Sld HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Selenium	0	49.7 ug/g	44.5	89.6	50 - 150
Silver	0.93	49.7 ug/g	50	98.9	50 - 150
Thallium	0.224	49.7 ug/g	40.4	80.9	75 - 125
Tin	29.1	49.7 ug/g	85.2	113	75 - 125
Vanadium	0.232	49.7 ug/g	52.2	105	75 - 125
Zinc	118	49.7 ug/g	170	104	50 - 150

MSD Lab ID: 3661 | Original Lab ID: 030004-01714 | Matrix: Solid | Prep Batch: 4003 | Analytical: 5301

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	514 ug/g	576	110	75 - 125	2.69	0 - 25
Antimony	51.4 ug/g	53.5	102	75 - 125	4.78	0 - 25
Arsenic	51.4 ug/g	1730	420 *	50 - 150	82.5 *	0 - 25
Barium	51.4 ug/g	56	108	75 - 125	4.74	0 - 25
Beryllium	51.4 ug/g	58.8	114	75 - 125	4.48	0 - 25
Boron	514 ug/g	480	92.6	75 - 125	14.4	0 - 25
Cadmium	51.4 ug/g	55.6	105	75 - 125	0.948	0 - 25
Chromium	51.4 ug/g	73.9	99	75 - 125	4.93	0 - 25
Cobalt	51.4 ug/g	52.9	94.5	75 - 125	3.84	0 - 25
Copper	51.4 ug/g	181	101	75 - 125	2.93	0 - 25
Lead	51.4 ug/g	96.4	118	75 - 125	2.51	0 - 25
Manganese	51.4 ug/g	376	109	75 - 125	56.6 *	0 - 25
Mercury	2.57 ug/g	3.46	119	50 - 150	0.837	0 - 25
Nickel	51.4 ug/g	83.2	104	75 - 125	1.9	0 - 25
Selenium	51.4 ug/g	56.7	110	50 - 150	20.4	0 - 25
Silver	51.4 ug/g	51.7	98.8	50 - 150	0.101	0 - 25
Thallium	51.4 ug/g	51.3	99.4	75 - 125	20.5	0 - 25
Tin	51.4 ug/g	80.7	100	75 - 125	12.2	0 - 25
Vanadium	51.4 ug/g	54	105	75 - 125	0	0 - 25
Zinc	51.4 ug/g	160	82.2	50 - 150	23.4	0 - 25

LCS Lab ID: 3662 | Original Lab ID: | Matrix: Solid | Prep Batch: 4003 | Analytical: 5301

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	6000 ug/g	5770	96.2	75 - 125
Arsenic	141 ug/g	156	110	75 - 125
Barium	58.2 ug/g	65.1	112	75 - 125
Chromium	111 ug/g	116	105	75 - 125
Cobalt	11.1 ug/g	11.9	107	75 - 125
Copper	398 ug/g	384	96.4	75 - 125
Lead	5.73 ug/g	6	105	75 - 125
Manganese	480 ug/g	488	102	75 - 125
Nickel	195 ug/g	200	103	75 - 125
Vanadium	11.9 ug/g	14.4	121	75 - 125
Zinc	249 ug/g	243	97.7	75 - 125

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LCSD Lab ID: 3663 | Original Lab ID: | Prep Batch: 4003
Matrix: Solid | Analytical: 5301

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	6000 ug/g	5830	97.2	75 - 125	1.03	0 - 25
Arsenic	141 ug/g	159	113	75 - 125	2.69	0 - 25
Barium	58.2 ug/g	68.1	117	75 - 125	4.37	0 - 25
Chromium	111 ug/g	120	108	75 - 125	2.82	0 - 25
Cobalt	11.1 ug/g	12.2	110	75 - 125	2.76	0 - 25
Copper	398 ug/g	393	98.9	75 - 125	2.56	0 - 25
Lead	5.73 ug/g	6.04	105	75 - 125	0	0 - 25
Manganese	480 ug/g	503	105	75 - 125	2.9	0 - 25
Nickel	195 ug/g	207	106	75 - 125	2.87	0 - 25
Vanadium	11.9 ug/g	15.2	128 *	75 - 125	5.62	0 - 25
Zinc	249 ug/g	249	99.9	75 - 125	2.23	0 - 25

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Report of Analysis

QC Summary

LCS Lab ID: 3678 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 4006 — **Analytical:** 4101

AM100 Non-Vols in HD by GC	Expected	Result	Recovery	Rec Limits
Thiodiglycol (TDG)	1020 ug/g	1190	117	50 - 150

DUP Lab ID: 3679 — **Original Lab ID:** 030004-01602 — **Matrix:** Liquid — **Prep Batch:** 4006 — **Analytical:** 4101

AM100 Non-Vols in HD by GC	Original Result	Result	RPD	RPD Limits
Thiodiglycol (TDG)	42	28.1	39.5 *	0 - 25

MS Lab ID: 3680 — **Original Lab ID:** 030004-01602 — **Matrix:** Liquid — **Prep Batch:** 4006 — **Analytical:** 4101

AM100 Non-Vols in HD by GC	Original Result	Expected	Result	Recovery	Rec Limits
Thiodiglycol (TDG)	42	975 ug/g	1130	112	50 - 150

MSD Lab ID: 3681 — **Original Lab ID:** 030004-01602 — **Matrix:** Liquid — **Prep Batch:** 4006 — **Analytical:** 4101

AM100 Non-Vols in HD by GC	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Thiodiglycol (TDG)	1020 ug/g	1220	116	50 - 150	3.51	0 - 25

LCS Lab ID: 3682 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 4006 — **Analytical:** 4101

AM100 Non-Vols in HD by GC	Expected	Result	Recovery	Rec Limits
Thiodiglycol (TDG)	1020 ug/g	1210	118	50 - 150

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Report of Analysis

QC Summary

LCS Lab ID: 3665 | Original Lab ID: | Prep Batch: 4004
Matrix: Liquid | Analytical: 4102

AM117 Semi-Vols Liq HD by GC	Expected	Result	Recovery	Rec Limits
T	1020 ug/g	1900	186 *	50 - 150
Q	9290 ug/g	9260	9.96	50 - 150
Hexachloroethane	998 ug/g	1200	120	50 - 150

DUP Lab ID: 3667 | Original Lab ID: 030004-01602 | Prep Batch: 4004
Matrix: Liquid | Analytical: 4102

AM117 Semi-Vols Liq HD by GC	Original Result	Result	RPD	RPD Limits
T	2170	23.2	6.27	0 - 25
Q	29200	32300	9.99	0 - 25
Hexachloroethane	10.7	12	11.8	0 - 25

MS Lab ID: 3668 | Original Lab ID: 030004-01602 | Prep Batch: 4004
Matrix: Liquid | Analytical: 4102

AM117 Semi-Vols Liq HD by GC	Original Result	Expected	Result	Recovery	Rec Limits
T	2170	1100 ug/g	2560	35.2 *	50 - 150
Q	29200	10000 ug/g	38200	89.7	50 - 150
Hexachloroethane	10.7	1080 ug/g	12700	117	50 - 150

MSD Lab ID: 3669 | Original Lab ID: 030004-01602 | Prep Batch: 4004
Matrix: Liquid | Analytical: 4102

AM117 Semi-Vols Liq HD by GC	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
T	1120 ug/g	2590	37.5 *	50 - 150	6.33	0 - 25
Q	10200 ug/g	38900	95.1	50 - 150	5.84	0 - 25
Hexachloroethane	1100 ug/g	1320	119	50 - 150	1.69	0 - 25

LCS Lab ID: 3670 | Original Lab ID: | Prep Batch: 4004
Matrix: Liquid | Analytical: 4102

AM117 Semi-Vols Liq HD by GC	Expected	Result	Recovery	Rec Limits
T	1020 ug/g	1620	159 *	50 - 150
Q	9290 ug/g	7770	83.6	50 - 150
Hexachloroethane	998 ug/g	1160	116	50 - 150

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Report of Analysis

QC Summary

LCS Lab ID: 3737 | Original Lab ID: | Prep Batch: 4201
Matrix: Liquid | Analytical: 4702

AM101 Vols in Liquid HD by GC	Expected	Result	Recovery	Rec Limits
1,2-Dichloroethane	9880 ug/g	9830	99.5	50 - 150
Tetrachloroethylene	10100 ug/g	10000	98.7	50 - 150
1,1,2,2-Tetrachloroethane	10400 ug/g	10600	102	50 - 150

DUP Lab ID: 3738 | Original Lab ID: 030004-01602 | Prep Batch: 4201
Matrix: Liquid | Analytical: 4702

AM101 Vols in Liquid HD by GC	Original Result	Result	RPD	RPD Limits
1,2-Dichloroethane	4650	4440	4.79	0 - 25
Tetrachloroethylene	0	0	0	0 - 25
1,1,2,2-Tetrachloroethane	0	0	0	0 - 25

MS Lab ID: 3739 | Original Lab ID: 030004-01602 | Prep Batch: 4201
Matrix: Liquid | Analytical: 4702

AM101 Vols in Liquid HD by GC	Original Result	Expected	Result	Recovery	Rec Limits
1,2-Dichloroethane	4650	10200 ug/g	14400	95.8	50 - 150
Tetrachloroethylene	0	10400 ug/g	9700	93	50 - 150
1,1,2,2-Tetrachloroethane	0	10700 ug/g	10000	94	50 - 150

MSD Lab ID: 3740 | Original Lab ID: 030004-01602 | Prep Batch: 4201
Matrix: Liquid | Analytical: 4702

AM101 Vols in Liquid HD by GC	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
1,2-Dichloroethane	10500 ug/g	15500	103	50 - 150	7.24	0 - 25
Tetrachloroethylene	10800 ug/g	11000	102	50 - 150	9.23	0 - 25
1,1,2,2-Tetrachloroethane	11100 ug/g	11100	100	50 - 150	6.19	0 - 25

LCS Lab ID: 3741 | Original Lab ID: | Prep Batch: 4201
Matrix: Liquid | Analytical: 4702

AM101 Vols in Liquid HD by GC	Expected	Result	Recovery	Rec Limits
1,2-Dichloroethane	9880 ug/g	9890	100	50 - 150
Tetrachloroethylene	10100 ug/g	10100	99.2	50 - 150
1,1,2,2-Tetrachloroethane	10400 ug/g	10600	102	50 - 150

Appendix C-3

Analytical Test Report
Sample Set #3

U.S. Army Research, Development and Engineering Command
Edgewood Chemical Biological Center
ATTN: Edgewood Chemical Biological
Forensic Analytical Center
Aberdeen Proving Ground, MD 21010-5424
Phone: (410) 436-8600
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ANALYTICAL TEST REPORT

Report Date: 14 November 2003

Project/Event Title: Analysis of HD Sample Collected From Ton Containers Stored at the Deseret Chemical Depot – Sample Set 3

Project/Event Number: 97P-0033-46

Report Number: 0033-46-111403B3

Report Prepared for:

EG&G Defense Materials Division
Attn.: Mr. Don Milton
11600 Stark Rd
Tooele, UT 84074

NOTE: This report replaces Analytical Test Report Numbered 0033-46-070903B3.

This report shall not be reproduced except in full, without the written approval of the laboratory. Test results reported herein refer only to samples tested.

CASE NARRATIVE
Tooele Samples (Set 3)
Project/Event # 97P-0033-46

Receiving Notes

All sample containers were visually checked and compared to sample transfer form 1911. The containers were noted to be in satisfactory condition and all samples were received intact.

Sample Preparatory Notes

No discrepancies.

Analytical Notes

VOLATILES

Volatile Organic Compounds (VOCs) were extracted on 04-Mar-03 analyzed on 11-Mar-03 by method AM-101. The target compounds were not detected in the Method Blank or the Reagent Blank. Samples analyzed for VOCs met the 28-day holding time.

The bromofluorobenzene (BFB) tune, the tune evaluation, and performance standard passed the acceptance criteria.

The calibration curves for the target compounds and the surrogate had correlation coefficients (r^2) of 0.999 to 1.000 for linear / (0, 0) curve fits. The calibration standards were within the acceptance criteria of ±15% except for 1,2- dichloroethane (1,2-DCE), which had a recovery of 121% for the 5.0 µg/mL Practical Quantitation Level (PQL) level. The other standards had recoveries between 95% and 107%. The Continuing Calibration Verification (CCV) samples were between 95% and 103%.

The Surrogate (1,4-difluorobenzene) Percent Recovery (%R) ranged from 102% to 119%, which met the criteria (50% to 150%).

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) met the %R criteria (50%-150%). The MS/MSD Relative Percent Difference (RPD) failed for 1,2-DCE (52.4%), tetrachloroethylene (TCE) (54.7%), and 1,1,2,2-tetrachloroethane (1,1,2,2-TCE) (55.9%). The results were qualified for precision due to the failure of the RPD to meet the criteria.

The Blank Spike (BS) and the Blank Spike Duplicate (BSD) %R ranged from 113% to 126%. The BS/BSD was less than 25% for the target analytes.

The RPD for the sample duplicates was less than 25%.

SEMI-VOLATILES

Semi-Volatile Organic Compound (SVOCs) were extracted on 06-Mar-03 and analyzed on 10-Mar-03 by method AM-117. Target compounds were not detected in the Method Blank or the Reagent Blank. The sample holding time of 28 days from collection to analysis was met for the SVOC analyses.

The decafluorotriphenylphosphine (DFTPP) tune, the tune evaluation, and performance standard met the acceptance criteria. The calibration curves for the target compounds and the surrogate resulted in correlation coefficients (r^2) of 1.000 for 1,4-dithiane-d4 and 0.999 for hexachloroethane (HCE) for a linear / (0, 0) curve fit. Q had a r^2 of 1.000 for a linear curve with a PQL of 25 µg/mL. T was analyzed with a quadratic 6-point curve (not passing through zero) with a PQL of 25 µg/mL.

Calibration standard recoveries for T ranged from 97% to 109%. The correlation coefficient of the calibration curve met the criteria (±15%).

The calibration standards for the surrogate (99% to 104%), HCE (85% to 101%), and Q (97% to 106%) met the criteria (±15%).

The CCV recoveries for the surrogate (97% to 100%), HCE (88% to 102%), Q (84 to 103%), and T (77% to 104%) met the criteria except for the 72% recovery for T at the 50 µg/mL level. The T sample results were below 30 µg/mL.

Because T was spiked at a level below the PQL, the MS/MSD %R was <5%.

The MS/MSD %R and RPD for the surrogate (95.9% and 96.4%), and HCE (111.3% and 109.8%) met the criteria The Q MS/MSD %R were 48.8% and 45.9% and the RPD was 6.12%. The Q data was qualified as estimated low based on the low %R of the MS/MSD results.

The BS/BSD %R for T were 245% and 223%. The T data was qualified as biased high based on the BS/BSD results. The BS/BSD %R for the surrogate (99.8%/98.6%), HCE (115.8%/112.1%), and Q (103%/90.1%) met the criteria.

The duplicate samples RPD for all analytes were below the method criteria of ±25% (<4%). HCE was not detected in the sample or sample duplicate.

Sample 030004-02009 (21-03-114) did not receive a surrogate spike, therefore, it was run at a latter time.

NON-VOLATILES

The target compound for Method AM-100 was thiodiglycol (TDG). The non-volatiles were extracted 06-Mar-03 and analyzed on 11-Mar-03 by Method AM-100. The target compounds were not detected in the Method Blank or the Reagent Blank.

The DFTPP tune, the tune evaluation, and performance standard met the criteria. The calibration curves for TDG and the surrogate (TDG_{d8}) had correlation coefficients (r^2) of 1.000 and 0.999, respectively for linear / (0, 0) curves.

The %R of the TDG 2.5 µg/mL calibration standard was 115.7%. The Quality Asssurance Project Plan (QAPP) specified standards to be within 15%. There was no corrective action taken since there was no TDG detected in any of the samples. Other calibration standards were between 99% and 103%.

The TDG and surrogate CCV samples met the criteria of ±25% (97% to 106%).

The sample duplicates surrogate RPD met the criteria of < 25%(<4%).

The MS/MSD %R were 86.5% and 90.8% for TDG and 99.5% and 100.5% for the surrogate. The RPD for the MS/MSD were 4.92% for TDG and 3.9% for the surrogate.

The BS/BSD TDG %R were 95.7% and 101%. The BS/BSD surrogate %R were 108% and 99.5%. The BS/BSD RPD for TDG was 5.68% and 8.19% for the surrogate.

Analysis of the non-volatile samples met the 28-day holding time except for samples 030004-02001 through 030004-02005 collected on 11-Feb-03 and 12-Feb-03 and analyzed on 13-Mar-03.

LEWISITE

Lewisite was extracted on 10-Mar-03 and analyzed on 10-Mar-03 by Method AM-126. Lewisite was not detected in the Method Blank (MB) or the Reagent Blank (RB). The sample holding time of 28 days was met for all samples.

The decafluorotriphenylphosphine (DFTPP) tune, the tune evaluation, and performance standard met the acceptance criteria.

The Lewisite had a correlation coefficient (r^2) of 1.000 for a Quadratic (not forced through 0, 0) curve fit for Lewisite. After investigation, it was decided that a quadratic curve best represented the existing data. Six concentration levels were used in this determination. This meets the minimal requirements specified in EPA SW846 Method 8000B. The calibration standards had calculated recoveries ranging from 89% to 104%, which meets the acceptance criteria of ±15%.

The CCV samples had %R ranging from 89% to 103%, which meets the criteria (±25%).

The Lewisite MS/MSD %R were 97.8% and 95.4%. The Lewisite RPD was 2.48%.

The Lewisite BS/BSD %R were 119% and 100%. The BS/BSD RPD was 16.7%.

PURITY

Purity samples were extracted on 06-Mar-03 and analyzed on 18-Mar-03 by Method AM-098. Mustard was not detected in the Method Blank or the Reagent Blank.

The DFTPP tune passed the acceptance criteria. The mustard calibration curve had a correlation coefficient (r^2) of 0.999 for a linear / (0, 0) curve fit. The calibration standards had %R calculated between 98% and 111% except for the 2 mg/mL standard at 124%. The criterion is 115%.

The CCV standards were calculated at 103%, 102%, and 103%.

The CASARM grade (HD) Laboratory Control Sample (LCS) had a %R of 97.2%.

The purity duplicate samples had a RPD of 1.41%.

The sample holding time of 28 days was exceeded for samples 030004-02001 to 02009. These were sampled before 18-Feb-03.

METALS ANALYSIS

LIQUIDS:
All undiluted samples were analyzed on 07-Mar-03. Samples that needed to be diluted and reruns were analyzed on 11-Mar-03 and 18-Mar-03. The samples were analyzed by Method AM-118.

Aluminum, boron, and beryllium were outside the acceptance limits for both CCV's when analyzed on 07-Mar-03. Upon reanalysis on 18-Mar-03 all were within acceptable limits.
Mercury samples 030004-02006 and 02016 were diluted and reanalyzed on 11-Mar-03.

Chromium was found in the second reagent blank at a level above the Method Detection Limit (MDL), but below the PQL. No corrective action was taken. Aluminum and chromium were found in the method blank at a level above the MDL, but below the PQL. No corrective action was taken.

The %R for the MS/MSD, BS, Post Digestion Spike Addition sample (PDSA), lab control spike, and lab control spike duplicate indicated that all elements met the acceptance criteria of ± 25%. The MS/MSD RPD met the criterion.

Copper, the only element that had a result above 100 times the Instrument Detection Limit (IDL) had an acceptable RPD for the sample duplicate. The criteria for the sample/sample duplicate RPD is ≤20% for any elements at a level of at least 100 times the IDL.

All samples were analyzed within the 28 day holding time with the exception of samples 030004-02001 through 02009 for the elements of aluminum, beryllium, and boron.

***Non-Cohesive Solids*:**
All undiluted samples were analyzed on 10-Mar-03. Samples that needed to be diluted and reruns were analyzed on 11-Mar-03, 20-Mar-03, and 26-Mar-03. All samples were analyzed by Method AM-118.

Aluminum, boron, and beryllium were outside the acceptance limits for both CCV's when analyzed on 10-Mar-03. Upon reanalysis on 20-Mar-03, boron and beryllium were within acceptable limits; however, aluminum fell outside the acceptable limits on the last 2 CCVs. Aluminum had a recovery of 110.7% and 112.7%, on the last 2 samples respectively. Samples 030004-02106, 030004-02113 to 02121 will be slightly overestimated for Aluminum.

Sample 030004-02105 was diluted for arsenic and reanalyzed on 11-Mar-03. Sample 030003-02110 was diluted for manganese and reanalyzed on 11-Mar-03. Samples 030004-02106 and 02116 were diluted for mercury and reanalyzed on 11-Mar-03. Sample 030004-02118 was diluted for mercury and reanalyzed on 26-Mar-03. Samples 030004-02107 and 02108 were reanalyzed for mercury on 20-Mar-03 due to carryover from a sample preceding these samples. Sample 030004-02119 was reanalyzed for mercury due to carryover from a sample preceding it.

Barium and cadmium were found in all reagent blanks at a level above the MDL, but below the PQL. No corrective action was taken. Arsenic was found in the initial reagent blank at a level above the MDL, but below the PQL. Aluminum, barium, cadmium, and chromium were found in the method blank at a level above the MDL, but below the PQL. No corrective action was taken.

The original sample used for the MS (3881) and MSD (3882) had high levels of manganese in it. Since the spike level was considerably less than the original levels in the sample and the sample was non-homogenous, the MS and MSD could not be properly evaluated for those elements. The %R for the MS and MSD indicated that manganese (161% and 63% recovery) was outside the acceptable limit of 75%-125%. The RPD was also outside the acceptable limit for manganese. All other elements gave acceptable recoveries and RPD's for the MS and MSD.

The recovery data for the post digestion spike addition sample indicated that boron was outside the acceptable limit when analyzed on 10-Mar-03, but when it was reanalyzed on 20-Mar-03 it was within the acceptable limit.

The %R data for the Certified Reference Material (CRM) indicated that aluminum (65%), copper (67%), nickel (69%), and zinc (69%) were outside the acceptable limits of 75%-125%. The RPD for all elements was within acceptable limits.

The recovery data for the BS indicated that all elements were within the acceptable limit of 75%-125%.

Chromium, lead, and nickel had an acceptable RPD for the sample duplicate.

All the Non-Cohesive samples were initially analyzed within the 28-day hold time; however, due to reanalysis of samples and diluted samples, the final analysis was past the hold time of 28 days for aluminum, beryllium, and boron for all samples except for samples 030004-02114 through 02121. Samples 030004-02107, 02108, 02118, and 02119 were reanalyzed for mercury after the 28-day hold time.

***Solids*:**
All undiluted samples were analyzed on 11-Mar-03. Sample that needed to be diluted and reruns were analyzed on 19-Mar-03, 25-Mar-03, 26-Mar-03, and 01-Apr-03. All samples were analyzed by Method AM-118.

Aluminum, boron, and beryllium were outside the acceptance limits for both CCV's when analyzed on 11-Mar-03. Upon reanalysis on 25-Mar-03 all were within acceptable limits. The copper %R of 110.8% obtained from the last CCV analyzed on 11-Mar-03 was outside acceptable limits. Upon reanalysis for samples 030004-02212 through 02221 copper was within acceptable limits. On 25-Mar-03, boron and beryllium had a %R of 78% in the Initial Calibration Verification (ICV) sample. The results for samples 030004-02201 and 02211 will be slightly underestimated. Both elements were within acceptable limits for all CCV's analyzed, so the results for that day were kept.

Samples 030004-02208, 02214, 02215, 02218, and 02221 were diluted for arsenic and reanalyzed on 25-Mar-03. Sample 030004-02212 was diluted for copper and reanalyzed on 25-Mar-03. Sample 030004-02220 was diluted for lead and was reanalyzed on 25-Mar-03. Samples 030004-02209, 02210, 02213, 02214, 02215, 02218, 02220, and 02221 were diluted for manganese and reanalyzed on 25-Mar-03. Samples 030004-02206, 02216, and 02218 were diluted for mercury and reanalyzed on 19-Mar-03 and sample 030004-02209 was diluted on 01-Apr-03 and reanalyzed.

Antimony, chromium, and mercury were detected in reagent blanks at a level above the MDL, but below the PQL when analyzed on 11-Mar-03. No corrective action was taken for antimony and chromium. Mercury was reanalyzed on 26-Mar-03 due to the probability of carryover from samples high in this element. No mercury was detected in the reagent blanks upon reanalysis. Arsenic was found in reagent blanks at a level above

the MDL, but below the PQL on 25-Mar-03 when analyzing arsenic dilutions. No elements were found in the method blank on initial analysis. Upon reanalysis for arsenic dilutions on 11-Mar-03, arsenic was found in the method blank at a level above the MDL, but below the PQL. No corrective action was taken.

The original sample used for the MS (3921) had high levels of manganese. Since the spike level was considerably less than the original levels in the sample, the MS could not be properly evaluated for that element. The %R data for the MS (3921) indicated that beryllium, chromium, manganese, mercury, and nickel were outside the acceptable limits of 75%-125% on the initial run on 11-Mar-03. The %R data for the MSD (3922) indicated that aluminum, beryllium, boron, copper, manganese, and mercury were outside the acceptable limits of 75%-125% on the initial run on 11-Mar-03. Upon reanalysis for the above elements on 25-Mar-03, copper and manganese were outside the acceptable limits for both MS and MSD. The MS and MSD were re-prepared and analyzed on 26-Mar-03. Copper was within acceptable limits for the MS and MSD, while manganese (362% recovery) was outside acceptable limits for the MS, but within acceptable limits for the MSD. The RPD for the MS and MSD were within acceptable limits for all elements except for manganese (131%). All other elements gave acceptable recoveries for the MS and MSD.

The recovery data for the PDSA indicated that copper was outside the acceptable limit when analyzed on 11-Mar-03 and 25-Mar-03, but upon reanalysis on 26-Mar-03 it was within the acceptable limit. The post digestion spike was reprepared and analyzed for copper on 26-Mar-03.

The recovery data for the CRM indicated that aluminum (69%), copper (68%), and lead (74%) were outside the acceptable limits of 75%-125%. For the CRM duplicate all element were within the acceptable limits. The RPD for all elements was within acceptable limits.

The recovery data for the BS indicated that all elements were within the acceptable limit of 75%-125%.

Chromium, copper, lead, manganese, and nickel had an acceptable RPD for the sample duplicate.

All the solid samples were initially analyzed within the 28-day hold time; however, due to reanalysis of diluted and undiluted samples, the final analysis was past the hold time of 28 days for aluminum, beryllium, thallium, and boron for all samples. Samples 030004-02212 through 02221 and 02201 were analyzed for copper past the hold time of 28 days. Samples 030004-02208, 02214, 02215, 02218, and 02221 were past the hold time of 28 days for arsenic. Sample 030004-02201 was analyzed past the 28-day hold time for chromium. Sample 030004-02220 was analyzed past the 28-day hold time for lead. Samples 030004-02209, 02210, 02213 through 02215, 02218, 02220 and 02221 were analyzed past the 28-day hold time for manganese. All samples except for 030004-02203 through 02205, 02216 and 02218 were analyzed past the 28-day hold time for mercury.

Sample 030004-02201 and 02220 were analyzed past the 28-day hold time for nickel.
Sample 030004-02212 and 02221 were analyzed past the 28-day hold time for zinc.

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Analyst(s) of Record (Signature) 17 Dec 03 (Date) **Robert L. Calloway** **Physical Science Technican, Edgewood Chemical & Biological Forensic Analytical Center**	**Analyst(s) of Record** (Signature) 12-17-03 (Date) for **Stephen S. Houck** **Researcher, Battelle Memorial Institute**
Analyst(s) of Record (Signature) 12-17-03 (Date) for **Doug S. Nichols** **Researcher, Battelle Memorial Institute**	**Analyst(s) of Record** (Signature) 12-17-03 (Date) for **Stanley A. Ostazeski, Ph. D.** **Senior Research Scientist, Battelle Memorial Institute**
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17 Dec 03 (Date)

Robert L. Calloway

Designated Authority, Edgewood C/B Forensic Analytical Center

Report Approved by

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17 Dec 03 (Date)

Dennis J. Reutter, Ph.D.

Chief, Edgewood C/B Forensic Analytical Center

LIMS DATA REPORT

This appendix contains the 103-page data report produced from the LIMS system. It contains a summary of sample numbers, sample results, method blank results and results of QC samples analyzed. Since the report is generated by the LIMS, the page numbers will begin again at 1, but each page has been identified as part of the appendix so that it may be distinguishable from the main report.

ECB Forensic Analytical Center
Edgewood Chemical and Biological Center
Aberdeen Proving Ground, MD 21010-5424
(410) 436-8600

ANALYTICAL RESULTS

Report Date: 11/14/2003

Work Order: Tooele HD/TC 03/04/2003

Deliver To: Don Milton
EG&G Defense Materials Div.
11600 Stark Road
Tooele, UT 84074

James Newman
Project Manager

ECB Forensic Analytical Center
Edgewood Chemical and Biological Center
Aberdeen Proving Ground, MD 21010-5424
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The following represents qualifications to the associated analytical reports.

1. These descriptors will help identify the specific sample and clarify the report.

   DUP - Matrix Duplicate
   MS - Matrix Spike
   MSD - Matrix Spike Duplicate
   RPD - Relative Percent Difference
   PQL - Practical Quantitiation Limit
   MDL - Method Detection Limit
   ND - Not Detected at the PQL
   * - Indicates a limit was exceeded

   Surrogate - Organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromotography, but which are not normally found in the samples.

2. Qualifier keys - These descriptors will follow individual results for a specific sample and a specific analyte and will help qualify the data.

   J - Indicates an estimated value between the PQL and MDL

NOTE: This document is included as part of the Analytical Report for the above referenced and should be retained as a permanent record thereof.

ECB Forensic Analytical Center
Edgewood Chemical and Biological Center
Aberdeen Proving Ground, MD 21010-5424
(410) 436-8600

Report of Analysis

Client
EG&G Defense Materials Division

Work ID
Tooele HD/TC 03/04/2003

Workorder Sample Summary

Lab ID	Sample ID	Matrix	Collect Date/Time	Receive Date/Time	
030004-020-01	21-03-090	Liquid	2/11/2003 10:13	3/3/2003 10:12	
030004-020-02	21-03-093	Liquid	2/11/2003 10:13	3/3/2003 10:12	Cancelled
030004-020-03	21-03-096	Liquid	2/12/2003 10:13	3/3/2003 10:12	
030004-020-04	21-03-099	Liquid	2/12/2003 10:13	3/3/2003 10:12	
030004-020-05	21-03-102	Liquid	2/12/2003 10:13	3/3/2003 10:12	
030004-020-06	21-03-105	Liquid	2/13/2003 10:13	3/3/2003 10:12	
030004-020-07	21-03-108	Liquid	2/13/2003 10:13	3/3/2003 10:12	
030004-020-08	21-03-111	Liquid	2/14/2003 10:13	3/3/2003 10:12	
030004-020-09	21-03-114	Liquid	2/14/2003 10:13	3/3/2003 10:12	
030004-020-10	21-03-117	Liquid	2/18/2003 10:13	3/3/2003 10:12	
030004-020-11	21-03-120	Liquid	2/18/2003 10:13	3/3/2003 10:12	
030004-020-12	21-03-123	Liquid	2/19/2003 10:13	3/3/2003 10:12	
030004-020-13	21-03-126	Liquid	2/19/2003 10:13	3/3/2003 10:12	
030004-020-14	21-03-129	Liquid	2/20/2003 10:13	3/3/2003 10:12	
030004-020-15	21-03-132	Liquid	2/20/2003 10:32	3/3/2003 10:32	
030004-020-16	21-03-135	Liquid	2/20/2003 10:13	3/3/2003 10:12	
030004-020-17	21-03-138	Liquid	2/21/2003 10:13	3/3/2003 10:12	
030004-020-18	21-03-141	Liquid	2/21/2003 10:13	3/3/2003 10:12	
030004-020-19	21-03-144	Liquid	2/22/2003 10:13	3/3/2003 10:12	
030004-020-20	21-03-147	Liquid	2/22/2003 10:13	3/3/2003 10:12	
030004-020-21	21-03-150	Liquid	2/22/2003 10:13	3/3/2003 10:12	
030004-021-01	21-03-091	Non-cohesive Solid	2/11/2003 12:02	3/3/2003 12:02	
030004-021-02	21-03-094	Non-cohesive Solid	2/11/2003 12:02	3/3/2003 12:02	Cancelled
030004-021-03	21-03-097	Non-cohesive Solid	2/12/2003 12:02	3/3/2003 12:02	
030004-021-04	21-03-100	Non-cohesive Solid	2/12/2003 12:02	3/3/2003 12:02	
030004-021-05	21-03-103	Non-cohesive Solid	2/12/2003 12:02	3/3/2003 12:02	
030004-021-06	21-03-106	Non-cohesive Solid	2/13/2003 12:02	3/3/2003 12:02	
030004-021-07	21-03-109	Non-cohesive Solid	2/13/2003 12:02	3/3/2003 12:02	
030004-021-08	21-03-112	Non-cohesive Solid	2/14/2003 12:02	3/3/2003 12:02	
030004-021-09	21-03-115	Non-cohesive Solid	2/14/2003 12:02	3/3/2003 12:02	
030004-021-10	21-03-118	Non-cohesive Solid	2/18/2003 12:02	3/3/2003 12:02	
030004-021-11	21-03-121	Non-cohesive Solid	2/18/2003 9:01	3/3/2003 9:00	
030004-021-12	21-03-124	Non-cohesive Solid	2/19/2003 12:02	3/3/2003 12:02	
030004-021-13	21-03-127	Non-cohesive Solid	2/19/2003 12:02	3/3/2003 12:02	
030004-021-14	21-03-130	Non-cohesive Solid	2/20/2003 12:02	3/3/2003 12:02	
030004-021-15	21-03-133	Non-cohesive Solid	2/20/2003 12:02	3/3/2003 12:02	
030004-021-16	21-03-136	Non-cohesive Solid	2/20/2003 12:02	3/3/2003 12:02	
030004-021-17	21-03-139	Non-cohesive Solid	2/21/2003 9:01	3/3/2003 9:00	
030004-021-18	21-03-142	Non-cohesive Solid	2/21/2003 12:02	3/3/2003 12:02	
030004-021-19	21-03-145	Non-cohesive Solid	2/22/2003 12:02	3/3/2003 12:02	
030004-021-20	21-03-148	Non-cohesive Solid	2/22/2003 12:02	3/3/2003 12:02	
030004-021-21	21-03-151	Non-cohesive Solid	2/22/2003 12:02	3/3/2003 12:02	
030004-022-01	21-03-092	Solid	2/11/2003 12:02	3/3/2003 12:02	
030004-022-02	21-03-095	Solid	2/11/2003 12:02	3/3/2003 12:02	Cancelled
030004-022-03	21-03-098	Solid	2/12/2003 12:02	3/3/2003 12:02	

Report of Analysis

030004-022-04	21-03-101	Solid	2/12/2003 12:02	3/3/2003 12:02
030004-022-05	21-03-104	Solid	2/12/2003 12:02	3/3/2003 12:02
030004-022-06	21-03-107	Solid	2/13/2003 12:02	3/3/2003 12:02
030004-022-07	21-03-110	Solid	2/13/2003 12:02	3/3/2003 12:02
030004-022-08	21-03-113	Solid	2/14/2003 12:02	3/3/2003 12:02
030004-022-09	21-03-116	Solid	2/14/2003 12:02	3/3/2003 12:02
030004-022-10	21-03-119	Solid	2/18/2003 12:02	3/3/2003 12:02
030004-022-11	21-03-122	Solid	2/18/2003 12:02	3/3/2003 12:02
030004-022-12	21-03-125	Solid	2/19/2003 12:02	3/3/2003 12:02
030004-022-13	21-03-128	Solid	2/19/2003 12:02	3/3/2003 12:02
030004-022-14	21-03-131	Solid	2/20/2003 12:02	3/3/2003 12:02
030004-022-15	21-03-134	Solid	2/20/2003 12:02	3/3/2003 12:02
030004-022-16	21-03-137	Solid	2/20/2003 12:02	3/3/2003 12:02
030004-022-17	21-03-140	Solid	2/21/2003 12:02	3/3/2003 12:02
030004-022-18	21-03-143	Solid	2/21/2003 12:02	3/3/2003 12:02
030004-022-19	21-03-146	Solid	2/22/2003 12:02	3/3/2003 12:02
030004-022-20	21-03-149	Solid	2/22/2003 12:02	3/3/2003 12:02
030004-022-21	21-03-152	Solid	2/22/2003 12:02	3/3/2003 12:02

ECB Forensic Analytical Center
Edgewood Chemical and Biological Center
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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-01	21-03-090	2/11/2003 10:13	3/3/2003 10:12	11/14/2003 10:22	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 14:13	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	87.1			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 0:00	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	213	254	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	971 ug/g	95.6	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/11/2003 23:09	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7140	256	493	ug/g
Tetrachloroethylene	ND	98.5	493	ug/g
1,1,2,2-Tetrachloroethane	ND	148	493	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10200	10700 ug/g	105	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 21:31	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	16.7 J	10.3	51.5	ug/g
Antimony	ND	0.649	5.15	ug/g
Arsenic	ND	1.26	5.15	ug/g
Barium	ND	0.443	5.15	ug/g
Beryllium	ND	0.928	5.15	ug/g
Boron	ND	3.86	10.3	ug/g
Cadmium	ND	0.423	5.15	ug/g
Chromium	3.35 J	1.33	5.15	ug/g
Cobalt	ND	0.278	1.03	ug/g
Copper	5.79	2.51	5.15	ug/g
Lead	ND	0.423	5.15	ug/g
Manganese	1.52	0.330	1.03	ug/g
Mercury	0.0908 J	0.0515	0.515	ug/g
Nickel	ND	0.361	5.15	ug/g
Selenium	ND	1.21	10.3	ug/g
Silver	ND	0.485	5.15	ug/g

Report of Analysis

Thallium	ND	1.01	5.15	ug/g
Tin	ND	2.57	10.3	ug/g
Vanadium	ND	1.03	5.15	ug/g
Zinc	ND	3.22	10.3	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 17:34	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2900	71.4	2550	ug/g
Q	30200	52.0	2550	ug/g
Hexachloroethane	ND	81.5	2550	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1020	1010 ug/g	98.9	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/10/2003 21:08	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.99	5.10	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-03	21-03-096	2/12/2003 10:13	3/3/2003 10:12	11/14/2003 10:22	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 14:52	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	90.8			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 0:00	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	211	251	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1000	985 ug/g	98.1	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:19	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6110	271	522	ug/g
Tetrachloroethylene	ND	104	522	ug/g
1,1,2,2-Tetrachloroethane	ND	157	522	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10800	12000 ug/g	111	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 21:56	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	20.7 J	9.89	49.5	ug/g
Antimony	ND	0.623	4.95	ug/g
Arsenic	ND	1.21	4.95	ug/g
Barium	ND	0.425	4.95	ug/g
Beryllium	ND	0.890	4.95	ug/g
Boron	ND	3.70	9.89	ug/g
Cadmium	ND	0.406	4.95	ug/g
Chromium	6.22	1.28	4.95	ug/g
Cobalt	ND	0.267	0.989	ug/g
Copper	32.0	2.40	4.95	ug/g
Lead	ND	0.406	4.95	ug/g
Manganese	2.78	0.317	0.989	ug/g
Mercury	0.171 J	0.0495	0.495	ug/g
Nickel	0.405 J	0.346	4.95	ug/g
Selenium	ND	1.16	9.89	ug/g
Silver	1.72 J	0.465	4.95	ug/g

Report of Analysis

Thallium	ND	0.969	4.95	ug/g
Tin	ND	2.46	9.89	ug/g
Vanadium	1.72 J	0.989	4.95	ug/g
Zinc	ND	3.09	9.89	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 18:51	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2720	72.1	2570	ug/g
Q	30200	52.5	2570	ug/g
Hexachloroethane	ND	82.4	2570	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1030	1040 ug/g	101	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/10/2003 22:16	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.10	5.39	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-04	21-03-099	2/12/2003 10:13	3/3/2003 10:12	11/14/2003 10:22	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 15:11	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	87.4			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 0:00	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	215	256	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	1070 ug/g	105	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:54	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6510	278	535	ug/g
Tetrachloroethylene	ND	107	535	ug/g
1,1,2,2-Tetrachloroethane	ND	160	535	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	11100	11700 ug/g	106	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 22:04	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	36.6 J	10.3	51.3	ug/g
Antimony	ND	0.646	5.13	ug/g
Arsenic	2.62 J	1.25	5.13	ug/g
Barium	ND	0.441	5.13	ug/g
Beryllium	ND	0.923	5.13	ug/g
Boron	6.21 J	3.84	10.3	ug/g
Cadmium	ND	0.421	5.13	ug/g
Chromium	6.94	1.32	5.13	ug/g
Cobalt	ND	0.277	1.03	ug/g
Copper	63.7	2.49	5.13	ug/g
Lead	ND	0.421	5.13	ug/g
Manganese	0.868 J	0.328	1.03	ug/g
Mercury	0.153 J	0.0513	0.513	ug/g
Nickel	2.07 J	0.359	5.13	ug/g
Selenium	ND	1.20	10.3	ug/g
Silver	ND	0.482	5.13	ug/g

Report of Analysis

Thallium	ND	1.01	5.13	ug/g
Tin	ND	2.55	10.3	ug/g
Vanadium	1.79 J	1.03	5.13	ug/g
Zinc	ND	3.20	10.3	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 19:29	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2320 J	70.8	2530	ug/g
Q	32900	51.6	2530	ug/g
Hexachloroethane	ND	80.9	2530	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1010	997 ug/g	98.6	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/10/2003 22:50	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.97	5.06	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-05	21-03-102	2/12/2003 10:13	3/3/2003 10:12	11/14/2003 10:22	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 15:31	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	92.5			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 0:00	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	213	254	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1010	1080 ug/g	106	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:00	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6190	272	523	ug/g
Tetrachloroethylene	ND	105	523	ug/g
1,1,2,2-Tetrachloroethane	ND	157	523	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10800	11400 ug/g	105	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 22:12	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	17.2 J	10.3	51.5	ug/g
Antimony	ND	0.649	5.15	ug/g
Arsenic	5.32	1.26	5.15	ug/g
Barium	ND	0.443	5.15	ug/g
Beryllium	ND	0.928	5.15	ug/g
Boron	ND	3.86	10.3	ug/g
Cadmium	ND	0.423	5.15	ug/g
Chromium	5.72	1.33	5.15	ug/g
Cobalt	ND	0.278	1.03	ug/g
Copper	45.2	2.51	5.15	ug/g
Lead	ND	0.423	5.15	ug/g
Manganese	ND	0.330	1.03	ug/g
Mercury	0.115 J	0.0515	0.515	ug/g
Nickel	ND	0.361	5.15	ug/g
Selenium	ND	1.21	10.3	ug/g
Silver	ND	0.485	5.15	ug/g

Report of Analysis

Thallium	ND	1.01	5.15	ug/g
Tin	ND	2.57	10.3	ug/g
Vanadium	1.49 J	1.03	5.15	ug/g
Zinc	ND	3.22	10.3	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 20:07	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2460 J	71.3	2550	ug/g
Q	29900	51.9	2550	ug/g
Hexachloroethane	ND	81.5	2550	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1020	986 ug/g	96.8	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/10/2003 23:23	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.02	5.18	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-06	21-03-105	2/13/2003 10:13	3/3/2003 10:12	11/14/2003 10:22	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 15:50	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	88.3			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 0:00	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	214	255	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	1050 ug/g	103	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:00	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7950	259	499	ug/g
Tetrachloroethylene	ND	99.8	499	ug/g
1,1,2,2-Tetrachloroethane	ND	150	499	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10300	11300 ug/g	109	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 22:20	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	19.2 J	10.2	50.9	ug/g
Antimony	ND	0.642	5.09	ug/g
Arsenic	1.89 J	1.24	5.09	ug/g
Barium	ND	0.438	5.09	ug/g
Beryllium	ND	0.916	5.09	ug/g
Boron	ND	3.81	10.2	ug/g
Cadmium	ND	0.418	5.09	ug/g
Chromium	4.88 J	1.31	5.09	ug/g
Cobalt	ND	0.275	1.02	ug/g
Copper	25.9	2.47	5.09	ug/g
Lead	ND	0.418	5.09	ug/g
Manganese	3.38	0.326	1.02	ug/g
Mercury	46.8	0.0509	0.509	ug/g
Nickel	ND	0.356	5.09	ug/g
Selenium	ND	1.19	10.2	ug/g
Silver	ND	0.479	5.09	ug/g

Report of Analysis

Thallium	ND	0.998	5.09	ug/g
Tin	ND	2.54	10.2	ug/g
Vanadium	1.30 J	1.02	5.09	ug/g
Zinc	ND	3.18	10.2	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 20:45	ssh	4901

Parameter	Result	MDL	PQL	Units
T	3200	71.4	2550	ug/g
Q	29600	52.0	2550	ug/g
Hexachloroethane	ND	81.5	2550	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1020	1010 ug/g	99.1	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/10/2003 23:57	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.12	5.44	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.
Mercury was diluted an additional 20 fold and reanalyzed on 03/11/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-07	21-03-108	2/13/2003 10:13	3/3/2003 10:12	11/14/2003 10:22	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 16:09	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	87.0			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 0:00	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	217	258	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1030	1010 ug/g	97.7	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:00	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	5940	259	499	ug/g
Tetrachloroethylene	ND	99.8	499	ug/g
1,1,2,2-Tetrachloroethane	ND	150	499	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10300	10600 ug/g	102	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 22:28	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	16.2 J	10.3	51.4	ug/g
Antimony	ND	0.647	5.14	ug/g
Arsenic	ND	1.25	5.14	ug/g
Barium	ND	0.442	5.14	ug/g
Beryllium	ND	0.925	5.14	ug/g
Boron	ND	3.84	10.3	ug/g
Cadmium	ND	0.421	5.14	ug/g
Chromium	3.85 J	1.33	5.14	ug/g
Cobalt	ND	0.277	1.03	ug/g
Copper	8.59	2.50	5.14	ug/g
Lead	ND	0.421	5.14	ug/g
Manganese	2.38	0.329	1.03	ug/g
Mercury	0.219 J	0.0514	0.514	ug/g
Nickel	ND	0.360	5.14	ug/g
Selenium	ND	1.20	10.3	ug/g
Silver	ND	0.483	5.14	ug/g

Report of Analysis

Thallium	ND	1.01	5.14	ug/g
Tin	ND	2.56	10.3	ug/g
Vanadium	1.11 J	1.03	5.14	ug/g
Zinc	ND	3.21	10.3	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 21:22	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2750	71.4	2550	ug/g
Q	29000	52.0	2550	ug/g
Hexachloroethane	ND	81.5	2550	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1020	1060 ug/g	104	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:31	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.09	5.36	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-08	21-03-111	2/14/2003 10:13	3/3/2003 10:12	11/14/2003 10:22	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 16:29	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	90.1			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 0:00	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	213	254	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	967 ug/g	95.2	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/13/2003 15:59	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	5410	267	514	ug/g
Tetrachloroethylene	ND	103	514	ug/g
1,1,2,2-Tetrachloroethane	ND	154	514	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10600	11100 ug/g	104	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 22:36	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	16.7 J	10.6	52.9	ug/g
Antimony	ND	0.667	5.29	ug/g
Arsenic	16.4	1.29	5.29	ug/g
Barium	ND	0.455	5.29	ug/g
Beryllium	ND	0.952	5.29	ug/g
Boron	ND	3.96	10.6	ug/g
Cadmium	ND	0.434	5.29	ug/g
Chromium	6.38	1.37	5.29	ug/g
Cobalt	ND	0.286	1.06	ug/g
Copper	55.8	2.57	5.29	ug/g
Lead	ND	0.434	5.29	ug/g
Manganese	0.577 J	0.339	1.06	ug/g
Mercury	0.197 J	0.0529	0.529	ug/g
Nickel	2.94 J	0.370	5.29	ug/g
Selenium	ND	1.24	10.6	ug/g
Silver	ND	0.497	5.29	ug/g

Report of Analysis

Thallium	ND	1.04	5.29	ug/g
Tin	ND	2.63	10.6	ug/g
Vanadium	1.58 J	1.06	5.29	ug/g
Zinc	ND	3.30	10.6	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 22:01	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2590 J	73.1	2610	ug/g
Q	44300	53.2	2610	ug/g
Hexachloroethane	ND	83.5	2610	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1040	1070 ug/g	103	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.06	5.28	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-09	21-03-114	2/14/2003 10:13	3/3/2003 10:12	11/14/2003 10:22	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 16:48	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	84.5			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 0:00	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	216	257	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1030	1080 ug/g	105	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:00	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6740	273	525	ug/g
Tetrachloroethylene	ND	105	525	ug/g
1,1,2,2-Tetrachloroethane	ND	157	525	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10900	11800 ug/g	108	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 22:44	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	18.7 J	10.4	52.2	ug/g
Antimony	ND	0.658	5.22	ug/g
Arsenic	ND	1.27	5.22	ug/g
Barium	ND	0.449	5.22	ug/g
Beryllium	ND	0.940	5.22	ug/g
Boron	ND	3.91	10.4	ug/g
Cadmium	ND	0.428	5.22	ug/g
Chromium	6.20	1.35	5.22	ug/g
Cobalt	ND	0.282	1.04	ug/g
Copper	28.3	2.54	5.22	ug/g
Lead	0.575 J	0.428	5.22	ug/g
Manganese	3.74	0.334	1.04	ug/g
Mercury	0.491 J	0.0522	0.522	ug/g
Nickel	ND	0.366	5.22	ug/g
Selenium	ND	1.22	10.4	ug/g
Silver	ND	0.491	5.22	ug/g

Report of Analysis

Thallium	ND	1.02	5.22	ug/g
Tin	ND	2.60	10.4	ug/g
Vanadium	1.56 J	1.04	5.22	ug/g
Zinc	ND	3.26	10.4	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 22:39	ssh	4901

Parameter	Result	MDL	PQL	Units
T	3070	71.1	2540	ug/g
Q	30500	51.8	2540	ug/g
Hexachloroethane	ND	81.2	2540	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1020	33.5 ug/g	3.3 *	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.10	5.39	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-10	21-03-117	2/18/2003 10:13	3/3/2003 10:12	11/14/2003 10:22	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 17:07	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	86.6			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 0:00	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	211	251	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1000	946 ug/g	94.2	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:00	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	5380	279	536	ug/g
Tetrachloroethylene	ND	107	536	ug/g
1,1,2,2-Tetrachloroethane	ND	161	536	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	11100	11900 ug/g	107	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 22:52	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	19.4 J	10.2	50.8	ug/g
Antimony	ND	0.640	5.08	ug/g
Arsenic	ND	1.24	5.08	ug/g
Barium	ND	0.437	5.08	ug/g
Beryllium	ND	0.914	5.08	ug/g
Boron	ND	3.80	10.2	ug/g
Cadmium	ND	0.416	5.08	ug/g
Chromium	4.92 J	1.31	5.08	ug/g
Cobalt	ND	0.274	1.02	ug/g
Copper	21.3	2.47	5.08	ug/g
Lead	0.467 J	0.416	5.08	ug/g
Manganese	4.25	0.325	1.02	ug/g
Mercury	0.194 J	0.0508	0.508	ug/g
Nickel	0.568 J	0.355	5.08	ug/g
Selenium	ND	1.19	10.2	ug/g
Silver	ND	0.477	5.08	ug/g

Report of Analysis

Thallium	ND	0.995	5.08	ug/g
Tin	ND	2.53	10.2	ug/g
Vanadium	1.29 J	1.02	5.08	ug/g
Zinc	4.62 J	3.17	10.2	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 23:17	ssh	4901

Parameter	Result	MDL	PQL	Units
T	3010	73.1	2610	ug/g
Q	30200	53.2	2610	ug/g
Hexachloroethane	ND	83.5	2610	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1040	1040 ug/g	99.2	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.03	5.20	ug/g

Comments: Mercury was reanalyzed on 02/27/03.
Aluminum, Beryllium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-11	21-03-120	2/18/2003 10:13	3/3/2003 10:12	11/14/2003 10:22	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 17:27	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	90.5			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 10:36	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	215	256	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1050	969 ug/g	92.6	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:00	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	8440	283	545	ug/g
Tetrachloroethylene	ND	109	545	ug/g
1,1,2,2-Tetrachloroethane	ND	163	545	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	11300	12500 ug/g	111	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 23:00	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	17.4 J	10.7	53.5	ug/g
Antimony	ND	0.674	5.35	ug/g
Arsenic	ND	1.30	5.35	ug/g
Barium	ND	0.460	5.35	ug/g
Beryllium	ND	0.963	5.35	ug/g
Boron	ND	4.00	10.7	ug/g
Cadmium	ND	0.439	5.35	ug/g
Chromium	4.28 J	1.38	5.35	ug/g
Cobalt	ND	0.289	1.07	ug/g
Copper	23.9	2.60	5.35	ug/g
Lead	ND	0.439	5.35	ug/g
Manganese	1.28	0.342	1.07	ug/g
Mercury	0.123 J	0.0535	0.535	ug/g
Nickel	0.848 J	0.374	5.35	ug/g
Selenium	ND	1.25	10.7	ug/g
Silver	ND	0.503	5.35	ug/g

Report of Analysis

Thallium	ND	1.05	5.35	ug/g
Tin	ND	2.66	10.7	ug/g
Vanadium	ND	1.07	5.35	ug/g
Zinc	ND	3.34	10.7	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 23:56	ssh	4901

Parameter	Result	MDL	PQL	Units
T	3290	72.6	2590	ug/g
Q	33100	52.9	2590	ug/g
Hexachloroethane	ND	83.0	2590	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1040	1000 ug/g	96.6	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.16	5.55	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-12	21-03-123	2/19/2003 10:13	3/3/2003 10:12	11/14/2003 10:22	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 18:25	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	90.7			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 14:11	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	216	258	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1030	984 ug/g	95.4	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:00	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7520	275	528	ug/g
Tetrachloroethylene	ND	106	528	ug/g
1,1,2,2-Tetrachloroethane	ND	158	528	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10900	11800 ug/g	108	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 23:25	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	20.6 J	10.5	52.4	ug/g
Antimony	ND	0.660	5.24	ug/g
Arsenic	1.87 J	1.28	5.24	ug/g
Barium	ND	0.450	5.24	ug/g
Beryllium	ND	0.942	5.24	ug/g
Boron	ND	3.92	10.5	ug/g
Cadmium	ND	0.429	5.24	ug/g
Chromium	11.8	1.35	5.24	ug/g
Cobalt	ND	0.283	1.05	ug/g
Copper	70.7	2.54	5.24	ug/g
Lead	ND	0.429	5.24	ug/g
Manganese	0.338 J	0.335	1.05	ug/g
Mercury	0.0683 J	0.0524	0.524	ug/g
Nickel	0.382 J	0.366	5.24	ug/g
Selenium	ND	1.23	10.5	ug/g
Silver	ND	0.492	5.24	ug/g

Report of Analysis

Thallium	ND	1.03	5.24	ug/g
Tin	ND	2.61	10.5	ug/g
Vanadium	ND	1.05	5.24	ug/g
Zinc	ND	3.27	10.5	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/11/2003 0:00	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2550 J	74.6	2670	ug/g
Q	37700	54.4	2670	ug/g
Hexachloroethane	ND	85.3	2670	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1070	1120 ug/g	105	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.09	5.37	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-13	21-03-126	2/19/2003 10:13	3/3/2003 10:12	11/14/2003 10:23	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 18:44	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	89.6			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 15:11	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	218	260	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1040	982 ug/g	94.5	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:00	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6900	291	559	ug/g
Tetrachloroethylene	295 J	112	559	ug/g
1,1,2,2-Tetrachloroethane	ND	168	559	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	11600	13500 ug/g	117	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 23:33	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	19.4 J	10.2	50.9	ug/g
Antimony	ND	0.641	5.09	ug/g
Arsenic	ND	1.24	5.09	ug/g
Barium	ND	0.437	5.09	ug/g
Beryllium	ND	0.916	5.09	ug/g
Boron	ND	3.80	10.2	ug/g
Cadmium	ND	0.417	5.09	ug/g
Chromium	5.95	1.31	5.09	ug/g
Cobalt	ND	0.275	1.02	ug/g
Copper	30.7	2.47	5.09	ug/g
Lead	ND	0.417	5.09	ug/g
Manganese	ND	0.326	1.02	ug/g
Mercury	0.0985 J	0.0509	0.509	ug/g
Nickel	0.628 J	0.356	5.09	ug/g
Selenium	ND	1.19	10.2	ug/g
Silver	ND	0.478	5.09	ug/g

Report of Analysis

Thallium	ND	0.997	5.09	ug/g
Tin	ND	2.53	10.2	ug/g
Vanadium	1.40 J	1.02	5.09	ug/g
Zinc	ND	3.17	10.2	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/11/2003 0:00	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2610	72.7	2600	ug/g
Q	41600	53.0	2600	ug/g
Hexachloroethane	ND	83.1	2600	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1040	1020 ug/g	98.1	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.13	5.46	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-14	21-03-129	2/20/2003 10:13	3/3/2003 10:12	11/14/2003 10:23	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 19:03	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	89.4			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 16:11	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	216	257	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1030	958 ug/g	93	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:00	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	5930	263	506	ug/g
Tetrachloroethylene	660	101	506	ug/g
1,1,2,2-Tetrachloroethane	ND	152	506	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10500	12000 ug/g	115	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 23:41	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	21.1 J	10.4	51.9	ug/g
Antimony	ND	0.654	5.19	ug/g
Arsenic	4.04 J	1.27	5.19	ug/g
Barium	ND	0.447	5.19	ug/g
Beryllium	ND	0.935	5.19	ug/g
Boron	ND	3.88	10.4	ug/g
Cadmium	ND	0.426	5.19	ug/g
Chromium	6.05	1.34	5.19	ug/g
Cobalt	ND	0.280	1.04	ug/g
Copper	62.1	2.52	5.19	ug/g
Lead	ND	0.426	5.19	ug/g
Manganese	0.629 J	0.332	1.04	ug/g
Mercury	0.134 J	0.0519	0.519	ug/g
Nickel	2.97 J	0.363	5.19	ug/g
Selenium	ND	1.21	10.4	ug/g
Silver	ND	0.488	5.19	ug/g

Report of Analysis

Thallium	ND	1.02	5.19	ug/g
Tin	ND	2.59	10.4	ug/g
Vanadium	1.52 J	1.04	5.19	ug/g
Zinc	ND	3.24	10.4	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/11/2003 0:00	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2520 J	73.4	2620	ug/g
Q	39000	53.5	2620	ug/g
Hexachloroethane	ND	83.9	2620	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1050	1020 ug/g	97.2	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.18	5.59	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-15	21-03-132	2/20/2003 10:32	3/3/2003 10:32	11/14/2003 10:23	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 19:23	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	90.5			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 17:11	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	219	261	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1040	981 ug/g	94	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:00	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6600	264	508	ug/g
Tetrachloroethylene	684	102	508	ug/g
1,1,2,2-Tetrachloroethane	ND	152	508	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10500	12300 ug/g	117	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/8/2003 0:38	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	24.7 J	10.4	51.9	ug/g
Antimony	ND	0.654	5.19	ug/g
Arsenic	3.10 J	1.27	5.19	ug/g
Barium	ND	0.447	5.19	ug/g
Beryllium	ND	0.935	5.19	ug/g
Boron	ND	3.88	10.4	ug/g
Cadmium	ND	0.426	5.19	ug/g
Chromium	4.06 J	1.34	5.19	ug/g
Cobalt	ND	0.280	1.04	ug/g
Copper	65.0	2.52	5.19	ug/g
Lead	ND	0.426	5.19	ug/g
Manganese	0.609 J	0.332	1.04	ug/g
Mercury	0.103 J	0.0519	0.519	ug/g
Nickel	1.70 J	0.363	5.19	ug/g
Selenium	ND	1.21	10.4	ug/g
Silver	ND	0.488	5.19	ug/g

Report of Analysis

Thallium	ND	1.02	5.19	ug/g
Tin	ND	2.59	10.4	ug/g
Vanadium	ND	1.04	5.19	ug/g
Zinc	ND	3.24	10.4	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/11/2003 0:00	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2200 J	71.8	2560	ug/g
Q	38600	52.3	2560	ug/g
Hexachloroethane	ND	82.1	2560	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1030	969 ug/g	94.5	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.21	5.66	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-16	21-03-135	2/20/2003 10:13	3/3/2003 10:12	11/14/2003 10:23	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 19:42	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	91.1			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 18:11	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	215	256	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	982 ug/g	95.8	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 0:00	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7120	264	508	ug/g
Tetrachloroethylene	ND	102	508	ug/g
1,1,2,2-Tetrachloroethane	ND	152	508	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10500	12200 ug/g	116	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 23:49	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	21.2 J	10.3	51.3	ug/g
Antimony	ND	0.646	5.13	ug/g
Arsenic	3.49 J	1.25	5.13	ug/g
Barium	ND	0.441	5.13	ug/g
Beryllium	ND	0.923	5.13	ug/g
Boron	ND	3.84	10.3	ug/g
Cadmium	ND	0.421	5.13	ug/g
Chromium	4.48 J	1.32	5.13	ug/g
Cobalt	ND	0.277	1.03	ug/g
Copper	28.6	2.49	5.13	ug/g
Lead	ND	0.421	5.13	ug/g
Manganese	2.65	0.328	1.03	ug/g
Mercury	57.2	0.0513	0.513	ug/g
Nickel	ND	0.359	5.13	ug/g
Selenium	ND	1.20	10.3	ug/g
Silver	ND	0.482	5.13	ug/g

Report of Analysis

Thallium	ND	1.01	5.13	ug/g
Tin	ND	2.55	10.3	ug/g
Vanadium	1.12 J	1.03	5.13	ug/g
Zinc	ND	3.20	10.3	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/11/2003 0:00	ssh	4901

Parameter	Result	MDL	PQL	Units
T	3040	74.9	2670	ug/g
Q	26200	54.5	2670	ug/g
Hexachloroethane	ND	85.6	2670	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1070	1040 ug/g	97.2	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.01	5.15	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.
Mercury was diluted an additional 20 fold and reanalyzed on 03/11/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-17	21-03-138	2/21/2003 10:13	3/3/2003 10:12	11/14/2003 10:23	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 20:01	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	82.7			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 19:10	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	232	277	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1110	1030 ug/g	93.1	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 10:13	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6940	265	510	ug/g
Tetrachloroethylene	ND	102	510	ug/g
1,1,2,2-Tetrachloroethane	ND	153	510	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10600	12300 ug/g	116	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 23:57	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	23.8 J	10.4	52.1	ug/g
Antimony	ND	0.656	5.21	ug/g
Arsenic	ND	1.27	5.21	ug/g
Barium	ND	0.448	5.21	ug/g
Beryllium	ND	0.938	5.21	ug/g
Boron	ND	3.90	10.4	ug/g
Cadmium	ND	0.427	5.21	ug/g
Chromium	3.51 J	1.34	5.21	ug/g
Cobalt	ND	0.281	1.04	ug/g
Copper	19.9	2.53	5.21	ug/g
Lead	1.61 J	0.427	5.21	ug/g
Manganese	0.654 J	0.333	1.04	ug/g
Mercury	0.267 J	0.0521	0.521	ug/g
Nickel	ND	0.365	5.21	ug/g
Selenium	ND	1.22	10.4	ug/g
Silver	ND	0.490	5.21	ug/g

Report of Analysis

Thallium	ND	1.02	5.21	ug/g
Tin	ND	2.59	10.4	ug/g
Vanadium	ND	1.04	5.21	ug/g
Zinc	ND	3.25	10.4	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/11/2003 0:00	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2800	69.8	2490	ug/g
Q	28400	50.8	2490	ug/g
Hexachloroethane	ND	79.8	2490	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	997	999 ug/g	100	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.12	5.45	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-18	21-03-141	2/21/2003 10:13	3/3/2003 10:12	11/14/2003 10:23	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 20:20	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	87.9			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 20:07	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	227	271	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1080	958 ug/g	88.5	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 10:47	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7260	260	501	ug/g
Tetrachloroethylene	ND	100	501	ug/g
1,1,2,2-Tetrachloroethane	ND	150	501	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10400	12000 ug/g	116	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/8/2003 0:05	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	18.8 J	10.4	52.2	ug/g
Antimony	ND	0.658	5.22	ug/g
Arsenic	5.38	1.27	5.22	ug/g
Barium	ND	0.449	5.22	ug/g
Beryllium	ND	0.940	5.22	ug/g
Boron	ND	3.91	10.4	ug/g
Cadmium	ND	0.428	5.22	ug/g
Chromium	6.23	1.35	5.22	ug/g
Cobalt	ND	0.282	1.04	ug/g
Copper	24.2	2.54	5.22	ug/g
Lead	ND	0.428	5.22	ug/g
Manganese	1.67	0.334	1.04	ug/g
Mercury	5.20	0.0522	0.522	ug/g
Nickel	ND	0.366	5.22	ug/g
Selenium	ND	1.22	10.4	ug/g
Silver	ND	0.491	5.22	ug/g

Report of Analysis

Thallium	ND	1.02	5.22	ug/g
Tin	ND	2.60	10.4	ug/g
Vanadium	1.66 J	1.04	5.22	ug/g
Zinc	ND	3.26	10.4	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/11/2003 0:00	ssh	4901

Parameter	Result	MDL	PQL	Units
T	3450	76.0	2710	ug/g
Q	29200	55.4	2710	ug/g
Hexachloroethane	ND	86.9	2710	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1090	1060 ug/g	97.6	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.97	5.06	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-19	21-03-144	2/22/2003 10:13	3/3/2003 10:12	11/14/2003 10:23	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 20:39	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	88.6			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 21:03	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	213	254	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	916 ug/g	90.1	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 11:22	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7730	269	517	ug/g
Tetrachloroethylene	734	103	517	ug/g
1,1,2,2-Tetrachloroethane	ND	155	517	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10700	12100 ug/g	114	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/8/2003 0:13	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	21.0 J	10.4	51.9	ug/g
Antimony	ND	0.654	5.19	ug/g
Arsenic	51.6	1.27	5.19	ug/g
Barium	ND	0.446	5.19	ug/g
Beryllium	ND	0.934	5.19	ug/g
Boron	ND	3.88	10.4	ug/g
Cadmium	ND	0.425	5.19	ug/g
Chromium	4.18 J	1.34	5.19	ug/g
Cobalt	ND	0.280	1.04	ug/g
Copper	50.5	2.52	5.19	ug/g
Lead	ND	0.425	5.19	ug/g
Manganese	0.567 J	0.332	1.04	ug/g
Mercury	0.126 J	0.0519	0.519	ug/g
Nickel	4.20 J	0.363	5.19	ug/g
Selenium	ND	1.21	10.4	ug/g
Silver	ND	0.488	5.19	ug/g

Report of Analysis

Thallium	ND	1.02	5.19	ug/g
Tin	ND	2.58	10.4	ug/g
Vanadium	1.06 J	1.04	5.19	ug/g
Zinc	ND	3.24	10.4	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/11/2003 0:00	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2530 J	75.4	2690	ug/g
Q	34500	55.0	2690	ug/g
Hexachloroethane	ND	86.2	2690	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1080	1010 ug/g	93.9	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	14.5	2.08	5.34	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

ECB Forensic Analytical Center
Edgewood Chemical and Biological Center
Aberdeen Proving Ground, MD 21010-5424
(410) 436-8600

Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-20	21-03-147	2/22/2003 10:13	3/3/2003 10:12	11/14/2003 10:23	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 20:59	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	81.3			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 21:58	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	215	256	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1030	894 ug/g	87.2	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 11:57	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7080	267	514	ug/g
Tetrachloroethylene	ND	103	514	ug/g
1,1,2,2-Tetrachloroethane	ND	154	514	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10600	12600 ug/g	118	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/8/2003 0:21	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	22.9 J	11.1	55.3	ug/g
Antimony	ND	0.697	5.53	ug/g
Arsenic	ND	1.35	5.53	ug/g
Barium	0.540 J	0.476	5.53	ug/g
Beryllium	ND	0.996	5.53	ug/g
Boron	ND	4.14	11.1	ug/g
Cadmium	ND	0.454	5.53	ug/g
Chromium	9.19	1.43	5.53	ug/g
Cobalt	0.334 J	0.299	1.11	ug/g
Copper	22.2	2.69	5.53	ug/g
Lead	0.848 J	0.454	5.53	ug/g
Manganese	4.98	0.354	1.11	ug/g
Mercury	0.185 J	0.0553	0.553	ug/g
Nickel	2.46 J	0.387	5.53	ug/g
Selenium	ND	1.29	11.1	ug/g
Silver	ND	0.520	5.53	ug/g

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Thallium	ND	1.08	5.53	ug/g
Tin	ND	2.75	11.1	ug/g
Vanadium	1.71 J	1.11	5.53	ug/g
Zinc	ND	3.45	11.1	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/11/2003 0:00	ssh	4901

Parameter	Result	MDL	PQL	Units
T	2980	71.6	2560	ug/g
Q	28000	52.1	2560	ug/g
Hexachloroethane	ND	81.8	2560	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1020	962 ug/g	94.1	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	2.16	5.54	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-020-21	21-03-150	2/22/2003 10:13	3/3/2003 10:12	11/14/2003 10:23	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 21:18	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	85.3			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 22:53	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	212	252	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1010	865 ug/g	85.8	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/12/2003 12:32	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7350	261	503	ug/g
Tetrachloroethylene	187 J	101	503	ug/g
1,1,2,2-Tetrachloroethane	ND	151	503	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10400	11900 ug/g	115	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/8/2003 0:30	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	21.7 J	10.2	51.2	ug/g
Antimony	ND	0.645	5.12	ug/g
Arsenic	1.59 J	1.25	5.12	ug/g
Barium	ND	0.440	5.12	ug/g
Beryllium	ND	0.921	5.12	ug/g
Boron	ND	3.83	10.2	ug/g
Cadmium	ND	0.420	5.12	ug/g
Chromium	3.63 J	1.32	5.12	ug/g
Cobalt	ND	0.276	1.02	ug/g
Copper	33.2	2.49	5.12	ug/g
Lead	ND	0.420	5.12	ug/g
Manganese	3.12	0.328	1.02	ug/g
Mercury	0.0887 J	0.0512	0.512	ug/g
Nickel	ND	0.358	5.12	ug/g
Selenium	ND	1.20	10.2	ug/g
Silver	ND	0.481	5.12	ug/g

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Thallium	ND	1.00	5.12	ug/g
Tin	ND	2.55	10.2	ug/g
Vanadium	ND	1.02	5.12	ug/g
Zinc	ND	3.19	10.2	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/11/2003 0:00	ssh	4901

Parameter	*Result*	*MDL*	*PQL*	*Units*
T	2690	72.5	2590	ug/g
Q	30100	52.8	2590	ug/g
Hexachloroethane	ND	82.8	2590	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1040	1050 ug/g	101	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/11/2003 0:00	ssh	5002

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.99	5.09	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/18/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-01	21-03-091	2/11/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 17:20	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.94	49.7	ug/g
Antimony	ND	0.129	4.97	ug/g
Arsenic	1.89J	0.567	4.97	ug/g
Barium	0.0895J	0.0398	4.97	ug/g
Beryllium	ND	0.0497	4.97	ug/g
Boron	ND	3.98	9.94	ug/g
Cadmium	0.139J	0.0199	4.97	ug/g
Chromium	16.4	0.994	4.97	ug/g
Cobalt	1.53	0.119	0.994	ug/g
Copper	5.59J	3.21	9.94	ug/g
Lead	4.46J	1.88	9.94	ug/g
Manganese	95.4	3.28	9.94	ug/g
Mercury	0.129J	0.0696	0.497	ug/g
Nickel	11.3	0.616	4.97	ug/g
Selenium	ND	0.706	24.9	ug/g
Silver	ND	0.0596	4.97	ug/g
Thallium	ND	0.328	4.97	ug/g
Tin	0.497J	0.437	9.94	ug/g
Vanadium	2.05J	0.994	4.97	ug/g
Zinc	3.09J	2.19	9.94	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-03	21-03-097	2/12/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 17:46	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.0	50.1	ug/g
Antimony	0.711 J	0.130	5.01	ug/g
Arsenic	3.85 J	0.571	5.01	ug/g
Barium	0.200 J	0.0400	5.01	ug/g
Beryllium	ND	0.0501	5.01	ug/g
Boron	ND	4.00	10.0	ug/g
Cadmium	0.163 J	0.0200	5.01	ug/g
Chromium	31.7	1.00	5.01	ug/g
Cobalt	6.56	0.120	1.00	ug/g
Copper	18.1	3.23	10.0	ug/g
Lead	7.09 J	1.89	10.0	ug/g
Manganese	178	3.30	10.0	ug/g
Mercury	0.320 J	0.0701	0.501	ug/g
Nickel	10.4	0.621	5.01	ug/g
Selenium	ND	0.711	25.0	ug/g
Silver	ND	0.0601	5.01	ug/g
Thallium	ND	0.330	5.01	ug/g
Tin	2.76 J	0.440	10.0	ug/g
Vanadium	1.78 J	1.00	5.01	ug/g
Zinc	47.2	2.20	10.0	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-04	21-03-100	2/12/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 17:54	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.2	50.9	ug/g
Antimony	0.417J	0.132	5.09	ug/g
Arsenic	13.5	0.580	5.09	ug/g
Barium	0.112J	0.0407	5.09	ug/g
Beryllium	ND	0.0509	5.09	ug/g
Boron	ND	4.07	10.2	ug/g
Cadmium	0.214J	0.0203	5.09	ug/g
Chromium	31.2	1.02	5.09	ug/g
Cobalt	5.11	0.122	1.02	ug/g
Copper	74.6	3.29	10.2	ug/g
Lead	9.40J	1.92	10.2	ug/g
Manganese	240	3.36	10.2	ug/g
Mercury	0.122J	0.0712	0.509	ug/g
Nickel	14.2	0.631	5.09	ug/g
Selenium	ND	0.722	25.4	ug/g
Silver	ND	0.0610	5.09	ug/g
Thallium	ND	0.336	5.09	ug/g
Tin	2.53J	0.448	10.2	ug/g
Vanadium	2.05J	1.02	5.09	ug/g
Zinc	120	2.24	10.2	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-05	21-03-103	2/12/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 18:03	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.82	49.1	ug/g
Antimony	0.403 J	0.128	4.91	ug/g
Arsenic	587	0.560	4.91	ug/g
Barium	0.0833 J	0.0393	4.91	ug/g
Beryllium	ND	0.0491	4.91	ug/g
Boron	ND	3.93	9.82	ug/g
Cadmium	0.157 J	0.0196	4.91	ug/g
Chromium	21.9	0.982	4.91	ug/g
Cobalt	2.33	0.118	0.982	ug/g
Copper	58.4	3.17	9.82	ug/g
Lead	17.9	1.86	9.82	ug/g
Manganese	163	3.24	9.82	ug/g
Mercury	0.118 J	0.0688	0.491	ug/g
Nickel	29.8	0.609	4.91	ug/g
Selenium	ND	0.697	24.6	ug/g
Silver	ND	0.0589	4.91	ug/g
Thallium	ND	0.324	4.91	ug/g
Tin	2.50 J	0.432	9.82	ug/g
Vanadium	1.90 J	0.982	4.91	ug/g
Zinc	51.4	2.16	9.82	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.
Arsenic was diluted an additional 2 fold and reanalyzed an 03/11/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-06	21-03-106	2/13/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 18:12	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.75	48.7	ug/g
Antimony	0.419J	0.127	4.87	ug/g
Arsenic	25.9	0.556	4.87	ug/g
Barium	0.0780J	0.0390	4.87	ug/g
Beryllium	ND	0.0487	4.87	ug/g
Boron	ND	3.90	9.75	ug/g
Cadmium	0.185J	0.0195	4.87	ug/g
Chromium	13.5	0.975	4.87	ug/g
Cobalt	2.58	0.117	0.975	ug/g
Copper	21.2	3.15	9.75	ug/g
Lead	10.3	1.84	9.75	ug/g
Manganese	171	3.22	9.75	ug/g
Mercury	1560	0.0682	0.487	ug/g
Nickel	29.0	0.604	4.87	ug/g
Selenium	ND	0.692	24.4	ug/g
Silver	ND	0.0585	4.87	ug/g
Thallium	ND	0.322	4.87	ug/g
Tin	2.07J	0.429	9.75	ug/g
Vanadium	1.96J	0.975	4.87	ug/g
Zinc	44.2	2.14	9.75	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.
Mercury was diluted an additional 500 fold and reanalyzed on 03/11/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-07	21-03-109	2/13/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 18:20	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	20.5 J	10.6	52.9	ug/g
Antimony	0.609 J	0.137	5.29	ug/g
Arsenic	6.09	0.603	5.29	ug/g
Barium	0.217 J	0.0423	5.29	ug/g
Beryllium	ND	0.0529	5.29	ug/g
Boron	ND	4.23	10.6	ug/g
Cadmium	0.180 J	0.0211	5.29	ug/g
Chromium	27.6	1.06	5.29	ug/g
Cobalt	3.49	0.127	1.06	ug/g
Copper	10.4 J	3.41	10.6	ug/g
Lead	8.01 J	2.00	10.6	ug/g
Manganese	155	3.49	10.6	ug/g
Mercury	2.59	0.0740	0.529	ug/g
Nickel	27.6	0.655	5.29	ug/g
Selenium	ND	0.751	26.4	ug/g
Silver	ND	0.0634	5.29	ug/g
Thallium	ND	0.349	5.29	ug/g
Tin	3.36 J	0.465	10.6	ug/g
Vanadium	2.12 J	1.06	5.29	ug/g
Zinc	3.08 J	2.33	10.6	ug/g

Comments: Aluminum, Berylium, Mercury, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-08	21-03-112	2/14/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 18:29	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.3	51.5	ug/g
Antimony	0.330 J	0.134	5.15	ug/g
Arsenic	433	0.588	5.15	ug/g
Barium	0.155 J	0.0412	5.15	ug/g
Beryllium	0.0656 J	0.0515	5.15	ug/g
Boron	ND	4.12	10.3	ug/g
Cadmium	0.237 J	0.0206	5.15	ug/g
Chromium	16.6	1.03	5.15	ug/g
Cobalt	3.47	0.124	1.03	ug/g
Copper	56.3	3.33	10.3	ug/g
Lead	126	1.95	10.3	ug/g
Manganese	119	3.40	10.3	ug/g
Mercury	0.116 J	0.0722	0.515	ug/g
Nickel	13.1	0.639	5.15	ug/g
Selenium	ND	0.732	25.8	ug/g
Silver	ND	0.0619	5.15	ug/g
Thallium	ND	0.340	5.15	ug/g
Tin	2.40 J	0.454	10.3	ug/g
Vanadium	1.77 J	1.03	5.15	ug/g
Zinc	75.4	2.27	10.3	ug/g

Comments: Aluminum, Berylium, Mercury, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-09	21-03-115	2/14/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 18:38	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	45.4 J	9.86	49.3	ug/g
Antimony	ND	0.128	4.93	ug/g
Arsenic	10.5	0.562	4.93	ug/g
Barium	0.335 J	0.0394	4.93	ug/g
Beryllium	ND	0.0493	4.93	ug/g
Boron	9.02 J	3.94	9.86	ug/g
Cadmium	0.158 J	0.0197	4.93	ug/g
Chromium	37.4	0.986	4.93	ug/g
Cobalt	0.937 J	0.118	0.986	ug/g
Copper	26.9	3.19	9.86	ug/g
Lead	2.62 J	1.86	9.86	ug/g
Manganese	50.9	3.25	9.86	ug/g
Mercury	1.63	0.0690	0.493	ug/g
Nickel	102	0.611	4.93	ug/g
Selenium	ND	0.700	24.7	ug/g
Silver	ND	0.0592	4.93	ug/g
Thallium	ND	0.325	4.93	ug/g
Tin	1.15 J	0.434	9.86	ug/g
Vanadium	1.56 J	0.986	4.93	ug/g
Zinc	12.8	2.17	9.86	ug/g

Comments: Aluminum, Beryllium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-10	21-03-118	2/18/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 18:46	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	9.90 J	9.52	47.6	ug/g
Antimony	2.06 J	0.124	4.76	ug/g
Arsenic	15.7	0.543	4.76	ug/g
Barium	0.533 J	0.0381	4.76	ug/g
Beryllium	ND	0.0476	4.76	ug/g
Boron	ND	3.81	9.52	ug/g
Cadmium	0.204 J	0.0190	4.76	ug/g
Chromium	63.3	0.952	4.76	ug/g
Cobalt	12.8	0.114	0.952	ug/g
Copper	25.7	3.08	9.52	ug/g
Lead	48.8	1.80	9.52	ug/g
Manganese	615	3.14	9.52	ug/g
Mercury	2.04	0.0667	0.476	ug/g
Nickel	74.3	0.590	4.76	ug/g
Selenium	ND	0.676	23.8	ug/g
Silver	ND	0.0571	4.76	ug/g
Thallium	ND	0.314	4.76	ug/g
Tin	13.2	0.419	9.52	ug/g
Vanadium	2.20 J	0.952	4.76	ug/g
Zinc	135	2.10	9.52	ug/g

Comments: Aluminum, Beryllium, and Boron were reanalyzed on 03/20/03.
Manganese was diluted an additional 2 fold and reanalyzed on 03/11/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-11	21-03-121	2/18/2003 09:01	3/3/2003 09:00	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 20:39	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.83	49.2	ug/g
Antimony	ND	0.128	4.92	ug/g
Arsenic	1.85 J	0.560	4.92	ug/g
Barium	0.0885 J	0.0393	4.92	ug/g
Beryllium	ND	0.0492	4.92	ug/g
Boron	ND	3.93	9.83	ug/g
Cadmium	0.128 J	0.0197	4.92	ug/g
Chromium	5.36	0.983	4.92	ug/g
Cobalt	ND	0.118	0.983	ug/g
Copper	23.4	3.18	9.83	ug/g
Lead	ND	1.86	9.83	ug/g
Manganese	ND	3.24	9.83	ug/g
Mercury	0.458 J	0.0688	0.492	ug/g
Nickel	1.39 J	0.610	4.92	ug/g
Selenium	ND	0.698	24.6	ug/g
Silver	ND	0.0590	4.92	ug/g
Thallium	ND	0.324	4.92	ug/g
Tin	ND	0.433	9.83	ug/g
Vanadium	1.52 J	0.983	4.92	ug/g
Zinc	ND	2.16	9.83	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-12	21-03-124	2/19/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 18:55	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	16.1 J	9.82	49.1	ug/g
Antimony	0.206 J	0.128	4.91	ug/g
Arsenic	86.1	0.560	4.91	ug/g
Barium	0.501 J	0.0393	4.91	ug/g
Beryllium	ND	0.0491	4.91	ug/g
Boron	ND	3.93	9.82	ug/g
Cadmium	0.147 J	0.0196	4.91	ug/g
Chromium	16.1	0.982	4.91	ug/g
Cobalt	2.56	0.118	0.982	ug/g
Copper	68.3	3.17	9.82	ug/g
Lead	3.35 J	1.86	9.82	ug/g
Manganese	86.2	3.24	9.82	ug/g
Mercury	0.339 J	0.0688	0.491	ug/g
Nickel	23.3	0.609	4.91	ug/g
Selenium	ND	0.697	24.6	ug/g
Silver	ND	0.0589	4.91	ug/g
Thallium	ND	0.324	4.91	ug/g
Tin	1.42 J	0.432	9.82	ug/g
Vanadium	1.30 J	0.982	4.91	ug/g
Zinc	42.1	2.16	9.82	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-13	21-03-127	2/19/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 19:29	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	11.0 J	10.4	52.0	ug/g
Antimony	ND	0.135	5.20	ug/g
Arsenic	42.2	0.593	5.20	ug/g
Barium	0.854 J	0.0416	5.20	ug/g
Beryllium	0.0663 J	0.0520	5.20	ug/g
Boron	ND	4.16	10.4	ug/g
Cadmium	0.166 J	0.0208	5.20	ug/g
Chromium	6.65	1.04	5.20	ug/g
Cobalt	1.39	0.125	1.04	ug/g
Copper	10.7	3.36	10.4	ug/g
Lead	20.8	1.97	10.4	ug/g
Manganese	91.3	3.43	10.4	ug/g
Mercury	0.198 J	0.0728	0.520	ug/g
Nickel	7.03	0.645	5.20	ug/g
Selenium	ND	0.739	26.0	ug/g
Silver	ND	0.0624	5.20	ug/g
Thallium	ND	0.343	5.20	ug/g
Tin	0.989 J	0.458	10.4	ug/g
Vanadium	ND	1.04	5.20	ug/g
Zinc	31.7	2.29	10.4	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-14	21-03-130	2/20/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 19:38	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.3	51.7	ug/g
Antimony	0.176 J	0.134	5.17	ug/g
Arsenic	55.7	0.589	5.17	ug/g
Barium	0.0871 J	0.0414	5.17	ug/g
Beryllium	ND	0.0517	5.17	ug/g
Boron	ND	4.14	10.3	ug/g
Cadmium	0.186 J	0.0207	5.17	ug/g
Chromium	12.0	1.03	5.17	ug/g
Cobalt	3.26	0.124	1.03	ug/g
Copper	59.2	3.34	10.3	ug/g
Lead	3.60 J	1.95	10.3	ug/g
Manganese	116	3.41	10.3	ug/g
Mercury	0.248 J	0.0724	0.517	ug/g
Nickel	15.6	0.641	5.17	ug/g
Selenium	ND	0.734	25.9	ug/g
Silver	ND	0.0620	5.17	ug/g
Thallium	ND	0.341	5.17	ug/g
Tin	1.71 J	0.455	10.3	ug/g
Vanadium	1.57 J	1.03	5.17	ug/g
Zinc	51.9	2.28	10.3	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-15	21-03-133	2/20/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 19:47	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	11.0	54.8	ug/g
Antimony	ND	0.143	5.48	ug/g
Arsenic	71.4	0.625	5.48	ug/g
Barium	0.143J	0.0439	5.48	ug/g
Beryllium	ND	0.0548	5.48	ug/g
Boron	ND	4.39	11.0	ug/g
Cadmium	0.164J	0.0219	5.48	ug/g
Chromium	19.1	1.10	5.48	ug/g
Cobalt	2.06	0.132	1.10	ug/g
Copper	93.6	3.54	11.0	ug/g
Lead	3.20J	2.07	11.0	ug/g
Manganese	68.0	3.62	11.0	ug/g
Mercury	0.197J	0.0768	0.548	ug/g
Nickel	45.3	0.680	5.48	ug/g
Selenium	ND	0.779	27.4	ug/g
Silver	ND	0.0658	5.48	ug/g
Thallium	ND	0.362	5.48	ug/g
Tin	1.11J	0.482	11.0	ug/g
Vanadium	1.49J	1.10	5.48	ug/g
Zinc	33.6	2.41	11.0	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-16	21-03-136	2/20/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 19:55	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	33.3 J	11.2	56.2	ug/g
Antimony	2.24 J	0.146	5.62	ug/g
Arsenic	71.6	0.640	5.62	ug/g
Barium	0.697 J	0.0449	5.62	ug/g
Beryllium	ND	0.0562	5.62	ug/g
Boron	ND	4.49	11.2	ug/g
Cadmium	0.281 J	0.0225	5.62	ug/g
Chromium	40.7	1.12	5.62	ug/g
Cobalt	4.44	0.135	1.12	ug/g
Copper	22.8	3.63	11.2	ug/g
Lead	21.7	2.12	11.2	ug/g
Manganese	266	3.71	11.2	ug/g
Mercury	2580	0.0787	0.562	ug/g
Nickel	65.1	0.697	5.62	ug/g
Selenium	ND	0.798	28.1	ug/g
Silver	ND	0.0674	5.62	ug/g
Thallium	ND	0.371	5.62	ug/g
Tin	6.11 J	0.494	11.2	ug/g
Vanadium	2.10 J	1.12	5.62	ug/g
Zinc	50.9	2.47	11.2	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.
Mercury was diluted an addition 1000 fold and reanalyzed on 03/11/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-17	21-03-139	2/21/2003 09:01	3/3/2003 09:00	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 21:48	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	22.7 J	9.53	47.7	ug/g
Antimony	1.34 J	0.124	4.77	ug/g
Arsenic	14.7	0.543	4.77	ug/g
Barium	1.60 J	0.0381	4.77	ug/g
Beryllium	ND	0.0477	4.77	ug/g
Boron	ND	3.81	9.53	ug/g
Cadmium	0.190 J	0.0191	4.77	ug/g
Chromium	41.6	0.953	4.77	ug/g
Cobalt	6.08	0.114	0.953	ug/g
Copper	93.8	3.08	9.53	ug/g
Lead	273	1.80	9.53	ug/g
Manganese	435	3.15	9.53	ug/g
Mercury	4.04	0.0667	0.477	ug/g
Nickel	69.3	0.591	4.77	ug/g
Selenium	ND	0.677	23.8	ug/g
Silver	ND	0.0572	4.77	ug/g
Thallium	ND	0.315	4.77	ug/g
Tin	21.7	0.419	9.53	ug/g
Vanadium	1.60 J	0.953	4.77	ug/g
Zinc	86.4	2.10	9.53	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-18	21-03-142	2/21/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 20:04	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.3	51.3	ug/g
Antimony	0.386 J	0.133	5.13	ug/g
Arsenic	113	0.585	5.13	ug/g
Barium	0.190 J	0.0410	5.13	ug/g
Beryllium	ND	0.0513	5.13	ug/g
Boron	ND	4.10	10.3	ug/g
Cadmium	0.177 J	0.0205	5.13	ug/g
Chromium	18.3	1.03	5.13	ug/g
Cobalt	2.47	0.123	1.03	ug/g
Copper	33.3	3.31	10.3	ug/g
Lead	6.90 J	1.94	10.3	ug/g
Manganese	182	3.38	10.3	ug/g
Mercury	238	0.0718	0.513	ug/g
Nickel	24.7	0.636	5.13	ug/g
Selenium	ND	0.728	25.6	ug/g
Silver	ND	0.0615	5.13	ug/g
Thallium	ND	0.338	5.13	ug/g
Tin	4.39 J	0.451	10.3	ug/g
Vanadium	1.62 J	1.03	5.13	ug/g
Zinc	24.7	2.26	10.3	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.
Mercury was diluted an additional 100 fold and reanalyzed on 03/26/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-19	21-03-145	2/22/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals In NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 20:13	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.2	50.8	ug/g
Antimony	ND	0.132	5.08	ug/g
Arsenic	451	0.579	5.08	ug/g
Barium	0.629 J	0.0406	5.08	ug/g
Beryllium	ND	0.0508	5.08	ug/g
Boron	ND	4.06	10.2	ug/g
Cadmium	0.173 J	0.0203	5.08	ug/g
Chromium	17.2	1.02	5.08	ug/g
Cobalt	2.27	0.122	1.02	ug/g
Copper	46.9	3.28	10.2	ug/g
Lead	7.24 J	1.92	10.2	ug/g
Manganese	138	3.35	10.2	ug/g
Mercury	96.7	0.0711	0.508	ug/g
Nickel	6.93	0.629	5.08	ug/g
Selenium	ND	0.721	25.4	ug/g
Silver	ND	0.0609	5.08	ug/g
Thallium	ND	0.335	5.08	ug/g
Tin	1.23 J	0.447	10.2	ug/g
Vanadium	2.31 J	1.02	5.08	ug/g
Zinc	71.4	2.23	10.2	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.
Mercury was reanalyzed on 03/26/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-20	21-03-148	2/22/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 20:21	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.90	49.5	ug/g
Antimony	ND	0.129	4.95	ug/g
Arsenic	1.95J	0.564	4.95	ug/g
Barium	0.168J	0.0396	4.95	ug/g
Beryllium	ND	0.0495	4.95	ug/g
Boron	ND	3.96	9.90	ug/g
Cadmium	0.129J	0.0198	4.95	ug/g
Chromium	6.09	0.990	4.95	ug/g
Cobalt	ND	0.119	0.990	ug/g
Copper	19.7	3.20	9.90	ug/g
Lead	ND	1.87	9.90	ug/g
Manganese	5.49J	3.27	9.90	ug/g
Mercury	0.960	0.0693	0.495	ug/g
Nickel	2.32J	0.614	4.95	ug/g
Selenium	ND	0.703	24.8	ug/g
Silver	ND	0.0594	4.95	ug/g
Thallium	ND	0.327	4.95	ug/g
Tin	ND	0.436	9.90	ug/g
Vanadium	1.73J	0.990	4.95	ug/g
Zinc	2.55J	2.18	9.90	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-021-21	21-03-151	2/22/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 20:30	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	10.9J	9.64	48.2	ug/g
Antimony	2.04J	0.125	4.82	ug/g
Arsenic	318	0.550	4.82	ug/g
Barium	4.44J	0.0386	4.82	ug/g
Beryllium	ND	0.0482	4.82	ug/g
Boron	ND	3.86	9.64	ug/g
Cadmium	0.183J	0.0193	4.82	ug/g
Chromium	49.0	0.964	4.82	ug/g
Cobalt	7.12	0.116	0.964	ug/g
Copper	33.7	3.11	9.64	ug/g
Lead	77.0	1.82	9.64	ug/g
Manganese	413	3.18	9.64	ug/g
Mercury	1.56	0.0675	0.482	ug/g
Nickel	25.3	0.598	4.82	ug/g
Selenium	ND	0.685	24.1	ug/g
Silver	ND	0.0579	4.82	ug/g
Thallium	ND	0.318	4.82	ug/g
Tin	5.76J	0.424	9.64	ug/g
Vanadium	1.53J	0.964	4.82	ug/g
Zinc	149	2.12	9.64	ug/g

Comments: Aluminum, Berylium, and Boron were reanalyzed on 03/20/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-01	21-03-092	2/11/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 21:35	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.85	49.3	ug/g
Antimony	ND	0.128	4.93	ug/g
Arsenic	1.75 J	0.562	4.93	ug/g
Barium	0.0717 J	0.0394	4.93	ug/g
Beryllium	ND	0.0493	4.93	ug/g
Boron	ND	3.94	9.85	ug/g
Cadmium	ND	0.0197	4.93	ug/g
Chromium	19.1	0.985	4.93	ug/g
Cobalt	2.94	0.118	0.985	ug/g
Copper	18.3	3.18	9.85	ug/g
Lead	8.13 J	1.86	9.85	ug/g
Manganese	188	3.25	9.85	ug/g
Mercury	0.116 J	0.0690	0.493	ug/g
Nickel	21.7	0.611	4.93	ug/g
Selenium	ND	0.700	24.6	ug/g
Silver	ND	0.0591	4.93	ug/g
Thallium	ND	0.325	4.93	ug/g
Tin	2.03 J	0.433	9.85	ug/g
Vanadium	1.32 J	0.985	4.93	ug/g
Zinc	2.62 J	2.17	9.85	ug/g

Comments: Aluminum, Berylium, Boron, Chromium, Nickel and Thallium were reanalyzed on 03/25/03.
Mercury and Copper were reanalyzed on 03/26/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-03	21-03-098	2/12/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 22:01	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.1	50.6	ug/g
Antimony	2.50J	0.131	5.06	ug/g
Arsenic	5.07	0.576	5.06	ug/g
Barium	1.34J	0.0404	5.06	ug/g
Beryllium	ND	0.0506	5.06	ug/g
Boron	ND	4.04	10.1	ug/g
Cadmium	ND	0.0202	5.06	ug/g
Chromium	71.2	1.01	5.06	ug/g
Cobalt	10.4	0.121	1.01	ug/g
Copper	60.1	3.27	10.1	ug/g
Lead	14.0	1.91	10.1	ug/g
Manganese	317	3.34	10.1	ug/g
Mercury	0.530	0.0708	0.506	ug/g
Nickel	40.0	0.627	5.06	ug/g
Selenium	ND	0.718	25.3	ug/g
Silver	ND	0.0607	5.06	ug/g
Thallium	ND	0.334	5.06	ug/g
Tin	5.54J	0.445	10.1	ug/g
Vanadium	3.84J	1.01	5.06	ug/g
Zinc	62.9	2.22	10.1	ug/g

Comments: Aluminum, Berylium, Boron, and Thallium were reanalyzed on 03/25/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-04	21-03-101	2/12/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 22:10	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.3	51.6	ug/g
Antimony	0.738J	0.134	5.16	ug/g
Arsenic	33.4	0.588	5.16	ug/g
Barium	0.128J	0.0413	5.16	ug/g
Beryllium	ND	0.0516	5.16	ug/g
Boron	ND	4.13	10.3	ug/g
Cadmium	0.204J	0.0206	5.16	ug/g
Chromium	42.1	1.03	5.16	ug/g
Cobalt	7.46	0.124	1.03	ug/g
Copper	198	3.33	10.3	ug/g
Lead	41.2	1.95	10.3	ug/g
Manganese	366	3.41	10.3	ug/g
Mercury	0.0910J	0.0722	0.516	ug/g
Nickel	17.1	0.640	5.16	ug/g
Selenium	ND	0.733	25.8	ug/g
Silver	0.0654J	0.0619	5.16	ug/g
Thallium	ND	0.341	5.16	ug/g
Tin	4.23J	0.454	10.3	ug/g
Vanadium	1.82J	1.03	5.16	ug/g
Zinc	431	2.27	10.3	ug/g

Comments: *Aluminum, Berylium, Boron, and Thallium were reanalyzed on 03/25/03.*

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-05	21-03-104	2/12/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 22:19	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	14.9J	10.1	50.4	ug/g
Antimony	0.398J	0.131	5.04	ug/g
Arsenic	254	0.575	5.04	ug/g
Barium	0.178J	0.0403	5.04	ug/g
Beryllium	ND	0.0504	5.04	ug/g
Boron	ND	4.03	10.1	ug/g
Cadmium	ND	0.0202	5.04	ug/g
Chromium	13.6	1.01	5.04	ug/g
Cobalt	3.33	0.121	1.01	ug/g
Copper	116	3.26	10.1	ug/g
Lead	97.7	1.91	10.1	ug/g
Manganese	329	3.33	10.1	ug/g
Mercury	0.106J	0.0706	0.504	ug/g
Nickel	14.7	0.625	5.04	ug/g
Selenium	ND	0.716	25.2	ug/g
Silver	ND	0.0605	5.04	ug/g
Thallium	ND	0.333	5.04	ug/g
Tin	2.89J	0.444	10.1	ug/g
Vanadium	1.15J	1.01	5.04	ug/g
Zinc	111	2.22	10.1	ug/g

Comments: Aluminum, Berylium, Boron, and Thallium were reanalyzed on 03/25/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-06	21-03-107	2/13/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 22:27	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	17.9J	10.7	53.5	ug/g
Antimony	2.29J	0.139	5.35	ug/g
Arsenic	62.8	0.610	5.35	ug/g
Barium	0.448J	0.0428	5.35	ug/g
Beryllium	ND	0.0535	5.35	ug/g
Boron	ND	4.28	10.7	ug/g
Cadmium	0.0707J	0.0214	5.35	ug/g
Chromium	38.8	1.07	5.35	ug/g
Cobalt	5.13	0.128	1.07	ug/g
Copper	75.5	3.45	10.7	ug/g
Lead	103	2.02	10.7	ug/g
Manganese	391	3.53	10.7	ug/g
Mercury	2010	0.0749	0.535	ug/g
Nickel	137	0.663	5.35	ug/g
Selenium	ND	0.759	26.7	ug/g
Silver	0.0775J	0.0642	5.35	ug/g
Thallium	ND	0.353	5.35	ug/g
Tin	4.91J	0.471	10.7	ug/g
Vanadium	1.57J	1.07	5.35	ug/g
Zinc	103	2.35	10.7	ug/g

Comments: Berylium, Boron, and Thallium were reanalyzed on 03/25/03.
Aluminum reanalyzed on 03/26/03.
Mercury was diluted an additional 1000 fold and reanalyzed on 03/19/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-07	21-03-110	2/13/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 22:36	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	19.1J	10.7	53.4	ug/g
Antimony	0.915J	0.139	5.34	ug/g
Arsenic	9.01	0.609	5.34	ug/g
Barium	0.137J	0.0427	5.34	ug/g
Beryllium	ND	0.0534	5.34	ug/g
Boron	ND	4.27	10.7	ug/g
Cadmium	ND	0.0214	5.34	ug/g
Chromium	37.8	1.07	5.34	ug/g
Cobalt	7.46	0.128	1.07	ug/g
Copper	29.4	3.45	10.7	ug/g
Lead	26.8	2.02	10.7	ug/g
Manganese	369	3.53	10.7	ug/g
Mercury	0.514J	0.0748	0.534	ug/g
Nickel	50.3	0.662	5.34	ug/g
Selenium	ND	0.759	26.7	ug/g
Silver	ND	0.0641	5.34	ug/g
Thallium	ND	0.353	5.34	ug/g
Tin	6.56J	0.470	10.7	ug/g
Vanadium	2.06J	1.07	5.34	ug/g
Zinc	4.43J	2.35	10.7	ug/g

Comments: Aluminum, Berylium, Boron, and Thallium were reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/26/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-08	21-03-113	2/14/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 22:45	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.91	49.6	ug/g
Antimony	1.08 J	0.129	4.96	ug/g
Arsenic	1370	0.565	4.96	ug/g
Barium	0.0484 J	0.0396	4.96	ug/g
Beryllium	ND	0.0496	4.96	ug/g
Boron	ND	3.96	9.91	ug/g
Cadmium	0.0975 J	0.0198	4.96	ug/g
Chromium	31.3	0.991	4.96	ug/g
Cobalt	8.73	0.119	0.991	ug/g
Copper	135	3.20	9.91	ug/g
Lead	60.5	1.87	9.91	ug/g
Manganese	289	3.27	9.91	ug/g
Mercury	0.369 J	0.0694	0.496	ug/g
Nickel	13.0	0.614	4.96	ug/g
Selenium	ND	0.704	24.8	ug/g
Silver	ND	0.0595	4.96	ug/g
Thallium	ND	0.327	4.96	ug/g
Tin	7.10 J	0.436	9.91	ug/g
Vanadium	1.12 J	0.991	4.96	ug/g
Zinc	415	2.18	9.91	ug/g

Comments: Aluminum, Berylium, Boron, and Thallium were reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/26/03.
Arsenic was diluted an additional 4 fold and reanalyzed on 03/25/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-09	21-03-116	2/14/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 22:53	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	40.1 J	9.70	48.5	ug/g
Antimony	2.46 J	0.126	4.85	ug/g
Arsenic	71.3	0.553	4.85	ug/g
Barium	1.32 J	0.0388	4.85	ug/g
Beryllium	ND	0.0485	4.85	ug/g
Boron	ND	3.88	9.70	ug/g
Cadmium	ND	0.0194	4.85	ug/g
Chromium	91.4	0.970	4.85	ug/g
Cobalt	9.12	0.116	0.970	ug/g
Copper	43.5	3.13	9.70	ug/g
Lead	24.9	1.83	9.70	ug/g
Manganese	591	3.20	9.70	ug/g
Mercury	14.5	0.0679	0.485	ug/g
Nickel	337	0.601	4.85	ug/g
Selenium	ND	0.689	24.2	ug/g
Silver	ND	0.0582	4.85	ug/g
Thallium	ND	0.320	4.85	ug/g
Tin	14.8	0.427	9.70	ug/g
Vanadium	1.85 J	0.970	4.85	ug/g
Zinc	119	2.13	9.70	ug/g

Comments: Aluminum, Berylium, Boron, and Thallium were reanalyzed on 03/25/03.
Manganese was diluted an additional 2 fold and reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/26/03.
Result for Mercury reported was above highest calibration curve standard. Sample diluted 5 fold and reanalyzed for accuracy on 04/01/03.
Original result was accurate.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-10	21-03-119	2/18/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 23:02	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	20.3 J	10.3	51.3	ug/g
Antimony	1.81 J	0.133	5.13	ug/g
Arsenic	19.6	0.585	5.13	ug/g
Barium	1.32 J	0.0410	5.13	ug/g
Beryllium	ND	0.0513	5.13	ug/g
Boron	ND	4.10	10.3	ug/g
Cadmium	ND	0.0205	5.13	ug/g
Chromium	92.5	1.03	5.13	ug/g
Cobalt	13.5	0.123	1.03	ug/g
Copper	25.6	3.31	10.3	ug/g
Lead	61.7	1.94	10.3	ug/g
Manganese	536	3.38	10.3	ug/g
Mercury	1.60	0.0718	0.513	ug/g
Nickel	154	0.636	5.13	ug/g
Selenium	ND	0.728	25.6	ug/g
Silver	ND	0.0615	5.13	ug/g
Thallium	ND	0.338	5.13	ug/g
Tin	11.1	0.451	10.3	ug/g
Vanadium	2.75 J	1.03	5.13	ug/g
Zinc	120	2.26	10.3	ug/g

Comments: Aluminum, Berylium, Boron, and Thallium were reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/26/03.
Manganese was diluted an additional 2 fold and reanalyzed on 03/25/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-11	21-03-122	2/18/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 23:11	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.53	47.7	ug/g
Antimony	0.736J	0.124	4.77	ug/g
Arsenic	4.03J	0.543	4.77	ug/g
Barium	0.122J	0.0381	4.77	ug/g
Beryllium	ND	0.0477	4.77	ug/g
Boron	ND	3.81	9.53	ug/g
Cadmium	ND	0.0191	4.77	ug/g
Chromium	53.4	0.953	4.77	ug/g
Cobalt	14.2	0.114	0.953	ug/g
Copper	109	3.08	9.53	ug/g
Lead	14.8	1.80	9.53	ug/g
Manganese	357	3.15	9.53	ug/g
Mercury	0.502	0.0667	0.477	ug/g
Nickel	12.2	0.591	4.77	ug/g
Selenium	ND	0.677	23.8	ug/g
Silver	ND	0.0572	4.77	ug/g
Thallium	ND	0.315	4.77	ug/g
Tin	5.35J	0.419	9.53	ug/g
Vanadium	2.52J	0.953	4.77	ug/g
Zinc	118	2.10	9.53	ug/g

Comments: Aluminum, Berylium, Boron, and Thallium were reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/26/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-12	21-03-125	2/19/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 23:45	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.0	50.1	ug/g
Antimony	0.251 J	0.130	5.01	ug/g
Arsenic	9.49	0.571	5.01	ug/g
Barium	0.116 J	0.0401	5.01	ug/g
Beryllium	ND	0.0501	5.01	ug/g
Boron	ND	4.01	10.0	ug/g
Cadmium	0.263 J	0.0200	5.01	ug/g
Chromium	16.4	1.00	5.01	ug/g
Cobalt	5.48	0.120	1.00	ug/g
Copper	498	3.24	10.0	ug/g
Lead	70.6	1.89	10.0	ug/g
Manganese	227	3.31	10.0	ug/g
Mercury	ND	0.0701	0.501	ug/g
Nickel	40.1	0.621	5.01	ug/g
Selenium	ND	0.711	25.1	ug/g
Silver	0.101 J	0.0601	5.01	ug/g
Thallium	ND	0.331	5.01	ug/g
Tin	3.32 J	0.441	10.0	ug/g
Vanadium	ND	1.00	5.01	ug/g
Zinc	1640	2.20	10.0	ug/g

Comments: Aluminum, Berylium, Boron, Copper, and Thallium were reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/26/03.
Zinc was diluted an additional 5 fold and realanyzed on 03/25/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-13	21-03-128	2/19/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 23:54	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	28.3J	9.75	48.7	ug/g
Antimony	9.84	0.127	4.87	ug/g
Arsenic	341	0.556	4.87	ug/g
Barium	0.321J	0.0390	4.87	ug/g
Beryllium	ND	0.0487	4.87	ug/g
Boron	ND	3.90	9.75	ug/g
Cadmium	0.0877J	0.0195	4.87	ug/g
Chromium	44.2	0.975	4.87	ug/g
Cobalt	18.7	0.117	0.975	ug/g
Copper	163	3.15	9.75	ug/g
Lead	177	1.84	9.75	ug/g
Manganese	1030	3.22	9.75	ug/g
Mercury	0.300J	0.0682	0.487	ug/g
Nickel	171	0.604	4.87	ug/g
Selenium	ND	0.692	24.4	ug/g
Silver	ND	0.0585	4.87	ug/g
Thallium	ND	0.322	4.87	ug/g
Tin	52.6	0.429	9.75	ug/g
Vanadium	2.06J	0.975	4.87	ug/g
Zinc	336	2.14	9.75	ug/g

Comments: Aluminum, Berylium, Boron, Copper, and Thallium were reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/26/03.
Manganese was diluted an additional 5 fold and reanalyzed on 03/25/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-14	21-03-131	2/20/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/12/2003 0:02	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	20.3J	10.3	51.4	ug/g
Antimony	4.18J	0.134	5.14	ug/g
Arsenic	660	0.586	5.14	ug/g
Barium	0.136J	0.0412	5.14	ug/g
Beryllium	ND	0.0514	5.14	ug/g
Boron	ND	4.12	10.3	ug/g
Cadmium	0.0492J	0.0206	5.14	ug/g
Chromium	56.3	1.03	5.14	ug/g
Cobalt	17.6	0.123	1.03	ug/g
Copper	319	3.32	10.3	ug/g
Lead	80.1	1.94	10.3	ug/g
Manganese	496	3.40	10.3	ug/g
Mercury	0.552	0.0720	0.514	ug/g
Nickel	34.4	0.638	5.14	ug/g
Selenium	ND	0.730	25.7	ug/g
Silver	ND	0.0617	5.14	ug/g
Thallium	ND	0.340	5.14	ug/g
Tin	19.8	0.453	10.3	ug/g
Vanadium	1.13J	1.03	5.14	ug/g
Zinc	323	2.26	10.3	ug/g

Comments: Aluminum, Berylium, Boron, Copper, and Thallium were reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/26/03.
Arsenic was diluted an additional 2 fold and reanalyzed on 03/25/03.
Manganese was diluted an additional 2 fold and reanalyzed on 03/25/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-15	21-03-134	2/20/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/12/2003 0:11	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	24.0 J	9.99	50.0	ug/g
Antimony	7.20	0.130	5.00	ug/g
Arsenic	882	0.569	5.00	ug/g
Barium	0.158 J	0.0400	5.00	ug/g
Beryllium	ND	0.0500	5.00	ug/g
Boron	ND	4.00	9.99	ug/g
Cadmium	0.0980 J	0.0200	5.00	ug/g
Chromium	64.3	0.999	5.00	ug/g
Cobalt	23.1	0.120	0.999	ug/g
Copper	185	3.23	9.99	ug/g
Lead	74.6	1.89	9.99	ug/g
Manganese	647	3.30	9.99	ug/g
Mercury	0.742	0.0699	0.500	ug/g
Nickel	33.6	0.619	5.00	ug/g
Selenium	ND	0.709	25.0	ug/g
Silver	ND	0.0599	5.00	ug/g
Thallium	ND	0.330	5.00	ug/g
Tin	29.8	0.440	9.99	ug/g
Vanadium	1.83 J	0.999	5.00	ug/g
Zinc	331	2.20	9.99	ug/g

Comments: Aluminum, Berylium, Boron, Copper, and Thallium were reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/26/03.
Arsenis was diluted an additional 5 fold and reanalyzed on 03/25/03.
Manganese was diluted an additional 5 fold and reanalyzed on 03/25/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-16	21-03-137	2/20/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/12/2003 0:20	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	18.6 J	10.3	51.3	ug/g
Antimony	2.73 J	0.133	5.13	ug/g
Arsenic	116	0.585	5.13	ug/g
Barium	0.199 J	0.0410	5.13	ug/g
Beryllium	ND	0.0513	5.13	ug/g
Boron	ND	4.10	10.3	ug/g
Cadmium	ND	0.0205	5.13	ug/g
Chromium	42.5	1.03	5.13	ug/g
Cobalt	6.29	0.123	1.03	ug/g
Copper	43.8	3.31	10.3	ug/g
Lead	39.5	1.94	10.3	ug/g
Manganese	386	3.38	10.3	ug/g
Mercury	2000	0.0718	0.513	ug/g
Nickel	104	0.636	5.13	ug/g
Selenium	ND	0.728	25.6	ug/g
Silver	ND	0.0615	5.13	ug/g
Thallium	ND	0.338	5.13	ug/g
Tin	5.17 J	0.451	10.3	ug/g
Vanadium	1.46 J	1.03	5.13	ug/g
Zinc	108	2.26	10.3	ug/g

Comments: Berylium, Boron, Copper, and Thallium were reanalyzed on 03/25/03.
Aluminum was reanalyzed on 03/26/03.
Mercury was rediluted an additional 1000 fold and reanalyzed on 03/19/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-17	21-03-140	2/21/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/12/2003 0:28	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	28.1 J	10.4	52.1	ug/g
Antimony	3.07 J	0.135	5.21	ug/g
Arsenic	13.5	0.594	5.21	ug/g
Barium	4.00 J	0.0417	5.21	ug/g
Beryllium	ND	0.0521	5.21	ug/g
Boron	ND	4.17	10.4	ug/g
Cadmium	ND	0.0208	5.21	ug/g
Chromium	74.9	1.04	5.21	ug/g
Cobalt	6.84	0.125	1.04	ug/g
Copper	31.0	3.36	10.4	ug/g
Lead	281	1.97	10.4	ug/g
Manganese	435	3.44	10.4	ug/g
Mercury	3.44	0.0729	0.521	ug/g
Nickel	126	0.646	5.21	ug/g
Selenium	ND	0.740	26.0	ug/g
Silver	ND	0.0625	5.21	ug/g
Thallium	ND	0.344	5.21	ug/g
Tin	43.3	0.458	10.4	ug/g
Vanadium	2.52 J	1.04	5.21	ug/g
Zinc	91.4	2.29	10.4	ug/g

Comments: Aluminum, Berylium, Boron, Copper, and Thallium were reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/26/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-18	21-03-143	2/21/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/12/2003 0:37	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	17.9J	9.99	50.0	ug/g
Antimony	3.49J	0.130	5.00	ug/g
Arsenic	1250	0.569	5.00	ug/g
Barium	0.346J	0.0400	5.00	ug/g
Beryllium	ND	0.0500	5.00	ug/g
Boron	ND	4.00	9.99	ug/g
Cadmium	ND	0.0200	5.00	ug/g
Chromium	70.4	0.999	5.00	ug/g
Cobalt	10.3	0.120	0.999	ug/g
Copper	87.6	3.23	9.99	ug/g
Lead	28.5	1.89	9.99	ug/g
Manganese	483	3.30	9.99	ug/g
Mercury	442	0.0699	0.500	ug/g
Nickel	66.7	0.619	5.00	ug/g
Selenium	ND	0.709	25.0	ug/g
Silver	ND	0.0599	5.00	ug/g
Thallium	ND	0.330	5.00	ug/g
Tin	13.8	0.440	9.99	ug/g
Vanadium	2.51J	0.999	5.00	ug/g
Zinc	68.0	2.20	9.99	ug/g

Comments: Berylium, Boron, Copper, and Thallium were reanalyzed on 03/25/03.
Aluminum was reanalyzed on 03/26/03.
Mercury was diluted an additional 200 fold and reanalyzed on 03/19/03.
Arsenic was diluted an additional 5 fold and reanalyzed on 03/25/03.
Manganese was diluted an additional 5 fold and reanalyzed on 03/25/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-19	21-03-146	2/22/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/12/2003 0:46	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	25.5 J	10.2	51.1	ug/g
Antimony	0.595 J	0.133	5.11	ug/g
Arsenic	185	0.583	5.11	ug/g
Barium	0.265 J	0.0409	5.11	ug/g
Beryllium	ND	0.0511	5.11	ug/g
Boron	ND	4.09	10.2	ug/g
Cadmium	ND	0.0204	5.11	ug/g
Chromium	18.2	1.02	5.11	ug/g
Cobalt	5.93	0.123	1.02	ug/g
Copper	91.9	3.30	10.2	ug/g
Lead	10.6	1.93	10.2	ug/g
Manganese	434	3.37	10.2	ug/g
Mercury	1.76	0.0716	0.511	ug/g
Nickel	9.61	0.634	5.11	ug/g
Selenium	ND	0.726	25.6	ug/g
Silver	ND	0.0613	5.11	ug/g
Thallium	ND	0.337	5.11	ug/g
Tin	2.28 J	0.450	10.2	ug/g
Vanadium	1.96 J	1.02	5.11	ug/g
Zinc	99.5	2.25	10.2	ug/g

Comments: Aluminum, Berylium, Boron, Copper, and Thallium were reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/25/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-20	21-03-149	2/22/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/12/2003 0:54	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	67.0	10.5	52.6	ug/g
Antimony	30.3	0.137	5.26	ug/g
Arsenic	11.0	0.599	5.26	ug/g
Barium	1.18 J	0.0421	5.26	ug/g
Beryllium	ND	0.0526	5.26	ug/g
Boron	ND	4.21	10.5	ug/g
Cadmium	ND	0.0210	5.26	ug/g
Chromium	213	1.05	5.26	ug/g
Cobalt	12.2	0.126	1.05	ug/g
Copper	18.7	3.40	10.5	ug/g
Lead	625	1.99	10.5	ug/g
Manganese	1960	3.47	10.5	ug/g
Mercury	2.20	0.0736	0.526	ug/g
Nickel	965	0.652	5.26	ug/g
Selenium	ND	0.747	26.3	ug/g
Silver	ND	0.0631	5.26	ug/g
Thallium	ND	0.347	5.26	ug/g
Tin	44.4	0.463	10.5	ug/g
Vanadium	2.28 J	1.05	5.26	ug/g
Zinc	93.3	2.31	10.5	ug/g

Comments: Aluminum, Berylium, Boron, Copper, and Thallium were reanalyzed on 03/25/03.
Mercury was reanlyzed on 03/26/03.
Lead was diluted an additional 5 fold and reanalyzed on 03/25/03.
Nickel was diluted an additional 5 fold and reanalyzed on 03/25/03.
Manganese was diluted an additional 5 fold and reanalyzed on 03/25/03.

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-022-21	21-03-152	2/22/2003 12:02	3/3/2003 12:02	11/14/2003 10:23	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/12/2003 1:03	blb	5602

Parameter	Result	MDL	PQL	Units
Aluminum	41.2 J	10.0	50.2	ug/g
Antimony	2.01 J	0.131	5.02	ug/g
Arsenic	1260	0.572	5.02	ug/g
Barium	14.2	0.0402	5.02	ug/g
Beryllium	ND	0.0502	5.02	ug/g
Boron	ND	4.02	10.0	ug/g
Cadmium	0.207 J	0.0201	5.02	ug/g
Chromium	67.2	1.00	5.02	ug/g
Cobalt	27.1	0.120	1.00	ug/g
Copper	178	3.24	10.0	ug/g
Lead	161	1.90	10.0	ug/g
Manganese	969	3.31	10.0	ug/g
Mercury	2.62	0.0703	0.502	ug/g
Nickel	26.1	0.622	5.02	ug/g
Selenium	ND	0.713	25.1	ug/g
Silver	ND	0.0602	5.02	ug/g
Thallium	ND	0.331	5.02	ug/g
Tin	19.4	0.442	10.0	ug/g
Vanadium	ND	1.00	5.02	ug/g
Zinc	1240	2.21	10.0	ug/g

Comments: Aluminum, Berylium, Boron, Copper, and Thallium were reanalyzed on 03/25/03.
Mercury was reanalyzed on 03/26/03.
Arsenic was diluted an additional 5 fold and reanalyzed on 03/25/03.
Manganese was diluted an additional 5 fold and reanalyzed on 03/25/03.
Zinc was diluted an additional 5 fold and reanalyzed on 03/25/03.

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Report of Analysis

Method Blank

Lab ID	Sample ID	Reported
3860	MB for HBN 4701 [PREP/1422] *(Results reported on a wet weight basis)*	4/1/2003 17:00

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 16:19	ssh	4901

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1000	10.4 ug/mL	104	50 - 150

Method Blank

Lab ID	Sample ID	Reported
3854	MB for HBN 4601 [PREP/1421] *(Results reported on a wet weight basis)*	4/1/2003 17:00

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 0:00	ssh	4903

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	10.2	10.6 ug/mL	104	50 - 150

Method Blank

Lab ID	Sample ID	Reported
3792	MB for HBN 4401 [PREP/1418] *(Results reported on a wet weight basis)*	4/1/2003 17:00

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/11/2003 21:59	ssh	5004

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	103	114 ug/mL	110	50 - 150

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Method Blank

Lab ID	Sample ID	Reported
3893	MB for HBN 4902 [PREP/1424] *(Results reported on a wet weight basis)*	4/1/2003 17:00

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/10/2003 15:32	4902	AM126 Lewisite in HD by GC	1	3/10/2003 19:59	ssh	5002

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.95	5.00	ug/g

Method Blank

Lab ID	Sample ID	Reported
3860	MB for HBN 4701 [PREP/1422] *(Results reported on a wet weight basis)*	4/1/2003 17:00

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/18/2003 13:35	ssh	5101

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	0.00			%

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Report of Analysis

Method Blank

Lab ID	Sample ID	Reported
3846	MB for HBN 4501 [PREP/1420]	4/1/2003 17:00
	(Results reported on a wet weight basis)	

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/5/2003 13:00	4501	AM118 Metals in Liq HD by ICP	1	3/7/2003 21:07	blb	5501

Parameter	Result	MDL	PQL	Units
Aluminum	24.4 J	10.0	50.0	ug/g
Antimony	ND	0.630	5.00	ug/g
Arsenic	ND	1.22	5.00	ug/g
Barium	ND	0.430	5.00	ug/g
Beryllium	ND	0.900	5.00	ug/g
Boron	ND	3.74	10.0	ug/g
Cadmium	ND	0.410	5.00	ug/g
Chromium	1.79 J	1.29	5.00	ug/g
Cobalt	ND	0.270	1.00	ug/g
Copper	ND	2.43	5.00	ug/g
Lead	ND	0.410	5.00	ug/g
Manganese	ND	0.320	1.00	ug/g
Mercury	ND	0.0500	0.500	ug/g
Nickel	ND	0.350	5.00	ug/g
Selenium	ND	1.17	10.0	ug/g
Silver	ND	0.470	5.00	ug/g
Thallium	ND	0.980	5.00	ug/g
Tin	ND	2.49	10.0	ug/g
Vanadium	ND	1.00	5.00	ug/g
Zinc	ND	3.12	10.0	ug/g

Method Blank

Lab ID	Sample ID	Reported
3878	MB for HBN 4801 [PREP/1423]	4/1/2003 17:00
	(Results reported on a wet weight basis)	

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/7/2003 15:33	4801	AM118 Metals in Sld HD by ICP	1	3/10/2003 15:46	blb	5601

Parameter	Result	MDL	PQL	Units
Aluminum	18.3 J	10.0	50.0	ug/g
Antimony	ND	0.130	5.00	ug/g
Arsenic	ND	0.570	5.00	ug/g
Barium	0.0400 J	0.0400	5.00	ug/g
Beryllium	ND	0.0500	5.00	ug/g
Boron	ND	4.00	10.0	ug/g
Cadmium	0.130 J	0.0200	5.00	ug/g
Chromium	2.19 J	1.00	5.00	ug/g
Cobalt	ND	0.120	1.00	ug/g
Copper	ND	3.23	10.0	ug/g

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Method Blank

Lead	ND	1.89	10.0	ug/g
Manganese	ND	3.30	10.0	ug/g
Mercury	ND	0.0700	0.500	ug/g
Nickel	ND	0.620	5.00	ug/g
Selenium	ND	0.710	25.0	ug/g
Silver	ND	0.0600	5.00	ug/g
Thallium	ND	0.330	5.00	ug/g
Tin	ND	0.440	10.0	ug/g
Vanadium	ND	1.00	5.00	ug/g
Zinc	ND	2.20	10.0	ug/g

Method Blank

Lab ID	*Sample ID*	*Reported*
3918	MB for HBN 5003 [PREP/1425]	4/1/2003 17:00
	(Results reported on a wet weight basis)	

AM118 Metals in Sld HD by ICP

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
3/11/2003 15:08	5003	AM118 Metals in Sld HD by ICP	1	3/11/2003 20:01	blb	5602

Parameter	*Result*	*MDL*	*PQL*	*Units*
Aluminum	ND	10.0	50.0	ug/g
Antimony	ND	0.130	5.00	ug/g
Arsenic	ND	0.570	5.00	ug/g
Barium	ND	0.0400	5.00	ug/g
Beryllium	ND	0.0500	5.00	ug/g
Boron	ND	4.00	10.0	ug/g
Cadmium	ND	0.0200	5.00	ug/g
Chromium	ND	1.00	5.00	ug/g
Cobalt	ND	0.120	1.00	ug/g
Copper	ND	3.23	10.0	ug/g
Lead	ND	1.89	10.0	ug/g
Manganese	ND	3.30	10.0	ug/g
Mercury	ND	0.0700	0.500	ug/g
Nickel	ND	0.620	5.00	ug/g
Selenium	ND	0.710	25.0	ug/g
Silver	ND	0.0600	5.00	ug/g
Thallium	ND	0.330	5.00	ug/g
Tin	ND	0.440	10.0	ug/g
Vanadium	ND	1.00	5.00	ug/g
Zinc	ND	2.20	10.0	ug/g

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Report of Analysis

Method Blank

Lab ID	Sample ID	Reported
3854	MB for HBN 4601 [PREP/1421] *(Results reported on a wet weight basis)*	4/1/2003 17:00

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 13:37	4601	AM100 Non-Vols in HD by GC	1	3/13/2003 0:00	ssh	4903

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	210	250	ug/g

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Method Blank

Lab ID	Sample ID	Reported
3860	MB for HBN 4701 [PREP/1422] *(Results reported on a wet weight basis)*	4/1/2003 17:00

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/6/2003 16:29	4701	AM117 Semi-Vols Liq HD by GC	1	3/10/2003 16:19	ssh	4901

Parameter	Result	MDL	PQL	Units
T	ND	7.00	250	ug/g
Q	ND	5.10	250	ug/g
Hexachloroethane	ND	8.00	250	ug/g

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Method Blank

Lab ID	Sample ID	Reported
3792	MB for HBN 4401 [PREP/1418] *(Results reported on a wet weight basis)*	4/1/2003 17:00

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
3/4/2003 10:12	4401	AM101 Vols in Liquid HD by GC	1	3/11/2003 21:59	ssh	5004

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	ND	260	500	ug/g
Tetrachloroethylene	ND	100	500	ug/g
1,1,2,2-Tetrachloroethane	ND	150	500	ug/g

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QC Summary

LCS Lab ID: 3894 | Original Lab ID: | Prep Batch: 4902
Matrix: Liquid | Analytical: 5002

AM126 Lewisite in HD by GC	Expected	Result	Recovery	Rec Limits
Lewisite	25.2 ug/g	29.9	119	50 - 150

DUP Lab ID: 3895 | Original Lab ID: 030004-020-01 | Prep Batch: 4902
Matrix: Liquid | Analytical: 5002

AM126 Lewisite in HD by GC	Original Result	Result	RPD	RPD Limits
Lewisite	0	0	0	0 - 25

MS Lab ID: 3896 | Original Lab ID: 030004-020-01 | Prep Batch: 4902
Matrix: Liquid | Analytical: 5002

AM126 Lewisite in HD by GC	Original Result	Expected	Result	Recovery	Rec Limits
Lewisite	0	27.2 ug/g	26.6	97.8	50 - 150

MSD Lab ID: 3897 | Original Lab ID: 030004-020-01 | Prep Batch: 4902
Matrix: Liquid | Analytical: 5002

AM126 Lewisite in HD by GC	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Lewisite	27.3 ug/g	26	95.4	50 - 150	2.48	0 - 25

LCS Lab ID: 3898 | Original Lab ID: | Prep Batch: 4902
Matrix: Liquid | Analytical: 5002

AM126 Lewisite in HD by GC	Expected	Result	Recovery	Rec Limits
Lewisite	25.2 ug/g	25.3	100	50 - 150

LCS Lab ID: 3862 | Original Lab ID: | Prep Batch: 4701
Matrix: Liquid | Analytical: 5101

AM098 HD Purity by GC	Expected	Result	Recovery	Rec Limits
bis-(2-Chloroethyl)sulfide	98.4 %	97.2	98.8	85 - 115

DUP Lab ID: 3863 | Original Lab ID: 030004-020-01 | Prep Batch: 4701
Matrix: Liquid | Analytical: 5101

AM098 HD Purity by GC	Original Result	Result	RPD	RPD Limits
bis-(2-Chloroethyl)sulfide	87.1	88.3	1.41	0 - 25

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QC Summary

LCS Lab ID: 3847 | Original Lab ID: | Prep Batch: 4501
Matrix: Liquid | Analytical: 5501

AM118 Metals in Liq HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	500 ug/g	524	105	75 - 125
Antimony	50 ug/g	54.9	110	75 - 125
Arsenic	50 ug/g	53.2	106	75 - 125
Barium	50 ug/g	53.6	107	75 - 125
Beryllium	50 ug/g	41.8	83.6	75 - 125
Boron	500 ug/g	418	83.6	75 - 125
Cadmium	50 ug/g	56.2	112	75 - 125
Chromium	50 ug/g	52.9	106	75 - 125
Cobalt	50 ug/g	50.6	101	75 - 125
Copper	50 ug/g	51.3	103	75 - 125
Lead	50 ug/g	51.1	102	75 - 125
Manganese	50 ug/g	52.1	104	75 - 125
Mercury	2.5 ug/g	2.89	116	75 - 125
Nickel	50 ug/g	50.3	101	75 - 125
Selenium	50 ug/g	51.9	104	75 - 125
Silver	50 ug/g	55.1	110	75 - 125
Thallium	50 ug/g	49.8	99.5	75 - 125
Tin	50 ug/g	54.8	110	75 - 125
Vanadium	50 ug/g	50.4	101	75 - 125
Zinc	50 ug/g	52.9	106	75 - 125

DUP Lab ID: 3848 | Original Lab ID: 030004-020-01 | Prep Batch: 4501
Matrix: Liquid | Analytical: 5501

AM118 Metals in Liq HD by ICP	Original Result	Result	RPD	RPD Limits
Aluminum	16.7	15.5	7.7	0 - 20
Antimony	0	0	0	0 - 20
Arsenic	0.111	0.113	1.41	0 - 20
Barium	0.292	0.255	13.3	0 - 20
Beryllium	0	0	0	0 - 20
Boron	1.65	4.55	93.5 *	0 - 20
Cadmium	0.124	0.116	6.46	0 - 20
Chromium	3.35	4.57	30.7 *	0 - 20
Cobalt	0.0642	0.0588	8.82	0 - 20
Copper	5.79	5.99	3.36	0 - 20
Lead	0.09	0.0796	12.3	0 - 20
Manganese	1.52	1.59	4.61	0 - 20
Mercury	0.0908	0.151	49.5 *	0 - 20
Nickel	0.158	0.129	19.9	0 - 20
Selenium	0	0	0	0 - 20
Silver	0.00696	0	200 *	0 - 20
Thallium	0.11	0.0646	52.3 *	0 - 20
Tin	0.0469	0.0334	33.7 *	0 - 20
Vanadium	0.849	1.22	35.9 *	0 - 20
Zinc	0.482	0.483	0.153	0 - 20

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MS Lab ID: 3849 | Original Lab ID: 030004-020-01 | Prep Batch: 4501
Matrix: Liquid | Analytical: 5501

AM118 Metals in Liq HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Aluminum	16.7	543 ug/g	613	110	75 - 125
Antimony	0	54.3 ug/g	58.5	108	75 - 125
Arsenic	0.111	54.3 ug/g	58.7	108	50 - 150
Barium	0.292	54.3 ug/g	58.8	108	75 - 125
Beryllium	0	54.3 ug/g	62.1	114	75 - 125
Boron	1.65	543 ug/g	574	105	75 - 125
Cadmium	0.124	54.3 ug/g	58.8	108	75 - 125
Chromium	3.35	54.3 ug/g	66.8	117	75 - 125
Cobalt	0.0642	54.3 ug/g	59.6	110	75 - 125
Copper	5.79	54.3 ug/g	66.2	111	75 - 125
Lead	0.09	54.3 ug/g	58.7	108	75 - 125
Manganese	1.52	54.3 ug/g	63.4	114	75 - 125
Mercury	0.0908	2.71 ug/g	3.15	113	50 - 150
Nickel	0.158	54.3 ug/g	59.8	110	75 - 125
Selenium	0	54.3 ug/g	56.8	105	50 - 150
Silver	0.00696	54.3 ug/g	57.9	107	50 - 150
Thallium	0.11	54.3 ug/g	56.8	104	75 - 125
Tin	0.0469	54.3 ug/g	62	114	75 - 125
Vanadium	0.849	54.3 ug/g	60.6	110	75 - 125
Zinc	0.482	54.3 ug/g	57.5	105	50 - 150

MSD Lab ID: 3850 | Original Lab ID: 030004-020-01 | Prep Batch: 4501
Matrix: Liquid | Analytical: 5501

AM118 Metals in Liq HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	505 ug/g	557	107	75 - 125	2.76	0 - 25
Antimony	50.5 ug/g	51.4	102	75 - 125	5.71	0 - 25
Arsenic	50.5 ug/g	54.2	107	50 - 150	0.93	0 - 25
Barium	50.5 ug/g	52.2	103	75 - 125	4.74	0 - 25
Beryllium	50.5 ug/g	57.1	113	75 - 125	0.881	0 - 25
Boron	505 ug/g	492	97.3	75 - 125	7.61	0 - 25
Cadmium	50.5 ug/g	53.3	105	75 - 125	2.82	0 - 25
Chromium	50.5 ug/g	58.1	109	75 - 125	7.08	0 - 25
Cobalt	50.5 ug/g	52.6	104	75 - 125	5.61	0 - 25
Copper	50.5 ug/g	58.8	105	75 - 125	5.56	0 - 25
Lead	50.5 ug/g	52	103	75 - 125	4.74	0 - 25
Manganese	50.5 ug/g	55.6	107	75 - 125	6.33	0 - 25
Mercury	2.52 ug/g	2.92	112	50 - 150	0.889	0 - 25
Nickel	50.5 ug/g	52.8	104	75 - 125	5.61	0 - 25
Selenium	50.5 ug/g	53.1	105	50 - 150	0	0 - 25
Silver	50.5 ug/g	53.5	106	50 - 150	0.939	0 - 25
Thallium	50.5 ug/g	51.1	101	75 - 125	2.93	0 - 25
Tin	50.5 ug/g	53	105	75 - 125	8.22	0 - 25
Vanadium	50.5 ug/g	53	103	75 - 125	6.57	0 - 25
Zinc	50.5 ug/g	53.9	106	50 - 150	0.948	0 - 25

LCS Lab ID: 3879 | Original Lab ID: | Prep Batch: 4801
Matrix: Solid | Analytical: 5601

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LCS Lab ID: 3879 | Original Lab ID: | Prep Batch: 4801
Matrix: Solid | Analytical: 5601

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	500 ug/g	511	102	75 - 125
Antimony	50 ug/g	46.6	93.1	75 - 125
Arsenic	50 ug/g	52.9	106	75 - 125
Barium	50 ug/g	51	102	75 - 125
Beryllium	50 ug/g	44.8	89.5	75 - 125
Boron	500 ug/g	408	81.5	75 - 125
Cadmium	50 ug/g	52.9	106	75 - 125
Chromium	50 ug/g	52.4	105	75 - 125
Cobalt	50 ug/g	49.9	99.7	75 - 125
Copper	50 ug/g	51.1	102	75 - 125
Lead	50 ug/g	49.2	98.4	75 - 125
Manganese	50 ug/g	50.3	101	75 - 125
Mercury	2.5 ug/g	2.83	113	75 - 125
Nickel	50 ug/g	49.8	99.6	75 - 125
Selenium	50 ug/g	51.5	103	75 - 125
Silver	50 ug/g	52.5	105	75 - 125
Thallium	50 ug/g	48.2	96.5	75 - 125
Tin	50 ug/g	50.6	101	75 - 125
Vanadium	50 ug/g	49.4	98.9	75 - 125
Zinc	50 ug/g	61.7	123	75 - 125

DUP Lab ID: 3880 | Original Lab ID: 030004-021-01 | Prep Batch: 4801
Matrix: Non-cohesive Solid | Analytical: 5601

AM118 Metals in NCS HD by ICP	Original Result	Result	RPD		RPD Limits
Aluminum	5.6	9.12	47.9	*	0 - 20
Antimony	0	0	0		0 - 20
Arsenic	1.89	4.56	82.8	*	0 - 20
Barium	0.0895	0.213	81.5	*	0 - 20
Beryllium	0.0106	0.00374	95.9	*	0 - 20
Boron	0	0.699	200	*	0 - 20
Cadmium	0.139	0.159	13.6		0 - 20
Chromium	16.4	18.7	13.1		0 - 20
Cobalt	1.53	1.62	5.37		0 - 20
Copper	5.59	6.03	7.56		0 - 20
Lead	4.46	4.2	6.13		0 - 20
Manganese	95.4	101	5.63		0 - 20
Mercury	0.129	0.159	20.9	*	0 - 20
Nickel	11.3	14.2	22.7	*	0 - 20
Selenium	0.119	0.17	35.1	*	0 - 20
Silver	0	0	0		0 - 20
Thallium	0.0696	0.0531	26.8	*	0 - 20
Tin	0.497	0.542	8.65		0 - 20
Vanadium	2.05	2.31	11.9		0 - 20
Zinc	3.09	2.31	29.1	*	0 - 20

MS Lab ID: 3881 | Original Lab ID: 030004-021-01 | Prep Batch: 4801
Matrix: Non-cohesive Solid | Analytical: 5601

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MS Lab ID: 3881 | Original Lab ID: 030004-021-01 | Prep Batch: 4801
Matrix: Non-cohesive Solid | Analytical: 5601

AM118 Metals in NCS HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Aluminum	5.6	548 ug/g	606	109	75 - 125
Antimony	0	54.8 ug/g	57.7	105	75 - 125
Arsenic	1.89	54.8 ug/g	61.2	108	50 - 150
Barium	0.0895	54.8 ug/g	57.7	105	75 - 125
Beryllium	0.0106	54.8 ug/g	59.4	108	75 - 125
Boron	0	548 ug/g	553	101	75 - 125
Cadmium	0.139	54.8 ug/g	59.2	108	75 - 125
Chromium	16.4	54.8 ug/g	71.9	101	75 - 125
Cobalt	1.53	54.8 ug/g	56	99.4	75 - 125
Copper	5.59	54.8 ug/g	60.9	101	75 - 125
Lead	4.46	54.8 ug/g	61	103	75 - 125
Manganese	95.4	54.8 ug/g	184	161 *	75 - 125
Mercury	0.129	2.74 ug/g	3.5	123	50 - 150
Nickel	11.3	54.8 ug/g	71.4	110	75 - 125
Selenium	0.119	54.8 ug/g	57.9	105	50 - 150
Silver	0	54.8 ug/g	59.4	108	50 - 150
Thallium	0.0696	54.8 ug/g	54.5	99.3	75 - 125
Tin	0.497	54.8 ug/g	59.8	108	75 - 125
Vanadium	2.05	54.8 ug/g	55.2	96.9	75 - 125
Zinc	3.09	54.8 ug/g	59.2	102	50 - 150

MSD Lab ID: 3882 | Original Lab ID: 030004-021-01 | Prep Batch: 4801
Matrix: Non-cohesive Solid | Analytical: 5601

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	510 ug/g	514	99.6	75 - 125	9.01	0 - 25
Antimony	51 ug/g	49.8	97.6	75 - 125	7.31	0 - 25
Arsenic	51 ug/g	55.3	105	50 - 150	2.82	0 - 25
Barium	51 ug/g	52.4	103	75 - 125	1.92	0 - 25
Beryllium	51 ug/g	52.7	103	75 - 125	4.74	0 - 25
Boron	510 ug/g	494	96.9	75 - 125	4.14	0 - 25
Cadmium	51 ug/g	54.3	106	75 - 125	1.87	0 - 25
Chromium	51 ug/g	63.2	91.7	75 - 125	9.65	0 - 25
Cobalt	51 ug/g	51	97	75 - 125	2.44	0 - 25
Copper	51 ug/g	53.8	94.5	75 - 125	6.65	0 - 25
Lead	51 ug/g	52.6	94.3	75 - 125	8.82	0 - 25
Manganese	51 ug/g	128	63 *	75 - 125	87.5 *	0 - 25
Mercury	2.55 ug/g	3.04	114	50 - 150	7.59	0 - 25
Nickel	51 ug/g	58.7	92.8	75 - 125	17	0 - 25
Selenium	51 ug/g	51.9	102	50 - 150	2.9	0 - 25
Silver	51 ug/g	54	106	50 - 150	1.87	0 - 25
Thallium	51 ug/g	49.6	97.1	75 - 125	2.24	0 - 25
Tin	51 ug/g	52.6	102	75 - 125	5.71	0 - 25
Vanadium	51 ug/g	49.4	92.8	75 - 125	4.32	0 - 25
Zinc	51 ug/g	54.5	101	50 - 150	0.985	0 - 25

LCS Lab ID: 3883 | Original Lab ID: | Prep Batch: 4801
Matrix: Solid | Analytical: 5601

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LCS Lab ID: 3883 | Original Lab ID: | Prep Batch: 4801
Matrix: Solid | Analytical: 5601

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	6000 ug/g	3910	65.1 *	75 - 125
Arsenic	141 ug/g	108	76.4	75 - 125
Barium	58.2 ug/g	46.7	80.2	75 - 125
Chromium	111 ug/g	81.3	73.2 *	75 - 125
Cobalt	11.1 ug/g	7.98	71.9 *	75 - 125
Copper	398 ug/g	254	63.8 *	75 - 125
Lead	5.73 ug/g	4.11	71.8 *	75 - 125
Manganese	480 ug/g	331	68.9 *	75 - 125
Nickel	195 ug/g	135	69.1 *	75 - 125
Vanadium	11.9 ug/g	10.8	90.5	75 - 125
Zinc	249 ug/g	172	68.9 *	75 - 125

LCSD Lab ID: 3884 | Original Lab ID: | Prep Batch: 4801
Matrix: Solid | Analytical: 5601

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	6000 ug/g	5060	84.4	75 - 125	25.8 *	0 - 25
Arsenic	141 ug/g	140	99.1	75 - 125	25.9 *	0 - 25
Barium	58.2 ug/g	58.8	101	75 - 125	23	0 - 25
Chromium	111 ug/g	106	95.9	75 - 125	26.8 *	0 - 25
Cobalt	11.1 ug/g	10.3	92.5	75 - 125	25.1 *	0 - 25
Copper	398 ug/g	327	82.1	75 - 125	25.1 *	0 - 25
Lead	5.73 ug/g	5.4	94.2	75 - 125	27 *	0 - 25
Manganese	480 ug/g	431	89.8	75 - 125	26.3 *	0 - 25
Nickel	195 ug/g	173	88.8	75 - 125	25	0 - 25
Vanadium	11.9 ug/g	14.1	118	75 - 125	26.4 *	0 - 25
Zinc	249 ug/g	215	86.4	75 - 125	22.5	0 - 25

LCS Lab ID: 3919 | Original Lab ID: | Prep Batch: 5003
Matrix: Solid | Analytical: 5602

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	500 ug/g	480	96	75 - 125
Antimony	50 ug/g	49.1	98.2	75 - 125
Arsenic	50 ug/g	49.4	98.8	75 - 125
Barium	50 ug/g	49.6	99.2	75 - 125
Beryllium	50 ug/g	40.4	80.7	75 - 125
Boron	500 ug/g	377	75.3	75 - 125
Cadmium	50 ug/g	52.7	105	75 - 125
Chromium	50 ug/g	49.4	98.8	75 - 125
Cobalt	50 ug/g	47.4	94.8	75 - 125
Copper	50 ug/g	48.4	96.8	75 - 125
Lead	50 ug/g	45.8	91.6	75 - 125
Manganese	50 ug/g	49.3	98.6	75 - 125
Mercury	2.5 ug/g	2.63	105	75 - 125
Nickel	50 ug/g	47.7	95.4	75 - 125
Selenium	50 ug/g	49.4	98.8	75 - 125
Silver	50 ug/g	51.4	103	75 - 125

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LCS Lab ID: 3919 | Original Lab ID: | Prep Batch: 5003
Matrix: Solid | Analytical: 5602

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits
Thallium	50 ug/g	44.1	88.2	75 - 125
Tin	50 ug/g	52.1	104	75 - 125
Vanadium	50 ug/g	47.2	94.4	75 - 125
Zinc	50 ug/g	50.9	102	75 - 125

DUP Lab ID: 3920 | Original Lab ID: 030004-022-01 | Prep Batch: 5003
Matrix: Solid | Analytical: 5602

AM118 Metals in Sld HD by ICP	Original Result	Result	RPD	RPD Limits
Aluminum	7.52	3.07	84 *	0 - 20
Antimony	0.0819	0.113	32.3 *	0 - 20
Arsenic	1.75	3.93	76.5 *	0 - 20
Barium	0.0717	0.0452	45.3 *	0 - 20
Beryllium	0	0	0	0 - 20
Boron	0.673	0	200 *	0 - 20
Cadmium	0	0	0	0 - 20
Chromium	19.1	27.2	34.8 *	0 - 20
Cobalt	2.94	4.04	31.7 *	0 - 20
Copper	18.3	15.2	18.7	0 - 20
Lead	8.13	9.18	12.1	0 - 20
Manganese	188	248	27.5 *	0 - 20
Mercury	0.116	0.123	5.63	0 - 20
Nickel	21.7	28.6	27.3 *	0 - 20
Selenium	0	0	0	0 - 20
Silver	0.0211	0.0139	41 *	0 - 20
Thallium	0.0232	0.0135	52.8 *	0 - 20
Tin	2.03	1.88	7.53	0 - 20
Vanadium	1.32	1.9	36.2 *	0 - 20
Zinc	2.62	1.99	27.4 *	0 - 20

MS Lab ID: 3921 | Original Lab ID: 030004-022-01 | Prep Batch: 5003
Matrix: Solid | Analytical: 5602

AM118 Metals in Sld HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Aluminum	7.52	505 ug/g	564	110	75 - 125
Antimony	0.0819	50.5 ug/g	50.8	101	75 - 125
Arsenic	1.75	50.5 ug/g	62.2	120	50 - 150
Barium	0.0717	50.5 ug/g	53	105	75 - 125
Beryllium	0	50.5 ug/g	52.4	104	75 - 125
Boron	0.673	505 ug/g	491	97.1	75 - 125
Cadmium	0	50.5 ug/g	53	105	75 - 125
Chromium	19.1	50.5 ug/g	78.2	117	75 - 125
Cobalt	2.94	50.5 ug/g	60.4	114	75 - 125
Copper	18.3	50.5 ug/g	75.1	112	75 - 125
Lead	8.13	50.5 ug/g	63.4	109	75 - 125
Manganese	188	50.5 ug/g	377	374 *	75 - 125
Mercury	0.116	2.53 ug/g	3.19	122	50 - 150
Nickel	21.7	50.5 ug/g	79.3	114	75 - 125

Report of Analysis

MS Lab ID: 3921 | Original Lab ID: 030004-022-01 | Prep Batch: 5003
Matrix: Solid | Analytical: 5602

AM118 Metals in Sld HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Selenium	0	50.5 ug/g	53.5	106	50 - 150
Silver	0.0211	50.5 ug/g	51.4	102	50 - 150
Thallium	0.0232	50.5 ug/g	55.6	110	75 - 125
Tin	2.03	50.5 ug/g	53.3	102	75 - 125
Vanadium	1.32	50.5 ug/g	57	110	75 - 125
Zinc	2.62	50.5 ug/g	62	118	50 - 150

MSD Lab ID: 3922 | Original Lab ID: 030004-022-01 | Prep Batch: 5003
Matrix: Solid | Analytical: 5602

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	522 ug/g	648	123	75 - 125	11.2	0 - 25
Antimony	52.2 ug/g	51	97.5	75 - 125	3.53	0 - 25
Arsenic	52.2 ug/g	60.5	112	50 - 150	6.9	0 - 25
Barium	52.2 ug/g	54.6	104	75 - 125	0.957	0 - 25
Beryllium	52.2 ug/g	51.9	99.4	75 - 125	4.52	0 - 25
Boron	522 ug/g	513	98.1	75 - 125	1.02	0 - 25
Cadmium	52.2 ug/g	54	103	75 - 125	1.92	0 - 25
Chromium	52.2 ug/g	68.7	95	75 - 125	20.8	0 - 25
Cobalt	52.2 ug/g	59.5	108	75 - 125	5.41	0 - 25
Copper	52.2 ug/g	74.3	107	75 - 125	4.57	0 - 25
Lead	52.2 ug/g	57.9	95.3	75 - 125	13.4	0 - 25
Manganese	52.2 ug/g	230	79.2	75 - 125	130 *	0 - 25
Mercury	2.61 ug/g	3.36	124	50 - 150	1.63	0 - 25
Nickel	52.2 ug/g	70.9	94.2	75 - 125	19	0 - 25
Selenium	52.2 ug/g	52.7	101	50 - 150	4.83	0 - 25
Silver	52.2 ug/g	52.2	99.9	50 - 150	2.08	0 - 25
Thallium	52.2 ug/g	55.2	106	75 - 125	3.7	0 - 25
Tin	52.2 ug/g	53.4	98.2	75 - 125	3.8	0 - 25
Vanadium	52.2 ug/g	57	107	75 - 125	2.76	0 - 25
Zinc	52.2 ug/g	61.3	112	50 - 150	5.22	0 - 25

LCS Lab ID: 3923 | Original Lab ID: | Prep Batch: 5003
Matrix: Solid | Analytical: 5602

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	6000 ug/g	4820	80.3	75 - 125
Arsenic	141 ug/g	138	97.8	75 - 125
Barium	58.2 ug/g	55.2	94.8	75 - 125
Chromium	111 ug/g	107	96.1	75 - 125
Cobalt	11.1 ug/g	10.4	94	75 - 125
Copper	398 ug/g	314	78.8	75 - 125
Lead	5.73 ug/g	4.94	86.1	75 - 125
Manganese	480 ug/g	436	90.9	75 - 125
Nickel	195 ug/g	175	89.5	75 - 125
Vanadium	11.9 ug/g	13.6	114	75 - 125
Zinc	249 ug/g	218	87.4	75 - 125

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LCSD Lab ID: 3924 | Original Lab ID: | Prep Batch: 5003
Matrix: Solid | Analytical: 5602

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	6000 ug/g	5070	84.5	75 - 125	5.1	0 - 25
Arsenic	141 ug/g	149	106	75 - 125	8.05	0 - 25
Barium	58.2 ug/g	59.3	102	75 - 125	7.32	0 - 25
Chromium	111 ug/g	112	101	75 - 125	4.97	0 - 25
Cobalt	11.1 ug/g	11	99.2	75 - 125	5.38	0 - 25
Copper	398 ug/g	336	84.5	75 - 125	6.98	0 - 25
Lead	5.73 ug/g	5.35	93.3	75 - 125	8.03	0 - 25
Manganese	480 ug/g	471	98.2	75 - 125	7.72	0 - 25
Nickel	195 ug/g	186	95.1	75 - 125	6.07	0 - 25
Vanadium	11.9 ug/g	13.8	116	75 - 125	1.74	0 - 25
Zinc	249 ug/g	231	92.8	75 - 125	5.99	0 - 25

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Report of Analysis

QC Summary

LCS Lab ID: 3855 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 4601 — **Analytical:** 4903

AM100 Non-Vols in HD by GC	Expected	Result	Recovery	Rec Limits
Thiodiglycol (TDG)	9700 ug/g	9290	95.7	50 - 150

DUP Lab ID: 3856 — **Original Lab ID:** 030004-020-01 — **Matrix:** Liquid — **Prep Batch:** 4601 — **Analytical:** 4903

AM100 Non-Vols in HD by GC	Original Result	Result	RPD	RPD Limits
Thiodiglycol (TDG)	0	0	0	0 - 25

MS Lab ID: 3857 — **Original Lab ID:** 030004-020-01 — **Matrix:** Liquid — **Prep Batch:** 4601 — **Analytical:** 4903

AM100 Non-Vols in HD by GC	Original Result	Expected	Result	Recovery	Rec Limits
Thiodiglycol (TDG)	0	9660 ug/g	8360	86.5	50 - 150

MSD Lab ID: 3858 — **Original Lab ID:** 030004-020-01 — **Matrix:** Liquid — **Prep Batch:** 4601 — **Analytical:** 4903

AM100 Non-Vols in HD by GC	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Thiodiglycol (TDG)	9750 ug/g	8860	90.9	50 - 150	4.96	0 - 25

LCS Lab ID: 3859 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 4601 — **Analytical:** 4903

AM100 Non-Vols in HD by GC	Expected	Result	Recovery	Rec Limits
Thiodiglycol (TDG)	9700 ug/g	9830	101	50 - 150

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Report of Analysis

QC Summary

LCS Lab ID: 3861 | Original Lab ID: | Prep Batch: 4701
Matrix: Liquid | Analytical: 4901

AM117 Semi-Vols Liq HD by GC	Expected	Result	Recovery	Rec Limits
T	1020 ug/g	2500	245	50 - 150
Q	9290 ug/g	9590	103	50 - 150
Hexachloroethane	998 ug/g	1160	116 *	50 - 150

DUP Lab ID: 3863 | Original Lab ID: 030004-020-01 | Prep Batch: 4701
Matrix: Liquid | Analytical: 4901

AM117 Semi-Vols Liq HD by GC	Original Result	Result	RPD	RPD Limits
T	2900	2850	1.52	0 - 25
Q	30200	30000	0.617	0 - 25
Hexachloroethane	0	0	0	0 - 25

MS Lab ID: 3865 | Original Lab ID: 030004-020-01 | Prep Batch: 4701
Matrix: Liquid | Analytical: 4901

AM117 Semi-Vols Liq HD by GC	Original Result	Expected	Result	Recovery	Rec Limits
T	29	1020 ug/g	2940	4	50 - 150
Q	302	9310 ug/g	34700	48.8	50 - 150
Hexachloroethane	0	1000 ug/g	1120	112	50 - 150

MSD Lab ID: 3866 | Original Lab ID: 030004-020-01 | Prep Batch: 4701
Matrix: Liquid | Analytical: 4901

AM117 Semi-Vols Liq HD by GC	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
T	1030 ug/g	2920	2.45 *	50 - 150	48.1 *	0 - 25
Q	9380 ug/g	34500	45.9 *	50 - 150	6.12	0 - 25
Hexachloroethane	1010 ug/g	1110	110	50 - 150	1.8	0 - 25

LCS Lab ID: 3867 | Original Lab ID: | Prep Batch:
Matrix: Liquid | Analytical: 4901

AM117 Semi-Vols Liq HD by GC	Expected	Result	Recovery	Rec Limits
T	1020 ug/g	2270	223 *	50 - 150
Q	9290 ug/g	8370	90.1	50 - 150
Hexachloroethane	998 ug/g	1120	112	50 - 150

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Report of Analysis

QC Summary

LCS Lab ID: 3793 | Original Lab ID: | Prep Batch: 4401
Matrix: Liquid | Analytical: 5004

AM101 Vols in Liquid HD by GC	Expected	Result	Recovery	Rec Limits
1,2-Dichloroethane	9880 ug/g	12400	125	50 - 150
Tetrachloroethylene	10100 ug/g	12400	122	50 - 150
1,1,2,2-Tetrachloroethane	10400 ug/g	13100	126	50 - 150

DUP Lab ID: 3794 | Original Lab ID: 030004-020-01 | Prep Batch: 4401
Matrix: Liquid | Analytical: 5004

AM101 Vols in Liquid HD by GC	Original Result	Result	RPD	RPD Limits
1,2-Dichloroethane	7140	7600	6.31	0 - 25
Tetrachloroethylene	0	0	0	0 - 25
1,1,2,2-Tetrachloroethane	0	0	0	0 - 25

MS Lab ID: 3795 | Original Lab ID: 030004-020-01 | Prep Batch: 4401
Matrix: Liquid | Analytical: 5004

AM101 Vols in Liquid HD by GC	Original Result	Expected	Result	Recovery	Rec Limits
1,2-Dichloroethane	7140	10300 ug/g	22200	145	50 - 150
Tetrachloroethylene	0	10600 ug/g	14900	141	50 - 150
1,1,2,2-Tetrachloroethane	0	10800 ug/g	15100	139	50 - 150

MSD Lab ID: 3796 | Original Lab ID: 030004-020-01 | Prep Batch: 4401
Matrix: Liquid | Analytical: 5004

AM101 Vols in Liquid HD by GC	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
1,2-Dichloroethane	9960 ug/g	15600	85.1	50 - 150	52.1 *	0 - 25
Tetrachloroethylene	10200 ug/g	8190	80.2	50 - 150	55 *	0 - 25
1,1,2,2-Tetrachloroethane	10500 ug/g	8180	78.3	50 - 150	55.9 *	0 - 25

LCS Lab ID: 3797 | Original Lab ID: | Prep Batch: 4401
Matrix: Liquid | Analytical: 5004

AM101 Vols in Liquid HD by GC	Expected	Result	Recovery	Rec Limits
1,2-Dichloroethane	9880 ug/g	11200	114	50 - 150
Tetrachloroethylene	10100 ug/g	12300	122	50 - 150
1,1,2,2-Tetrachloroethane	10400 ug/g	12200	118	50 - 150

Appendix C-4

Analytical Test Report
Sample Set #4

Edgewood Chemical Biological Center
ATTN: Edgewood Chemical Biological
Forensic Analytical Center
Aberdeen Proving Ground, MD 21010-5424
Phone: (410) 436-8600
Fax: (410) 436-3384

ANALYTICAL TEST REPORT

Report Date: 15 January 2004

Project/Event Title: Analysis of HD Sample Collected From Ton Containers Stored at the Deseret Chemical Depot – Sample Set 4

Project/Event Number: 97P-0033-46

Report Number: 0033-46-011504B4

Report Prepared for:

EG&G Defense Materials Division
Attn.: Mr. Don Milton
11600 Stark Rd
Tooele, UT 84074

NOTE: This report replaces the report numbered 0033-46-060903B4

This report shall not be reproduced except in full, without the written approval of the laboratory. Test results reported herein refer only to samples tested.

CASE NARRATIVE

Tooele Samples (Set 4)
Project/Event # 97P-0033-46

Receiving Notes

All sample containers were visually checked and compared to sample transfer form DD 1911. The containers were noted to be in satisfactory condition and all samples were received intact.

Sample Preparatory Notes

No discrepancies.

Analytical Notes:

Organic Compounds Anaylsis

VOLATILE ORGANIC COMPOUNDS

Volatile Organic Compounds (VOCs) were extracted on 15-Apr-03 and analyzed 21-Apr-03 through 22-Apr-03 by method AM-101.

The bromofluorobenzene (BFB) tune and the tune evaluation and performance standard both passed acceptance criteria.

The calibration curves for the target compounds along with the surrogate resulted in correlation coefficient (r^2) of 0.999 for Linear / (0, 0) curve fits for all compounds except for 1,1,2,2-Tetrachloroethane (1,1,2,2-TCE) which was 0.998. The individual calibration curve recovery values for all compounds of interest were within the acceptance criteria of ±15%. All levels had recovery values between 91% and 113% for all compounds.

The Continuing Calibration Verification (CCV) samples were all within acceptance criteria (±25%). Recovery values for all compounds were between 93% and 99%.

The Surrogate (1,4-difluorobenzene) was present and fulfilled the recovery criteria (50%-150%) in all samples. Recovery values ranged from 107% to 115%.

The Matrix Spike (MS) and Matrix Spike Duplicate (MSD) fulfilled the recovery criteria (50%-150%) in all analytes of interest. Recovery values for the surrogate, 1,2-Dichloroethane (1,2-DCE), Tetrachloroethylene (TCE) and 1,1,2,2-TCE were 103% to 113%. The Relative Percent Difference (RPD) for the MS and the MSD for 1,2-DCE, TCE, and 1,1,2,2-TCE were 0 to 3.6% with acceptance criteria (±25%) for all analytes of interest.

The Blank Spike (BS) and Blank Spike Duplicate (BSD) fulfilled the recovery criteria (50%-150%) for all analytes of interest. The BS/BSD are identified in the report as the Laboratory Control Sample (LCS).

Results showed that target compounds were not detected in either the Method Blank (MB) or the Reagent Blanks (RB).

The RPD values for the sample and sample duplicate met the specification required in AM-101 of ≤25%. All were <5% (1,1,2,2-TCE was not detected in either sample).

Sample holding time of 28 days from collection to analysis was met for all samples. Samples were collected starting 1-Apr-03 through 5-Apr-03 and analyzed on 21-Apr-03 through 22-Apr-03.

SEMI-VOLATILE ORGANIC COMPOUNDS

Semi-Volatiles Organic Compounds (SVOCs) were extracted on 15-Apr-03 and analyzed on 24-Apr-03 through 25-Apr-03 by method AM-117.

The decafluorotriphenylphosphine (DFTPP) tune and the tune evaluation and performance standard both passed acceptance criteria.

The calibration curves for the target compounds along with the surrogate resulted in correlation coefficient (r^2) of 0.999 for 1,4-dithiane-d4 and 0.999 for Hexachloroethane (HCE) for a Linear / (0, 0) curve fit. Compound Q had an r^2 of 1.000 for a linear curve with a Practical Quantitation Limit (PQL) of 25 µg/ml. T had an r^2 of 1.000 for a linear curve with a PQL of 25 µg/ml. In the calibration curve for T there was no traceability for the highest calibration point value. No corrective action was taken.

All analytes in the calibration curve standards were within the method criteria (±15%). For the surrogate, HCE, Q, and T recovery values ranged from 85% to 106%.

The CCV recovery values for, HCE, Q and T ranged from 94% to 101%.

The MS/MSD values for the surrogate, HCE, Q and T were within criteria of 50% to 150% and ±25% for the RPD (<13%).

The BS recovery values for the surrogate, HCE, Q and T were within acceptance levels.

When duplicate samples were analyzed, the RPDs for all analytes were below the method criteria of ±25% (<5%). HCE was not detected in the sample or sample duplicate.

Results showed that target compounds were not detected in either the MB or RB.

Sample holding time of 28 days from collection to analysis was met for all of the submitted samples. Samples were collected starting 1-Apr-03 through 5-Apr-03 and analyzed on 24-Apr-03 through 25-Apr-03.

THIODIGLYCOL

Samples for the non-volatile organic compound, thiodiglycol (TDG), were extracted 22-Apr-03 and analyzed on 29-Apr-03 through 30-Apr-03 by method AM-100.

The decafluorotriphenylphosphine (DFTPP) tune and the tune evaluation and performance standard both passed acceptance criteria.

The calibration curves for TDG along with the surrogate (TDG_{d8}) resulted in correlation coefficient (r^2) of 1.000 and 0.999, respectively for Linear / (0, 0) curves.

The recovery value of the 2.5 µg/mL calibration standard was 124% of the known concentration. The test plan specifies that the standards to be within ±15%. There was no corrective action taken since there was no TDG detected in any of the samples and the error would be on the high side (124% vs. 115%) which would enhance the detection of TDG, if present. Other calibration levels were between 91% and 109%.

All CCV samples passed acceptance criteria of ±25% for TDG and the surrogate (100% to 111%).

When duplicate samples were analyzed, the RPD for the surrogate was 66.7% (106.1% vs. 54.1%) the method criteria is ±25%. A spiking error was suspected and no TDG was detected, therefore samples were not re-extracted. TDG was not detected in the sample or sample duplicate.

The MS/MSD for all target compounds passed criteria. Recovery values were 103% and 111% for TDG and 102% and 111% for the surrogate. The RPD for the MS and the MSD passed acceptance criteria.

The BS/BSD fulfilled the acceptance criteria.

Results showed that target compounds were not detected in either the Method or the Reagent Blanks.

For sample 4133 (sample duplicate), the surrogate was spiked at 50% of the true spiking level of 10 µg/mL. The sample spike result was 106%. No corrective actions were taken. For sample 030004-03402 (21-03-155), the surrogate spike was not detected. Since TDG was not present in this or any submitted sample in this sample set, no corrective action was taken.

Sample holding time of 28 days from collection to analysis was not met for all samples. Samples 030004-034-01 (21-03-154) and 030004-034-02 (21-03-155) were collected 1-Apr-03 and analyzed 30-Apr-03. The remaining samples were collected starting 2-Apr-03 through 5-Apr-03 and analyzed on 30-Apr-03 thus meeting the holding time.

LEWISITE

Lewisite was extracted on 22-Apr-03 and analyzed on 22-Apr-03 through 23-Apr-03 by method AM-126.

The decafluorotriphenylphosphine (DFTPP) tune and the tune evaluation and performance standard both passed acceptance criteria.

The calibration curve for the target compound (L) resulted in a correlation coefficient (r^2) of 1.000 for a quadratic (not forced through 0, 0) curve fit for Lewisite. A quadratic fit was used to determine the calibration curve. Calibration curves behave differently for compounds over large orders of magnitude as well as for instrumental conditions and column types. After investigation, it was determined that a quadratic curve best represented the existing data. Six concentration levels were used in this curve. This meets the minimal requirements specified in EPA SW846 method 8000b. The individual calibration curve levels (91% to 119%) for Lewisite were within the acceptance criteria of ±15% except for the lowest level standard of 50 ng/ml (119%). No Lewisite was detected in any of the samples with the bias being on the high (119%) side.

The CCV samples (87% to 93%) were all within acceptance criteria (±25%).

The MS/MSD and BS/BSD recovery values were within acceptance limits.

Results showed that lewisite was not detected in either the Method or the Reagent Blanks.

Sample holding time of 28 days from collection to analysis was met for all samples. Samples were collected starting 1-Apr-03 through 5-Apr-03 and analyzed on 23-Apr-03.

PURITY

Purity samples were extracted on 15-Apr-03 and analyzed on 16-Apr-03 by method AM-098.

The decafluorotriphenylphosphine (DFTPP) tune passed acceptance criteria.

The calibration curve for the target compound (HD) resulted in a correlation coefficient (r^2) of 0.999 for a Linear / (0, 0) curve fit. All individual points of the curve were between 98% and 103%.

The CCV standards all passed the acceptance criteria of ±15%.

The CASARM grade (HD) Laboratory Control Sample (LCS) results showed a purity that was 99.6% of its true value.

When duplicate samples were analyzed, the RPD for the purity was 9.91% well below the method criteria of ±25%.

Results showed that HD was not detected in either the Method or the Reagent Blanks.

Sample holding time of 28 days from collection to analysis was met for all samples. Samples were collected starting 1-Apr-03 through 5-Apr-03 and analyzed on 16-Apr-03.

ANALYSIS FOR METALS

LIQUID SAMPLES

All undiluted samples were analyzed on 16-Apr-03. Samples that needed to be rerun were analyzed on 17-Apr-03. There were no dilutions required. All samples were analyzed following Method AM-118.

Boron, chromium, cobalt, copper, lead, manganese, mercury, nickel, thallium, vanadium, and zinc were outside the acceptance limits of 90% to 110% for the CCV when analyzed on 16-Apr-03. Upon reanalysis 17-Apr-03, all were within the limits.

Selenium and zinc were in the method blank at a level above the Method Detection Limit (MDL), but below the PQL. Selenium was detected within the analytical run on 16-Apr-03 and zinc was detected on 17-Apr-03. No corrective was action taken.

The recovery values for the MS/MSD, BS, Post Digestion Spike Addition sample (PDSA), LCS, and LCS duplicate indicated that all elements met the acceptance criteria of 75%-125%. The MS/MSD RPD met the criteria.

The Sample Duplicate passed all criteria for the elements that were 100 times the instrument detection limit (IDL).

All liquid samples were analyzed within the 28-day holding period.

NON-COHESIVE SOLID SAMPLES

All undiluted samples were analyzed on 21-Apr-03. There were no dilutions or reanalysis required. Samples were analyzed following Method AM-118.

All elements met the acceptable limits for the CCV.

Cadmium was detected in all reagent blanks at a level above the MDL, but below the PQL. No corrective action was taken. Barium and cadmium were detected in the MB at a level above the MDL, but below the PQL. No corrective action was taken.

The recovery values for the MS/MSD, BS, PDSA, Certified Reference material (CRM) and CRM duplicate (CRMD) indicated that all elements met the acceptance criteria of 75%-125%. The MS/MSD RPD and CRM/CRMD RPD met the criterium.

The Sample Duplicate RPD of 20% passed for the elements that were 100 times the IDL. However, manganese (37.8%) and zinc(38.8%) failed the RPD criteria. The failure was attributed to the sample non-homogeneity.

All the Non-Cohesive samples were analyzed within the 28-day hold time.

SOLIDS SAMPLES

All undiluted samples were analyzed on 22-Apr-03. There were no dilutions or reanalysis required. Samples were analyzed following Method AM-118.

All elements met the acceptable limits for the CCV.

Cadmium was detected in all reagent blanks at a level above the MDL, but below the PQL. No corrective action was taken. Arsenic was detected in the second reagent blank at a level above the MDL, but below the PQL. Cadmium and barium were found in the method blank at a level above the MDL, but below the PQL. No corrective action was taken.

The native sample used for the MS/MSD had high levels of manganese and copper. Since the spike level was less than the original levels in the sample, the MS could not be properly evaluated for that element. The recovery data for the MS indicated that manganese and copper were outside the acceptable limits of 75%-125%. The MSD indicated that manganese was outside the acceptable limits. The RPD for the MS and MSD were within acceptable limits for all elements except for manganese and copper. All other elements gave acceptable recovery values and RPD's for the MS and MSD. No corrective actions were taken.

The recovery values for the BS, PDSA, CRM and CRM duplicate indicated that all elements met the acceptance criteria of 75%-125%. The RPD for the MS/MSD and CRM/CRMD met the acceptance limits.

The sample duplicate RPD of 20% passed for all the elements that were 100 times the IDL with the exception of chromium. The failure was due to the sample non-homogeneity.

All the solid samples were analyzed within the 28-day hold time.

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Report Approved by
Dennis J. Reutter (Signature)
15 Jan 2004 (Date)
Dennis J. Reutter, Ph.D.
Chief, Edgewood C/B Forensic Analytical Center

Appendix A

LIMS DATA REPORT

This appendix contains the 52-page data report produced from the LIMS system. It contains a summary of sample numbers, sample results, method blank results and results of QC samples analyzed. Since the report is generated by the LIMS, the page numbers will begin again at 1, but each page has been identified as part of the appendix so that it may be distinguishable from the main report.

ECB Forensic Analytical Center
Edgewood Chemical and Biological Center
Aberdeen Proving Ground, MD 21010-5424
(410) 436-8600

ANALYTICAL RESULTS

Report Date: 01/15/2004

Work Order: Tooele HD/TC 04/14/03

Deliver To: Don Milton
EG&G Defense Materials Div.
11600 Stark Road
Tooele, UT 84074

James Newman
Project Manager

The following represents qualifications to the associated analytical reports.

1. These descriptors will help identify the specific sample and clarify the report.

   DUP - Matrix Duplicate
   MS - Matrix Spike
   MSD - Matrix Spike Duplicate
   RPD - Relative Percent Difference
   PQL - Practical Quantitiation Limit
   MDL - Method Detection Limit
   ND - Not Detected at the PQL

   Surrogate - Organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromotography, but which are not normally found in the samples.

2. Qualifier keys - These descriptors will follow individual results for a specific sample and a specific analyte and will help qualify the data.

   J - Indicates an estimated value between the PQL and MDL

NOTE: This document is included as part of the Analytical Report for the above referenced and should be retained as a permanent record thereof.

ECB Forensic Analytical Center
Edgewood Chemical and Biological Center
Aberdeen Proving Ground, MD 21010-5424
(410) 436-8600

Report of Analysis

Client
EG&G Defense Materials Division

Work ID
Tooele HD/TC 04/14/03

Workorder Sample Summary

Lab ID	Sample ID	Matrix	Collect Date/Time	Receive Date/Time
030004-034-01	21-03-154	Liquid	4/1/2003 16:21	4/14/2003 16:17
030004-034-02	21-03-155	Liquid	4/1/2003 16:21	4/14/2003 16:17
030004-034-03	21-03-160	Liquid	4/2/2003 16:21	4/14/2003 16:17
030004-034-04	21-03-163	Liquid	4/3/2003 16:21	4/14/2003 16:17
030004-034-05	21-03-166	Liquid	4/3/2003 16:21	4/14/2003 16:17
030004-034-06	21-03-169	Liquid	4/4/2003 16:21	4/14/2003 16:17
030004-034-07	21-03-173	Liquid	4/5/2003 16:21	4/14/2003 16:17
030004-035-01	21-03-156	Non-cohesive Solid	4/1/2003 10:15	4/14/2003 10:05
030004-035-02	21-03-157	Non-cohesive Solid	4/1/2003 10:15	4/14/2003 10:05
030004-035-03	21-03-161	Non-cohesive Solid	4/2/2003 10:15	4/14/2003 10:05
030004-035-04	21-03-164	Non-cohesive Solid	4/3/2003 10:15	4/14/2003 10:05
030004-035-05	21-03-167	Non-cohesive Solid	4/3/2003 10:15	4/14/2003 10:05
030004-035-06	21-03-170	Non-cohesive Solid	4/4/2003 10:15	4/14/2003 10:05
030004-035-07	21-03-174	Non-cohesive Solid	4/5/2003 10:30	4/14/2003 10:05
030004-037-01	21-03-158	Solid	4/1/2003 10:36	4/14/2003 10:33
030004-037-02	21-03-159	Solid	4/1/2003 10:36	4/14/2003 10:33
030004-037-03	21-03-162	Solid	4/2/2003 10:36	4/14/2003 10:33
030004-037-04	21-03-165	Solid	4/3/2003 10:36	4/14/2003 10:33
030004-037-05	21-03-168	Solid	4/3/2003 10:36	4/14/2003 10:33
030004-037-06	21-03-171	Solid	4/4/2003 10:36	4/14/2003 10:33
030004-037-07	21-03-175	Solid	4/5/2003 10:36	4/14/2003 10:33

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-034-01	21-03-154	4/1/2003 16:21	4/14/2003 16:17	6/9/2003 11:20	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 16:11	5901	AM098 HD Purity by GC	1	4/16/2003 18:31	jwr	6303

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	101			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 15:52	6108	AM100 Non-Vols in HD by GC	1	4/30/2003 0:36	tfr	6302

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	218	260	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1040	1100 ug/g	106	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:21	5801	AM101 Vols in Liquid HD by GC	1	4/21/2003 21:41	tfr	6107

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6950	266	511	ug/g
Tetrachloroethylene	492 J	102	511	ug/g
1,1,2,2-Tetrachloroethane	ND	153	511	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10600	11600 ug/g	109	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/16/2003 17:55	blb	6003

Parameter	Result	MDL	PQL	Units
Aluminum	20.2 J	10.2	51.1	ug/g
Antimony	ND	0.644	5.11	ug/g
Arsenic	7.51	1.25	5.11	ug/g
Barium	ND	0.440	5.11	ug/g
Beryllium	ND	0.920	5.11	ug/g
Cadmium	ND	0.419	5.11	ug/g
Selenium	ND	1.20	10.2	ug/g
Silver	ND	0.481	5.11	ug/g
Tin	ND	2.55	10.2	ug/g

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/17/2003 13:13	blb	6101

Parameter	Result	MDL	PQL	Units
Boron	6.70 J	3.82	10.2	ug/g
Chromium	2.77 J	1.32	5.11	ug/g
Copper	39.3	2.48	5.11	ug/g

Report of Analysis

Lead			ND	0.419	5.11	ug/g
Manganese			0.442 J	0.327	1.02	ug/g
Mercury			ND	0.0511	0.511	ug/g
Nickel			5.64	0.358	5.11	ug/g
Vanadium			ND	1.02	5.11	ug/g
Thallium			ND	1.00	5.11	ug/g
Zinc			3.42 J	3.19	10.2	ug/g

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/17/2003 13:13	blb	6101

Parameter	Result	MDL	PQL	Units
Cobalt	ND	0.276	1.02	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 09:16	5902	AM117 Semi-Vols Liq HD by GC	1	4/24/2003 21:40	tfr	6203

Parameter	Result	MDL	PQL	Units
Hexachloroethane	ND	83.5	2610	ug/g
Q	29700	53.2	2610	ug/g
T	787 J	73.1	2610	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1040	1050 ug/g	100	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 16:26	6109	AM126 Lewisite in HD by GC	1	4/23/2003 0:42	tfr	6201

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.97	5.06	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-034-02	21-03-155	4/1/2003 16:21	4/14/2003 16:17	6/9/2003 11:20	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 16:11	5901	AM098 HD Purity by GC	1	4/16/2003 19:10	jwr	6303

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	92.4			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 15:56	6108	AM100 Non-Vols in HD by GC	1	4/30/2003 0:00	tfr	6302

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	214	254	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	41.7 ug/g	4.1 *	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:21	5801	AM101 Vols in Liquid HD by GC	1	4/21/2003 22:51	tfr	6107

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6370	263	505	ug/g
Tetrachloroethylene	487 J	101	505	ug/g
1,1,2,2-Tetrachloroethane	ND	152	505	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10400	11200 ug/g	107	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/16/2003 18:50	blb	6003

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.4	52.2	ug/g
Antimony	ND	0.658	5.22	ug/g
Arsenic	3.76 J	1.27	5.22	ug/g
Barium	ND	0.449	5.22	ug/g
Beryllium	ND	0.939	5.22	ug/g
Cadmium	ND	0.428	5.22	ug/g
Selenium	ND	1.22	10.4	ug/g
Silver	ND	0.491	5.22	ug/g
Tin	ND	2.60	10.4	ug/g

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/17/2003 13:57	blb	6101

Parameter	Result	MDL	PQL	Units
Boron	4.26 J	3.90	10.4	ug/g
Chromium	5.24	1.35	5.22	ug/g
Copper	41.3	2.54	5.22	ug/g

Report of Analysis

Lead	ND	0.428	5.22	ug/g
Manganese	ND	0.334	1.04	ug/g
Mercury	ND	0.0522	0.522	ug/g
Nickel	4.14 J	0.365	5.22	ug/g
Vanadium	1.88 J	1.04	5.22	ug/g
Thallium	ND	1.02	5.22	ug/g
Zinc	ND	3.26	10.4	ug/g
Cobalt	ND	0.282	1.04	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
4/15/2003 09:16	5902	AM117 Semi-Vols Liq HD by GC	1	4/24/2003 22:56	tfr	6203

Parameter	*Result*	*MDL*	*PQL*	*Units*
Hexachloroethane	ND	81.7	2550	ug/g
Q	29400	52.1	2550	ug/g
T	759 J	71.5	2550	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1020	1050 ug/g	103	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
4/22/2003 16:26	6109	AM126 Lewisite in HD by GC	1	4/23/2003 0:00	tfr	6201

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.97	5.04	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-034-03	21-03-160	4/2/2003 16:21	4/14/2003 16:17	6/9/2003 11:20	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 16:11	5901	AM098 HD Purity by GC	1	4/16/2003 19:29	jwr	6303

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	84.1			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 15:56	6108	AM100 Non-Vols in HD by GC	1	4/30/2003 0:00	tfr	6302

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	211	251	ug/g

Surrogates

	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1000	1160 ug/g	115	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:21	5801	AM101 Vols in Liquid HD by GC	1	4/21/2003 23:26	tfr	6107

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	5120	265	509	ug/g
Tetrachloroethylene	ND	102	509	ug/g
1,1,2,2-Tetrachloroethane	ND	153	509	ug/g

Surrogates

	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10500	11800 ug/g	112	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/16/2003 18:56	blb	6003

Parameter	Result	MDL	PQL	Units
Aluminum	ND	11.0	54.9	ug/g
Antimony	ND	0.692	5.49	ug/g
Arsenic	ND	1.34	5.49	ug/g
Barium	ND	0.473	5.49	ug/g
Beryllium	ND	0.989	5.49	ug/g
Cadmium	ND	0.451	5.49	ug/g
Selenium	ND	1.29	11.0	ug/g
Silver	ND	0.516	5.49	ug/g
Tin	ND	2.74	11.0	ug/g

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/17/2003 14:03	blb	6101

Parameter	Result	MDL	PQL	Units
Boron	ND	4.11	11.0	ug/g
Chromium	2.13 J	1.42	5.49	ug/g
Copper	13.7	2.67	5.49	ug/g

Report of Analysis

Lead	1.04 J	0.451	5.49	ug/g
Manganese	6.49	0.352	1.10	ug/g
Mercury	0.141 J	0.0549	0.549	ug/g
Nickel	1.54 J	0.385	5.49	ug/g
Vanadium	ND	1.10	5.49	ug/g
Thallium	ND	1.08	5.49	ug/g
Zinc	5.01 J	3.43	11.0	ug/g
Cobalt	ND	0.297	1.10	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
4/15/2003 09:16	5902	AM117 Semi-Vols Liq HD by GC	1	4/24/2003 23:34	tfr	6203

Parameter	*Result*	*MDL*	*PQL*	*Units*
Hexachloroethane	ND	81.4	2540	ug/g
Q	28900	51.9	2540	ug/g
T	1650 J	71.2	2540	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1020	1030 ug/g	102	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
4/22/2003 16:26	6109	AM126 Lewisite in HD by GC	1	4/23/2003 0:00	tfr	6201

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.98	5.08	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-034-04	21-03-163	4/3/2003 16:21	4/14/2003 16:17	6/9/2003 11:20	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 16:11	5901	AM098 HD Purity by GC	1	4/16/2003 19:48	jwr	6303

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	78.7			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 15:57	6108	AM100 Non-Vols in HD by GC	1	4/30/2003 0:00	tfr	6302

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	210	251	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1000	1120 ug/g	112	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:21	5801	AM101 Vols in Liquid HD by GC	1	4/22/2003 0:01	tfr	6107

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6800	264	508	ug/g
Tetrachloroethylene	ND	102	508	ug/g
1,1,2,2-Tetrachloroethane	ND	152	508	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10500	11400 ug/g	108	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/16/2003 19:02	blb	6003

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.5	52.5	ug/g
Antimony	ND	0.662	5.25	ug/g
Arsenic	ND	1.28	5.25	ug/g
Barium	ND	0.452	5.25	ug/g
Beryllium	ND	0.945	5.25	ug/g
Cadmium	ND	0.431	5.25	ug/g
Selenium	ND	1.23	10.5	ug/g
Silver	ND	0.494	5.25	ug/g
Tin	ND	2.62	10.5	ug/g

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/17/2003 14:08	blb	6101

Parameter	Result	MDL	PQL	Units
Boron	ND	3.93	10.5	ug/g
Chromium	2.88 J	1.36	5.25	ug/g
Copper	29.8	2.55	5.25	ug/g

Report of Analysis

Cobalt	ND	0.284	1.05	ug/g
Lead	ND	0.431	5.25	ug/g
Manganese	3.75	0.336	1.05	ug/g
Mercury	ND	0.0525	0.525	ug/g
Nickel	0.766 J	0.368	5.25	ug/g
Vanadium	1.25 J	1.05	5.25	ug/g
Thallium	ND	1.03	5.25	ug/g
Zinc	ND	3.28	10.5	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
4/15/2003 09:16	5902	AM117 Semi-Vols Liq HD by GC	1	4/25/2003 0:12	tfr	6203

Parameter	*Result*	*MDL*	*PQL*	*Units*
Hexachloroethane	ND	80.2	2510	ug/g
Q	26100	51.2	2510	ug/g
T	1470 J	70.2	2510	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1000	1000 ug/g	99.8	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
4/22/2003 16:26	6109	AM126 Lewisite in HD by GC	1	4/23/2003 0:00	tfr	6201

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.94	4.97	ug/g

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030004-034-05	21-03-166	4/3/2003 16:21	4/14/2003 16:17	6/9/2003 11:20	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 16:11	5901	AM098 HD Purity by GC	1	4/16/2003 20:08	jwr	6303

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	87.5			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 15:57	6108	AM100 Non-Vols in HD by GC	1	4/30/2003 0:00	tfr	6302

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	213	253	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1010	1070 ug/g	105	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:21	5801	AM101 Vols in Liquid HD by GC	1	4/22/2003 0:36	tfr	6107

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	6770	263	505	ug/g
Tetrachloroethylene	ND	101	505	ug/g
1,1,2,2-Tetrachloroethane	ND	152	505	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10400	11500 ug/g	110	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/16/2003 19:08	blb	6003

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.1	50.6	ug/g
Antimony	ND	0.637	5.06	ug/g
Arsenic	3.76 J	1.23	5.06	ug/g
Barium	ND	0.435	5.06	ug/g
Beryllium	ND	0.910	5.06	ug/g
Cadmium	ND	0.415	5.06	ug/g
Selenium	ND	1.18	10.1	ug/g
Silver	ND	0.475	5.06	ug/g
Tin	ND	2.52	10.1	ug/g

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/17/2003 14:14	blb	6101

Parameter	Result	MDL	PQL	Units
Chromium	3.11 J	1.30	5.06	ug/g
Boron	ND	3.78	10.1	ug/g
Cobalt	ND	0.273	1.01	ug/g

Report of Analysis

Copper	65.7	2.46	5.06	ug/g
Lead	ND	0.415	5.06	ug/g
Manganese	0.328 J	0.324	1.01	ug/g
Mercury	ND	0.0506	0.506	ug/g
Nickel	0.772 J	0.354	5.06	ug/g
Vanadium	1.31 J	1.01	5.06	ug/g
Thallium	ND	0.991	5.06	ug/g
Zinc	4.70 J	3.15	10.1	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 09:16	5902	AM117 Semi-Vols Liq HD by GC	1	4/25/2003 0:50	tfr	6203

Parameter	Result	MDL	PQL	Units
Hexachloroethane	ND	84.2	2630	ug/g
Q	30800	53.7	2630	ug/g
T	855 J	73.7	2630	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1050	1060 ug/g	101	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 16:26	6109	AM126 Lewisite in HD by GC	1	4/23/2003 0:00	tfr	6201

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.96	5.03	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-034-06	21-03-169	4/4/2003 16:21	4/14/2003 16:17	6/9/2003 11:20	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 16:11	5901	AM098 HD Purity by GC	1	4/16/2003 20:27	jwr	6303

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	88.5			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 15:57	6108	AM100 Non-Vols in HD by GC	1	4/30/2003 0:00	tfr	6302

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	215	256	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1020	1190 ug/g	116	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:21	5801	AM101 Vols in Liquid HD by GC	1	4/22/2003 0:00	tfr	6107

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7990	261	501	ug/g
Tetrachloroethylene	ND	100	501	ug/g
1,1,2,2-Tetrachloroethane	ND	150	501	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10400	11900 ug/g	114	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/16/2003 19:14	blb	6003

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.2	51.2	ug/g
Antimony	ND	0.645	5.12	ug/g
Arsenic	ND	1.25	5.12	ug/g
Barium	ND	0.441	5.12	ug/g
Beryllium	ND	0.922	5.12	ug/g
Cadmium	ND	0.420	5.12	ug/g
Selenium	ND	1.20	10.2	ug/g
Silver	ND	0.482	5.12	ug/g
Tin	ND	2.55	10.2	ug/g

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/17/2003 14:19	blb	6101

Parameter	Result	MDL	PQL	Units
Boron	ND	3.83	10.2	ug/g
Chromium	2.87 J	1.32	5 12	ug/g
Cobalt	ND	0.277	1.02	ug/g

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Copper			17.2	2.49	5.12	ug/g
Lead			ND	0.420	5.12	ug/g
Manganese			0.885 J	0.328	1.02	ug/g
Mercury			ND	0.0512	0.512	ug/g
Nickel			ND	0.359	5.12	ug/g
Vanadium			1.16 J	1.02	5.12	ug/g
Zinc			ND	3.20	10.2	ug/g

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/17/2003 14:19	blb	6101

Parameter	*Result*	*MDL*	*PQL*	*Units*
Thallium	ND	1.00	5.12	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
4/15/2003 09:16	5902	AM117 Semi-Vols Liq HD by GC	1	4/25/2003 0:00	tfr	6203

Parameter	*Result*	*MDL*	*PQL*	*Units*
Hexachloroethane	ND	84.5	2640	ug/g
Q	28000	53.9	2640	ug/g
T	1510 J	73.9	2640	ug/g

Surrogates	*Expected*	*Result*	*Recovery*	*Limits*
1,4-Dithiane-d4	1060	1040 ug/g	98.9	50 - 150

AM126 Lewisite in HD by GC

Prep Date	*Prep Batch*	*Prep Method*	*Dilution*	*Analysis Date*	*By*	*Analytical Batch*
4/22/2003 16:26	6109	AM126 Lewisite in HD by GC	1	4/23/2003 0:00	tfr	6201

Parameter	*Result*	*MDL*	*PQL*	*Units*
Lewisite	ND	1.98	5.08	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-034-07	21-03-173	4/5/2003 16:21	4/14/2003 16:17	6/9/2003 11:20	Liquid

(Results reported as received basis)

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 16:11	5901	AM098 HD Purity by GC	1	4/16/2003 20:46	jwr	6303

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	95.4			%

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 15:57	6108	AM100 Non-Vols in HD by GC	1	4/30/2003 0:00	tfr	6302

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	211	252	ug/g

Surrogates	Expected	Result	Recovery	Limits
Thiodiglycol-d8 (TDG-d8)	1010	1010 ug/g	101	50 - 150

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:21	5801	AM101 Vols in Liquid HD by GC	1	4/22/2003 0:00	tfr	6107

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	7590	266	512	ug/g
Tetrachloroethylene	254 J	102	512	ug/g
1,1,2,2-Tetrachloroethane	ND	154	512	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Difluorobenzene	10600	11400 ug/g	108	50 - 150

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/16/2003 19:20	blb	6003

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.2	51.1	ug/g
Antimony	ND	0.644	5.11	ug/g
Arsenic	ND	1.25	5.11	ug/g
Barium	ND	0.440	5.11	ug/g
Beryllium	ND	0.920	5.11	ug/g
Cadmium	ND	0.419	5.11	ug/g
Selenium	ND	1.20	10.2	ug/g
Silver	ND	0.481	5.11	ug/g
Tin	ND	2.55	10.2	ug/g

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/17/2003 14:25	blb	6101

Parameter	Result	MDL	PQL	Units
Boron	ND	3.82	10.2	ug/g
Chromium	3.18 J	1.32	5.11	ug/g
Cobalt	ND	0.276	1.02	ug/g

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Copper	64.6	2.48	5.11	ug/g
Lead	ND	0.419	5.11	ug/g
Manganese	ND	0.327	1.02	ug/g
Mercury	ND	0.0511	0.511	ug/g
Nickel	ND	0.358	5.11	ug/g
Vanadium	1.20 J	1.02	5.11	ug/g
Thallium	ND	1.00	5.11	ug/g
Zinc	4.75 J	3.19	10.2	ug/g

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 09:16	5902	AM117 Semi-Vols Liq HD by GC	1	4/25/2003 0:00	tfr	6203

Parameter	Result	MDL	PQL	Units
Hexachloroethane	ND	87.2	2730	ug/g
Q	40800	55.6	2730	ug/g
T	1060 J	76.3	2730	ug/g

Surrogates	Expected	Result	Recovery	Limits
1,4-Dithiane-d4	1090	1110 ug/g	102	50 - 150

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 16:26	6109	AM126 Lewisite in HD by GC	1	4/23/2003 0:00	tfr	6201

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.87	4.78	ug/g

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030004-035-01	21-03-156	4/1/2003 10:15	4/14/2003 10:05	6/9/2003 11:20	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:10	6001	AM118 Metals in NCS HD by ICP	1	4/21/2003 13:12	blb	6103

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.91	49.6	ug/g
Antimony	0.334 J	0.129	4.96	ug/g
Arsenic	18.5	0.565	4.96	ug/g
Barium	0.118 J	0.0396	4.96	ug/g
Beryllium	ND	0.0496	4.96	ug/g
Boron	ND	3.96	9.91	ug/g
Cadmium	0.253 J	0.0198	4.96	ug/g
Chromium	5.86	0.991	4.96	ug/g
Cobalt	0.323 J	0.119	0.991	ug/g
Copper	64.3	3.20	9.91	ug/g
Lead	ND	1.87	9.91	ug/g
Manganese	23.6	3.27	9.91	ug/g
Mercury	ND	0.0694	0.496	ug/g
Nickel	11.6	0.614	4.96	ug/g
Selenium	ND	0.704	24.8	ug/g
Silver	ND	0.0595	4.96	ug/g
Thallium	ND	0.327	4.96	ug/g
Tin	ND	0.436	9.91	ug/g
Vanadium	1.32 J	0.991	4.96	ug/g
Zinc	10.0	2.18	9.91	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-035-02	21-03-157	4/1/2003 10:15	4/14/2003 10:05	6/9/2003 11:20	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:10	6001	AM118 Metals in NCS HD by ICP	1	4/21/2003 12:41	blb	6103

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.54	47.7	ug/g
Antimony	0.428 J	0.124	4.77	ug/g
Arsenic	33.7	0.544	4.77	ug/g
Barium	ND	0.0382	4.77	ug/g
Beryllium	ND	0.0477	4.77	ug/g
Boron	ND	3.82	9.54	ug/g
Cadmium	0.243 J	0.0191	4.77	ug/g
Chromium	13.7	0.954	4.77	ug/g
Cobalt	2.09	0.115	0.954	ug/g
Copper	44.3	3.08	9.54	ug/g
Lead	10.6	1.80	9.54	ug/g
Manganese	137	3.15	9.54	ug/g
Mercury	0.135 J	0.0668	0.477	ug/g
Nickel	11.6	0.592	4.77	ug/g
Selenium	ND	0.677	23.9	ug/g
Silver	ND	0.0573	4.77	ug/g
Thallium	ND	0.315	4.77	ug/g
Tin	1.06 J	0.420	9.54	ug/g
Vanadium	1.27 J	0.954	4.77	ug/g
Zinc	50.1	2.10	9.54	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-035-03	21-03-161	4/2/2003 10:15	4/14/2003 10:05	6/9/2003 11:20	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:10	6001	AM118 Metals in NCS HD by ICP	1	4/21/2003 13:18	blb	6103

Parameter	Result	MDL	PQL	Units
Aluminum	13.0 J	10.6	53.2	ug/g
Antimony	0.234 J	0.138	5.32	ug/g
Arsenic	1.83 J	0.606	5.32	ug/g
Barium	0.369 J	0.0426	5.32	ug/g
Beryllium	0.0641 J	0.0532	5.32	ug/g
Boron	ND	4.26	10.6	ug/g
Cadmium	0.372 J	0.0213	5.32	ug/g
Chromium	9.35	1.06	5.32	ug/g
Cobalt	0.484 J	0.128	1.06	ug/g
Copper	15.2	3.44	10.6	ug/g
Lead	22.7	2.01	10.6	ug/g
Manganese	35.0	3.51	10.6	ug/g
Mercury	0.259 J	0.0745	0.532	ug/g
Nickel	19.7	0.660	5.32	ug/g
Selenium	ND	0.755	26.6	ug/g
Silver	ND	0.0638	5.32	ug/g
Thallium	ND	0.351	5.32	ug/g
Tin	0.485 J	0.468	10.6	ug/g
Vanadium	1.59 J	1.06	5.32	ug/g
Zinc	9.19 J	2.34	10.6	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-035-04	21-03-164	4/3/2003 10:15	4/14/2003 10:05	6/9/2003 11:20	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:10	6001	AM118 Metals in NCS HD by ICP	1	4/21/2003 13:24	blb	6103

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.6	53.1	ug/g
Antimony	1.70 J	0.138	5.31	ug/g
Arsenic	11.1	0.605	5.31	ug/g
Barium	0.983 J	0.0425	5.31	ug/g
Beryllium	ND	0.0531	5.31	ug/g
Boron	ND	4.25	10.6	ug/g
Cadmium	0.308 J	0.0212	5.31	ug/g
Chromium	64.6	1.06	5.31	ug/g
Cobalt	8.65	0.127	1.06	ug/g
Copper	26.2	3.43	10.6	ug/g
Lead	35.5	2.01	10.6	ug/g
Manganese	425	3.50	10.6	ug/g
Mercury	0.287 J	0.0743	0.531	ug/g
Nickel	85.1	0.658	5.31	ug/g
Selenium	ND	0.754	26.5	ug/g
Silver	ND	0.0637	5.31	ug/g
Thallium	ND	0.350	5.31	ug/g
Tin	14.6	0.467	10.6	ug/g
Vanadium	1.25 J	1.06	5.31	ug/g
Zinc	82.0	2.34	10.6	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-035-05	21-03-167	4/3/2003 10:15	4/14/2003 10:05	6/9/2003 11:20	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:10	6001	AM118 Metals in NCS HD by ICP	1	4/21/2003 13:30	blb	6103

Parameter	Result	MDL	PQL	Units
Aluminum	19.9 J	9.72	48.6	ug/g
Antimony	0.190 J	0.126	4.86	ug/g
Arsenic	91.4	0.554	4.86	ug/g
Barium	0.107 J	0.0389	4.86	ug/g
Beryllium	0.0511 J	0.0486	4.86	ug/g
Boron	ND	3.89	9.72	ug/g
Cadmium	0.263 J	0.0194	4.86	ug/g
Chromium	10.6	0.972	4.86	ug/g
Cobalt	2.45	0.117	0.972	ug/g
Copper	68.3	3.14	9.72	ug/g
Lead	6.97 J	1.84	9.72	ug/g
Manganese	166	3.21	9.72	ug/g
Mercury	ND	0.0680	0.486	ug/g
Nickel	8.26	0.603	4.86	ug/g
Selenium	ND	0.690	24.3	ug/g
Silver	0.245 J	0.0583	4.86	ug/g
Thallium	ND	0.321	4.86	ug/g
Tin	1.53 J	0.428	9.72	ug/g
Vanadium	1.60 J	0.972	4.86	ug/g
Zinc	64.9	2.14	9.72	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-035-06	21-03-170	4/4/2003 10:15	4/14/2003 10:05	6/9/2003 11:20	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:10	6001	AM118 Metals in NCS HD by ICP	1	4/21/2003 13:36	blb	6103

Parameter	Result	MDL	PQL	Units
Aluminum	13.1 J	9.77	48.8	ug/g
Antimony	1.02 J	0.127	4.88	ug/g
Arsenic	8.35	0.557	4.88	ug/g
Barium	0.0952 J	0.0391	4.88	ug/g
Beryllium	ND	0.0488	4.88	ug/g
Boron	ND	3.91	9.77	ug/g
Cadmium	0.278 J	0.0195	4.88	ug/g
Chromium	23.5	0.977	4.88	ug/g
Cobalt	4.75	0.117	0.977	ug/g
Copper	12.7	3.15	9.77	ug/g
Lead	11.0	1.85	9.77	ug/g
Manganese	320	3.22	9.77	ug/g
Mercury	0.448 J	0.0684	0.488	ug/g
Nickel	27.1	0.605	4.88	ug/g
Selenium	ND	0.693	24.4	ug/g
Silver	ND	0.0586	4.88	ug/g
Thallium	ND	0.322	4.88	ug/g
Tin	6.41 J	0.430	9.77	ug/g
Vanadium	1.88 J	0.977	4.88	ug/g
Zinc	33.3	2.15	9.77	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-035-07	21-03-174	4/5/2003 10:30	4/14/2003 10:05	6/9/2003 11:20	Non-cohesive Solid

(Results reported as received basis)

AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:10	6001	AM118 Metals in NCS HD by ICP	1	4/21/2003 13:42	blb	6103

Parameter	Result	MDL	PQL	Units
Aluminum	13.1 J	11.1	55.4	ug/g
Antimony	0.230 J	0.144	5.54	ug/g
Arsenic	48.5	0.631	5.54	ug/g
Barium	0.117 J	0.0443	5.54	ug/g
Beryllium	ND	0.0554	5.54	ug/g
Boron	ND	4.43	11.1	ug/g
Cadmium	0.343 J	0.0221	5.54	ug/g
Chromium	14.3	1.11	5.54	ug/g
Cobalt	1.48	0.133	1.11	ug/g
Copper	85.4	3.58	11.1	ug/g
Lead	15.8	2.09	11.1	ug/g
Manganese	96.9	3.65	11.1	ug/g
Mercury	0.0893 J	0.0775	0.554	ug/g
Nickel	29.7	0.687	5.54	ug/g
Selenium	ND	0.786	27.7	ug/g
Silver	ND	0.0664	5.54	ug/g
Thallium	ND	0.365	5.54	ug/g
Tin	1.42 J	0.487	11.1	ug/g
Vanadium	1.85 J	1.11	5.54	ug/g
Zinc	43.0	2.44	11.1	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-037-01	21-03-158	4/1/2003 10:36	4/14/2003 10:33	6/9/2003 11:20	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:12	6002	AM118 Metals in Sld HD by ICP	1	4/22/2003 14:21	blb	6105

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.1	50.6	ug/g
Antimony	0.337 J	0.132	5.06	ug/g
Arsenic	27.0	0.577	5.06	ug/g
Barium	0.0622 J	0.0405	5.06	ug/g
Beryllium	ND	0.0506	5.06	ug/g
Boron	ND	4.05	10.1	ug/g
Cadmium	0.278 J	0.0202	5.06	ug/g
Chromium	16.0	1.01	5.06	ug/g
Cobalt	2.51	0.121	1.01	ug/g
Copper	75.2	3.27	10.1	ug/g
Lead	10.7	1.91	10.1	ug/g
Manganese	181	3.34	10.1	ug/g
Mercury	0.167 J	0.0709	0.506	ug/g
Nickel	9.26	0.628	5.06	ug/g
Selenium	ND	0.719	25.3	ug/g
Silver	ND	0.0607	5.06	ug/g
Thallium	ND	0.334	5.06	ug/g
Tin	1.13 J	0.445	10.1	ug/g
Vanadium	1.17 J	1.01	5.06	ug/g
Zinc	56.2	2.23	10.1	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-037-02	21-03-159	4/1/2003 10:36	4/14/2003 10:33	6/9/2003 11:20	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:12	6002	AM118 Metals in Sld HD by ICP	1	4/22/2003 14:51	blb	6105

Parameter	Result	MDL	PQL	Units
Aluminum	21.0 J	10.8	53.8	ug/g
Antimony	0.371 J	0.140	5.38	ug/g
Arsenic	22.9	0.613	5.38	ug/g
Barium	1.92 J	0.0430	5.38	ug/g
Beryllium	0.0817 J	0.0538	5.38	ug/g
Boron	ND	4.30	10.8	ug/g
Cadmium	0.322 J	0.0215	5.38	ug/g
Chromium	15.4	1.08	5.38	ug/g
Cobalt	3.33	0.129	1.08	ug/g
Copper	80.2	3.47	10.8	ug/g
Lead	6.61 J	2.03	10.8	ug/g
Manganese	205	3.55	10.8	ug/g
Mercury	0.177 J	0.0753	0.538	ug/g
Nickel	10.6	0.667	5.38	ug/g
Selenium	ND	0.763	26.9	ug/g
Silver	0.181 J	0.0645	5.38	ug/g
Thallium	ND	0.355	5.38	ug/g
Tin	0.966 J	0.473	10.8	ug/g
Vanadium	1.45 J	1.08	5.38	ug/g
Zinc	58.3	2.37	10.8	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-037-03	21-03-162	4/2/2003 10:36	4/14/2003 10:33	6/9/2003 11:20	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:12	6002	AM118 Metals in Sld HD by ICP	1	4/22/2003 14:57	blb	6105

Parameter	Result	MDL	PQL	Units
Aluminum	15.0 J	9.78	48.9	ug/g
Antimony	0.574 J	0.127	4.89	ug/g
Arsenic	24.4	0.558	4.89	ug/g
Barium	1.09 J	0.0391	4.89	ug/g
Beryllium	ND	0.0489	4.89	ug/g
Boron	ND	3.91	9.78	ug/g
Cadmium	0.302 J	0.0196	4.89	ug/g
Chromium	25.0	0.978	4.89	ug/g
Cobalt	5.05	0.117	0.978	ug/g
Copper	9.47 J	3.16	9.78	ug/g
Lead	118	1.85	9.78	ug/g
Manganese	446	3.23	9.78	ug/g
Mercury	4.14	0.0685	0.489	ug/g
Nickel	72.0	0.607	4.89	ug/g
Selenium	ND	0.695	24.5	ug/g
Silver	ND	0.0587	4.89	ug/g
Thallium	ND	0.323	4.89	ug/g
Tin	1.81 J	0.431	9.78	ug/g
Vanadium	1.36 J	0.978	4.89	ug/g
Zinc	54.1	2.15	9.78	ug/g

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Report of Analysis

Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-037-04	21-03-165	4/3/2003 10:36	4/14/2003 10:33	6/9/2003 11:20	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:12	6002	AM118 Metals in Sld HD by ICP	1	4/22/2003 15:03	blb	6105

Parameter	Result	MDL	PQL	Units
Aluminum	ND	9.85	49.3	ug/g
Antimony	1.24 J	0.128	4.93	ug/g
Arsenic	10.3	0.562	4.93	ug/g
Barium	0.630 J	0.0394	4.93	ug/g
Beryllium	0.0629 J	0.0493	4.93	ug/g
Boron	ND	3.94	9.85	ug/g
Cadmium	0.305 J	0.0197	4.93	ug/g
Chromium	49.0	0.985	4.93	ug/g
Cobalt	6.23	0.118	0.985	ug/g
Copper	34.3	3.18	9.85	ug/g
Lead	26.0	1.86	9.85	ug/g
Manganese	381	3.25	9.85	ug/g
Mercury	0.284 J	0.0690	0.493	ug/g
Nickel	42.6	0.611	4.93	ug/g
Selenium	ND	0.700	24.6	ug/g
Silver	0.0622 J	0.0591	4.93	ug/g
Thallium	ND	0.325	4.93	ug/g
Tin	10.4	0.433	9.85	ug/g
Vanadium	ND	0.985	4.93	ug/g
Zinc	81.8	2.17	9.85	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-037-05	21-03-168	4/3/2003 10:36	4/14/2003 10:33	6/9/2003 11:20	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:12	6002	AM118 Metals in Sld HD by ICP	1	4/22/2003 15:09	blb	6105

Parameter	Result	MDL	PQL	Units
Aluminum	12.8 J	11.1	55.3	ug/g
Antimony	2.75 J	0.144	5.53	ug/g
Arsenic	138	0.631	5.53	ug/g
Barium	0.264 J	0.0442	5.53	ug/g
Beryllium	0.0572 J	0.0553	5.53	ug/g
Boron	ND	4.42	11.1	ug/g
Cadmium	0.365 J	0.0221	5.53	ug/g
Chromium	21.7	1.11	5.53	ug/g
Cobalt	5.73	0.133	1.11	ug/g
Copper	281	3.57	11.1	ug/g
Lead	25.6	2.09	11.1	ug/g
Manganese	490	3.65	11.1	ug/g
Mercury	0.138 J	0.0774	0.553	ug/g
Nickel	33.5	0.686	5.53	ug/g
Selenium	ND	0.785	27.7	ug/g
Silver	ND	0.0664	5.53	ug/g
Thallium	ND	0.365	5.53	ug/g
Tin	10.6 J	0.487	11.1	ug/g
Vanadium	1.53 J	1.11	5.53	ug/g
Zinc	200	2.43	11.1	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-037-06	21-03-171	4/4/2003 10:36	4/14/2003 10:33	6/9/2003 11:20	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:12	6002	AM118 Metals in Sld HD by ICP	1	4/22/2003 15:15	blb	6105

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.1	50.3	ug/g
Antimony	0.795 J	0.131	5.03	ug/g
Arsenic	7.03	0.573	5.03	ug/g
Barium	0.604 J	0.0402	5.03	ug/g
Beryllium	ND	0.0503	5.03	ug/g
Boron	ND	4.02	10.1	ug/g
Cadmium	0.372 J	0.0201	5.03	ug/g
Chromium	28.9	1.01	5.03	ug/g
Cobalt	4.76	0.121	1.01	ug/g
Copper	39.0	3.25	10.1	ug/g
Lead	13.4	1.90	10.1	ug/g
Manganese	349	3.32	10.1	ug/g
Mercury	0.384 J	0.0704	0.503	ug/g
Nickel	30.8	0.624	5.03	ug/g
Selenium	ND	0.714	25.2	ug/g
Silver	ND	0.0604	5.03	ug/g
Thallium	ND	0.332	5.03	ug/g
Tin	6.12 J	0.443	10.1	ug/g
Vanadium	1.37 J	1.01	5.03	ug/g
Zinc	34.2	2.21	10.1	ug/g

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Lab ID	Sample ID	Collected	Received	Reported	Matrix
030004-037-07	21-03-175	4/5/2003 10:36	4/14/2003 10:33	6/9/2003 11:20	Solid

(Results reported as received basis)

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:12	6002	AM118 Metals in Sld HD by ICP	1	4/22/2003 15:21	blb	6105

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.5	52.4	ug/g
Antimony	1.68 J	0.136	5.24	ug/g
Arsenic	52.9	0.597	5.24	ug/g
Barium	0.136 J	0.0419	5.24	ug/g
Beryllium	ND	0.0524	5.24	ug/g
Boron	ND	4.19	10.5	ug/g
Cadmium	0.461 J	0.0209	5.24	ug/g
Chromium	15.9	1.05	5.24	ug/g
Cobalt	3.57	0.126	1.05	ug/g
Copper	124	3.38	10.5	ug/g
Lead	19.7	1.98	10.5	ug/g
Manganese	329	3.46	10.5	ug/g
Mercury	0.364 J	0.0733	0.524	ug/g
Nickel	18.2	0.649	5.24	ug/g
Selenium	ND	0.743	26.2	ug/g
Silver	0.0876 J	0.0628	5.24	ug/g
Thallium	ND	0.346	5.24	ug/g
Tin	9.33 J	0.461	10.5	ug/g
Vanadium	1.10 J	1.05	5.24	ug/g
Zinc	95.7	2.30	10.5	ug/g

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Method Blank

Lab ID	Sample ID	Reported
4070	MB for HBN 5801 [PREP/1432] *(Results reported on a wet weight basis)*	5/12/2003 17:00

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:21	5801	AM101 Vols in Liquid HD by GC	1	4/21/2003 20:31	tfr	6107

Surrogates	Expected	Result	Recover	Limits
1,4-Difluorobenzene	103	115 ug/mL	111	50 - 150

Method Blank

Lab ID	Sample ID	Reported
4079	MB for HBN 5902 [PREP/1434] *(Results reported on a wet weight basis)*	5/12/2003 17:00

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 09:16	5902	AM117 Semi-Vols Liq HD by GC	1	4/24/2003 20:24	tfr	6203

Surrogates	Expected	Result	Recover	Limits
1,4-Dithiane-d4	1000	986 ug/mL	98.6	50 - 150

Method Blank

Lab ID	Sample ID	Reported
4131	MB for HBN 6108 [PREP/1438] *(Results reported on a wet weight basis)*	5/12/2003 17:00

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 14:16	6108	AM100 Non-Vols in HD by GC	1	4/29/2003 22:26	tfr	6302

Surrogates	Expected	Result	Recover	Limits
Thiodiglycol-d8 (TDG-d8)	1000	994 ug/mL	99.4	50 - 150

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Method Blank

Lab ID	Sample ID	Reported
4137	MB for HBN 6109 [PREP/1439] *(Results reported on a wet weight basis)*	5/12/2003 17:00

AM126 Lewisite in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 16:26	6109	AM126 Lewisite in HD by GC	1	4/22/2003 23:35	tfr	6201

Parameter	Result	MDL	PQL	Units
Lewisite	ND	1.95	5.00	ug/g

Method Blank

Lab ID	Sample ID	Reported
4076	MB for HBN 5901 [PREP/1433] *(Results reported on a wet weight basis)*	5/12/2003 17:00

AM098 HD Purity by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 16:11	5901	AM098 HD Purity by GC	1	4/16/2003 17:53	jwr	6303

Parameter	Result	MDL	PQL	Units
bis-(2-Chloroethyl)sulfide	0.00			%

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Method Blank

Lab ID	Sample ID	Reported
4085	MB for HBN 5903 [PREP/1435]	5/12/2003 17:00
	(Results reported on a wet weight basis)	

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/16/2003 17:36	blb	6003

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.0	50.0	ug/g
Antimony	ND	0.630	5.00	ug/g
Arsenic	ND	1.22	5.00	ug/g
Barium	ND	0.430	5.00	ug/g
Beryllium	ND	0.900	5.00	ug/g
Cadmium	ND	0.410	5.00	ug/g
Selenium	1.95 J	1.17	10.0	ug/g
Silver	ND	0.470	5.00	ug/g
Tin	ND	2.49	10.0	ug/g

Method Blank

Lab ID	Sample ID	Reported
4085	MB for HBN 5903 [PREP/1435]	5/13/2003 16:22
	(Results reported on a wet weight basis)	

AM118 Metals in Liq HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:08	5903	AM118 Metals in Liq HD by ICP	1	4/17/2003 12:57	blb	6101

Parameter	Result	MDL	PQL	Units
Boron	ND	3.74	10.0	ug/g
Chromium	ND	1.29	5.00	ug/g
Copper	ND	2.43	5.00	ug/g
Lead	ND	0.410	5.00	ug/g
Manganese	ND	0.320	1.00	ug/g
Mercury	ND	0.0500	0.500	ug/g
Nickel	ND	0.350	5.00	ug/g
Vanadium	ND	1.00	5.00	ug/g
Thallium	ND	0.980	5.00	ug/g
Zinc	5.08 J	3.12	10.0	ug/g
Cobalt	ND	0.270	1.00	ug/g

Method Blank

Lab ID	Sample ID	Reported
4093	MB for HBN 6001 [PREP/1436]	5/12/2003 17:00
	(Results reported on a wet weight basis)	

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AM118 Metals in NCS HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:10	6001	AM118 Metals in NCS HD by ICP	1	4/21/2003 12:23	blb	6103

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.0	50.0	ug/g
Antimony	ND	0.130	5.00	ug/g
Arsenic	ND	0.570	5.00	ug/g
Barium	0.0791 J	0.0400	5.00	ug/g
Beryllium	ND	0.0500	5.00	ug/g
Boron	ND	4.00	10.0	ug/g
Cadmium	0.222 J	0.0200	5.00	ug/g
Chromium	ND	1.00	5.00	ug/g
Cobalt	ND	0.120	1.00	ug/g
Copper	ND	3.23	10.0	ug/g
Lead	ND	1.89	10.0	ug/g
Manganese	ND	3.30	10.0	ug/g
Mercury	ND	0.0700	0.500	ug/g
Nickel	ND	0.620	5.00	ug/g
Selenium	ND	0.710	25.0	ug/g
Silver	ND	0.0600	5.00	ug/g
Thallium	ND	0.330	5.00	ug/g
Tin	ND	0.440	10.0	ug/g
Vanadium	ND	1.00	5.00	ug/g
Zinc	ND	2.20	10.0	ug/g

Method Blank

Lab ID	Sample ID	Reported
4100	MB for HBN 6002 [PREP/1437] *(Results reported on a wet weight basis)*	5/12/2003 17:00

AM118 Metals in Sld HD by ICP

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/18/2003 09:12	6002	AM118 Metals in Sld HD by ICP	1	4/22/2003 14:02	blb	6105

Parameter	Result	MDL	PQL	Units
Aluminum	ND	10.0	50.0	ug/g
Antimony	ND	0.130	5.00	ug/g
Arsenic	ND	0.570	5.00	ug/g
Barium	0.0563 J	0.0400	5.00	ug/g
Beryllium	ND	0.0500	5.00	ug/g
Boron	ND	4.00	10.0	ug/g
Cadmium	0.206 J	0.0200	5.00	ug/g
Chromium	ND	1.00	5.00	ug/g
Cobalt	ND	0.120	1.00	ug/g
Copper	ND	3.23	10.0	ug/g
Lead	ND	1.89	10.0	ug/g
Manganese	ND	3.30	10.0	ug/g
Mercury	ND	0.0700	0.500	ug/g
Nickel	ND	0.620	5.00	ug/g

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6002 6105 Method Blank

Selenium	ND	0.710	25.0	ug/g
Silver	ND	0.0600	5.00	ug/g
Thallium	ND	0.330	5.00	ug/g
Tin	ND	0.440	10.0	ug/g
Vanadium	ND	1.00	5.00	ug/g
Zinc	ND	2.20	10.0	ug/g

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Lab ID	Sample ID	Reported
4131	MB for HBN 6108 [PREP/1438] *(Results reported on a wet weight basis)*	5/12/2003 17:00

AM100 Non-Vols in HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/22/2003 14:16	6108	AM100 Non-Vols in HD by GC	1	4/29/2003 22:26	tfr	6302

Parameter	Result	MDL	PQL	Units
Thiodiglycol (TDG)	ND	210	250	ug/g

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Lab ID	Sample ID	Reported
4079	MB for HBN 5902 [PREP/1434] *(Results reported on a wet weight basis)*	5/12/2003 17:00

AM117 Semi-Vols Liq HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 09:16	5902	AM117 Semi-Vols Liq HD by GC	1	4/24/2003 20:24	tfr	6203

Parameter	Result	MDL	PQL	Units
Hexachloroethane	ND	80.0	2500	ug/g
Q	ND	51.0	2500	ug/g
T	ND	70.0	2500	ug/g

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Lab ID	Sample ID	Reported
4070	MB for HBN 5801 [PREP/1432] *(Results reported on a wet weight basis)*	5/12/2003 17:00

AM101 Vols in Liquid HD by GC

Prep Date	Prep Batch	Prep Method	Dilution	Analysis Date	By	Analytical Batch
4/15/2003 11:21	5801	AM101 Vols in Liquid HD by GC	1	4/21/2003 20:31	tfr	6107

Parameter	Result	MDL	PQL	Units
1,2-Dichloroethane	ND	260	500	ug/g
Tetrachloroethylene	ND	100	500	ug/g
1,1,2,2-Tetrachloroethane	ND	150	500	ug/g

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QC Summary

LCS Lab ID: 4138 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 6109 — **Analytical:** 6201

	Expected	Result	Recovery	Rec Limits
AM126 Lewisite in HD by GC Lewisite	25.2 ug/g	26.1	104	50 - 150

DUP Lab ID: 4139 — **Original Lab ID:** 030004-034-01 — **Matrix:** Liquid — **Prep Batch:** 6109 — **Analytical:** 6201

	Original Result	Result	RPD	RPD Limits
AM126 Lewisite in HD by GC Lewisite	0	0	0	0 - 25

MS Lab ID: 4140 — **Original Lab ID:** 030004-034-01 — **Matrix:** Liquid — **Prep Batch:** 6109 — **Analytical:** 6201

	Original Result	Expected	Result	Recovery	Rec Limits
AM126 Lewisite in HD by GC Lewisite	0	25.5 ug/g	26.4	103	50 - 150

MSD Lab ID: 4141 — **Original Lab ID:** 030004-034-01 — **Matrix:** Liquid — **Prep Batch:** 6109 — **Analytical:** 6201

	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
AM126 Lewisite in HD by GC Lewisite	25.3 ug/g	24.2	95.6	50 - 150	7.45	0 - 25

LCS Lab ID: 4142 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 6109 — **Analytical:** 6201

	Expected	Result	Recovery	Rec Limits
AM126 Lewisite in HD by GC Lewisite	25.2 ug/g	26.3	104	50 - 150

LCS Lab ID: 4077 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 5901 — **Analytical:** 6303

	Expected	Result	Recovery	Rec Limits
AM098 HD Purity by GC bis-(2-Chloroethyl)sulfide	98.4 %	98	99.6	85 - 115

DUP Lab ID: 4078 — **Original Lab ID:** 030004-034-01 — **Matrix:** Liquid — **Prep Batch:** 5901 — **Analytical:** 6303

	Original Result	Result	RPD	RPD Limits
AM098 HD Purity by GC bis-(2-Chloroethyl)sulfide	101	91.6	9.91	0 - 25

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QC Summary

LCS Lab ID: 4086 | Original Lab ID: | Prep Batch: 5903
Matrix: Liquid | Analytical: 6003

AM118 Metals in Liq HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	500 ug/g	483	96.6	75 - 125
Antimony	50 ug/g	47	94	75 - 125
Arsenic	50 ug/g	51.5	103	75 - 125
Barium	50 ug/g	50	100	75 - 125
Beryllium	50 ug/g	43.8	87.6	75 - 125
Cadmium	50 ug/g	48.1	96.2	75 - 125
Selenium	50 ug/g	51.3	103	75 - 125
Silver	50 ug/g	47.7	95.4	75 - 125
Tin	50 ug/g	47.7	95.4	75 - 125

DUP Lab ID: 4087 | Original Lab ID: 030004-034-01 | Prep Batch: 5903
Matrix: Liquid | Analytical: 6003

AM118 Metals in Liq HD by ICP	Original Result	Result	RPD	RPD Limits
Aluminum	20.2	5.13	119 *	0 - 25
Antimony	0	0	0	0 - 25
Arsenic	7.51	3.25	79 *	0 - 25
Barium	0.0349	0	200 *	0 - 25
Beryllium	0	0	0	0 - 25
Cadmium	0.146	0.13	11.4	0 - 25
Selenium	0.752	0.654	13.9	0 - 25
Silver	0	0	0	0 - 25
Tin	0.0458	0	200 *	0 - 25

MS Lab ID: 4088 | Original Lab ID: 030004-034-01 | Prep Batch: 5903
Matrix: Liquid | Analytical: 6003

AM118 Metals in Liq HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Aluminum	20.2	537 ug/g	489	87.2	75 - 125
Antimony	0	53.7 ug/g	50.2	93.4	75 - 125
Arsenic	7.51	53.7 ug/g	58.1	94.2	50 - 150
Barium	0.0349	53.7 ug/g	54	101	75 - 125
Beryllium	0	53.7 ug/g	43.8	81.6	75 - 125
Cadmium	0.146	53.7 ug/g	49.5	91.9	75 - 125
Selenium	0.752	53.7 ug/g	55.1	101	50 - 150
Silver	0	53.7 ug/g	50.7	94.4	50 - 150

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MS Lab ID: 4088 | Original Lab ID: 030004-034-01 | Prep Batch: 5903
Matrix: Liquid | Analytical: 6003

AM118 Metals in Liq HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Tin	0.0458	53.7 ug/g	51	94.9	75 - 125

MSD Lab ID: 4089 | Original Lab ID: 030004-034-01 | Prep Batch: 5903
Matrix: Liquid | Analytical: 6003

AM118 Metals in Liq HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	532 ug/g	449	80.6	75 - 125	7.87	0 - 25
Antimony	53.2 ug/g	49.6	93.2	75 - 125	0.214	0 - 25
Arsenic	53.2 ug/g	59.7	98.1	50 - 150	4.06	0 - 25
Barium	53.2 ug/g	53.1	99.7	75 - 125	1.3	0 - 25
Beryllium	53.2 ug/g	43.9	82.4	75 - 125	0.976	0 - 25
Cadmium	53.2 ug/g	48.6	90.9	75 - 125	1.09	0 - 25
Selenium	53.2 ug/g	54.7	101	50 - 150	0	0 - 25
Silver	53.2 ug/g	49.9	93.8	50 - 150	0.638	0 - 25
Tin	53.2 ug/g	50.5	94.7	75 - 125	0.211	0 - 25

LCS Lab ID: 4086 | Original Lab ID: | Prep Batch: 5903
Matrix: Liquid | Analytical: 6101

AM118 Metals in Liq HD by ICP	Expected	Result	Recovery	Rec Limits
Boron	500 ug/g	423	84.6	75 - 125
Cobalt	50 ug/g	47.9	95.8	75 - 125
Copper	50 ug/g	50.2	100	75 - 125
Lead	50 ug/g	49.9	99.8	75 - 125
Manganese	50 ug/g	48.8	97.6	75 - 125
Mercury	2.5 ug/g	2.57	103	75 - 125
Nickel	50 ug/g	47.3	94.6	75 - 125
Vanadium	50 ug/g	47.9	95.8	75 - 125
Thallium	50 ug/g	47	94	75 - 125
Zinc	50 ug/g	52	104	75 - 125
Chromium	50 ug/g	48.1	96.2	75 - 125

DUP Lab ID: 4087 | Original Lab ID: 030004-034-01 | Prep Batch: 5903
Matrix: Liquid | Analytical: 6101

AM118 Metals in Liq HD by ICP	Original Result	Result	RPD		RPD Limits
Boron	6.7	2.29	98.1	*	0 - 25
Chromium	2.77	4.86	54.7	*	0 - 25
Copper	39.3	39.6	0.929		0 - 25
Cobalt	0.0467	0.0209	76.2	*	0 - 25
Lead	0.316	0.172	58.7	*	0 - 25
Manganese	0.442	0.344	24.9		0 - 25
Mercury	0.00591	0.00464	24.1		0 - 25
Nickel	5.64	2.32	83.5	*	0 - 25
Vanadium	1.02	1.62	45.6	*	0 - 25
Thallium	0.0892	0.0511	54.2	*	0 - 25
Zinc	3.42	3.43	0.41		0 - 25

MS Lab ID: 4088 | Original Lab ID: 030004-034-01 | Prep Batch: 5903
Matrix: Liquid | Analytical: 6101

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MS Lab ID: 4088 | Original Lab ID: 030004-034-01 | Prep Batch: 5903
Matrix: Liquid | Analytical: 6101

AM118 Metals in Liq HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Chromium	2.77	53.7 ug/g	60.8	108	75 - 125
Boron	6.7	537 ug/g	448	82.2	75 - 125
Cobalt	0.0467	53.7 ug/g	53.7	99.9	75 - 125
Copper	39.3	53.7 ug/g	95.4	104	75 - 125
Lead	0.316	53.7 ug/g	55.3	102	75 - 125
Manganese	0.442	53.7 ug/g	55.7	103	75 - 125
Mercury	0.00591	2.69 ug/g	2.76	103	50 - 150
Nickel	5.64	53.7 ug/g	56	93.7	75 - 125
Vanadium	1.02	53.7 ug/g	56.8	104	75 - 125
Thallium	0.0892	53.7 ug/g	53	98.4	75 - 125
Zinc	3.42	53.7 ug/g	57	99.8	50 - 150

MSD Lab ID: 4089 | Original Lab ID: 030004-034-01 | Prep Batch: 5903
Matrix: Liquid | Analytical: 6101

AM118 Metals in Liq HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Chromium	53.2 ug/g	58	104	75 - 125	3.77	0 - 25
Boron	532 ug/g	459	84.9	75 - 125	3.23	0 - 25
Cobalt	53.2 ug/g	53.1	99.7	75 - 125	0.2	0 - 25
Copper	53.2 ug/g	96	106	75 - 125	1.9	0 - 25
Lead	53.2 ug/g	54.8	102	75 - 125	0	0 - 25
Manganese	53.2 ug/g	55.3	103	75 - 125	0	0 - 25
Mercury	2.66 ug/g	2.78	104	50 - 150	0.966	0 - 25
Nickel	53.2 ug/g	57.5	97.4	75 - 125	3.87	0 - 25
Vanadium	53.2 ug/g	55.8	103	75 - 125	0.966	0 - 25
Thallium	53.2 ug/g	51.7	96.8	75 - 125	1.64	0 - 25
Zinc	53.2 ug/g	58.7	104	50 - 150	4.12	0 - 25

LCS Lab ID: 4094 | Original Lab ID: | Prep Batch: 6001
Matrix: Non-cohesive Solid | Analytical: 6103

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	500 ug/g	513	103	75 - 125
Antimony	50 ug/g	44.1	88.2	75 - 125
Arsenic	50 ug/g	53.7	107	75 - 125
Barium	50 ug/g	53.2	106	75 - 125
Beryllium	50 ug/g	46	92	75 - 125
Boron	500 ug/g	417	83.4	75 - 125
Cadmium	50 ug/g	55.1	110	75 - 125
Chromium	50 ug/g	49.5	99	75 - 125
Cobalt	50 ug/g	49.3	98.6	75 - 125
Copper	50 ug/g	51.1	102	75 - 125
Lead	50 ug/g	51	102	75 - 125
Manganese	50 ug/g	49.9	99.8	75 - 125
Mercury	2.5 ug/g	2.69	108	75 - 125
Nickel	50 ug/g	49	98	75 - 125
Selenium	50 ug/g	55	110	75 - 125
Silver	50 ug/g	54.9	110	75 - 125

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LCS Lab ID: 4094 | Original Lab ID: | Prep Batch: 6001
Matrix: Non-cohesive Solid | Analytical: 6103

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits
Thallium	50 ug/g	48.8	97.6	75 - 125
Tin	50 ug/g	49.7	99.4	75 - 125
Vanadium	50 ug/g	49.3	98.6	75 - 125
Zinc	50 ug/g	51.3	103	75 - 125

DUP Lab ID: 4095 | Original Lab ID: 030004-035-02 | Prep Batch: 6001
Matrix: Non-cohesive Solid | Analytical: 6103

AM118 Metals in NCS HD by ICP	Original Result	Result	RPD		RPD Limits
Aluminum	4.55	11.2	84.1	*	0 - 25
Antimony	0.428	0.27	45.4	*	0 - 25
Arsenic	33.7	21.5	44.4	*	0 - 25
Barium	0.0352	0.142	120	*	0 - 25
Beryllium	0.0131	0.0129	1.38		0 - 25
Boron	0.534	0.0576	161	*	0 - 25
Cadmium	0.243	0.244	0.185		0 - 25
Chromium	13.7	10.9	22.7		0 - 25
Cobalt	2.09	1.41	38.9	*	0 - 25
Copper	44.3	44.5	0.572		0 - 25
Lead	10.6	8.3	24.3		0 - 25
Manganese	137	93.7	37.8	*	0 - 25
Mercury	0.135	0.0939	36.2	*	0 - 25
Nickel	11.6	7.26	46.4	*	0 - 25
Selenium	0.231	0.406	55	*	0 - 25
Silver	0.0168	0.0193	13.8		0 - 25
Thallium	0.0722	0.0547	27.6	*	0 - 25
Tin	1.06	0.758	33.1	*	0 - 25
Vanadium	1.27	1.5	16.4		0 - 25
Zinc	50.1	33.8	38.8	*	0 - 25

MS Lab ID: 4096 | Original Lab ID: 030004-035-02 | Prep Batch: 6001
Matrix: Non-cohesive Solid | Analytical: 6103

AM118 Metals in NCS HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Aluminum	4.55	498 ug/g	513	102	75 - 125
Antimony	0.428	49.8 ug/g	42.5	84.5	75 - 125
Arsenic	33.7	49.8 ug/g	75	83.1	50 - 150
Barium	0.0352	49.8 ug/g	47.5	95.3	75 - 125
Beryllium	0.0131	49.8 ug/g	47.6	95.6	75 - 125
Boron	0.534	498 ug/g	455	91.3	75 - 125
Cadmium	0.243	49.8 ug/g	47.8	95.5	75 - 125
Chromium	13.7	49.8 ug/g	62.2	97.4	75 - 125
Cobalt	2.09	49.8 ug/g	49.5	95.2	75 - 125
Copper	44.3	49.8 ug/g	94.6	101	75 - 125
Lead	10.6	49.8 ug/g	58.7	96.7	75 - 125
Manganese	137	49.8 ug/g	200	126 *	75 - 125
Mercury	0.135	2.49 ug/g	2.52	95.8	50 - 150
Nickel	11.6	49.8 ug/g	55.8	88.8	75 - 125

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MS Lab ID: 4096 | Original Lab ID: 030004-035-02 | Prep Batch: 6001
Matrix: Non-cohesive Solid | Analytical: 6103

AM118 Metals in NCS HD by ICP	Original Result	Expected	Result	Recovery	Rec Limits
Selenium	0.231	49.8 ug/g	49.3	98.5	50 - 150
Silver	0.0168	49.8 ug/g	48.2	96.8	50 - 150
Thallium	0.0722	49.8 ug/g	45.5	91.3	75 - 125
Tin	1.06	49.8 ug/g	47	92.3	75 - 125
Vanadium	1.27	49.8 ug/g	50	97.8	75 - 125
Zinc	50.1	49.8 ug/g	99.5	99.3	50 - 150

MSD Lab ID: 4097 | Original Lab ID: 030004-035-02 | Prep Batch:
Matrix: Non-cohesive Solid | Analytical: 6103

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	531 ug/g	538	101	75 - 125	0.985	0 - 25
Antimony	53.1 ug/g	48.2	90	75 - 125	6.3	0 - 25
Arsenic	53.1 ug/g	87	101	50 - 150	19.4	0 - 25
Barium	53.1 ug/g	51.7	97.3	75 - 125	2.08	0 - 25
Beryllium	53.1 ug/g	52.4	98.8	75 - 125	3.29	0 - 25
Boron	531 ug/g	517	97.3	75 - 125	6.36	0 - 25
Cadmium	53.1 ug/g	52.1	97.7	75 - 125	2.28	0 - 25
Chromium	53.1 ug/g	67.5	101	75 - 125	3.63	0 - 25
Cobalt	53.1 ug/g	53.8	97.5	75 - 125	2.39	0 - 25
Copper	53.1 ug/g	97.7	101	75 - 125	0	0 - 25
Lead	53.1 ug/g	64.5	102	75 - 125	5.33	0 - 25
Manganese	53.1 ug/g	197	113	75 - 125	10.9	0 - 25
Mercury	2.65 ug/g	2.86	102	50 - 150	6.27	0 - 25
Nickel	53.1 ug/g	62.6	96.1	75 - 125	7.9	0 - 25
Selenium	53.1 ug/g	55.7	105	50 - 150	6.39	0 - 25
Silver	53.1 ug/g	52.5	99	50 - 150	2.25	0 - 25
Thallium	53.1 ug/g	50.1	94.3	75 - 125	3.23	0 - 25
Tin	53.1 ug/g	53.8	99.4	75 - 125	7.41	0 - 25
Vanadium	53.1 ug/g	54.2	99.8	75 - 125	2.02	0 - 25
Zinc	53.1 ug/g	103	100	50 - 150	0.702	0 - 25

LCS Lab ID: 4098 | Original Lab ID: | Prep Batch:
Matrix: Non-cohesive Solid | Analytical: 6103

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	6000 ug/g	4930	82.2	75 - 125
Arsenic	141 ug/g	143	101	75 - 125
Barium	58.2 ug/g	56.7	97.5	75 - 125
Chromium	111 ug/g	102	92	75 - 125
Cobalt	11.1 ug/g	10.5	94.7	75 - 125
Copper	398 ug/g	345	86.6	75 - 125
Lead	5.73 ug/g	5.62	98.1	75 - 125
Manganese	480 ug/g	441	91.8	75 - 125
Nickel	195 ug/g	178	91.3	75 - 125

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LCS Lab ID: 4098 | Original Lab ID: | Prep Batch:
Matrix: Non-cohesive Solid | Analytical: 6103

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits
Vanadium	11.9 ug/g	13.5	114	75 - 125
Zinc	249 ug/g	219	88.1	75 - 125

LCSD Lab ID: 4099 | Original Lab ID: | Prep Batch:
Matrix: Non-cohesive Solid | Analytical: 6103

AM118 Metals in NCS HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	6000 ug/g	5130	85.5	75 - 125	3.94	0 - 25
Arsenic	141 ug/g	144	102	75 - 125	0.985	0 - 25
Barium	58.2 ug/g	58.4	100	75 - 125	2.53	0 - 25
Chromium	111 ug/g	106	95.1	75 - 125	3.31	0 - 25
Cobalt	11.1 ug/g	11	98.9	75 - 125	4.34	0 - 25
Copper	398 ug/g	354	88.9	75 - 125	2.62	0 - 25
Lead	5.73 ug/g	5.54	96.8	75 - 125	1.33	0 - 25
Manganese	480 ug/g	448	93.3	75 - 125	1.62	0 - 25
Nickel	195 ug/g	183	93.7	75 - 125	2.59	0 - 25
Vanadium	11.9 ug/g	13.1	110	75 - 125	3.57	0 - 25
Zinc	249 ug/g	219	87.8	75 - 125	0.341	0 - 25

LCS Lab ID: 4101 | Original Lab ID: | Prep Batch: 6002
Matrix: Solid | Analytical: 6105

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	500 ug/g	485	97	75 - 125
Antimony	50 ug/g	49.3	98.6	75 - 125
Arsenic	50 ug/g	53.7	107	75 - 125
Barium	50 ug/g	54.3	109	75 - 125
Beryllium	50 ug/g	46.9	93.8	75 - 125
Boron	500 ug/g	400	80	75 - 125
Cadmium	50 ug/g	53.9	108	75 - 125
Chromium	50 ug/g	50.7	101	75 - 125
Cobalt	50 ug/g	50	100	75 - 125
Copper	50 ug/g	52.4	105	75 - 125
Lead	50 ug/g	51.8	104	75 - 125
Manganese	50 ug/g	50.6	101	75 - 125
Mercury	2.5 ug/g	2.66	106	75 - 125
Nickel	50 ug/g	50	100	75 - 125
Selenium	50 ug/g	53.6	107	75 - 125
Silver	50 ug/g	53.6	107	75 - 125
Thallium	50 ug/g	51.1	102	75 - 125
Tin	50 ug/g	49.8	99.6	75 - 125
Vanadium	50 ug/g	49.7	99.4	75 - 125
Zinc	50 ug/g	52.7	105	75 - 125

DUP Lab ID: 4102 | Original Lab ID: 030004-037-01 | Prep Batch: 6002
Matrix: Solid | Analytical: 6105

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DUP Lab ID: 4102 | Original Lab ID: 030004-037-01 | Prep Batch: 6002
Matrix: Solid | Analytical: 6105

AM118 Metals in Sld HD by ICP	Original Result	Result	RPD		RPD Limits
Aluminum	4.66	25.1	137	*	0 - 25
Antimony	0.337	0.398	16.6		0 - 25
Arsenic	27	27.9	3.2		0 - 25
Barium	0.0622	0.3	131	*	0 - 25
Beryllium	0.0276	0.124	127	*	0 - 25
Boron	0.678	3.95	141	*	0 - 25
Cadmium	0.278	0.376	29.8	*	0 - 25
Chromium	16	19.7	20.5		0 - 25
Cobalt	2.51	2.81	11.3		0 - 25
Copper	75.2	74.2	1.29		0 - 25
Lead	10.7	11	2.48		0 - 25
Manganese	181	186	2.82		0 - 25
Mercury	0.167	0.186	11		0 - 25
Nickel	9.26	10.7	14.3		0 - 25
Selenium	0	0	0		0 - 25
Silver	0.02	0.277	173	*	0 - 25
Thallium	0.111	0.201	57.2	*	0 - 25
Tin	1.13	1.25	9.97		0 - 25
Vanadium	1.17	1.07	9.35		0 - 25
Zinc	56.2	61.9	9.72		0 - 25

MS Lab ID: 4103 | Original Lab ID: 030004-037-01 | Prep Batch: 6002
Matrix: Solid | Analytical: 6105

AM118 Metals in Sld HD by ICP	Original Result	Expected	Result	Recovery		Rec Limits
Aluminum	4.66	479 ug/g	484	100		75 - 125
Antimony	0.337	47.9 ug/g	49.3	102		75 - 125
Arsenic	27	47.9 ug/g	74.2	98.4		50 - 150
Barium	0.0622	47.9 ug/g	51.6	107		75 - 125
Beryllium	0.0276	47.9 ug/g	47.1	98.1		75 - 125
Boron	0.678	479 ug/g	431	89.9		75 - 125
Cadmium	0.278	47.9 ug/g	47.7	98.8		75 - 125
Chromium	16	47.9 ug/g	68.2	109		75 - 125
Cobalt	2.51	47.9 ug/g	52.6	105		75 - 125
Copper	75.2	47.9 ug/g	143	141	*	75 - 125
Lead	10.7	47.9 ug/g	59.5	102		75 - 125
Manganese	181	47.9 ug/g	249	142	*	75 - 125
Mercury	0.167	2.4 ug/g	2.7	106		50 - 150
Nickel	9.26	47.9 ug/g	60.5	107		75 - 125
Selenium	0	47.9 ug/g	51.3	107		50 - 150
Silver	0.02	47.9 ug/g	48.7	102		50 - 150
Thallium	0.111	47.9 ug/g	50.7	106		75 - 125
Tin	1.13	47.9 ug/g	50.6	103		75 - 125
Vanadium	1.17	47.9 ug/g	52.5	107		75 - 125
Zinc	56.2	47.9 ug/g	105	103		50 - 150

MSD Lab ID: 4104 | Original Lab ID: 030004-037-01 | Prep Batch: 6002
Matrix: Solid | Analytical: 6105

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MSD Lab ID: 4104 | Original Lab ID: 030004-037-01 | Prep Batch: 6002
Matrix: Solid | Analytical: 6105

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	497 ug/g	485	96.7	75 - 125	3.36	0 - 25
Antimony	49.7 ug/g	50.3	101	75 - 125	0.985	0 - 25
Arsenic	49.7 ug/g	80.1	107	50 - 150	8.37	0 - 25
Barium	49.7 ug/g	51.8	104	75 - 125	2.84	0 - 25
Beryllium	49.7 ug/g	46.3	93.1	75 - 125	5.23	0 - 25
Boron	497 ug/g	437	87.9	75 - 125	2.25	0 - 25
Cadmium	49.7 ug/g	49.7	99.4	75 - 125	0.605	0 - 25
Chromium	49.7 ug/g	68	105	75 - 125	3.74	0 - 25
Cobalt	49.7 ug/g	53.1	102	75 - 125	2.9	0 - 25
Copper	49.7 ug/g	127	105	75 - 125	29.3 *	0 - 25
Lead	49.7 ug/g	61	101	75 - 125	0.985	0 - 25
Manganese	49.7 ug/g	213	63.1 *	75 - 125	76.9 *	0 - 25
Mercury	2.48 ug/g	2.69	102	50 - 150	3.85	0 - 25
Nickel	49.7 ug/g	60.1	102	75 - 125	4.78	0 - 25
Selenium	49.7 ug/g	54.2	109	50 - 150	1.85	0 - 25
Silver	49.7 ug/g	49.9	100	50 - 150	1.98	0 - 25
Thallium	49.7 ug/g	51.3	103	75 - 125	2.87	0 - 25
Tin	49.7 ug/g	51.1	101	75 - 125	1.96	0 - 25
Vanadium	49.7 ug/g	53.1	105	75 - 125	1.89	0 - 25
Zinc	49.7 ug/g	101	90.9	50 - 150	12.5	0 - 25

LCS Lab ID: 4105 | Original Lab ID: | Prep Batch:
Matrix: Solid | Analytical: 6105

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits
Aluminum	6000 ug/g	5340	89	75 - 125
Arsenic	141 ug/g	154	109	75 - 125
Barium	58.2 ug/g	64.1	110	75 - 125
Chromium	111 ug/g	115	104	75 - 125
Cobalt	11.1 ug/g	11.9	107	75 - 125
Copper	398 ug/g	384	96.5	75 - 125
Lead	5.73 ug/g	6.35	111	75 - 125
Manganese	480 ug/g	498	104	75 - 125
Nickel	195 ug/g	202	104	75 - 125
Vanadium	11.9 ug/g	14.8	124	75 - 125
Zinc	249 ug/g	242	97.1	75 - 125

LCSD Lab ID: 4106 | Original Lab ID: | Prep Batch:
Matrix: Solid | Analytical: 6105

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Aluminum	6000 ug/g	5290	88.2	75 - 125	0.903	0 - 25
Arsenic	141 ug/g	151	107	75 - 125	1.85	0 - 25
Barium	58.2 ug/g	62.3	107	75 - 125	2.76	0 - 25

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LCSD Lab ID: 4106 | Original Lab ID: | Prep Batch:
Matrix: Solid | Analytical: 6105

AM118 Metals in Sld HD by ICP	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Chromium	111 ug/g	114	103	75 - 125	0.966	0 - 25
Cobalt	11.1 ug/g	11.9	107	75 - 125	0	0 - 25
Copper	398 ug/g	379	95.2	75 - 125	1.36	0 - 25
Lead	5.73 ug/g	6.04	105	75 - 125	5.56	0 - 25
Manganese	480 ug/g	484	101	75 - 125	2.93	0 - 25
Nickel	195 ug/g	197	101	75 - 125	2.93	0 - 25
Vanadium	11.9 ug/g	14.1	119	75 - 125	4.12	0 - 25
Zinc	249 ug/g	237	95	75 - 125	2.19	0 - 25

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QC Summary

LCS Lab ID: 4132 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 6108 — **Analytical:** 6302

AM100 Non-Vols in HD by GC	Expected	Result	Recovery	Rec Limits
Thiodiglycol (TDG)	1020 ug/g	1140	111	50 - 150

DUP Lab ID: 4133 — **Original Lab ID:** 030004-034-01 — **Matrix:** Liquid — **Prep Batch:** 6108 — **Analytical:** 6302

AM100 Non-Vols in HD by GC	Original Result	Result	RPD	RPD Limits
Thiodiglycol-d8 (TDG-d8)	1103	551	66.7 *	0 - 25
Thiodiglycol (TDG)	0	0	0	0 - 25

MS Lab ID: 4134 — **Original Lab ID:** 030004-034-01 — **Matrix:** Liquid — **Prep Batch:** 6108 — **Analytical:** 6302

AM100 Non-Vols in HD by GC	Original Result	Expected	Result	Recovery	Rec Limits
Thiodiglycol (TDG)	0	1070 ug/g	1090	103	50 - 150

MSD Lab ID: 4135 — **Original Lab ID:** 030004-034-01 — **Matrix:** Liquid — **Prep Batch:** 6108 — **Analytical:** 6302

AM100 Non-Vols in HD by GC	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Thiodiglycol (TDG)	1040 ug/g	1150	111	50 - 150	7.48	0 - 25

LCS Lab ID: 4136 — **Original Lab ID:** — **Matrix:** Liquid — **Prep Batch:** 6108 — **Analytical:** 6302

AM100 Non-Vols in HD by GC	Expected	Result	Recovery	Rec Limits
Thiodiglycol (TDG)	1020 ug/g	1100	108	50 - 150

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QC Summary

LCS Lab ID: 4080 | Original Lab ID: | Prep Batch: 5902
Matrix: Liquid | Analytical: 6203

AM117 Semi-Vols Liq HD by GC	Expected	Result	Recovery	Rec Limits
Hexachloroethane	998 ug/g	1270	127	50 - 150
Q	9290 ug/g	9930	107	50 - 150
T	1020 ug/g	1060	104	50 - 150

DUP Lab ID: 4081 | Original Lab ID: 030004-034-01 | Prep Batch: 5902
Matrix: Liquid | Analytical: 6203

AM117 Semi-Vols Liq HD by GC	Original Result	Result	RPD	RPD Limits
1,4-Dithiane-d4	1050	1020	3.16	0 - 25
Hexachloroethane	0	0	0	0 - 25
Q	29700	28400	4.46	0 - 25
T	787	793	0.756	0 - 25

MS Lab ID: 4082 | Original Lab ID: 030004-034-01 | Prep Batch: 5902
Matrix: Liquid | Analytical: 6203

AM117 Semi-Vols Liq HD by GC	Original Result	Expected	Result	Recovery	Rec Limits
Hexachloroethane	0	1110 ug/g	1420	128	50 - 150
Q	29700	10300 ug/g	38500	85.8	50 - 150
T	787	1130 ug/g	1360	50.7	50 - 150

MSD Lab ID: 4083 | Original Lab ID: 030004-034-01 | Prep Batch: 5902
Matrix: Liquid | Analytical: 6203

AM117 Semi-Vols Liq HD by GC	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
Hexachloroethane	1020 ug/g	1300	127	50 - 150	0.784	0 - 25
Q	9510 ug/g	36900	75.6	50 - 150	12.6	0 - 25
T	1040 ug/g	1330	52	50 - 150	2.53	0 - 25

LCS Lab ID: 4084 | Original Lab ID: | Prep Batch: 5902
Matrix: Liquid | Analytical: 6203

AM117 Semi-Vols Liq HD by GC	Expected	Result	Recovery	Rec Limits
Hexachloroethane	998 ug/g	1340	134	50 - 150
Q	9290 ug/g	9200	99.1	50 - 150
T	1020 ug/g	911	89.5	50 - 150

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QC Summary

LCS Lab ID: 4071 | Original Lab ID: | Prep Batch: 5801
Matrix: Liquid | Analytical: 6107

AM101 Vols in Liquid HD by GC	Expected	Result	Recovery	Rec Limits
1,2-Dichloroethane	9880 ug/g	11500	116	50 - 150
Tetrachloroethylene	10100 ug/g	11800	116	50 - 150
1,1,2,2-Tetrachloroethane	10400 ug/g	11600	112	50 - 150

DUP Lab ID: 4072 | Original Lab ID: 030004-034-01 | Prep Batch: 5801
Matrix: Liquid | Analytical: 6107

AM101 Vols in Liquid HD by GC	Original Result	Result	RPD	RPD Limits
1,2-Dichloroethane	6950	6820	1.99	0 - 25
1,4-Difluorobenzene	116	121	4.34	0 - 25
Tetrachloroethylene	492	478	2.77	0 - 25
1,1,2,2-Tetrachloroethane	0	0	0	0 - 25

MS Lab ID: 4073 | Original Lab ID: 030004-034-01 | Prep Batch: 5801
Matrix: Liquid | Analytical: 6107

AM101 Vols in Liquid HD by GC	Original Result	Expected	Result	Recovery	Rec Limits
1,2-Dichloroethane	6950	11000 ug/g	18900	109	50 - 150
Tetrachloroethylene	492	11300 ug/g	12700	109	50 - 150
1,1,2,2-Tetrachloroethane	0	11500 ug/g	12000	105	50 - 150

MSD Lab ID: 4074 | Original Lab ID: 030004-034-01 | Prep Batch: 5801
Matrix: Liquid | Analytical: 6107

AM101 Vols in Liquid HD by GC	Expected	Result	Recovery	Rec Limits	RPD	RPD Limits
1,2-Dichloroethane	10300 ug/g	18200	109	50 - 150	0	0 - 25
Tetrachloroethylene	10600 ug/g	12400	113	50 - 150	3.6	0 - 25
1,1,2,2-Tetrachloroethane	10800 ug/g	11500	106	50 - 150	0.948	0 - 25

LCS Lab ID: 4075 | Original Lab ID: | Prep Batch: 5801
Matrix: Liquid | Analytical: 6107

AM101 Vols in Liquid HD by GC	Expected	Result	Recovery	Rec Limits
1,2-Dichloroethane	9880 ug/g	11400	115	50 - 150
Tetrachloroethylene	10100 ug/g	11900	117	50 - 150
1,1,2,2-Tetrachloroethane	10400 ug/g	11800	114	50 - 150