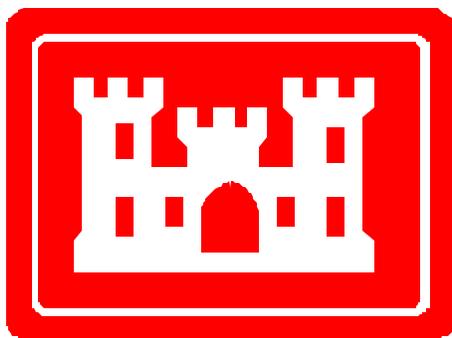


**WORK PLAN FOR
SEDGWICK TRENCH AREA INVESTIGATION**

**REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SPRING VALLEY OPERABLE UNIT 5
WASHINGTON, DC**

Prepared For:

**U.S. ARMY CORPS OF ENGINEERS,
BALTIMORE DISTRICT**



Prepared By:

**PARSONS ENGINEERING SCIENCE, INC.
10521 ROSEHAVEN STREET
FAIRFAX, VA 22030**

March 30, 2001

1 FINAL

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4 WORK PLAN

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6 FOR

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8 SEDGWICK TRENCH AREA INVESTIGATION

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10 REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)

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12 SPRING VALLEY OPERABLE UNIT 5

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14 WASHINGTON, DC

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18 Prepared for:

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20 U.S. ARMY CORPS OF ENGINEERS

21

22 BALTIMORE DISTRICT

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MARCH 30, 2001

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Attachment A AUES Chemicals List
Attachment B AUES Chemicals Laboratory Quality Assurance Objectives

1
2LIST OF ACRONYMS

ABP	Agent Breakdown Product
A/E	Architect Engineer
ANOVA	Analysis of Variance
ARARs	Applicable or Relevant and Appropriate Requirements
AUES	American University Experiment Station
Bgs	Below Ground Surface
CENAB	Corps of Engineers Baltimore District
CERCLA	Comprehensive Environmental Resource Conservation and Liability Act
COC	Chemical of Concern
COPC	Chemicals of Potential Concern
CSM	Conceptual Site Model
CWA	Clean Water Act
CWM	Chemical Warfare Material
DCEHA	District of Columbia Environmental Health Administration
DERP/FUDS	Defense Environmental Restoration Program/Formerly Used Defense Sites
EC	Exposure Concentration
EE/CA	Engineering Evaluation/Cost Analysis
EPC	Exposure Point Concentration
EPCRA	Emergency Planning and Community Right-to-Know Act
EV	Event Frequency
FUDS	Formerly Used Defense Site
GSD	Geometric Standard Deviation
HFA	Human Factors Applications
HEAST	Health Effects Assessment Summary Tables
HI	Hazard Index
HQ	Hazard Quotient
ICP	Inductively Coupled Plasma
IR	Soil Ingestion Rate
IRIS	Integrated Risk Information System
MCLs	Maximum Concentration Limits
MPH	Miles Per Hour
NCP	National Contingency Plan

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ACRONYM LIST (Cont.)1
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OE	Ordnance and Explosive
OSR	Operation Safe Removal
OSR FUDS	Operation Site Removal Formerly Used Defense Site
OU 4	Operable Unit 4
Parsons ES	Parsons Engineering Science, Inc.
POI	Point of Interest
PRGs	Preliminary Remediation Goals
PRSCs	Post Removal Site Controls
RA	Risk Assessment
RBCs	Risk-Based Concentrations
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI/FS	Remedial Investigation / Feasibility Study
RME	Reasonable Maximum Exposure
SOW	Scope Of Work
SPLP	Synthetic Precipitate Leaching Procedure
SQL	Sample Quantitation Limit
SSLs	Soil-To-Air Soil Screening Levels
SSS	Site Safety Submission
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compound List
TEC	Topographic Engineering Center
UCL	Upper Confidence Limit
ULMG	Urban Land-Manor Glenelg
ULSC	Urban Land-Sassafras Chillum
URF	Unit Risk Factor
USACE	U.S. Army Corps Of Engineers
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
VOCs	Volatile Organic Compound

3

1 INTRODUCTION

2 1.1 PURPOSE

3 1.1.0.1 The purpose of this document is to provide a plan to conduct soil sampling at the Spring
4 Valley Operable Unit 5 (OU-5) Sedgwick Trench area. This area has previously been identified during
5 the Operation Safe Removal (OSR) Formerly Used Defense Sites (FUDS) investigation as containing
6 various Points of Interest (POIs). POI 1 has been identified as the Sedgwick Trench. POIs 2 and 4
7 have been identified as possible pits. Section 1.3.1 describes the background history of these POIs.

8 1.1.0.2 Parsons Engineering Science (Parsons ES) will perform quadrant and other subsurface
9 sampling in this area (Figure 1-1). This Work Plan references the original Work Management Plan
10 (WMP) (*August 2000, Work Management Plan, Spring Valley Operable Unit 4, Parsons ES*),
11 which also references the Final Site Safety Submission, Volume I Work Plan, Spring Valley Operable
12 Unit 3, Washington D.C., (SSS) (*Parsons ES, March 1999*). WMP Amendments 1 through 3 are
13 also referenced. This Work Plan references background information presented in these documents.

14 1.2 SAMPLING OVERVIEW

15 1.2.0.1 Quadrant soil sampling will be performed to determine the possible presence of arsenic (As)
16 in the surface and subsurface in the vicinity of the Sedgwick Trench area. Subsurface samples will be
17 collected from the bottom of the trench to determine the possible presence of arsenic, pH, Mustard
18 Agent Breakdown Products (ABPs) dithiane, oxathiane, and thiodiglycol, Lewisite ABPs
19 [Chlorovinylarsine acid (CVAA) and Chlorovinylarsenous oxide (CVAO)], Target Compound List
20 (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), TCL
21 VOC and TCL SVOC tentatively identified compounds (TICs) and Target Analyte List (TAL) Metals.
22 Additionally, analysis will be performed for selected chemicals from the list of American University
23 Experiment Station (AUES) chemicals as contained in Attachment A (the first three columns of
24 compounds on the table will be analyzed for this project). The sampling locations are shown on Figure
25 1-2.

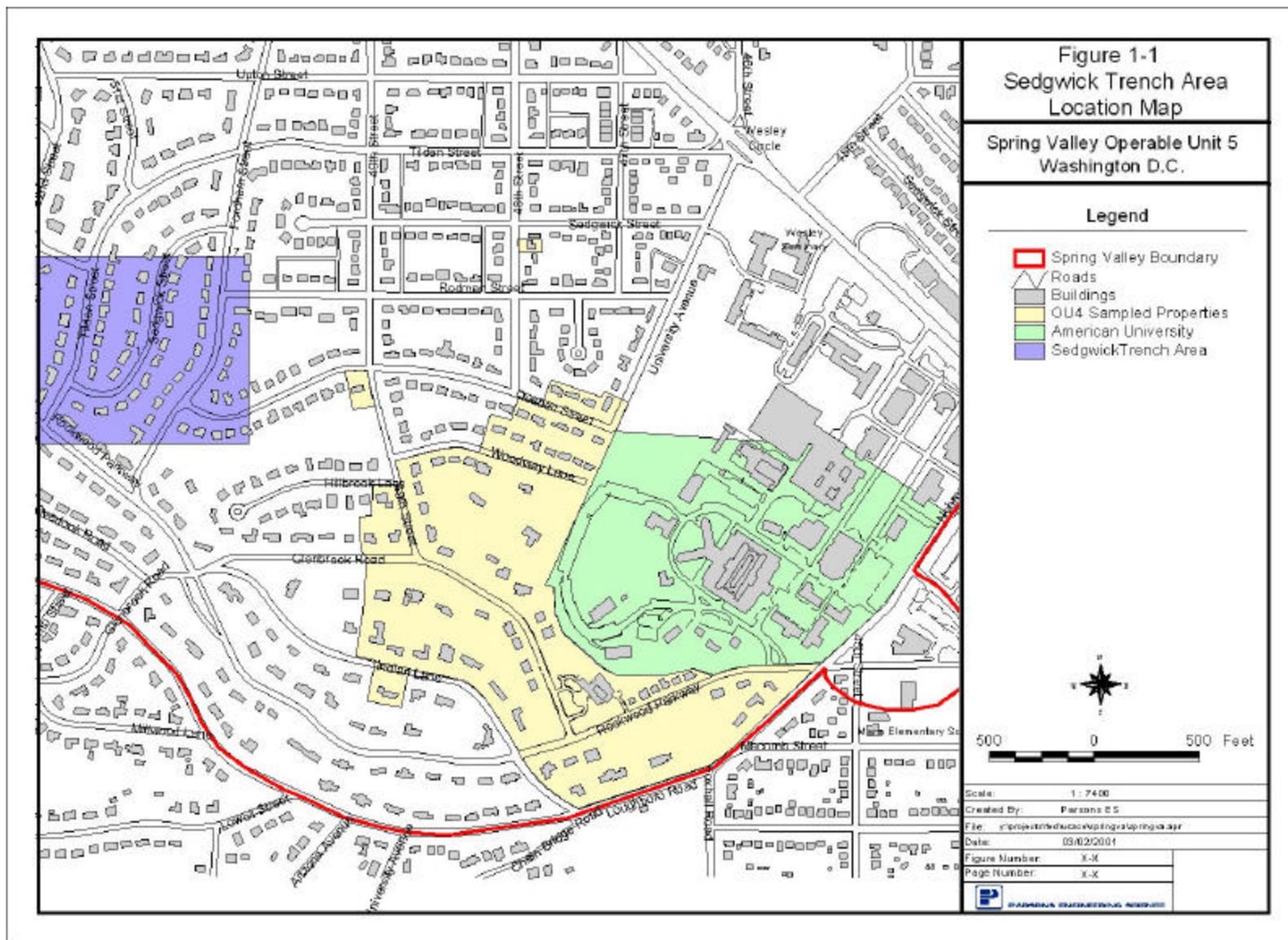
26 1.3 SITE DESCRIPTION AND BACKGROUND

27 1.3.1 Site Location and History

28 1.3.1.1 A general description of the Spring Valley background can be found in Section 1.3.1 of the
29 WMP (*Parsons ES, August 2000*). The Sedgwick Trench area described in this document contains
30 POIs 1, 2, and 4. POI 1 has been identified as the Sedgwick Trench. The trench comprises two
31 circular trenches approximately 200 feet in diameter where field testing of Chemical Warfare Materiel
32 (CWM) reportedly occurred. POIs 2 and 4 were reportedly possible pits used for disposal of scrap
33 metal, ordnance duds and other materials associated with the larger Sedgwick Trench.

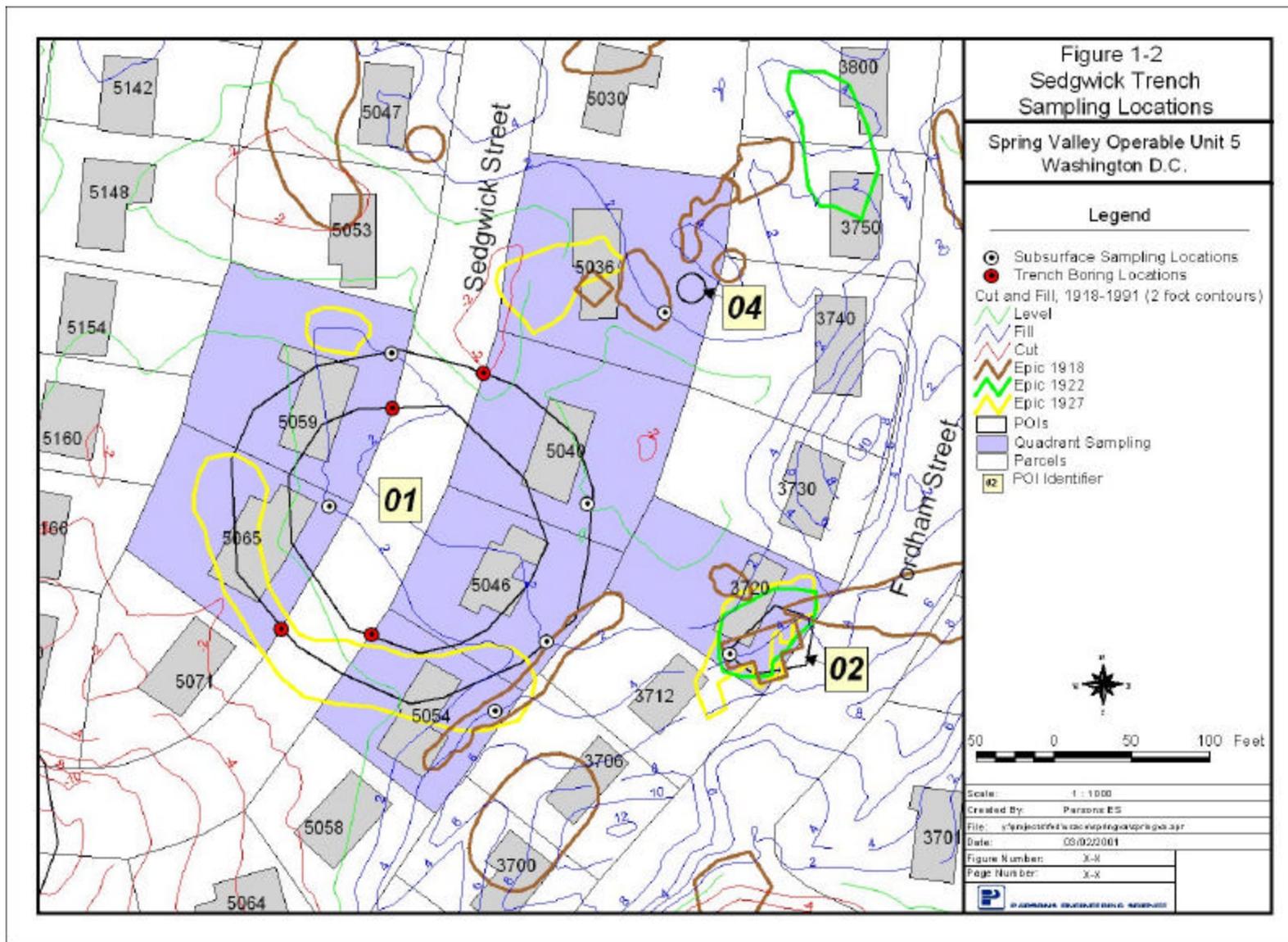
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**Figure 1-1
Location Map – Sedgwick Trench Area**



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**Figure 1-2
Sedgwick Trench Sampling Locations**



1 **1.3.2 Environmental Setting**

2 1.3.2.1 A full description of the environmental setting of Spring Valley is found in Section 1.3.3 of the
3 WMP (*Parsons ES, August 2000*).

4 **1.3.3 Previous Investigations**

5 1.3.3.1 Samples were collected in and around the Sedgwick Trench area in 1994. Various
6 properties in the area were geophysically surveyed in 1993 and 2000. Details regarding these
7 investigations can be found in the Remedial Investigation Report for OSR FUDS (*USCOE, June 1995*)
8 or the USEPA Risk Assessment (*Army Munitions Site, Spring Valley, October 1999*).

9

2 SAMPLE PLAN

2.1 INTRODUCTION

2.1.0.1 The following types of additional characterization sampling will be performed in the Sedgwick Trench area:

- Quadrant Surface Sampling
- 6" – 12" Subsurface Sampling
- Quadrant Subsurface Sampling
- Trench Subsurface Sampling

2.2 QUADRANT SURFACE SOIL SAMPLING

2.2.0.1 All Quadrant sampling will be performed in accordance with the Work Management Plan OU4 RI/FS (*Parsons ES, August 2000*). Surface soil samples for the Quadrant sampling will be collected from the first 6 inches of soil in accordance with Section 1.3.2 in Appendix A of the WMP. The sampling objective is to characterize the Sedgwick Trench area properties for the possible presence of arsenic. Quadrant sampling will be performed at the properties listed below. Figure 1-2 shows the location of the properties. Table 2.1 summarizes all sample locations.

- 5036, 5040, 5046, 5054, 5059, 5065 Sedgwick Street
- 3720 Fordham Street

2.3 6" – 12" SUBSURFACE SAMPLING

2.3.0.1 In addition to quadrant sampling, an additional sample from each quadrant will be collected at the 6"-12" depth interval for the quadrant sampling properties. Each of these samples will be composites of three randomly located samples from the quadrant. They will be analyzed for arsenic.

- 5036, 5040, 5046, 5054, 5059, 5065 Sedgwick Street
- 3720 Fordham Street

2.4 QUADRANT SUBSURFACE SAMPLING

2.4.0.1 The subsurface sampling component of the quadrant sampling will be performed at the properties listed above (one boring per property). In accordance with Section 1.3.3 in Appendix A of the WMP, each subsurface boring will be located in areas of fill, extending two feet below the fill to a maximum of ten feet. The borings will be installed following anomaly avoidance protocols. Every one-

1 foot increment of these samples will be analyzed for arsenic. Based on the cut and fill contours shown in
2 Figure 1-2, these borings will be approximately six feet deep.

3 **2.5 TRENCH SUBSURFACE SAMPLING**

4 2.5.0.1 Additional subsurface sampling will be performed at the Sedgwick Trench. These borings are
5 described relative to the property on which they will be located although the objective is characterization
6 of the trench. Four subsurface borings will be collected at the properties where the trench and
7 Sedgwick Street intersect (listed below). The location of these borings will be staggered such that the
8 southern inner and outer trench lines will be sampled on opposite sides of the street and the northern
9 inner and outer trench lines will be sampled on opposite sides of the street. The subsurface borings will
10 be a maximum of 10 feet deep. A composite sample will be taken at every 2-foot increment and
11 analyzed for arsenic and pH, and at the bottom of the trench, a sample will be collected and analyzed
12 for full scan parameters (ABPs, TCL VOCs, TCL SVOCs, TCL VOC and SVOC TICs, TAL
13 Metals, and the AUES List). The actual identification of the trench bottom will be based on the field
14 geologist's observations, information from the previous sampling, and information on trench depth
15 relative to the 1918 level as determined from old photographs.

16 2.5.0.2 A supplemental boring will be collected adjacent to each of these four subsurface borings.
17 These samples will be held for possible future analysis of discrete intervals. Should results from the
18 initial 2-foot increment sampling show elevated arsenic levels, discrete samples from selected intervals
19 from the supplemental boring will be analyzed for arsenic. These supplemental borings will be located
20 as close as possible to the initial boring. This will eliminate the need for additional anomaly avoidance
21 procedures for the supplemental boring. The locations are:

- 22 • 5040, 5054, 5059, and 5065 Sedgwick Street

23 **2.6 ANALYTICAL SCOPE**

24 2.6.0.1 Table 2.2 summarizes the analytical scope for each sample type and Table 2.3 outlines the
25 general sampling and analysis plan including number of samples for each type.

1
2

**Table 2.1
Sampling Locations**

Sample Location	Surface Sampling	Subsurface Sampling		
	Quadrant Surface Sampling ¹	6'' – 12'' Sampling ²	Quadrant Subsurface Sampling ³	Trench Subsurface Sampling ⁴
5040 Sedgwick Street	✓	✓	✓	✓
5046 Sedgwick Street	✓	✓	✓	
5054 Sedgwick Street	✓	✓	✓	✓
5059 Sedgwick Street	✓	✓	✓	✓
5065 Sedgwick Street	✓	✓	✓	✓
POI 2 – 3720 Fordham	✓	✓	✓	
POI 4– 5036 Sedgwick	✓	✓	✓	

3

¹ A composite of six samples will be collected from each of 4 quadrants at a depth of 0 - 6 inches.

4

² Three discrete samples (composited into one sample) will be collected from each quadrant at a depth of 6 - 12 inches.

5

³ Borings will be fill plus 2 feet to a maximum of 10 feet. Based on the cut/fill map, these will be 6 foot borings.

6

⁴ Each trench boring will have a supplemental boring next to it. The initial boring will be sampled in 2 foot intervals to 10 feet for arsenic analysis. The supplemental boring will be held for possible discrete analysis of selected intervals for arsenic based on the initial boring results. The trench bottom sample will be analyzed for full scan parameters from the initial boring only.

7

8

9

**Table 2.2
Analytical Scope**

Type of Samples	Arsenic	pH	TCL VOCs	TCL SVOCs	TAL Metals	AUES List	TICs	ABPs
Quadrant Surface Samples	✓							
6''-12'' Subsurface Samples	✓							
Quadrant Subsurface Samples	✓							
Trench Subsurface Samples	✓	✓	✓	✓	✓	✓	✓	✓

10

11

12

1 Notes: TICs will be reported for the TCL VOCs and TCL SVOCs. Additionally, many of the AUES List compounds will be reported as TICs (from the TCL VOC and SVOC
 2 mass spec analyses). Arsenic for the Trench samples will be run separately from the TAL Metals suite for consistency with the other arsenic results.

3 **Table 2.3**
 4 **Sampling and Analysis Plan**

Sample Type	Ex. Sample ID	Analytical Parameter	Estimated Number of Sample Locations	Number of Field Duplicates	Number of Equipment Blanks	Total No. of Samples	Number of MS/MSD Sample Sets ¹	Total Number of Analyses
Quadrant Surface Samples	OU5-5040-1	Arsenic	28	2	2	32	2	36
6"-12" Subsurface Samples	OU5-5046-1A,2A	Arsenic	28	2	2	32	2	36
Quadrant Subsurface Samples	OU5-3720-SB-1	Arsenic	42	3	3	48	3	54
Trench Subsurface Samples	OU5-5040TR-SB-1-1 OU5-5040TR-SB-1A-1	Arsenic, PH	20 ²	1	1	22	1	24
		TCL VOCs, TCL SVOCs, TAL Metals, AUES List ABPs	4	1	1	6	1	8

5 Notes:

6 \1 Each set is two separate samples.

7 \2 If these samples contain elevated arsenic concentrations, potentially every one-foot interval would be analyzed for arsenic (40 total).

3 FIELD PROCEDURES

3.1 HEALTH AND SAFETY PROCEDURES

3.1.0.1 All field activities will be performed in accordance with the health and safety procedures described in Appendix E of the RI/FS OU4 Work Management Plan (*Parsons ES, August 2000*). Sampling will be performed in Level D personal protective equipment.

3.2 SOIL SAMPLING PROCEDURES

3.2.0.1 The quadrant samples (surface and subsurface) will be collected following the procedures outlined in Tables A.2 and A.3 of Appendix A of the WMP (*Parsons ES, August 2000*). The sampling equipment will be decontaminated using the procedure described in section 1.5.5 of Appendix A of the WMP.

3.2.0.2 Table 3.1 presents the procedures for collecting the Trench subsurface samples.

Table 3.1
Trench Subsurface Sampling Procedures

SAMPLE COLLECTION PROCEDURE	
1.	For each boring, ensure Miss Utility has marked underground utilities.
2.	Advance 3" diameter Geoprobe to target depth following anomaly avoidance protocols.
3.	Composite each 2-foot increment (to total depth of 10 feet) and place in container for arsenic analysis.
4.	Using cut and fill information, carefully examine the depth that is six feet below the 1918 level (approximate trench bottom). This will be the default trench bottom sample.
5.	Continue to 10 feet below ground surface. If no obvious visual indications of the trench bottom (staining, lithology changes, etc.) containerize sample interval in no. 4 above and submit for full scan analyses.
6.	For the trench bottom samples, use the Encore device to obtain the TCL VOC sample from the Geoprobe sleeve.
7.	For the supplemental borings, collect the sleeved intervals and store on ice for possible future analysis.
8.	Decontaminate sampling equipment following the procedures described in this plan.
9.	Fill out chain of custody forms and prepare samples for shipment to laboratory.

3.3 SOIL SAMPLE QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

3.3.0.1 Several types of field Quality Assurance/Quality Control (QA/QC) samples will be collected. One sample for every 20 soil samples will be collected for matrix spike/matrix spike duplicate (MS/MSD) for analyzed as shown in Table 2.3. One blind field duplicate (DUP) and one equipment blank (EB) will also be collected per 20 field samples and analyzed as shown in Table 2.3.

1 3.4 SURFICIAL SOIL SAMPLE DESIGNATION

2 3.4.1 Quadrant Samples

3 3.4.1.1 For the Quadrant sampling, each quadrant will be represented by a composite sample with the
4 following alphanumeric code:

- 5 • OU5-5040-1

6 3.4.1.2 The first three characters represent the project. The second set of four represents the address
7 and street name. The next character represents the quadrant number.

8 3.4.1.3 Sub-samples making up the composite, for the residential lots, will have the following
9 alphanumeric code:

- 10 • OU5-5040-1a (b, c, d, e, or f)

11 3.4.1.4 The QA/QC samples will have the following alphanumeric code:

- 12 • OU5-5040-DUP01

13 3.4.1.5 The last five characters (ex: DUP01) indicate the type of QA/QC sample (e.g. Duplicate No.
14 1); the QA/QC samples will be numbered consecutively for a given type for this sampling event.

15 3.5 SUBSURFACE SOIL SAMPLE DESIGNATION

16 3.5.0.1 Each boring location will be given the following alphanumeric code:

- 17 • OU5-3720-SB-1
- 18 • OU5-5040TR-SB-1

19 3.5.0.2 The first three characters represent the project. The next set of characters represent the
20 address (with “TR” added to designate a trench boring), followed by SB to designate soil borings,
21 followed by 1, 2, etc., to represent the depth interval. For the supplemental boring samples, an A
22 character following the SB-1 character will indicate this is a boring supplementing the TR-SB-1 boring.
23 Interval samples collected from within a given boring will have the following alphanumeric code:

- 24 • OU5-3720-SB-1 (this is a discrete arsenic sample taken at the bottom of the 0-1 foot interval
25 for the 3720 Fordham quadrant boring).
- 26 • OU5-5040TR-SB-1A-1 (this is a discrete arsenic sample taken from the 0-1 foot interval for
27 the supplemental 5040 Sedgwick trench boring).

28 3.6 SURVEY PROCEDURE

29 3.6.0.1 After identification of sample, sub-sample, or boring locations, Charles P. Johnson Associates
30 will survey the locations.

1 3.6.0.2 Elevations will be tied to benchmarks onsite, and referenced to the National Geodetic Vertical
2 Datum. Horizontal locations will be tied to the existing on-site benchmarks in the Maryland State Plane
3 feet, North American Datum 1983 coordinate system. Horizontal locations will be accurate to +/- 0.1
4 feet and vertical elevations accurate to +/- 0.01 feet.

5 **3.7 SAMPLE CHAIN-OF-CUSTODY AND SHIPPING PROCEDURES**

6 3.7.0.1 Sample chain-of-custody procedures will be observed to ensure the validity of the data.
7 Sample chain-of-custody, sample handling, and sample shipment procedures are described in Section
8 1.6 and Section 1.7 of Appendix A of the WMP and apply to the sampling activities described in this
9 Addendum. Proper sample custody procedures include the use of field log books, sample labels,
10 custody seals, and chain-of-custody forms, as described in Section 1.6 of Appendix A of the WMP
11 (*Parsons ES, August 2000*).

4 QUALITY CONTROL PROCEDURES

4.1 OVERVIEW

4.1.0.1 This Section was prepared to supplement the Quality Assurance Project Plan (QAPP) contained in Appendix B of the WMP (*Parsons ES, August 2000*) and addresses quality control issues related to soil sampling.

4.2 INTRODUCTION

4.2.0.1 The overall quality assurance (QA) objective for the Spring Valley project is to develop and implement procedures that will provide data of known, documented, and defensible quality. Quality is ensured through appropriate sample collection, preservation, and transport methods, combined with an evaluation of analytical performance through the analysis of quality control (QC) samples. Data generated during the soil sampling addressed in this Addendum will be used to determine the presence of contaminants in the surface or subsurface soils.

4.2.1 Analytical Data Quality Level

4.2.1.1 The quadrant surface soil samples and the subsurface soil samples collected during this investigation will be analyzed for arsenic using trace inductively coupled plasma (ICP) (Method SW-846 3050B/6010B) by an off-site laboratory (GPL Laboratories) to generate definitive data. The trench subsurface sampling will be performed for ABPs, pH, TCL VOCs, TCL SVOCs, TCL VOC and SVOC TICs, TAL Metals, and the AUES List by the Southwest Research Institute (SRI). The TCL VOCs will be analyzed by SW-846 5035 using the Encore sampling device. ABPs will be analyzed by method UL04 and UW22. TCL SVOCs will be analyzed by SW-846 8270. TAL Metals will be analyzed by the 6010/7000 Series. Adamsite and Mustard, CWM compounds, will be analyzed by the Edgewood Chemical and Biological Command (ECBC) facility. Definitive data, data reporting, and validation levels are defined in the QAPP contained in Appendix B of the WMP (*Parsons ES, August 2000*). The detection limit will be less than the decision criteria. Sampling objectives for this sampling effort are listed in Table 4.1.

4.2.2 Project-Specific QA Objectives

4.2.2.1 QA objectives are expressed in terms of precision, accuracy, completeness, representativeness, comparability, and detection limits. These terms are defined in the QAPP contained in Appendix B of the WMP (*Parsons ES, August 2000*). The summary of the quality assurance objectives for this sampling effort is shown in Table 4.2. The quality assurance objectives for the SRI Laboratory parameters are presented in Attachment B. While objectives may not be met because of matrix effects unique to a sample, they must be met for laboratory quality control samples (e.g., method blank, blank spike, laboratory control samples, etc.). Matrix effects must be verified through reanalysis of affected samples and reporting both sets of data.

4.2.3 Bottle types, Preservation, and Holding Time Requirements

4.2.3.1 All samples collected at the site will be placed in an appropriate sample container for preservation and transfer to the appropriate laboratory. Table 4.3 specifies the sample container types, preservatives, and holding time requirements for the analysis. GPL Laboratories and SRI will supply all

1 sample containers and is responsible for ensuring that all sample containers are properly cleaned before
2 shipment to the site. No chemical preservatives are required for soil samples collected for this project.

3 **4.2.4 Quality Control Samples**

4 4.2.4.1 Three types of field QC samples will be collected during the soil sampling activity described in
5 this document, including equipment blanks, field duplicates, and MS/MSDs. Section 3.3 provides the
6 frequency and analytical requirements for each QC sample.

**Table 4.1
Sampling Objectives**

Type	Parameter	Objective
Quadrant Surface and Subsurface Samples	Arsenic	Investigate the Sedgwick Trench area for the possible presence of arsenic.
6"-12" Subsurface Samples	Arsenic	Further define extent of arsenic in the near surface or subsurface soils in the Sedgwick Trench area.
Trench Subsurface Sampling	Arsenic, pH, TAL Metals, TCL VOCs, TCL SVOCs, ABPs, and AUES List	Further define extent of arsenic and other parameters in the subsurface soils in the Sedgwick Trench. The analytical parameters were selected to accommodate the DC Health regulator's request to characterize the trench bottom, the likely depth of residual contamination.

**Table 4.2
Summary of Quality Assurance Objectives - Soil Samples**

Parameter	Analytical Method	Reporting Units	Practical Quantitation Limit ¹	Method Detection Limit	Precision (RPD)	Accuracy (% R)		Completeness (%)
						Samples and MS/MSD	LCS	
Arsenic	SW-846 3050B/6010B	mg/kg ²	1.2	0.24	≤20%	80 – 120	80 - 120	95
TAL Metals	6010/7000 Series	*	*	*	*	*	*	*
TCL VOCs	5035	*	*	*	*	*	*	*
TCL SVOCs	8270	*	*	*	*	*	*	*
AUES List	*	*	*	*	*	*	*	*
ABPs	Mustard and Lewisite ABPs *	*	*	*	*	*	*	*

¹ The Practical Quantitation Limit may be adjusted by the laboratory to reflect sample dilution, dry weight, or other required analytical adjustments.

² Results for environmental analyses of soil samples will be reported on a dry weight basis.

* Specific methodology and reporting limits for these parameters contained in Attachment B.

% R - Percent Recovery

RPD - Relative Percent Difference

**Table 4.3
Sample Containers, Preservation, and Holding Times - Soil Samples**

Parameter	Sample Container	Preservative	Holding Time
TCL VOCs	Encore sampling device	Cool to 4 Degrees Celsius	48 hours
TCL SVOCs	8-ounce glass with Teflon lined cap	Cool to 4 Degrees Celsius	14 days
TAL Metals	4-ounce glass with Teflon lined cap	Cool to 4 Degrees Celsius	180 days
ABPs and AUES List	8-ounce glass with Teflon lined cap (same container as TCL SVOCs)	Cool to 4 Degrees Celsius	7 days
Adamsite	8-ounce glass with Teflon lined cap	Cool to 4 Degrees Celsius	TBD
Arsenic/pH	4-ounce glass with Teflon lined cap	Cool to 4 Degrees Celsius	180 days
Arsenic	Geoprobe sleeved core from supplemental boring	Cool to 4 Degrees Celsius	180 days

1

2

5 REFERENCES

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10 US Army Engineering and Support Center, Huntsville; US Army Corps of Engineers, Baltimore District.
11 Prepared by US Army Engineering and Support Center, Huntsville; US Army Corps of Engineers,
12 Baltimore District; and Parsons Engineering Science, Inc.
- 13 USACE, 2000., Engineering Evaluation/Cost Analysis, 4801, 4825 & 4835 Glenbrook Road,
14 Washington, D.C., Spring Valley Operable Unit 3, Washington, D.C. Prepared for US Army
15 Engineering and Support Center, Huntsville, US Army Corps of Engineers, Baltimore District.
16 Prepared by Parsons Engineering Science, Inc.
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19 Assistance Team).
- 20 USACE, 2001a. Revised Final Work Management Plan, (Amendment 1), AU Lot 12 / Child
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22 Operable Unit 4, Washington, DC. Prepared for US Army Engineering and Support Center,
23 Huntsville, US Army Corps of Engineers, Baltimore District. Prepared by Parsons Engineering
24 Science, Inc.
- 25 USACE 2001b. Final Work Management Plan (Amendment 2), Follow On Sampling For OU-4
26 Residential Lots, Remedial Investigation/Feasibility Study (RI/FS), Spring Valley Operable Unit 4,
27 Washington, D.C.. Prepared for US Army Engineering and Support Center, Huntsville, US Army
28 Corps of Engineers, Baltimore District. Prepared by Parsons Engineering Science, Inc.
- 29 USACE 2001c. FINAL Work Management Plan (Amendment 3) Follow On Sampling For OU-4
30 American University Lots Remedial Investigation/Feasibility Study (RI/FS), Spring Valley Operable
31 Unit 4 Washington, DC. Prepared for US Army Engineering and Support Center, Huntsville, US Army
32 Corps of Engineers, Baltimore District. Prepared by Parsons Engineering Science, Inc.

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ATTACHMENT A
AUES CHEMICALS LIST

**SPRING VALLEY
AUES CHEMICALS**

COMPOUND	WILL BE ANALYZED FOR THIS PROJECT			WILL NOT BE ANALYZED FOR THIS PROJECT	
	ROUTINE (TCL or TAL) + TICs	NON-ROUTINE (But readily available methodology)	SPECIALTY LAB Chemical Warfare Materials	NON-SPECIFIC	RESEARCH PROJ
Acetonitrile	VOC				
Acetyl Cyanide					
Acetyl Fluoride		IC/ICP SCAN			
Acetyl Thiocyanate					
Acrolein	VOC				
Adamsite			CWM		
Alcohol	VOC				
Allyl Alcohol	VOC				
Allyl Isocyanide		IC/ICP SCAN			
Allyl Isothiocyanate		IC/ICP SCAN			
Allylamine					
Aluminium	METAL				
Aluminium –CC14-NaC103					
Aluminium Selenide		IC/ICP SCAN			
Ammonia	E-350				
Ammonia Gas		IC/ICP SCAN			
Ammonium Chloride		IC/ICP SCAN			
Ammonium Cyanide		IC/ICP SCAN			
Ammonium Nitrate		IC/ICP SCAN			
Ammonium Picrate		IC/ICP SCAN			
Arsenic Trichloride		IC/ICP SCAN			
Arsenic Trifluoride		IC/ICP SCAN			
Arsenic Trioxide		AOAC 920 D 4490			
Arsine		IC/ICP SCAN			
Barium Peroxide		IC/ICP SCAN 8121			
Benzotrachloride	SVOC TIC				
Benzyl Bromide	VOC				
Benzyl Chloride	VOC				
Benzyl Fluoride	SVOC TIC				
Benzyl Iodide	VOC				
Black Powder					
Bromine	SM-4500BR				
Bromoacetone	VOC				
Bromoketone		IC/ICP SCAN			
Bromoacetone, Chloroacetone	VOC TIC				
Bromoacetyl Bromide		IC/ICP SCAN			
Bromobenzene	VOC				
Bromobenzyl Cyanide		IC/ICP SCAN			
Bromomethyl Ether	VOC TIC				
Bromoxyllyl Cyanide		IC/ICP SCAN			
Butyl Mercaptan	SVOC TIC	D 4490			
Cacodyl		IC/ICP SCAN			
Cacodyl Bromide		IC/ICP SCAN			
Cacodyl Chloride		IC/ICP SCAN			
Cacodyl Cyanide		IC/ICP SCAN			
Cadmium Methyl		IC/ICP SCAN			
Calcium Carbonate		7020			
Calcium Sulfate		IC/ICP SCAN			
Carbon Bisulphide	VOC				
Carbon Disulfide	VOC				
Carbon Monoxide		D 3416			
Carbon Tetrachloride	VOC				
Carborundum					
Celluloid					
Chlorinated Acetone, Turpentine	VOC TIC				
Chlorinated Carbon Disulfide	VOC TIC				
Chlorine		IC/ICP SCAN			
Chloroacetic Anhydride					

**SPRING VALLEY
AUES CHEMICALS**

COMPOUND	WILL BE ANALYZED FOR THIS PROJECT			WILL NOT BE ANALYZED FOR THIS PROJECT	
	ROUTINE (TCL or TAL) + TICs	NON-ROUTINE (But readily available methodology)	SPECIALTY LAB Chemical Warfare Materials	NON-SPECIFIC	RESEARCH PROJ
Chloroacetonitrile	VOC TIC				
Chloroacetyl Fluoride					
Chlorobenzene	VOC				
Chlorobenzol					
Chlorodiethyl Sulfide					
Chloroform	VOC				
Chloroformate					
Chloromethyl Chloroformate					
Chloromethyl Ether	VOC				
Chloromethyl Ethyl Ether	VOC				
Chloropicrin	SVOC-MODIF.				
Chloroacetone	VOC TIC				
Chromyl Chloride					
Crotonaldehyde	VOC TIC				
Cyanogen		D 3695			
Cyanogen Bromide		D 4490			
Cyanogen Chloride		IC/ICP SCAN			
		IC/ICP SCAN			
Diazomethane					
Dichloroethyl Disulfide					
Dichloromethyl Ether	VOC				
Dichloromethyl Sulfide		IC/ICP SCAN			
Dichloropropyl Sulfide		IC/ICP SCAN			
Diiodoacetylene					
Dimethylarsine		IC/ICP SCAN			
Diphenylchloroarsine	SVOC				
Ethyl Bromoacetate	VOC TIC				
Ethyl Chloroformate	VOC TIC				
Ethyl Dibromoacetate	VOC TIC				
Ethyl Iodoacetate					
Ethyl Isocyanide					
Ethyl Isothiocyanate					
Ethyl Mercaptan	SVOC				
Ethyl Sulfide		GC FPD			
Ethyl Trichloroacetate					
Ethylchloroarsine					
Flash mixture					
Halo Wax					
Hexachloroethane	SVOC				
Hydrochloric Acid		IC/ICP SCAN			
Hydrocyanic Acid		IC/ICP SCAN			
Hydrofluoric Acid		IC/ICP SCAN			
Hydrogen Selenide		IC/ICP SCAN			
Iron	METAL				
Isoallylamine					
Kendallite					
Kieselguhr					
Lead Ferrocyanide		IC/ICP SCAN			
Lead Peroxide		IC/ICP SCAN			
Lead Thiocyanate		IC/ICP SCAN			
Magnesium	METAL				
Magnesium Arsenide		IC/ICP SCAN			
Magnesium Carbonate		IC/ICP SCAN			
Magnesium Oxide and Limestone		IC/ICP SCAN			
Methyl					
Methyl Bromoacetate	VOC TIC				
Methyl Chloroacetate	VOC TIC				
Methyl Chloroarsine		IC/ICP SCAN			
Methyl Chloroformate	VOC TIC				
Methyl Chlorosulfonate	VOC TIC				

**SPRING VALLEY
AUES CHEMICALS**

COMPOUND	WILL BE ANALYZED FOR THIS PROJECT			WILL NOT BE ANALYZED FOR THIS PROJECT	
	ROUTINE (TCL or TAL) + TICs	NON-ROUTINE (But readily available methodology)	SPECIALTY LAB Chemical Warfare Materials	NON-SPECIFIC	RESEARCH PROJ
Methyl Isocyanide		IC/ICP SCAN			
Methyl Selenide		IC/ICP SCAN			
Methyl Sulfate					
Methyldichloroarsine					
Methylnitrosourethan					
Mustard (crude, pure, distilled, gas forms)			CWM		
Nickel Carbonyl		IC/ICP SCAN			
o-Chloronitrobenzene	SVOC TIC				
Oil Smoke					
Oleic Acid					
o-Tolyl Isocyanide	SVOC				
Oxaly Chloride		IC/ICP SCAN			
Paraffin					
Parazol					
Perchloromethylmercaptan	SVOC TIC				
Phenyl Isocyanate	SVOC				
Phenyl Isocyanide	SVOC				
Phenyl Isothiocyanate	SVOC				
Phenylcarbylamine Chloride		IC/ICP SCAN			
Phenyldichloroarsine	SVOC				
Phenylhydrazine	SVOC				
Phosgene		IC/ICP SCAN			
Phosphorus	E-365.2				
Phosphorus, Red	SVOC TIC				
Phosphorus, White	SVOC TIC				
Potassium Chlorate		IC/ICP SCAN			
Potassium Chlorate and Aluminum		IC/ICP SCAN			
Potassium Nitrate		IC/ICP SCAN			
Potassium Perchlorate		IC/ICP SCAN			
Potassium Permanganate		IC/ICP SCAN			
Ricin					
Rosin, Turpentine					
Silicon		IC/ICP SCAN			
Silicon Tetrachloride		IC/ICP SCAN			
Sodium	METAL				
Sodium (metallic)	METAL				
Sodium Bicarbonate		IC/ICP SCAN			
Sodium Chlorate		IC/ICP SCAN			
Sodium Cyanide		IC/ICP SCAN			
Sodium Hydroxide		IC/ICP SCAN			
Sodium Nitrate		IC/ICP SCAN			
Sodium Oleate		IC/ICP SCAN			
Sodium Silicate		IC/ICP SCAN			
Sodium Stearate		IC/ICP SCAN			
Stannic Chloride (Tin Tetrachloride)		IC/ICP SCAN			
Stannic Chloride, Anhydrous		IC/ICP SCAN			
Stearic Acid					
Sulfur	GPL's SOP				
Sulfur Chloride		IC/ICP SCAN			
Sulfur Trioxide		IC/ICP SCAN			
Sulfuryl Chloride		IC/ICP SCAN			
Superpalite					
Tetrachloromethyl Sulfide		IC/ICP SCAN			
Thermite					
Thermite Igniter					
Thiophene	SVOC TIC				
Thiophosgene		IC/ICP SCAN			

**SPRING VALLEY
AUES CHEMICALS**

COMPOUND	WILL BE ANALYZED FOR THIS PROJECT			WILL NOT BE ANALYZED FOR THIS PROJECT	
	ROUTINE (TCL or TAL) + TICs	NON-ROUTINE (But readily available methodology)	SPECIALTY LAB Chemical Warfare Materiels	NON-SPECIFIC	RESEARCH PROJ
Titanium Tetrachloride: Cyanogen Chloride		IC/ICP SCAN			
Tolyl Isocyanides		IC/ICP SCAN			
Trichloroacetonitrile	VOC TIC				
Trichloroacetyl Chloride		IC/ICP SCAN			
Trichloroacetyl Cyanide		IC/ICP SCAN			
Trichlorohydrin		IC/ICP SCAN			
Trichloromethyl Chloroformate		IC/ICP SCAN			
Trinitrotoluene	8330				
Turpentine					
Waste					
Xylyl Bromide	VOC TIC				
Zinc	METAL				
Zinc Chloride mixture		IC/ICP SCAN			
Zinc Oxide		IC/ICP SCAN			
Zinc Powder		IC/ICP SCAN			
Totals	62	82	2	12	32

IC/ICP SCAN This process uses ion chromatography or induction coupled plasma to scan for prominent atoms in the compound. For example, for bromobenzyl cyanide, the sample would be scanned for bromine and cyanide. If both were present, then this compound could be "tentatively" identified. The idea is similar to the TICs.

ROUTINE Standard services from most labs. Either the compound category, whether it can be identified as a TIC, or a separate method no., is shown.

NON-ROUTINE These are either the scan as described above, or a method not typically used but which has an established method. These are non-routine, but do not present difficulties for most labs to provide. In some cases, where the routine analyses only identify TICs, the non-routine method is shown if an additional level beyond the TIC is needed.

SPECIALTY LAB These chemicals are Chemical Warfare Materiels that require a special laboratory to handle. Special shipping requirements are also necessary.

RESEARCH PROJECT
If none of the labs suggested a way to identify these items, they were categorized as research projects. Some of these may not be familiar because of outdated names, synonyms, or "brand" names.

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ATTACHMENT B

AUES CHEMICALS LABORATORY
QUALITY ASSURANCE OBJECTIVES

SOUTHWEST RESEARCH INSTITUTE

Chemistry and Chemical Engineering Division
Department of Analytical and Environmental Chemistry

March 8, 2001

Parsons Engineering Science, Inc.
10521 Rosehaven Street
Fairfax, VA 22030

Attn: Mr. David Badio

Subject: Quality Assurance Objectives for Laboratory Analyses
In Support of The Spring Valley Project

Dear Mr. Badio:

Please find the revised information, which describes the quality assurance objectives for the above referenced laboratory analyses. Should you have any questions, please feel free to contact me at (210) 522-3051.

Sincerely,

Herbert J. Schattenberg III
Manager

Southwest Research Institute – Internal Quality Control and Corrective Action Requirements

Inorganics Analysis Performed for Parsons Engineering Science

Analytical Method	Parameters	Laboratory QC	Frequency	Acceptance Criteria	Corrective Action
SW-846 6010B (ICP), 3050B, 3005A Total Quantitative Analysis (ICP-MS), 3050B, 3005A SW-846 7470A, 7471A (CVAA)	See attached list identified as Metals List #1.	Initial Calibration (single point calibration and an instrument blank, at a minimum)	Prior to the analysis of samples	CVAA: correlation coefficient > 0.995	Check system. Correct problem. Re-calibrate instrument.
		ICV – Initial Calibration Verification	After initial calibration	% recovery between 80-120%	Check system. Correct problem. Re-calibrate instrument. Repeat ICV.
		CCV – Continuing Calibration Verification	Every 10 samples and at end of run	±20% of the expected value for each analyte	Check system. Correct problem. Recalibrate system. Reanalyze all samples since last compliant CCV.
		ICB/CCB – Initial and Continuing Calibration Blank	Following ICV and every CCV.	All analytes < respective reporting limits (RL)	Check system. Correct problem. Recalibrate system. Reanalyze affected samples.
		Interference check samples (ICP only)	Beginning and end of each analysis run.	±20% of true value for the analytes present	Check system. Correct problem. Recalibrate system. Reanalyze affected samples.
		PB – Procedure Blank	1 per batch of samples prepared (maximum of 20 samples per batch)	All analytes < respective reporting limits (RL). If not, then the lowest conc. for that analyte in all field samples must be > 10x that detected in PB.	Redigest and reanalyze associated samples if sample result is < 10x PB result for a given analyte. Note in narrative.
		LCS-Laboratory Control Sample	1 per batch of samples prepared (maximum of 20 samples per batch)	Aqueous LCS 80–120% recovery for TAL metals plus Sr. Solid LCS- within the manufacturer' s specified limits.	Redigest and reanalyze the samples associated with that LCS.
		Duplicate	1 per batch of ≤20 project samples	If analyte conc. is ≥10x RL, then the RPD must be <20%.	If conc are ≥10x RL, and RPD >20%, note in narrative.
		MS/MSD – Matrix Spike and Matrix Spike Duplicate	1 pair per batch of ≤20 project samples	For TAL metals plus Sr, 75–125% recovery except where sample concentration exceeds spike concentration by ≥ 4x. MSD ≤ 20% RPD.	Note in narrative.
		Post digestion spike (ICP only)	When MS and/or MSD outside acceptance range	Percent recovery 75-125%	Note in narrative.
Serial dilution (ICP only)	1 per batch of ≤20 project samples	±10% of original determination for analyte conc > 50x RL.	Note in narrative.		

Southwest Research Institute – Internal Quality Control and Corrective Action Requirements

Inorganics Analysis Performed for Parsons Engineering Science

Analytical Method	Parameters	Laboratory QC	Frequency	Acceptance Criteria	Corrective Action
EPA 300 (Modified for solid samples)	Fluoride, Chloride, Nitrate, Nitrite, Bromide, Phosphate and Sulfate	ICV – Initial Calibration Verification	Prior to the analysis of samples	±10% of the expected value for each analyte	Check system. Correct problem. Recalibrate system, if necessary. Repeat ICV.
SW-846 9010B/ 9014 (Modified for solid samples)	Cyanide	CCV – Continuing Calibration Verification	After 10 analytical samples and at end of run	+10% of the expected value for each analyte	Check system. Correct problem. Recalibrate system, if necessary. Reanalyze all sample since last compliant CCV.
EPA 350.3 (Modified for solid samples)	Ammonia	ICB/CCB – Initial and Continuing Calibration Blank	Following ICV and every CCV.	All analytes < reporting limit (RL)	Check system. Correct problem. Reanalyze affected samples.
		PB – Procedure Blank	1 per batch of samples prepared (maximum of 20 samples per batch)	All analytes < RL. If not, then the lowest conc. for that analyte in field samples must be > 10x that detected in PB.	Reextract and reanalyze blank and associated sample if sample result is < 10x PB result for a given analyte. Note in narrative.
		LCS-Laboratory Control Sample	1 per batch of samples prepared (maximum of 20 samples per batch)	Aqueous LCS 80–120% recovery. Solid LCS - within the manufacture' s specified limits.	Correct problem. Reextract and reanalyze the samples associated with that LCS.
		Duplicate	1 per batch of ≤20 samples	If conc. are ≥10x RL, than ≤ 20% RPD.	If conc. are ≥10x MDL, and RPD ≥ 20%, flag data and note in narrative.
		MS/MSD – Matrix Spike and Matrix Spike Duplicate	1 pair per batch of ≤20 samples	75 – 125% recovery except where sample concentration exceeds spike concentration by ≥ 4x. MSD ≤ 20% RPD.	Flag all associated samples and note in narrative.

Parameter	Analytical Method	Reporting Units	Reporting Limit	Precision (RPD)	Accuracy	
					MS/MSD	LCS
ICP	SW-846 6010B, 3050B, 3005A	mg/kg ¹	0.5 – 50 mg/kg ²	<20% ³	75-125% ⁴	80-120% ⁵
ICP-MS	Total Quantitative Analysis, 3050B, 3005A	mg/kg ¹	0.1 – 1.0 mg/kg ²	<20% ³	75-125% ⁴	80-120% ⁵
CVAA	SW-846 7470A, 7471A	mg/kg ¹	0.1 mg/kg ²	<20% ³	75-125% ⁴	80-120% ⁵
Anions ⁶	EPA 300M ⁷	mg/kg ¹	1.0 mg/kg ²	<20% ³	75-125% ⁴	80-120% ⁵
Cyanide	SW 846 9010B/9014M ⁷	mg/kg ¹	0.5 mg/kg ²	<20% ³	75-125% ⁴	80-120% ⁵
Ammonia	EPA 350.3M ⁷	mg/kg ¹	2.0 mg/kg ²	<20% ³	75-125% ⁴	80-120% ⁵

¹ Reported on a dry weight basis.

² Reporting limit – based on 100% solids.

³ With the exception of analytes <10x their RLs.

⁴ With the exception of analyte concentrations exceeding spike concentrations by ≥4x.

⁵ For solid LCS - within the manufactures specified limits

⁶ Anions - fluoride, chloride, nitrate-N, bromide, nitrite-N, phosphate-P and sulfate

⁷ M - Modified for analysis of solids

Note: The reporting limits are expressed as a range. This is due to the fact that it is unpredictable as to which and to what extent sample matrix constituents will affect particular elements.

Southwest Research Institute – Internal Quality Assurance Objectives

Inorganics Analyte List and Reporting Limits for Parsons Engineering Science

Analyte	RL (ug/L)	Prep Factor	Est. Reporting Limits (mg/Kg)
Aluminum	50	100	5
Antimony	10	100	1
Arsenic	5	100	0.5
Barium	5	100	0.5
Beryllium	5	100	0.5
Cadmium	5	100	0.5
Calcium	50	100	5
Chromium	5	100	0.5
Cobalt	5	100	0.5
Copper	5	100	0.5
Iron	50	100	5
Lead	5	100	0.5
Magnesium	50	100	5
Manganese	5	100	0.5
Mercury	0.2	500	0.1
Nickel	5	100	0.5
Phosphorus	50	100	5
Potassium	250	100	25
Selenium	5	100	0.5
Silicon	100	100	10
Silver	5	100	0.5
Sodium	500	100	50
Strontium	10	100	1
Sulfur	50	100	5
Thallium	10	100	1
Tin	20	100	2
Titanium	10	100	1
Vanadium	5	100	0.5
Zinc	5	100	0.5

Southwest Research Institute – Internal Quality Control and Corrective Action Requirements
VOC Analysis Performed for Parsons Engineering Science

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptable Criteria	Corrective Action
SW-846-8260 Modified	Volatile Organics	BFB Tuning Check	Every 12 hours	See Method.	Re-tune as necessary. Document corrective action.
		Initial Calibration (5-pt)	Prior to initial analysis of samples. As necessary afterwards.	%RSD should be <30% for each CCC compound and each of the SPCC's must meet minimum RRF requirements.	Check system. Document corrective action. Repeat as needed to meet criteria prior to analysis of samples.
		Continuing Calibration Check	Every 12 hours	%D should be <30% for each CCC compound and each of the SPCC's must meet minimum RRF requirements.	Check system. Document corrective action. Repeat calibration check. If still unacceptable, repeat initial calibration and re-analyze any affected samples.
		Method Blank	One per batch (maximum of 20 samples) or 1 per 12 hours, which ever is more frequent.	Detected analytes <PQL	Document corrective action. Re-analyze blank and affected samples.
		LCS	One per batch (maximum of 20 samples).	% Recovery should be 70-130%.	Check system. Document corrective action. Re-analyze LCS.
		MS/MSD	One per batch (maximum of 20 samples).	% Recovery should be 70-130% and RPD <20%.	If LCS meets criteria, no corrective action required. If MS/MSD and LCS outside of criteria, contact client.

Southwest Research Institute – Quality Assurance Objectives
VOC Analysis Performed for Parsons Engineering Science

ANALYTES	Reporting Unit	PQL	MDL	%Rec MS/MSD	RPD MS/MSD
DICHLORODIFLUOROMETHANE	µg/Kg	1	0.5		
CHLOROMETHANE	µg/Kg	1	0.5		
VINYL CHLORIDE	µg/Kg	1	0.5		
BROMOMETHANE	µg/Kg	1	0.5		
CHLOROETHANE	µg/Kg	1	0.5		
TRICHLOROFLUOROMETHANE	µg/Kg	1	0.5		
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	µg/Kg	1	0.5		
METHYLENE CHLORIDE	µg/Kg	1	0.5		
ACETONE	µg/Kg	1	0.5		
METHYL ACETATE	µg/Kg	1	0.5		
METHYL T-BUTYL ETHER	µg/Kg	1	0.5		
CARBON DISULFIDE	µg/Kg	1	0.5		
1,1-DICHLOROETHENE	µg/Kg	1	0.5		
1,1-DICHLOROETHANE	µg/Kg	1	0.5	70-130%	20
TRANS-1,2-DICHLOROETHENE	µg/Kg	1	0.5		
CIS-1,2-DICHLOROETHENE	µg/Kg	1	0.5		
2-BUTANONE	µg/Kg	1	0.5		
CHLOROFORM	µg/Kg	1	0.5		
1,2-DICHLOROETHANE	µg/Kg	1	0.5		
1,1,1-TRICHLOROETHANE	µg/Kg	1	0.5		
CYCLOHEXANE	µg/Kg	1	0.5		
CARBON TETRACHLORIDE	µg/Kg	1	0.5		
BENZENE	µg/Kg	1	0.5	70-130%	20
TRICHLOROETHENE	µg/Kg	1	0.5	70-130%	20
BROMOCHLOROMETHANE	µg/Kg	1	0.5		
1,2-DICHLOROPROPANE	µg/Kg	1	0.5		
CIS-1,3-DICHLOROPROPENE	µg/Kg	1	0.5		
METHYLCYCLOHEXANE	µg/Kg	1	0.5		
DIBROMOCHLOROMETHANE	µg/Kg	1	0.5		

Southwest Research Institute – Quality Assurance Objectives
VOC Analysis Performed for Parsons Engineering Science

ANALYTES	Reporting Unit	PQL	MDL	%Rec MS/MSD	RPD MS/MSD
1,1,2-TRICHLOROETHANE	µg/Kg	1	0.5		
TRANS-1,3-DICHLOROPROPENE	µg/Kg	1	0.5		
4-METHYL-2-PENTANONE	µg/Kg	1	0.5		
2-HEXANONE	µg/Kg	1	0.5		
1,2-DIBROMOETHANE	µg/Kg	1	0.5		
TETRACHLOROETHENE	µg/Kg	1	0.5		
1,1,2,2-TETRACHLOROETHANE	µg/Kg	1	0.5		
TOLUENE	µg/Kg	1	0.5	70-130%	20
CHLOROBENZENE	µg/Kg	1	0.5	70-130%	20
ETHYLBENZENE	µg/Kg	1	0.5		
STYRENE	µg/Kg	1	0.5		
XYLENE (TOTAL)	µg/Kg	1	0.5		
M/P-XYLENE	µg/Kg	1	0.5		
O-XYLENE	µg/Kg	1	0.5		
BROMOFORM	µg/Kg	1	0.5		
ISOPROPYLBENZENE	µg/Kg	1	0.5		
1,3-DICHLOROBENENE	µg/Kg	1	0.5		
1,4-DICHLOROBENZENE	µg/Kg	1	0.5		
1,2-DICHLOROBENZENE	µg/Kg	1	0.5		
1,2-DIBROMO-3-CHLOROPROPANE	µg/Kg	1	0.5		
1,2,4-TRICHLOROBENZENE	µg/Kg	1	0.5		

Southwest Research Institute – Quality Assurance Objectives
VOC Analysis Performed for Parsons Engineering Science

ADDITIONAL TARGET ANALYTES	Reporting Unit	PQL	MDL	%Rec MS/MSD	RPD MS/MSD
CHLOROPICRIN	µg/Kg	25	TBD	N/A	N/A
BENZYL BROMIDE	µg/Kg	5	TBD	N/A	N/A
BENZYL CHLORIDE	µg/Kg	5	TBD	N/A	N/A
ACETONITRILE	µg/Kg	5	TBD	N/A	N/A
ACROLEIN	µg/Kg	5	TBD	N/A	N/A
ALCOHOL	µg/Kg	VOC-TIC	N/A	N/A	N/A
ALLYL ALCOHOL	µg/Kg	VOC-TIC	N/A	N/A	N/A
BENZL FLUORIDE	µg/Kg	VOC-TIC	N/A	N/A	N/A
BENZYL IODIDE	µg/Kg	VOC-TIC	N/A	N/A	N/A
BROMOACETONE	µg/Kg	VOC-TIC	N/A	N/A	N/A
CHLOROACETONE	µg/Kg	VOC-TIC	N/A	N/A	N/A
BROMOBENZENE	µg/Kg	VOC-TIC	N/A	N/A	N/A
BROMOMETHYL ETHER	µg/Kg	VOC-TIC	N/A	N/A	N/A
BUTYL MERCAPTAN	µg/Kg	VOC-TIC	N/A	N/A	N/A
CHLORINATED ACETONE	µg/Kg	VOC-TIC	N/A	N/A	N/A
CHLORINATED CARBON DISULFIDE	µg/Kg	VOC-TIC	N/A	N/A	N/A
CHLOROACETONITRILE	µg/Kg	VOC-TIC	N/A	N/A	N/A
CROTONALDEHYDE	µg/Kg	VOC-TIC	N/A	N/A	N/A
ETHYL BROMOACETATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
ETHYL CHLOROFORMATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
ETHYL DIBROMOACETATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
ETHYL MERCAPTAN	µg/Kg	VOC-TIC	N/A	N/A	N/A
ETHYL SULFIDE	µg/Kg	VOC-TIC	N/A	N/A	N/A
METHYL BROMOACETATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
METHYL CHLOROACETATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
METHYL CHLOROFORMATE	µg/Kg	VOC-TIC	N/A	N/A	N/A

N/A = Not Applicable

TBD = To Be Determined

VOC-TIC = Tentatively Identified Volatile Organic Compound. No Calibration.

Southwest Research Institute – Quality Assurance Objectives
VOC Analysis Performed for Parsons Engineering Science

ANALYTES	Reporting Unit	PQL	MDL	%Rec MS/MSD	RPD MS/MSD
METHYL CHLOROSULFONATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
BENZL FLUORIDE	µg/Kg	VOC-TIC	N/A	N/A	N/A
BENZYL IODIDE	µg/Kg	VOC-TIC	N/A	N/A	N/A
BROMOACETONE	µg/Kg	VOC-TIC	N/A	N/A	N/A
CHLOROACETONE	µg/Kg	VOC-TIC	N/A	N/A	N/A
BROMOBENZENE	µg/Kg	VOC-TIC	N/A	N/A	N/A
BROMOMETHYL ETHER	µg/Kg	VOC-TIC	N/A	N/A	N/A
BUTYL MERCAPTAN	µg/Kg	VOC-TIC	N/A	N/A	N/A
CHLORINATED ACETONE	µg/Kg	VOC-TIC	N/A	N/A	N/A
CHLORINATED CARBON DISULFIDE	µg/Kg	VOC-TIC	N/A	N/A	N/A
CHLOROACETONITRILE	µg/Kg	VOC-TIC	N/A	N/A	N/A
CROTONALDEHYDE	µg/Kg	VOC-TIC	N/A	N/A	N/A
ETHYL BROMOACETATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
ETHYL CHLOROFORMATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
ETHYL DIBROMOACETATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
ETHYL MERCAPTAN	µg/Kg	VOC-TIC	N/A	N/A	N/A
ETHYL SULFIDE	µg/Kg	VOC-TIC	N/A	N/A	N/A
METHYL BROMOACETATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
METHYL CHLOROACETATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
METHYL CHLOROFORMATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
METHYL CHLOROSULFONATE	µg/Kg	VOC-TIC	N/A	N/A	N/A
PERCHLOROMETHYLMERCAPTAN	µg/Kg	VOC-TIC	N/A	N/A	N/A
THIOPHENE	µg/Kg	VOC-TIC	N/A	N/A	N/A
TRICHLOROACETONITRILE	µg/Kg	VOC-TIC	N/A	N/A	N/A

Southwest Research Institute – Internal Quality Control and Corrective Action Requirements
Various Analyses Performed for Parsons Engineering Science

Analysis Parameters	Reporting Unit	Practical Quantitation Limit	Method Detection Limit	Accuracy (%R) Sample MS/MSD where applicable	Precision (%RPD) where applicable
Oxathiane	mg/Kg	200	25	46-131	30
Dithiane	mg/Kg	150	30	54-125	30
Thiodiglycol	mg/Kg	850	170	38-116	30
2,4,6-Trinitrotoluene	mg/Kg	180	90	60 - 115	35

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptable Criteria	Corrective Action
LL03/UL04 LW18/UW22	Oxathiane, Dithiane Thiodiglycol	Field QC, Equipment Blank	One per 20 environmental soil samples	<5%-10% of the decision limit, 510% of the sample concentration, or 2 x MDL.	Check method blank for possible lab problem. Document corrective action. If method blank is unacceptable, reanalyze associated samples. Flag data and discuss in technical narrative.
		Field Duplicate	One per 20 environmental soil samples	RPD <= 50%	Review and discuss in technical narrative. Flag data where appropriate.
		Laboratory QC: Initial Calibration (linear with 5 points)	Prior to analysis of initial project samples and as needed afterwards	Correlation Coefficient > 0.995	Check System, Document corrective action, repeat as needed to meet criteria prior to sample analysis.
		Initial Calibration Verification with second source standard	Prior to analysis of initial project samples and as needed afterwards	Within +/- 15% of expected concentration compared to response from initial calibration	Check System, Document corrective action, repeat as needed to meet criteria prior to sample analysis.

Southwest Research Institute – Internal Quality Control and Corrective Action Requirements
TNT Analysis Performed for Parsons Engineering Science

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptable Criteria	Corrective Action
SW846 - Method 8330 (modified)	2,4,6-Trinitrotoluene	Field QC, Equipment Blank	One per 20 environmental soil samples	<5%-10% of the decision limit, 510% of the sample concentration, or 2 x MDL.	Check method blank for possible lab problem. Document corrective action. If method blank is unacceptable, reanalyze associated samples. Flag data and discuss in technical narrative.
		Field Duplicate	One per 20 environmental soil samples	RPD <= 35%	Review and discuss in technical narrative. Flag data where appropriate.
		Laboratory QC: Initial Calibration (linear with 5 points)	Prior to analysis of initial project samples and as needed afterwards	Correlation Coefficient > 0.995	Check System, Document corrective action, repeat as needed to meet criteria prior to sample analysis.
		Initial Calibration Verification with second source standard	Prior to analysis of initial project samples and as needed afterwards	Within +/- 15% of expected concentration compared to response from initial calibration	Check System, Document corrective action, repeat as needed to meet criteria prior to sample analysis.

Southwest Research Institute – Internal Quality Control and Corrective Action Requirements
SVOC Analysis Performed for Parsons Engineering Science

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptable Criteria	Corrective Action
SW-846-8270C	Semivolatile Organics	DFTPP Tuning Check	Every 12 Hours	See method	Re-tune as necessary. Document corrective action.
		Initial Calibration (5-pt)	Prior to initial analysis of samples. As needed afterwards.	RSD should be < 15% for each compound; however, CCC compounds must be < 30%. Average RF for SPCCs > 0.050.	Check system. Document corrective action. Repeat as needed to meet criteria prior to analysis of samples.
		Continuing Calibration Check	Every 12 Hours	%D should be < 20% for each compound; however, CCC compounds must be < 30%. Average RF for SPCCs > 0.050.	Check system. Document corrective action. Repeat calibration check. If still unacceptable; repeat initial calibration and re-analyze affected samples.
		Method Blank	One per batch (maximum of 20 samples) or 1 per day; whichever is more frequent.	Detected analytes < PQL; Phthalate Esters < 2.5 PQL	Document corrective action. Re-analyze blank and affected samples.
		Surrogate Spikes	Field samples, QC, and blank(s).	For soil matrix:	Check system. Document corrective action. Re-analyze affected samples. If still out; contact client.
				Nitrobenzene-d5 (23-120) Fluorobiphenyl (30-115) Terphenyl-d14 (18-137) Phenol-d6 (24-113) 2- Fluorophenol (25-121) 2,4,6- Tribromophenol (19-122)	
		LCS	One per batch (maximum of 20 samples).	QC limits of 25-150	Check system. Document corrective action. Re-analyze LCS. If still out; contact client.
		MS/MSD	One per batch (maximum of 20 samples).	See QA table provided; acceptable to have two compounds outside QC limits in MS and or MSD.	If LCS meets criteria; no corrective action required. If MS/MSD and LCS outside of criteria, contact client.

Southwest Research Institute – Internal Quality Assurance Objectives
SVOC Analysis Performed for Parsons Engineering Science

Parameter	Reporting Unit	Practical Quantitation Limit	Method Detection Limit	Accuracy (%R) Sample MS/MSD where applicable	Precision (%RPD) where applicable
BIS(2-CHLOROETHYL)ETHER	mg/Kg	200	18.0		
PHENOL	mg/Kg	200	13.7	26-90	35
2-CHLOROPHENOL	mg/Kg	200	16.7	25-102	50
1,3-DICHLOROBENZENE	mg/Kg	200	17.6		
1,4-DICHLOROBENZENE	mg/Kg	200	13.9		
1,2-DICHLOROBENZENE	mg/Kg	200	15.3		
BENZYL ALCOHOL	mg/Kg	200	18.9		
2,2'-OXYBIS(1-CHLOROPROPANE)	mg/Kg	200	15.6		
2-METHYLPHENOL	mg/Kg	200	14.9		
HEXACHLOROETHANE	mg/Kg	200	15.4		
N-NITROSO-DI-N-PROPYLAMINE	mg/Kg	200	15.4	41-126	38
4-METHYLPHENOL	mg/Kg	200	16.3		
NITROBENZENE	mg/Kg	200	19.1		
ISOPHORONE	mg/Kg	200	16.7		
2-NITROPHENOL	mg/Kg	200	19.2		
2,4-DIMETHYLPHENOL	mg/Kg	200	33.5		
BIS(2-CHLOROETHOXY)METHANE	mg/Kg	200	14.1		
2,4-DICHLOROPHENOL	mg/Kg	200	15.7		
1,2,4-TRICHLOROBENZENE	mg/Kg	200	17.0		
NAPHTHALENE	mg/Kg	200	18.6		
BENZOIC ACID	mg/Kg	800	63.1		
4-CHLOROANILINE	mg/Kg	500	46.8		
HEXACHLOROBUTADIENE	mg/Kg	200	17.1		
4-CHLORO-3-METHYLPHENOL	mg/Kg	200	14.9	26-103	33
2-METHYLNAPHTHALENE	mg/Kg	200	19.1		
HEXACHLOROCYCLOPENTADIENE	mg/Kg	200	10.9		
2,4,6-TRICHLOROPHENOL	mg/Kg	200	16.3		
2,4,5-TRICHLOROPHENOL	mg/Kg	500	46.2		
2-CHLORONAPHTHALENE	mg/Kg	200	14.9		
2-NITROANILINE	mg/Kg	500	51.1		
ACENAPHTHYLENE	mg/Kg	200	12.3		
DIMETHYLPHTHALATE	mg/Kg	200	12.3		
2,6-DINITROTOLUENE	mg/Kg	200	11.6		
ACENAPHTHENE	mg/Kg	200	11.2	31-137	19
3-NITROANILINE	mg/Kg	800	93.8		
2,4-DINITROPHENOL	mg/Kg	500	50.9		

Southwest Research Institute – Internal Quality Assurance Objectives
SVOC Analysis Performed for Parsons Engineering Science

Parameter	Reporting Unit	Practical Quantitation Limit	Method Detection Limit	Accuracy (%R) Sample MS/MSD where applicable	Precision (%RPD) where applicable
DIBENZOFURAN	mg/Kg	200	13.8		
2,4-DINITROTOLUENE	mg/Kg	200	13.5	25-89	47
4-NITROPHENOL	mg/Kg	500	40.9	11-114	50
FLUORENE	mg/Kg	200	14.3		
4-CHLOROPHENYL-PHENYLEETHER	mg/Kg	200	13.4		
DIETHYLPHTHALATE	mg/Kg	200	13.4		
4-NITROANILINE	mg/Kg	800	106.6		
4,6-DINITRO-2-METHYLPHENOL	mg/Kg	200	61.7		
N-NITROSODIPHENYLAMINE (1)	mg/Kg	200	17.0		
4-BROMOPHENYL-PHENYLEETHER	mg/Kg	200	16.1		
HEXACHLOROBENZENE	mg/Kg	200	17.4		
PENTACHLOROPHENOL	mg/Kg	800	64.7	17-109	47
PHENANTHRENE	mg/Kg	200	13.5		
ANTHRACENE	mg/Kg	200	13.2		
CARBAZOLE	mg/Kg	200	32.1		
DI-N-BUTYLPHTHALATE	mg/Kg	200	17.7		
FLUORANTHENE	mg/Kg	200	15.1		
PYRENE	mg/Kg	200	14.2	35-142	36
BUTYLBENZYLPHTHALATE	mg/Kg	200	16.3		
3,3'-DICHLOROBENZIDINE	mg/Kg	800	62.0		
BENZO(A)ANTHRACENE	mg/Kg	200	18.1		
CHRYSENE	mg/Kg	200	17.0		
BIS(2-ETHYLHEXYL)PHTHALATE	mg/Kg	200	14.8		
DI-N-OCTYLPHTHALATE	mg/Kg	200	19.0		
BENZO(B)FLUORANTHENE	mg/Kg	200	15.9		
BENZO(K)FLUORANTHENE	mg/Kg	200	19.7		
BENZO(A)PYRENE	mg/Kg	200	14.8		
INDENO(1,2,3-CD)PYRENE	mg/Kg	200	13.6		
DIBENZ(A,H)ANTHRACENE	mg/Kg	200	16.6		
BENZO(G,H,I)PERYLENE	mg/Kg	200	19.1		

Southwest Research Institute – Internal Quality Assurance Objectives
SVOC Analysis Performed for Parsons Engineering Science

Parameter	Reporting Unit	Practical Quantitation Limit	Method Detection Limit	Accuracy (%R) Sample MS/MSD where applicable	Precision (%RPD) where applicable
Additional Compounds Requested					
o-CHLORONITROBENZENE	mg/Kg	TBD	TBD	N/A	N/A
PHENYL ISOCYANATE	mg/Kg	TBD	TBD	N/A	N/A
PHENYL ISOTHIOCYANATE	mg/Kg	TBD	TBD	N/A	N/A
PHENYLHYDRAZINE	mg/Kg	TBD	TBD	N/A	N/A
BENZOTRICHLORIDE	mg/Kg	SVOC – TIC	N/A	N/A	N/A
DIPHNEYLCHLOROARSINE	mg/Kg	SVOC – TIC	N/A	N/A	N/A
o-TOLYL ISOCYANIDE	mg/Kg	SVOC – TIC	N/A	N/A	N/A
PHENYL ISOCYANIDE	mg/Kg	SVOC – TIC	N/A	N/A	N/A
PHENYL DICHLOROARSINE	mg/Kg	SVOC – TIC	N/A	N/A	N/A
PHOSPHORUS, RED	mg/Kg	SVOC – TIC	N/A	N/A	N/A
PHOSPHORUS, WHITE	mg/Kg	SVOC – TIC	N/A	N/A	N/A

TBD = These compounds will be added to the calibration curve; best achievable quantitation limit will be reported.

N/A = Not Applicable

SVOC-TIC = Tentatively Identified Volatile Organic Compound. No Calibration. (See VOC Table)