DRAFT

Part II

Quality Assurance Project Plan Addendum for the Phase I Remedial Investigation of the NACA Test Area at the Ravenna Army Ammunition Plant, Ravenna, Ohio

October 1999

Prepared for

U.S. Army Corps of Engineers
Louisville District
Contract No. DACA62-94-D-0029
Delivery Order No. 0077

Prepared by

Science Applications International Corporation
800 Oak Ridge Turnpike, P.O. Box 2502
Oak Ridge, Tennessee 37831

CONTENTS
PART II – QUALITY ASSURANCE PROJECT PLAN ADDENDUM

CONTENTS (continued)

TABLES

ACRONYMS

CX	Center of Excellence
DQO	data quality objectives
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
GC	gas chromatograph
HTRW	Hazardous, Toxic, and Radioactive Waste
LCS	laboratory control sample
MS	matrix spike
MSD	matrix spike duplicate
NACA	National Advisory Committee on Aeronautics
Ohio EPA	Ohio Environmental Protection Agency
QA	quality assurance
QAMP	Quality Assurance Management Plan (Quanterra)
QAPP	Quality Assurance Project Plan
QC	quality control
QCMRL	quality control method reporting level
RI	Remedial Investigation
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedures
USACE	U.S. Army Corps of Engineers

THIS PAGE INTENTIONALLY LEFT BLANK

INTRODUCTION

This Quality Assurance Project Plan (QAPP) Addendum addresses supplemental project-specific information pertaining to the Phase I Remedial Investigation for the National Advisory Committee on Aeronautics Test Area at the Ravenna Army Ammunition Plant, Ravenna, Ohio. Each QAPP section is presented documenting adherence to the facility-wide QAPP or stipulating additional project-specific requirements.

THIS PAGE INTENTIONALLY LEFT BLANK

1.0 PROJECT DESCRIPTION

1.1 SITE HISTORY/BACKGROUND INFORMATION

This information is contained in Section 1.1 of the Field Sampling Plan (FSP) of this Phase I Remedial Investigation (RI) Sampling and Analysis Plan (SAP) Addendum for the National Advisory Committee on Aeronautics (NACA) Test Area.

1.2 PAST DATA COLLECTION ACTIVITY/CURRENT STATUS

This information is contained in Section 1.2 of the FSP of this Phase I RI SAP Addendum for the NACA Test Area.

1.3 PROJECT OBJECTIVES AND SCOPE

This information is contained in Chapter 3.0 of the FSP of this Phase I RI SAP Addendum for the NACA Test Area.

1.4 SAMPLE NETWORK DESIGN AND RATIONALE

This information is contained in Chapter 4.0 of the FSP of this Phase I RI SAP Addendum for the NACA Test Area.

1.5 PARAMETERS TO BE TESTED AND FREQUENCY

Sample matrix types, analytical parameters, and analytical methods are discussed in Chapter 4.0 of the Phase I RI SAP Addendum. These are summarized in Table 1-1 of this Quality Assurance Project Plan (QAPP) Addendum, in conjunction with anticipated sample numbers, quality assurance (QA) sample frequencies, and field quality control (QC) sample frequencies.

1.6 PROJECT SCHEDULE

The NACA Test Area Phase I RI project schedule is discussed in Chapter 2.0 of the FSP of this Phase I RI SAP Addendum.

Table 1-1. Sampling and Analytical Requirements for the Phase I RI at the NACA Test Area

Parameter	Methods	Field Samples	Field Duplicate Samples	Site Source Water[a]	Sampler Rinsates	Trip Blanks	Total A-E Samples	USACE QA Split Samples	USACE Trip Blanks
Soils									
Volatile Organics, TCL	SW-846, 5030/8260B	120	12	-	-	-	132	12	-
Semivolatile Organics, TCL	SW-846, 8270C	120	12	-	-	-	132	12	-
PCBs, TCL	SW-846, 8082	14	2	-	-	-	16	2	-
Explosives	SW-846, 8330	13	2	-	-	-	15	2	-
Propellants	SW-846, 8330Mod/353.2	13	2	-	-	-	15	2	-
Metals, TAL	SW-846, 6010B/7471A	120	12	-	-	-	132	12	-
Cyanide	SW-846, 9012A	120	12	-	-	-	132	12	-
Grain Size	ASTM D422-63	7	-	-	-	-	7	-	-
Moisture Content	ASTM D2216	7	-	-	-	-	7	-	-
Atterberg Limits	ASTM D4318	7	-	-	-	-	7	-	-
Unified Soil Classification		7	-	-	-	-	7	-	-
Sediments									
Volatile Organics, TCL	SW-846, 5030/8260B	6	1	-	-	-	7	1	-
Semivolatile Organics, TCL	SW-846, 8270C	6	1	-	-	-	7	1	-
PCBs	SW-846, 8082	6	1	-	-	-	7	1	-
Explosives	SW-846, 8330	6	1	-	-	-	7	1	-
Propellants	SW-846, 8330Mod/353.2	6	1	-	-	-	7	1	-
Metals, TAL	SW-846, 6010B/7471A	6	1	-	-	-	7	1	-
Cyanide	SW-846, 9012A	6	1	-	-	-	7	1	-
Total Organic Carbon	Walkley/Black Method	6	-	-	-	-	6	-	-
Grain Size	ASTM D422-63	6	-	-	-	-	6	-	-

Table 1-1 (continued)

Parameter	Methods	Field Samples	Field Duplicate Samples	Site Source Water[a]	Sampler Rinsates	Trip Blanks	Total A-E Samples	USACE QA Split Samples	USACE Trip Blanks
Surface Waters and Groundwater									
Volatile Organics, TCL	SW-846, 8260B	7	1	1	-	1	10	1	1
Semivolatile Organics, TCL	SW-846, 8270C	7	1	1	-	-	9	1	-
PCBs, TCL	SW-846, 8082	6	1	1	-	-	8	1	-
Explosives	SW-846, 8330	7	1	1	-	-	9	1	-
Propellants	SW-846, 8330Mod/353.2	7	1	1	-	-	9	1	-
Metals (total), TAL	SW-846, 6010A/7470A	7	1	1	-	-	9	1	-
Cyanide	SW-846, 9012A	7	1	1	-	-	9	1	-

[a]Source waters = One potable water source and one ASTM water supply lot for the project.

A-E = Architect Engineer
ASTM = American Society for Testing and Materials
PCB = Polychlorinated biphenyl
TAL = Target Analyte List
TCL = Target Compound List
USACE = U.S. Army Corps of Engineers

THIS PAGE INTENTIONALLY LEFT BLANK

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The functional project organization and responsibilities are described in Chapter 2.0 of the FSP of this NACA Test Area Phase I RI SAP Addendum.

Analytical support for this work has been assigned to Quanterra Environmental Services, Inc., and Catlin Engineering, Inc. The majority of analyses will be completed by Quanterra's North Canton, Ohio, facility, with explosive determinations being performed by the Knoxville, Tennessee, facility and nitrocellulose/nitroguanidine analyses being performed by the Sacramento, California, facility. These laboratories have been validated by the U.S. Army Corp of Engineers (USACE) Hazardous, Toxic, and Radioactive Waste (HTRW) Center of Excellence (CX), Omaha, Nebraska. Quanterra Environmental Services' Quality Assurance Management Plan (QAMP) Revision 3, November 1998 is available for review upon request. The laboratory's organizational structure, roles, and responsibilities are identified in Section 1 of its QAMP and facility-specific appendices. Catlin Engineering will perform all soil and sediment geotechnical determinations.

Analytical Facilities

Quanterra Environmental Services, Inc. – general analytical services:

North Canton, OH
4101 Shuffel Drive, N.W.
North Canton, OH 44720
Tel: (330) 497-9396
Fax: (330) 497-0772

Quanterra Environmental Services, Inc. – explosives analyses:

Knoxville, TN
5815 Middlebrook Pike
Knoxville, TN 37921
Tel: (423) 588-6401
Fax: (423) 584-4315

Quanterra Environmental Services, Inc. – nitrocellulose/nitroquanidine analyses:

Sacramento, CA
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916) 373-5600
Fax: (916) 372-1059

Catlin Engineering, Inc. – soil and sediment geotechnical analyses:

Mt. Pleasant, SC
1051 Johnnie Dodds Blvd
Suite C
Mt. Pleasant, SC 29464
Tel: (803) 881-6000
Fax: (803) 881-2619

THIS PAGE INTENTIONALLY LEFT BLANK

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT

3.1 DATA QUALITY OBJECTIVES

Data quality objective (DQO) summaries for this investigation will follow Tables 3-1 and 3-2, in the facility-wide QAPP (USACE 1996). All QC parameters stated in the specific SW-846 methods will be adhered to for each chemical listed. SW-846 method references found in the facility-wide QAPP have been revised to the Update III Methods (i.e., 8260A is now 8260B, 8270B is now 8270C, etc.), and project quantitation levels have been updated (see Tables 1-1 and 3-1 of this addendum). Laboratories are required to comply with all methods as written; recommendations are considered requirements.

3.2 LEVEL OF QUALITY CONTROL EFFORT

QC efforts will be in accordance with Section 3.2 of the facility-wide QAPP. Field QC measurements will include field source water blanks, trip blanks, field duplicates, and equipment rinsate blanks. Laboratory QC measurements will include method blanks, laboratory control samples, laboratory duplicates, and matrix spike (MS)/matrix spike duplicate (MSD) samples.

3.3 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSIS

Accuracy, precision, and sensitivity goals identified in the facility-wide QAPP Section 3.3 and Tables 3-1 through 3-3 will be imposed for these investigations.

3.4 COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

Completeness, representativeness, and comparability goals identified in the facility-wide QAPP Section 3.4 (Tables 3-1 and 3-2) will be imposed for these investigations.

Table 3-1. Analytical Methods, Parameters, and Project Quantitation Limits for the NACA Test Area Phase I RI

Parameters	Analytical Methods		Project Quantitation Levels[a,b]	
	Water	Soil/Sediment	Water	Soil/Sediment
Volatile Organic Compounds	SW 846-5030/8260B[c]	SW 846-5035/8260B[c]	(μg/L)	(μg/kg)[d]
Chloromethane			10	10
Bromomethane			10	10
Bromochloromethane			5	5
Vinyl chloride			10	10
Chloroethane			10	10
Methylene chloride			5	5
Acetone			10	10
Carbon disulfide			5	5
1,2-Dibromoethane			5	5
1,1-Dichloroethene			5	5
1,1-Dichloroethane			5	5
1,2-Dichloroethene (total)			5	5
Chloroform			5	5
1,2-Dichloroethane			5	5
2-Butanone			10	10
1,1,1-Trichloroethane			5	5
Carbon tetrachloride			5	5
Bromodichloromethane			5	5
1,2-Dichloropropane			5	5
1,3-*cis*-Dichloropropene			5	5
Trichloroethene			5	5
Dibromochloromethane			5	5
1,1,2-Trichloroethane			5	5
Benzene			5	5
1,3-*trans*-Dichloropropene			5	5
Tribromomethane			5	5
4-Methyl-2-pentanone			10	10

Table 3-1 (continued)

Parameters	Analytical Methods		Project Quantitation Levels[a,b]	
	Water	**Soil/Sediment**	**Water**	**Soil/Sediment**
2-Hexanone			10	10
Tetrachloroethene			5	5
Toluene			5	5
1,1,2,2-Tetrachloroethane			5	5
Chlorobenzene			5	5
Ethylbenzene			5	5
Styrene			5	5
Xylenes (total)			5	5
Semivolatile Organic Compounds	SW 846-3520/8270C[c]	SW 846-3550/8270C[c]	(µg/L)	(µg/kg)[d]
Phenol			10	330
bis(2-Chloroethyl) ether			10	330
2-Chlorophenol			10	330
1,3-Dichlorobenzene			10	330
1,4-Dichlorobenzene			10	330
1,2-Dichlorobenzene			10	330
2-Methylphenol			10	330
2,2'- Oxybis (1-chloropropane)			10	330
4-Methylphenol			10	330
N-nitroso-di-n-dipropylamine			10	330
Hexachloroethane			10	330
Nitrobenzene			10	330
Isophorone			10	330
2-Nitrophenol			10	330
2,4-Dimethylphenol			10	330
bis(2-Chloroethoxy) methane			10	330
2,4-Dichlorophenol			10	330
1,2,4-Trichlorobenzene			10	330
Naphthalene			10	330

Table 3-1 (continued)

Parameters	Analytical Methods		Project Quantitation Levels[a,b]	
	Water	Soil/Sediment	Water	Soil/Sediment
4-Chloroaniline			10	330
Hexachlorobutadiene			10	330
4-Chloro-3-methylphenol			10	330
2-Methylnaphthalene			10	330
Hexachlorocyclopentadiene			10	330
2,4,6-Trichlorophenol			10	330
2,4,5-Trichlorophenol			25	800
2-Chloronaphthalene			10	330
2-Nitroaniline			25	800
Dimethylphthalate			10	330
Acenaphthylene			10	330
2,6-Dinitrotoluene			10	330
3-Nitroaniline			25	800
Acenaphthene			10	330
2,4-Dinitrophenol			25	800
4-Nitrophenol			25	800
Dibenzofuran			10	330
2,4-Dinitrotoluene			10	330
Diethylphthalate			10	330
4-Chlorophenyl-phenyl ether			10	330
Fluorene			10	330
4-Nitroaniline			25	800
4,6-Dinitro-2-methylphenol			25	800
N-nitrosodiphenylamine			10	330
4-Bromophenyl-phenylether			10	330
Hexachlorobenzene			10	330
Pentachlorophenol			25	800
Phenanthrene			10	330
Anthracene			10	330

Table 3-1 (continued)

Parameters	Analytical Methods		Project Quantitation Levels[a,b]	
	Water	Soil/Sediment	Water	Soil/Sediment
Carbazole			10	330
di-N-butylphthalate			10	330
Fluoranthene			10	330
Pyrene			10	330
Butylbenzylphthalate			10	330
3,3'-Dichlorobenzidine			10	330
Benzo(*a*)anthracene			10	330
Chrysene			10	330
bis(2-Ethylhexyl)phthalate			10	330
di-N-octylphthalate			10	330
Benzo(*b*)fluoranthene			10	330
Benzo(*k*)fluoranthene			10	330
Benzo(*a*)pyrene			10	330
Indeno(*1,2,3-cd*)pyrene			10	330
Dibenzo(*a,h*)anthracene			10	330
Benzo(*g,h,i*)perylene			10	330
Polychlorinated Biphenyls	SW846-3520/8082[c]	SW846-3550/8082[c]	(μg/L)	(μg/kg)[d]
Arochlor-1016			1.0	33
Arochlor-1221			2.0	67
Arochlor-1232			1.0	33
Arochlor-1242			1.0	33
Arochlor-1248			1.0	33
Arochlor-1254			1.0	33
Arochlor-1260			1.0	33
Explosive Compounds	SW 846-8330[c]	SW 846-8330[c]	(μg/L)	(μg/kg)[d]
HMX [Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine]			20	2
RDX (cyclonite) [Hexahydro-1,3,5-trinitro-1,3,5-triazine]			20	2

Table 3-1 (continued)

Parameters	Analytical Methods		Project Quantitation Levels[a,b]	
	Water	Soil/Sediment	Water	Soil/Sediment
1,3,5-Trinitrobenzene			2[e]	1
1,3-Dinitrobenzene			3[e]	1
Tetryl			50	5
Nitrobenzene			10	1
2,4,6-Trinitrotoluene			3[e]	1
2,4-Dinitrotoluene			0.13[e]	1
2,6-Dinitrotoluene			0.13[e]	1
o-Nitrotoluene			10	1
m-Nitrotoluene			10	1
p-Nitrotoluene			10	1
Propellant Compounds			(µg/L)	(µg/kg)[d]
Nitroglycerin	SW 846-8330 Modified	SW 846-8330 Modified	10	2.5
Nitroquanidine			10	1
Nitrocellulose	EPA 353.2 Modified	EPA 353.2 Modified	10	1
Metals (Target Analyte List)	SW 846-3010A/6010B, 6020, or 7000 series[c]	SW 846-3050A/6010B, 6020, or 7000 series[c]	(µg/L)	(mg/kg)[d,f]
Aluminum			200	20
Antimony			1	0.5
Arsenic			5	0.5
Barium			200	20
Beryllium			4	0.5
Cadmium			1	0.5
Calcium			5,000	500
Chromium			10	1
Cobalt			50	15
Copper			25	2.5
Iron			100	10

Table 3-1 (continued)

Parameters	Analytical Methods		Project Quantitation Levels[a,b]	
	Water	Soil/Sediment	Water	Soil/Sediment
Lead			3	0.3
Magnesium			5,000	500
Manganese			15	1.5
Mercury (CVAA)	SW 846-7470A	SW 846-7471A	0.2	0.1
Nickel			40	4
Potassium			5,000	500
Selenium			5	0.5
Silver			10	1
Sodium			5,000	500
Thallium			2	0.5
Vanadium			50	5
Zinc			20	2
Cyanide	SW846-9012	SW846-9012	10	0.5

[a] These are expected quantitation limits based on reagent-grade water or a purified solid matrix. Actual quantitation limits may be higher depending upon the nature of the sample matrix. The limit reported on final laboratory reports will take into account the actual sample volume or weight, percent solids (where applicable), and the dilution factor, if any. The quantitation limits for additional analytes to this list may vary, depending upon the results of laboratory studies.

[b] Values determined between the laboratory method detection levels and the project quantitation levels will be reported as estimated "J".

[c] *Test Methods for Evaluating Solid Waste*, U.S. EPA, SW-846, third edition.

[d] Soils and sediment analysis will be reported on a dry weight basis.

[e] Modification of the SW-846 preparation and analysis procedures may be required to achieve these quantitation levels.

[f] Estimated detection limits for metals in soil are based on a 2-gram sa mple diluted to 200 milliliters.

THIS PAGE INTENTIONALLY LEFT BLANK

4.0 SAMPLING PROCEDURES

Sampling procedures are discussed in the facility-wide FSP and the SAP Addendum for the Phase I RI at the NACA Test Area.

Tables 4-1 and 4-2 summarize sample container, preservation, and holding time requirements for soil, sediment, and water matrices for these investigations. The number of containers required is estimated in these tables.

Table 4-1. Container Requirements for Soil and Sediment Samples for the NACA Test Area Phase I RI

Analyte Group	Approx. No. of Bottles, incl. Field QC	Container	Minimum Sample Size	Preservative	Holding Time
Volatile Organic Compounds	152	One 2-ounce glass jar with Teflon®-lined cap (no headspace)	20 grams	Cool, 4°C	14 days
Semivolatile Organic Compounds	152	One 4-ounce glass jar with Teflon®-lined cap	100 grams	Cool, 4°C	14 days (extraction) 40 days (analysis)
Polychlorinated Biphenyl Compounds	26	One 4-ounce glass jar with Teflon®-lined cap	100 grams	Cool, 4°C	14 days (extraction) 40 days (analysis)
Explosive Compounds	25	One 4-ounce glass jar with Teflon®-lined cap	100 grams	Cool, 4°C	14 days (extraction) 40 days (analysis)
Propellant Compounds	25	One 4-ounce glass jar with Teflon®-lined cap	100 grams	Cool, 4°C	14 days (extraction) 40 days (analysis)
Metals	152	One 4-ounce widemouth polybottle	50 grams	Cool, 4°C	180 days
Cyanide	–	Use same container as metals	25 grams	Cool, 4°C	14 days
Total Organic Carbon	6	One 4-ounce glass jar with Teflon®-lined cap	10 grams	Cool, 4°C	28 days
Grain Size	6	One 8-ounce widemouth container	100 grams	None	None

Table 4-2. Container Requirements for Water Samples for the NACA Test Area Phase I RI[a]

Analyte Group	Approx. No. of Bottles, incl. Field QC	Container	Minimum Sample Size	Preservative	Holding Time
Volatile Organic Compounds	36	Three 40 milliliter glass vials with Teflon®-lined septum (no headspace)	80 milliliters	HCl to pH <2 Cool, 4°C	14 days
Semivolatile Organic Compounds	20	Two 1-liter amber glass bottles with Teflon®-lined lid	1,000 milliliters	Cool, 4°C	7 days (extraction) 40 days (analysis)
Polychlorinated Biphenyl Compounds	18	Two 1-liter amber glass bottles with Teflon®-lined lid	1,000 milliliters	Cool, 4°C	7 days (extraction) 40 days (analysis)
Explosive Compounds	20	Two 1-liter amber glass bottles with Teflon®-lined lid	1,000 milliliters	Cool, 4°C	7 days (extraction) 40 days (analysis)
Propellant Compounds	20	Two 1-liter amber glass bottles with Teflon®-lined lid	1,000 milliliters	Cool, 4°C	7 days (extraction) 40 days (analysis)
Metals (total)	10	One 1-liter polybottle	500 milliliters	HNO_3 to pH <2 Cool, 4°C	180 days
Cyanide	10	One 1-liter polybottle	500 milliliters	NaOH to pH >12 Cool, 4°C	14 days

[a] Additional sample volume will be collected for one sample in order for the laboratory to perform appropriate laboratory QC analysis.

THIS PAGE INTENTIONALLY LEFT BLANK

5.0 SAMPLE CUSTODY

5.1 FIELD CHAIN-OF-CUSTODY PROCEDURES

Sample handling, packaging, and shipment procedures will follow those identified in Section 5.1 of the facility-wide QAPP.

5.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

Laboratory chain of custody will follow handling and custody procedures identified in Section 8.5.3 of the Quanterra QAMP.

5.3 FINAL EVIDENCE FILES CUSTODY PROCEDURES

Custody-of-evidence files will follow the criteria defined in Section 5.3 of the facility-wide QAPP.

THIS PAGE INTENTIONALLY LEFT BLANK

6.0 CALIBRATION PROCEDURES AND FREQUENCY

6.1 FIELD INSTRUMENTS/EQUIPMENT

Field instruments and equipment calibrations will follow those identified in Section 6.1 of the facility-wide QAPP.

6.2 LABORATORY INSTRUMENTS

Calibration of laboratory equipment will follow the procedures identified in Section 8.5.4 of the Quanterra QAMP, corporate, and facility-specific operating procedures.

As directed by the Louisville USACE, the laboratories will institute analysis of a quality control method reporting level (QCMRL) standard during initial and continuing calibration verification. This low-level check standard will supplement information provided by the routine mid-level calibration verification check standard. Analytical method controls will be based on the mid-level calibration verification check standard, while the QCMRL standard will assist the project in assessing precision and accuracy near the method detection level.

Also as directed by the Louisville USACE, the laboratories will include all target compound list analytes in laboratory control sample (LCS) and MS analysis. Laboratories will implement analytical method corrective actions based on QC limits established for the SW-846 LCS and MS subset of these analytes. All LCS and MS results will be reported with the analytical data set.

THIS PAGE INTENTIONALLY LEFT BLANK

7.0 ANALYTICAL PROCEDURES

7.1 LABORATORY ANALYSIS

Analytical methods, parameters, and quantitation or detection limits are those listed in Table 3-3 of the facility-wide QAPP.

Quanterra's QAMP Section 8.0 and the facility-specific addenda for the North Canton, Knoxville, and Sacramento facilities will be followed during the analysis of these samples. The following laboratory Standard Operating Procedures (SOPs) will implement the defined U.S. Environmental Protection Agency (EPA) Methods.

- Gas Chromotograph/MS Volatile Organics Analysis, Based on Methods 8240B and 8260B, SW846, CORP-MS-0002, Rev. 2, 12/15/97.
- GC/MS Semivolatile Analysis, Based on Methods 8270C, SW846, CORP-MS-0001, Rev. 2, 12/15/97.
- GC Analysis Based on Method 8000A, 8010B, 8020A, 8021A, 8080A, 8081, 8082, 8150B, and 8051, SW846, CORP-GC-0001, Rev. 5.1, 3/30/99.
- Extraction and Cleanup of Organic Compounds from Waters and Soils, Based on SW846 3500 Series, 3600 Series, 8150, 8151, and 600 Series Methods, CORP-OP-0001, Rev. 3.4, 4/15/99.
- Total Organic Carbon and Total Inorganic Carbon, NC-WC-0017, Rev. 2, 2/15/99.
- Inductively Coupled Plasma–Atomic Emission Spectroscopy, Spectrometric Method for Trace Element Analysis, Methods 6010B and 200.7, CORP-MT-0001, Rev. 2, 12/15/97.
- Graphite Furnace Atomic Absorption Spectroscopy, SW846 Methods 7000A and MCAWW 200 series methods, CORP-MT-0003, Rev. 1, 08/22/95.
- Mercury in Aqueous Samples by Cold Vapor Atomic Absorption, SW846 7470A and MCAWW 245.1, CORP-MT-0005NC, Rev. 1.1, 04/19/97.
- Mercury in Solid Samples by Cold Vapor Atomic Absorption, SW846 7471A and MCAWW 245.5, CORP-MT-0007NC, Rev. 1.1, 04/17/97.
- Analysis of Nitroaromatic and Nitramine Explosives by High-performance Liquid Chromatography, KNOX-LC-0001, Rev. 1, 04/28/97.
- Preparation and Analysis of Nitrocellulose in Aqueous, Soil, and Sediments by Colorimetric Autoanalyzer, SAC-WC-0050, Rev. 0.0.
- Determination of Nitroaromatics, Nitramines, and Specialty Explosives in Water and Soil by High-performance Liquid Chromatography/Ultraviolet Detector (HPLC/UV) and Liquid Chromatography/ Thermospray/Mass Spectrometry (LC/TSP/MS), SAC-LC-0001, Rev. 5.0.

Quanterra facilities will at all times maintain a safe and contaminant-free environment for the analysis of samples. The laboratories will demonstrate through instrument blanks, holding blanks, and analytical method blanks that the laboratory environment and procedures will not and do not impact analytical results.

Quanterra facilities will also implement all reasonable procedures to maintain project reporting levels for all sample analyses. Where contaminant and sample matrix analytical interferences impact the laboratory's ability to obtain project reporting levels, the laboratory will institute sample cleanup processes, minimize dilutions, adjust instrument operational parameters, or propose alternative analytical methods or procedures. Elevated reporting levels will be kept to a minimum throughout the execution of this work.

7.2 FIELD SCREENING ANALYTICAL PROTOCOLS

Procedures for field analysis are identified in Chapter 6.0 of the facility-wide SAP (USACE 1996) and in Chapter 4.0 of the FSP of this Phase I RI SAP Addendum for the NACA Test Area. Only screening of samples for organic vapors using an photoionization detector will be conducted. Headspace analysis will not be conducted.

8.0 INTERNAL QUALITY CONTROL CHECKS

8.1 FIELD SAMPLE COLLECTION

Field QC sample types, numbers, and frequencies are identified in Chapter 4.0 of the FSP of this Phase I RI SAP Addendum. In general, field duplicates will be collected at a frequency of 10 percent. Field equipment rinsates will be collected at a frequency of 5 percent for water samples collected with nondedicated equipment, and volatile organic trip blanks will accompany all shipments containing volatile organic water samples. One source water blank is planned; this sample is accounted for under the surface water sampling summary in Table 1-1.

8.2 FIELD MEASUREMENT

Refer to Chapter 4.0 of the FSP of this Phase I RI SAP Addendum for the NACA Test Area for details regarding these measurements.

8.3 LABORATORY ANALYSIS

Analytical QC procedures will follow those identified in the referenced EPA methodologies. These will include method blanks, LCSs, MS, MSD, laboratory duplicate analysis, calibration standards, internal standards, surrogate standards, and calibration check standards.

As directed by the Louisville USACE, the laboratories will institute analysis of QCMRL standard during initial and continuing calibration verification. This low-level check standard will supplement information provided by the routine mid-level calibration verification check standard. Analytical method controls will be based on the mid-level calibration verification check standard, while the QCMRL standard will assist the project in assessing precision and accuracy near the method detection level.

Also as directed by the Louisville USACE, the laboratories will include all target compound list analytes in LCS and MS analysis. Laboratories will implement analytical method corrective actions based on QC limits established for the SW-846 LCS and MS subset of these analytes. All LCS and MS results will be reported with the analytical data set.

Quanterra facilities will conform to their QAMP and facility-specific appendices and will implement their established SOPs to perform the various analytical methods required by the project. QC frequencies will follow those identified in Section 8.3 of the facility-wide QAPP.

THIS PAGE INTENTIONALLY LEFT BLANK

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

9.1 DATA REDUCTION

Sample collection and field measurements will follow the established protocols defined in the facility-wide QAPP, facility-wide FSP, and this NACA Test Area Phase I RI SAP Addendum. Laboratory data reduction will follow Quanterra's QAMP Section 8.6 guidance and conform to general direction provided by the facility-wide QAPP.

9.2 DATA VALIDATION

Data validation will follow the direction provided in the facility-wide QAPP.

9.3 DATA REPORTING

Analytical data reports will follow the direction provided in the facility-wide QAPP.

THIS PAGE INTENTIONALLY LEFT BLANK

10.0 PERFORMANCE AND SYSTEM AUDITS

10.1 FIELD AUDITS

A minimum of one field surveillance for each medium being sampled during the investigation will be performed by the Science Applications International Corporation (SAIC) QA Officer and/or the SAIC Field Team Leader. These audits will encompass the sampling of surface soils, subsurface soils, well installation, and well sampling. Surveillances will follow SAIC QAPP No. 18.3.

USACE, EPA Region V, or Ohio Environmental Protection Agency (Ohio EPA) audits may be conducted at the discretion of the respective agency.

10.2 LABORATORY AUDITS

Routine HTRW CX on-site laboratory audits will be conducted by USACE, EPA Region V, or Ohio EPA. Audits may be conducted at the discretion of the respective agency.

Internal performance and systems audits will be conducted by Quanterra's QA staff as defined in the laboratory QAMP, Section 9.2.

THIS PAGE INTENTIONALLY LEFT BLANK

11.0 PREVENTIVE MAINTENANCE PROCEDURES

11.1 FIELD INSTRUMENTS AND EQUIPMENT

Maintenance of all field analytical and sampling equipment will follow directions provided in Section 11.1 of the facility-wide QAPP.

11.2 LABORATORY INSTRUMENTS

Routine and preventive maintenance for all laboratory instruments and equipment will follow the direction of Section 8.11 of Quanterra's QAMP.

THIS PAGE INTENTIONALLY LEFT BLANK

12.0 SPECIFIC ROUTINE PROCEDURES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

12.1 FIELD MEASUREMENTS DATA

Field data will be assessed as outlined in Section 12.1 of the facility-wide QAPP.

12.2 LABORATORY DATA

Laboratory data will be assessed as outlined in Section 12.2 of the facility-wide QAPP.

THIS PAGE INTENTIONALLY LEFT BLANK

13.0 CORRECTIVE ACTIONS

13.1 SAMPLE COLLECTION/FIELD MEASUREMENTS

Field activity corrective action protocol will follow directions provided in Section 13.1 of the facility-wide QAPP.

13.2 LABORATORY ANALYSES

Laboratory activity corrective action protocol will follow directions provided in Section 13.2 of the facility-wide QAPP and Section 9.1 of Quanterra's QAMP.

THIS PAGE INTENTIONALLY LEFT BLANK

14.0 QA REPORTS TO MANAGEMENT

Procedures and reports will follow the protocol identified in Section 14.0 of the facility-wide QAPP and those directed by Section 9.4 of Quanterra's QAMP.

THIS PAGE INTENTIONALLY LEFT BLANK

15.0 REFERENCES

USACE 1996. *Facility-wide Sampling and Analysis Plan for the Ravenna Army Ammunition Plant, Ravenna, Ohio*.

Additional references to the facility-wide QAPP are:

Quanterra Environmental Services, Inc., 1998. *Quality Assurance Management Plan* , Rev. 3, November 2, 1998.

GC/MS Volatile Organics Analysis, Based on Methods 8240B and 8260B, SW846, CORP-MS-0002, Rev. 2, 12/15/97.

GC/MS Semivolatile Analysis, Based on Methods 8270C, SW846, CORP-MS-0001, Rev. 2, 12/15/97.

Gas Chromatographic Analysis, Based on Method 8000A, 8010B, 8020A, 8021A, 8080A, 8081, 8082, 8150B, and 8051, SW846, CORP-GC-0001, Rev. 5.1, 3/30/99.

Extraction and Cleanup of Organic Compounds from Waters and Soils, Based on SW846 3500 Series, 3600 Series, 8150, 8151, and 600 Series Methods, CORP-OP-0001, Rev. 3.4, 4/15/99.

Total Organic Carbon and Total Inorganic Carbon, NC-WC-0017, Rev. 2, 2/15/99.

Inductively Coupled Plasma–Atomic Emission Spectroscopy, Spectrometric Method for Trace Element Analysis, Methods 6010B and 200.7, CORP-MT-0001, Rev. 2, 12/15/97.

Graphite Furnace Atomic Absorption Spectroscopy, SW846 Methods 7000A and MCAWW 200 series methods, CORP-MT-0003, Rev. 1, 08/22/95.

Mercury in Aqueous Samples by Cold Vapor Atomic Absorption, SW846 7470A and MCAWW 245.1, CORP-MT-0005NC, Rev. 1.1, 04/19/97.

Mercury in Solid Samples by Cold Vapor Atomic Absorption, SW846 7471A and MCAWW 245.5, CORP-MT-0007NC, Rev. 1.1, 04/17/97.

Analysis of Nitroaromatic and Nitramine Explosives by High-performance Liquid Chromatography, KNOX-LC-0001, Rev. 1, 04/28/97.

Preparation and Analysis of Nitrocellulose in Aqueous, Soil, and Sediments by Colorimetric Autoanalyzer, SAC-WC-0050, Rev. 0.0.

Determination of Nitroaromatics, Nitramines, and Specialty Explosives in Water and Soil by High-performance Liquid Chromatography/Ultraviolet Detector (HPLC/UV) and Liquid Chromatography/ Thermospray/Mass Spectrometry (LC/TSP/MS), SAC-LC-0001, Rev. 5.0.

THIS PAGE INTENTIONALLY LEFT BLANK