SMALL ARMS FIRING RANGE
REMEDIATION REPORT

Building 105
Federal Center
4300 Goodfellow
St. Louis, Missouri

Prepared for:
U.S. General Services Administration
Kansas City, Missouri

Prepared by:

SCS Engineers
10401 Holmes Road, Suite 400
Kansas City, Missouri 64131

March 18, 2003

Introduction

SCS Engineers (SCS) has prepared this report of the demolition and remediation of the small arms firing range (SAFR) at the referenced facility. During the months of August and September 2002, SCS supervised remediation of the abandoned SAFR in the basement of Building 105 at the Federal Complex located at 4300 Goodfellow, St. Louis, Missouri. The activities performed consist of demolition and removal of material associated with the firing range, cleaning the designated firing range area, and containerization of generated waste streams. The procedures generally followed the GSA Environmental Management Technical Guide for maintaining Indoor Firing Ranges. This report summarizes activities conducted and includes documentation supporting:

- Laboratory testing of samples collected before remediation.
- Results of laboratory testing of wastes generated and manifests of wastes that were removed and disposed off-site.
- Permit application and permit necessary to dispose of filtered water generated during final decontamination into the City sanitary sewer system
- Notes and photographs documenting remediation.

Purpose

Small arms firing ranges are those ranges accepting 50 caliber or smaller ammunition. The firing range at Goodfellow was reportedly used for ammunition less than 50 caliber. SAFRs may contain lead, antimony, copper, zinc, arsenic, and polycyclic aromatic hydrocarbons (PAHs) from nonexploding (nonenergetic) bullets and fragments, bullet jackets, and related sporting material (e.g., clay targets); however, lead is the primary risk driver and was thereby the focus of this remediation.

Lead has documented impacts on human health, particularly for children. There are many mechanisms for exposure to lead, including drinking lead-contaminated groundwater, ingesting lead-contaminated soil or sediment, or inhaling airborne particles of lead. Lead dissolution and migration to groundwater or through aerially (windblown) or hydraulically (erosion and deposition) dispersed particles can cause exposure and result in elevated levels of lead in the blood of humans and wildlife and may ultimately impact beneficial future land use.

Remediation of the Goodfellow SAFR was not preformed in response to a risk assessment that established a completed pathway for lead exposure; rather, it was performed instead of a risk assessment.

Pre-remediation Sampling

Prior to commencing remediation, a composite sample of bullet pit sand inside the SAFR was obtained and submitted to Peoria Disposal Company (PDC) Laboratories in Peoria, Illinois for hazardous waste profiling. A sample of the wood frame was collected and submitted to AM Labs for hazardous waste profiling. The bullet pit sand and wood framing sample were collected near the floor. These samples were used to profile the sand and some of the wood framing as hazardous waste since results indicated lead concentrations exceeded those allowed using the toxicity characterization leaching procedure (TCLP). A copy of the laboratory reports are included in Appendix A.

Additional pre-remediation baseline samples were obtained by wipe sampling the concrete columns in and near the firing range and submitted for analysis for lead to Severn Trent Laboratories in Chicago, Illinois. Each wipe sample was collected using a wipe wetted with nitric acid to facilitate sampling and used as a preservative for the sample in shipment. Each wipe represents a sampling area of approximately 100 square centimeters. Results of this sampling indicated the presence of lead and are summarized on Table 1. Copies of laboratory reports are included in Appendix A. The results ranged from 0.015 milligrams (mg) per wipe in LS-1, furthest from the firing range, to 0.72 mg/wipe in LS-3, nearest to the range.

Remediation Summary

The firing range consisted of two metal bullet pits containing sand, a wood frame support structure, waste bullet pit sand, and miscellaneous wood, metal, and plastic debris. NPN Environmental Engineers of Fenton, Missouri performed the remediation under SCS' oversight and coordination. Photographs were taken periodically that documented the progress of the remediation from its beginning to its completion. Copies of select photos are included in Appendix B.

The basement of Building105 is constructed of an extensive network of concrete columns, walls, and floors. Access to the basement area is limited to a stairwell off the central building entrance. Utilities that were used included: electricity provided by 120-volt receptacles on the concrete columns, water supplied by a faucet located outside Building 105, and a sanitary sewer drain sump. No other facility operations were ongoing within the basement area at the time of the remediation. Access to the basement area was restricted to necessary and authorized persons involved in the remediation efforts during the project.

The area of isolation for the firing range demolition and remediation consisted of approximately 3600 square feet of containment extending to the nearest column outside the bullet pit to the southern end of the building. The containment area was extended to the south to facilitate access to a ventilation fan opening to allow for removal of demolition materials and waste streams. The enclosed containment area was established by installing temporary floor-to-ceiling plastic

sheeting walls. A negative pressure was applied to the containment's interior by utilizing HEPA air filtering devices exhausting filtered air to an adjacent area in the basement. Personnel working inside the containment wore dust resistant coveralls and respirators fitted with filters appropriate for demolition of lead containing materials.

Remediation activities included HEPA vacuuming wood, plastic debris, and metal prior to size reduction and load-out for disposal as non-hazardous waste. Demolition activities included removal, size reduction (using cutting torches and wood saws, as appropriate), and containerization of firing range debris (various wood and plastic) and removal of bullet pit sand. Bullet pit sand was removed from the range using a truck mounted vacuum with hopper. As sand was removed, it filled the vacuum hopper that, when filled, periodically dumped into a container approved for hazardous waste. Two (2) twenty - cubic yard roll-off boxes were used for containerizing hazardous wastes (including bullet pit sand and wood framing that was deemed hazardous due to its exposure either to lead bullets or bullet pit sand) generated from the remediation activities.

After HEPA vacuuming, the metal backstop of the bullet pit was reduced in size using a cutting torch and recycled off-site. The remaining wood structure was HEPA vacuumed prior to being reduced in size using a wood saw. The vacuumed pieces of the wood structure were disposed as non-hazardous waste.

Upon removal of firing range materials, the concrete ceilings, walls, and floors within the containment area were washed with one pass of a 3000-psi pressure washer. All rinsate from pressure washing was captured, prefiltered through a 50-micron filter, and containerized for waste stream profiling.

Waste Disposal

All hazardous wastes removed from the SAFR were containerized and manifested for disposal to Peoria Disposal Company (PDC) # 1 Landfill in Peoria, Illinois. Approximately thirty (30) cubic yards of hazardous waste including bullet pit sand and debris, water rinsate filters and stained wood were manifested as hazardous waste. Approximately forty (40) cubic yards of nonhazardous wastes including non-stained wood and various plastics were disposed at Waste Management's Milam Landfill in East St. Louis, Illinois. In keeping with PDC's terms for waste handling, all waste profiled as hazardous was reduced in size to less than 3 feet prior to load-out. Bullet pit metal that formed the backstop was recycled at a local metal recycling facility, Grossman Iron and Metal of St. Louis, Missouri. Copies of hazardous waste manifests are included in Appendix C.

Results of the rinsate water are summarized in Table 2. These results indicate the rinsate water quality prior to further filtration using a 0.5 micron filter just prior to discharge into the City sanitary sewer. Approximately 750 gallons of rinsate was generated by the pressure washing

activity. A copy of the permit issued by the City of St. Louis' Metropolitan Sewer District is included in Appendix D.

Post-remediation Sampling

Upon the completion of the remediation, confirmation wipe samples of selected surfaces in and near the range were collected. Results of this sampling indicated the remediation was successful in mitigating the presence of lead on the columns in the immediate vicinity of the SAFR. These results are included in Table 1 to provide easy comparison to the pre-remediation sampling results. The results ranged from 0.017 mg per wipe in 105DCSWS1taken immediately adjacent to the range at pillar C-42 to 38 mg/wipe in 105DCSWS2 collected from the concrete floor within the footprint of the former range. Each wipe sample was collected in the same manner as those collected prior to remediation.

SAINT LOUIS ORDINANCE PLANT
4300 GOODFELLOW - BUILDING 105
ST. LOUIS, MISSOURI
U.S. GENERAL SERVICES ADMINISTRAITON

SUMMARY OF LEAD WIPE SAMPLING RESULTS

Sample ID	Description	Lead (mg/wipe)
Before Remediation		
LS-1	east side of pillar B-41 at northeast corner of range, 5 feet above floor	0.015
LS-2	west side of pillar C-41 at northwest corner of range 5 feet above floor	0.084
LS-3	west side of pillar C-42 at west corner of range 1.5 feet above floor	0.72
LS-4	east side of pillar E-42 5 feet above floor	0.17
LS-5	west side of pillar G-42 5 feet above floor	0.046
LS-6	west side of pillar C-45 5 feet above floor	0.042

Each wipe sample represents an area of approximately 100 square centimeters

SAINT LOUIS ORDINANCE PLANT
4300 GOODFELLOW - BUILDING 105
ST. LOUIS, MISSOURI
U.S. GENERAL SERVICES ADMINISTRAITON

SUMMARY OF RESULTS OF RINSATE WATER WATER ANALYSIS

SAMPLE NUMBER SAMPLE DATE LAB ID NUMBER		SRDECON 9/11/2002 211977-4
PARAMETER	**UNITS**	
PCBs (8082)		
Aroclor 1016	ug/L	ND
Aroclor 1221	ug/L	ND
Aroclor 1232	ug/L	ND
Aroclor 1242	ug/L	ND
Aroclor 1248	ug/L	ND
Aroclor 1254	ug/L	ND
Aroclor 1260	ug/L	5.6
CHEMICAL OXYGER DEMAND (Hach 8000)		
COD	mg/L	77
pH (150.1)		
pH	pH units	7.24
TOTAL SOLIDS (160.3)		
Total Solids	mg/L	1190
TOTAL VOLATILE SOLIDS (160.4)		
Total Volatile Solids	mg/L	14
TOTAL SUSPENDED SOLIDS (160.2)		
Total Suspended Solids	mg/L	27
MERCURY (7470A)		
Mercury	mg/L	0.0098

SAINT LOUIS ORDINANCE PLANT
4300 GOODFELLOW - BUILDING 105
ST. LOUIS, MISSOURI
U.S. GENERAL SERVICES ADMINISTRAITON

SUMMARY OF RESULTS OF RINSATE WATER WATER ANALYSIS

SAMPLE NUMBER SAMPLE DATE LAB ID NUMBER		SRDECON 9/11/2002 211977-4
PARAMETER	**UNITS**	
METALS (200.7)		
Cadmium	mg/L	0.0026
Chromium	mg/L	0.0097
Copper	mg/L	0.24
Iron	mg/L	2.4
Lead	mg/L	1.9
Nickel	mg/L	0.021
Zinc	mg/L	0.19
VOLATILE ORGANICS (624)		
Chloromethane	ug/L	ND
Vinyl chloride	ug/L	ND
Bromomethane	ug/L	ND
Chloroethane	ug/L	ND
Acrolein	ug/L	ND
1,1-Dichloroethene	ug/L	ND
Methylene chloride	ug/L	5.6
trans-1,2-Dichloroethene	ug/L	ND
Acrylonitrile	ug/L	ND
1,1-Dichloroethane	ug/L	ND
Chloroform	ug/L	ND
1,1,1-Trichloroethane	ug/L	ND
Carbon Tetrachloride	ug/L	ND
Benzene	ug/L	ND

SAINT LOUIS ORDINANCE PLANT
4300 GOODFELLOW - BUILDING 105
ST. LOUIS, MISSOURI
U.S. GENERAL SERVICES ADMINISTRAITON

SUMMARY OF RESULTS OF RINSATE WATER WATER ANALYSIS

SAMPLE NUMBER SAMPLE DATE LAB ID NUMBER		SRDECON 9/11/2002 211977-4
PARAMETER	**UNITS**	
VOLATILE ORGANICS (624)		
1,2-Dichloroethane	ug/L	ND
Trichloroethene	ug/L	ND
1,2-Dichloropropane	ug/L	ND
Bromodichloromethane	ug/L	ND
2-Chloroethylvinylether	ug/L	ND
cis-1,3-Dichloropropene	ug/L	ND
Toluene	ug/L	ND
trans-1,3-Dichloropropene	ug/L	ND
1,1,2-Trichloroethane	ug/L	ND
Tetrachloroethene	ug/L	ND
Dibromochloromethane	ug/L	ND
Chlorobenzene	ug/L	ND
Ethylbenzene	ug/L	ND
Bromoform	ug/L	ND
1,1,2,2-Tetrachloroethane	ug/L	ND

Appendix A

SEVERN TRENT SERVICES

STL Chicago

SEVERN TRENT LABORATORIES
ANALYTICAL REPORT

JOB NUMBER: 211607

Prepared For:

SCS Engineers, Inc.
10401 Holmes Road
Suite 400
Kansas City, MO 64131

Project: St. Louis GSA - Shooting Range

Attention: David Brewer

Date: 09/10/2002

(b) (6)

Signature

Name: Richard C. Wright

Title: Project Manager

E-Mail: rwright@stl-inc.com

9/10/02

Date

STL Chicago
2417 Bond Street
University Park, IL 60466

PHONE: (708) 534-5200
FAX..: (708) 534-5211

STL Chicago is part of Severn Trent Laboratories, Inc.

Severn Trent Laboratories - Chicago
METALS CASE NARRATIVE

Client: SCS Engineers, Inc
Project: St. Louis GSA
STL Job#: 211607

Date Recd: 08/28/02

1. This narrative covers the Lead analysis of Wipe samples in the above Job.

   Method Refs: USEPA, SW 846

2. All analyses were performed within the required holding times.

3. All Initial and Continuing Calibration Verification (ICV/CCV's) were within control limits.

4. All Initial and Continuing Calibration Blanks (ICB/CCB's) were within control limits.

5. All Preparation/Method Blanks were below the Reporting Limit.

6. Laboratory Control Sample recoveries were within the 80-120% control limits.

7. Additional sample was not provided for Matrix QC.

(b) (6) [redacted]

Mani S. Iyer
Metals Section Manager

9/9/02
Date

SAMPLE INFORMATION
Date: 09/10/2002

Job Number.: 211607
Customer...: SCS Engineers, Inc.
Attn.....: David Brewer

Project Number.....: 20002514
Customer Project ID....: ST. LOUIS GSA
Project Description....: St. Louis GSA - Shooting Range

Laboratory Sample ID	Customer Sample ID	Sample Matrix	Date Sampled	Time Sampled	Date Received	Time Received
211607-1	LS-1	Wipe	08/27/2002	11:45	08/28/2002	10:30
211607-2	LS-2	Wipe	08/27/2002	11:45	08/28/2002	10:30
211607-3	LS-3	Wipe	08/27/2002	11:45	08/28/2002	10:30
211607-4	LS-4	Wipe	08/27/2002	11:45	08/28/2002	10:30
211607-5	LS-5	Wipe	08/27/2002	11:45	08/28/2002	10:30
211607-6	LS-6	Wipe	08/27/2002	11:45	08/28/2002	10:30

SEVERN TRENT SERVICES

LABORATORY TEST RESULTS

Job Number: 211607

Date:09/10/2002

CUSTOMER: SCS Engineers, Inc. PROJECT: ST. LOUIS GSA ATTN: David Brewer

Customer Sample ID: LS-1
Date Sampled.....: 08/27/2002
Time Sampled.....: 11:45
Sample Matrix.....: Wipe

Laboratory Sample ID: 211607-1
Date Received.....: 08/28/2002
Time Received.....: 10:30

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	MDL	RL	DILUTION	UNITS	BATCH	DT	DATE/TIME	TECH
6010B	Metals Analysis (ICAP Trace) Lead, Wipe	0.015			0.0050	0.0050	1	mg/Wipe	61622		08/30/02 2218	pfk

* In Description = Dry Wgt.

SEVERN TRENT SERVICES

LABORATORY TEST RESULTS

Job Number: 211607

Date:09/10/2002

CUSTOMER: SCS Engineers, Inc. PROJECT: ST. LOUIS GSA ATTN: David Brewer

Customer Sample ID: LS-2
Date Sampled.....: 08/27/2002
Time Sampled.....: 11:45
Sample Matrix.....: Wipe

Laboratory Sample ID: 211607-2
Date Received.....: 08/28/2002
Time Received.....: 10:30

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	MDL	RL	DILUTION	UNITS	BATCH	DT	DATE/TIME	TECH
6010B	Metals Analysis (ICAP Trace) Lead, Wipe	0.084			0.0050	0.0050	1	mg/Wipe	61622		08/30/02 2230	pfk

* In Description = Dry Wgt.

SEVERN TRENT SERVICES

LABORATORY TEST RESULTS

Job Number: 211607

Date:09/10/2002

CUSTOMER: SCS Engineers, Inc. PROJECT: ST. LOUIS GSA ATTN: David Brewer

Customer Sample ID: LS-3
Date Sampled.....: 08/27/2002
Time Sampled.....: 11:45
Sample Matrix.....: Wipe

Laboratory Sample ID: 211607-3
Date Received.....: 08/28/2002
Time Received.....: 10:30

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	MDL	RL	DILUTION	UNITS	BATCH	DT	DATE/TIME	TECH
6010B	Metals Analysis (ICAP Trace) Lead, Wipe	0.72			0.0050	0.0050	1	mg/Wipe	61622		08/30/02 2236	pfk

* In Description = Dry Wgt.

SEVERN TRENT SERVICES

LABORATORY TEST RESULTS

Job Number: 211607

Date:09/10/2002

CUSTOMER: SCS Engineers, Inc. PROJECT: ST. LOUIS GSA ATTN: David Brewer

Customer Sample ID: LS-4
Date Sampled.....: 08/27/2002
Time Sampled.....: 11:45
Sample Matrix.....: Wipe

Laboratory Sample ID: 211607-4
Date Received.....: 08/28/2002
Time Received.....: 10:30

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	MDL	RL	DILUTION	UNITS	BATCH	DT	DATE/TIME	TECH
6010B	Metals Analysis (ICAP Trace) Lead, Wipe	0.17			0.0050	0.0050	1	mg/Wipe	61622		08/30/02 2302	pfk

* In Description = Dry Wgt.

SEVERN TRENT SERVICES

LABORATORY TEST RESULTS

Job Number: 211607

Date:09/10/2002

CUSTOMER: SCS Engineers, Inc. PROJECT: ST. LOUIS GSA ATTN: David Brewer

Customer Sample ID: LS-5
Date Sampled.....: 08/27/2002
Time Sampled.....: 11:45
Sample Matrix.....: Wipe

Laboratory Sample ID: 211607-5
Date Received.....: 08/28/2002
Time Received.....: 10:30

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	MDL	RL	DILUTION	UNITS	BATCH	DT	DATE/TIME	TECH
6010B	Metals Analysis (ICAP Trace) Lead, Wipe	0.046			0.0050	0.0050	1	mg/Wipe	61622		08/30/02 2308	pfk

* In Description = Dry Wgt.

SEVERN TRENT SERVICES

LABORATORY TEST RESULTS

Job Number: 211607

Date:09/10/2002

CUSTOMER: SCS Engineers, Inc. PROJECT: ST. LOUIS GSA ATTN: David Brewer

Customer Sample ID: LS-6
Date Sampled.....: 08/27/2002
Time Sampled.....: 11:45
Sample Matrix.....: Wipe

Laboratory Sample ID: 211607-6
Date Received.....: 08/28/2002
Time Received.....: 10:30

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	MDL	RL	DILUTION	UNITS	BATCH	DT	DATE/TIME	TECH
6010B	Metals Analysis (ICAP Trace) Lead, Wipe	0.042			0.0050	0.0050	1	mg/Wipe	61622		08/30/02 2314	pfk

* In Description = Dry Wgt.

LABORATORY CHRONICLE

Job Number: 211607

Date: 09/10/2002

CUSTOMER: SCS Engineers, Inc. PROJECT: ST. LOUIS GSA ATTN: David Brewer

Lab ID: 211607-1 Client ID: LS-1 Date Recvd: 08/28/2002 Sample Date: 08/27/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED	DILUTION
3050B	Acid Digestion: Solids (ICAP)	1	61286		08/28/2002 1800	
EDD	Electronic Data Deliverable	1				
6010B	Metals Analysis (ICAP Trace)	1	61622	61286	08/30/2002 2218	

Lab ID: 211607-2 Client ID: LS-2 Date Recvd: 08/28/2002 Sample Date: 08/27/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED	DILUTION
3050B	Acid Digestion: Solids (ICAP)	1	61286		08/28/2002 1800	
6010B	Metals Analysis (ICAP Trace)	1	61622	61286	08/30/2002 2230	

Lab ID: 211607-3 Client ID: LS-3 Date Recvd: 08/28/2002 Sample Date: 08/27/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED	DILUTION
3050B	Acid Digestion: Solids (ICAP)	1	61286		08/28/2002 1800	
6010B	Metals Analysis (ICAP Trace)	1	61622	61286	08/30/2002 2236	

Lab ID: 211607-4 Client ID: LS-4 Date Recvd: 08/28/2002 Sample Date: 08/27/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED	DILUTION
3050B	Acid Digestion: Solids (ICAP)	1	61286		08/28/2002 1800	
6010B	Metals Analysis (ICAP Trace)	1	61622	61286	08/30/2002 2302	

Lab ID: 211607-5 Client ID: LS-5 Date Recvd: 08/28/2002 Sample Date: 08/27/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED	DILUTION
3050B	Acid Digestion: Solids (ICAP)	1	61286		08/28/2002 1800	
6010B	Metals Analysis (ICAP Trace)	1	61622	61286	08/30/2002 2308	

Lab ID: 211607-6 Client ID: LS-6 Date Recvd: 08/28/2002 Sample Date: 08/27/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED	DILUTION
3050B	Acid Digestion: Solids (ICAP)	1	61286		08/28/2002 1800	
6010B	Metals Analysis (ICAP Trace)	1	61622	61286	08/30/2002 2314	

QUALITY CONTROL RESULTS

Job Number.: 211607

Report Date.: 09/10/2002

CUSTOMER: SCS Engineers, Inc. PROJECT: ST. LOUIS GSA ATTN: David Brewer

QC Type	Description	Reag. Code	Lab ID	Dilution Factor	Date	Time

Test Method.....: 6010B
Method Description.: Metals Analysis (ICAP Trace)

Equipment Code....: ICP3
Batch.....: 61622

Analyst...: pfk

LCS	Laboratory Control Sample	M02GSPK001	61420 -002		08/30/2002	1822

Parameter/Test Description	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
Lead, Solid	mg/Kg	9.81		10.00	0.43 U	98	%	80-120	

LCS	Laboratory Control Sample	M02GSPK001	61286 -002		08/30/2002	2211

Parameter/Test Description	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
Lead, Wipe	mg/Wipe	0.00961		0.01000	0.00500 U	96	%	80-120	

* %=% REC, R=RPD, A=ABS Diff., D=% Diff.

QUALITY CONTROL RESULTS

Job Number.: 211607

Report Date.: 09/10/2002

CUSTOMER: SCS Engineers, Inc.

PROJECT: ST. LOUIS GSA

ATTN:

QC Type	Description	Reag. Code	Lab ID	Dilution Factor	Date	Time

Test Method.....: 6010B
Method Description.: Metals Analysis (ICAP Trace)

Equipment Code....: ICP3
Batch.....: 61622

Analyst...: pfk

MB	Method Blank	61420	61420 -001		08/30/2002	1816

Parameter/Test Description	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
Lead, Solid	mg/Kg	0.43 U							

MB	Method Blank	61286	61286 -001		08/30/2002 2205

Parameter/Test Description	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
Lead, Wipe	mg/Wipe	0.00500 U							

* %=% REC, R=RPD, A=ABS Diff., D=% Diff.

QUALITY ASSURANCE METHODS

REFERENCES AND NOTES

Report Date: 09/10/2002

REPORT COMMENTS

1) All pages of this report are integral parts of the analytical data. Therefore, this report should be reproduced only in its entirety.
2) Soil, sediment and sludge sample results are reported on a "dry weight" basis except when analyzed for landfill disposal or incineration parameters. All other solid matrix samples are reported on an "as received" basis unless noted differently.
3) Reporting limits are adjusted for sample size used, dilutions and moisture content if applicable.
4) The test results for the noted analytical method(s) meet the requirements of NELAC. Lab Cert. ID# 100201
5) Arizona Environmental Laboratory License number AZ0603.
6) According to 40CFR Part 136.3, pH, Chlorine Residual and Dissolved Oxygen analyses are to be performed immediately after aqueous sample collection. When these parameters are not indicated as field (e.g. pH Field) they were not analyzed immediately, but as soon as possible on laboratory receipt.

Glossary of flags, qualifiers and abbreviations (any number of which may appear in the report)

Inorganic Qualifiers (Q-Column)

U	Analyte was not detected at or above the stated limit.
<	Not detected at or above the reporting limit.
J	Result is less than the RL, but greater than or equal to the method detection limit.
B	Result is less than the CRDL/RL, but greater than or equal to the IDL/MDL.
S	Result was determined by the Method of Standard Additions.
F	AFCEE: Result is less than the RL, but greater than or equal to the method detection limit.

Inorganic Flags (Flag Column)

^	ICV,CCV,ICB,CCB,ISA,ISB,CRI,CRA,MRL: Instrument related QC exceed the upper or lower control limits.
*	LCS, LCD, MD: Batch QC exceeds the upper or lower control limits.
+	MSA correlation coefficient is less than 0.995.
4	MS, MSD: The analyte present in the original sample is 4 times greater than the matrix spike concentration; therefore, control limits are not applicable.
E	SD: Serial dilution exceeds the control limits.
H	MB, EB1, EB2, EB3: Batch QC is greater than reporting limit or had a negative instrument reading lower than the absolute value of the reporting limit.
N	MS, MSD: Spike recovery exceeds the upper or lower control limits.
W	AS(GFAA) Post-digestion spike was outside 85-115% control limits.

Organic Qualifiers (Q - Column)

U	Analyte was not detected at or above the stated limit.
ND	Compound not detected.
J	Result is an estimated value below the reporting limit or a tentatively identified compound (TIC).
Q	Result was qualitatively confirmed, but not quantified.
C	Pesticide identification was confirmed by GC/MS.
Y	The chromatographic response resembles a typical fuel pattern.
Z	The chromatographic response does not resemble a typical fuel pattern.
E	Result exceeded calibration range, secondary dilution required.
F	AFCEE:Result is an estimated value below the reporting limit or a tentatively identified compound (TIC)

Organic Flags (Flags Column)

B	MB: Batch QC is greater than reporting limit.
*	LCS, LCD, ELC, ELD, CV, MS, MSD, Surrogate: Batch QC exceeds the upper or lower control limits.
^	EB1, EB2, EB3, MLE: Batch QC is greater than reporting Limit
A	Concentration exceeds the instrument calibration range
a	Concentration is below the method Reporting Limit (RL)
B	Compound was found in the blank and sample.
D	Surrogate or matrix spike recoveries were not obtained because the extract was diluted for analysis; also compounds analyzed at a dilution will be flagged with a D.
H	Alternate peak selection upon analytical review
I	Indicates the presence of an interfence, recovery is not calculated.
M	Manually integrated compound.

QUALITY ASSURANCE METHODS

REFERENCES AND NOTES

Report Date: 09/10/2002

P The lower of the two values is reported when the % difference between the results of two GC columns is greater than 25%.

Abbreviations

AS	Post Digestion Spike (GFAA Samples - See Note 1 below)
Batch	Designation given to identify a specific extraction, digestion, preparation set, or analysis set
CAP	Capillary Column CCB Continuing Calibration Blank
CCV	Continuing Calibration Verification
CF	Confirmation analysis of original
C1	Confirmation analysis of A1 or D1
C2	Confirmation analysis of A2 or D2
C3	Confirmation analysis of A3 or D3
CRA	Low Level Standard Check - GFAA; Mercury
CRI	Low Level Standard Check - ICP
CV	Calilbration Verification Standard
Dil Fac	Dilution Factor - Secondary dilution analysis
D1	Dilution 1
D2	Dilution 2
D3	Dilution 3
DLFac	Detection Limit Factor
DSH	Distilled Standard - High Level
DSL	Distilled Standard - Low Level
DSM	Distilled Standard - Medium Level
EB1	Extraction Blank 1
EB2	Extraction Blank 2
EB3	DI Blank
ELC	Method Extracted LCS
ELD	Method Extracted LCD
ICAL	Initial calibration
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
ISA	Interference Check Sample A - ICAP
ISB	Interference Check Sample B - ICAP
Job No.	The first six digits of the sample ID which refers to a specific client, project and sample group Lab ID An 8 number unique laboratory identification
LCD	Laboratory Control Standard Duplicate
LCS	Laboratory Control Standard with reagent grade water or a matrix free from the analyte of interest
MB	Method Blank or (PB) Preparation Blank
MD	Method Duplicate
MDL	Method Detection Limit
MLE	Medium Level Extraction Blank
MRL	Method Reporting Limit Standard
MSA	Method of Standard Additions
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not Detected
PREPF	Preparation factor used by the Laboratory's Information Management System (LIMS)
PDS	Post Digestion Spike (ICAP)
RA	Re-analysis of original
A1	Re-analysis of D1
A2	Re-analysis of D2
A3	Re-analysis of D3
RD	Re-extraction of dilution
RE	Re-extraction of original
RC	Re-extraction Confirmation
RL	Reporting Limit
RPD	Relative Percent Difference of duplicate (unrounded) analyses
RRF	Relative Response Factor

QUALITY ASSURANCE METHODS

REFERENCES AND NOTES

Report Date: 09/10/2002

RT	Retention Time
RTW	Retention Time Window Sample ID A 9 digit number unique for each sample, the first six digits are referred as the job number
SCB	Seeded Control Blank
SD	Serial Dilution (Calculated when sample concentration exceeds 50 times the MDL)
UCB	Unseeded Control Blank
SSV	Second Source Verification Standard
SLCS	Solid Laboratory Control Standard(LCS)
PHC	pH Calibration Check LCSP pH Laboratory Control Sample
LCDP	pH Laboratory Control Sample Duplicate
MDPH	pH Sample Duplicate
MDFP	Flashpoint Sample Duplicate
LCFP	Flashpoint LCS
G1	Gelex Check Standard Range 0-1
G2	Gelex Check Standard Range 1-10
G3	Gelex Check Standard Range 10-100
G4	Gelex Check Standard Range 100-1000

Note 1: The Post Spike Designation on Batch QC for GFAA is designated with an "S" added to the current abbreviation used. EX. LCS S=LCS Post Spike (GFAA); MSS=MS Post Spike (GFAA)

Note 2: The MD calculates an absolute difference (A) when the sample concentration is less than 5 times the reporting limit. The control limit is represented as +/- the RL.

SEVERN TRENT SERVICES

STL Chicago
2417 Bond Street
University Park, IL 60466
Phone: 708-534-5200
Fax: 708-534-5211

Report To:
Contact: David Brewer
Company: SCS Engineers
Address: 10401 Holmes Rd, Ste 400
Kansas City, MO 64131
Phone: (816) 941-7510
Fax: (816) 941-8025
E-Mail: dbrewer@scsengineers.com

Bill To:
Contact: Same
Company:
Address:
Phone:
Fax:
P.O.#: Quote:

Shaded Areas For Internal Use Only ____ of ____

Lab Lot# 211607

Package Sealed: Yes / No	Samples Sealed: Yes / No
Received on Ice: Yes / No	Samples Intact: Yes / No
Temperature °C of Cooler: (12.6, 13.4, 12.8)	
Within Hold Time: Yes / No	Preserv. Indicated: Yes / No / NA
pH Check OK: Yes / No / NA	Res Cl_2 Check OK: Yes / No / NA
Sample Labels and COC Agree: Yes / No	COC not present

Sampler Name: David Hempleman
Project Name: SLOP Shooting Range
Project Location: SLOP
Lab PM: Dick Wright
Project Number: 02200070-11
Date Required Hard Copy: 9/3/02
Fax: ___/___/___

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date	Sampling Time	Matrix	Comp/Grab	Refrg #	# / Cont.	Volume	Preserv	Lead	Additional Analyses / Remarks
1		LS-1	8/27	11:45	WI	G					X	
2		LS-2	8/27		WI	G					X	
3		LS-3	8/27		WI	G					X	
4		LS-4	8/27		WI	G					X	
5		LS-5	8/27		WI	G					X	
6		LS-6	8/27		WI	G					X	

RELINQUISHED BY	COMPANY SCS Engineers	DATE 8/27/02	TIME 1400
RECEIVED BY	COMPANY STL	DATE 8/28/02	TIME 1030
RELINQUISHED BY	COMPANY	DATE	TIME
RECEIVED BY	COMPANY	DATE	TIME

Matrix Key
WW = Wastewater, W = Water, S = Soil, SL = Sludge, MS = Miscellaneous, OL = Oil, A = Air, SE = Sediment, SO = Solid, DS = Drum Solid, DL = Drum Liquid, L = Leachate, WI = Wipe, O = _____

Container Key
1. Plastic
2. VOA Vial
3. Sterile Plastic
4. Amber Glass
5. Widemouth Glass
6. Other _____

Preservative Key
1. HCl, Cool to 4°
2. H_2SO_4, Cool to 4°
3. HNO_3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. Cool to 4°
7. None

COMMENTS: 5 day TAT

Date Received 8/28/02
Courier: FX **Hand Delivered** ☐
Bill of Lading see attach

STL 8208 (0600)