**ARMY Draft**

**UFP-QAPP**

**RCRA Facility INVESTIGATION - PARCEL 3 SWMUs (SWMUs 14, 15, 33 and 74) and AOCs**

**(AOCs 89, 90, 91, and 92)**

**Fort Wingate Depot Activity**

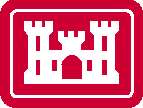
**McKinley County, New Mexico**

**October 23, 2015**

**Contract No. W912DY-10-D-0025**

**Task Order No. DS02  
Modification No. 1**

***Prepared for:***



**United States Army Corps of Engineers**

**CESWF-PEC-TM**

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A Field SOPs

B Laboratory Quality Assurance Management Plans, SOPs and Certifications

**Acronyms and Abbreviations**

AOC area of concern

bgs below ground surface

BRAC Base Realignment and Closure

CA corrective action

CCV continuing calibration verification

CESWF United States Corps of Engineers, Fort Worth District

CESWT United States Corps of Engineers, Tulsa District

COC chain of custody

COPC constituent of potential concern

COR Contracting Officers Representative

CVAA cold vapor atomic absorption

DL Detection Limit

DoD Department of Defense

DQI data quality indicator

DQO data quality objective

EB equipment blank

EDD electronic data deliverable

ELAP Environmental Laboratory Accreditation Program

FB field blank

ft feet/foot

FTR Functional Test Range

FWDA Fort Wingate Depot Activity

GC/MC Gas chromatography / Mass spectroscopy

GPS Global Positioning System

HI Hazard Index

HMX High Melting Point Explosive/octahydro-1,3,5,7-tetranitro-1,3,5,7 tetrazocine

HPLC high performance liquid chromatography

IAW in accordance with

ICAL initial calibration

ICP-AES inductively coupled plasma – atomic emission spectrometry

ICP-OES inductively coupled plasma – optical emission spectrometry

ICS interference check sample

ICV initial calibration verification

ID identification

ISM incremental sampling methodology

JV PIKA-Pirnie Joint Venture, LLC

KOA Kickout Area

LCS laboratory control sample

LOD limit of detection

LOQ limit of quantitation

MB method blank

MC munitions constituents

MEC munitions and explosives of concern

mg/kg milligram per kilogram

MPPEH Material Potentially Presenting an Explosive Hazard

MS matrix spike

MSD matrix spike duplicate

NA Not Applicable/Available

NMED New Mexico Environment Department

OB/OD open burn /open detonation

OE ordnance and explosives

PE Professional Engineer

PIKA PIKA International, Inc.

PM Project Manager

PMP Project Management Professional

QA quality assurance

QAPP Quality Assurance Project Plan

QA/QC quality assurance/quality control

QC quality control

QSM Quality Systems Manual

RCRA Resource Conservation and Recovery Act

RDX Royal or Research Department Explosive/hexahydro-1,3,5-trinitro-1,3,5-triazine, cyclonite

RFI Resource Conservation and Recovery Act Facility Investigation

RPD relative percent difference

RSD relative standard deviation

RSL Regional Screening Level

SOP standard operating procedure

SSL Soil Screening Level

SVOC semi-volatile organic compound

SWMU solid waste management unit

TBD to be determined

the Army United States Army

UFP-QAPP Uniform Federal Policy for Quality Assurance Project Plans

U.S. United States

USACE United States Army Corps of Engineers

USEPA United States Environmental Protection Agency

WMM Waste Military Munitions

% percent

%R percent recovery

## Introduction

This Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP) addresses constituents of potential concern (COPCs) associated with Resource Conservation and Recovery Act (RCRA) Facility Investigation of Solid Waste Management Units (SWMUs) 14, 15, 33, and 74, and Areas of Concern (AOCs) 89, 90, 91, and 92, within Parcel 3, Fort Wingate Depot Activity, McKinley County, New Mexico. The purpose of this UFP-QAPP is to document the planning processes for collecting analytical data, describe the implementation of the field activities, and describe the quality assurance (QA) and quality control (QC) activities developed for this project. The objectives of this UFP-QAPP are to generate data that are technically valid, legally defensible, and are useful in meeting the project goals, as well as to integrate the technical and QC requirements for future remedial alternative development activities. This UFP-QAPP addresses four primary elements:

* Project Management
* Measurement and Data Acquisition
* Assessment and Oversight
* Data Validation and Usability

The UFP-QAPP workbook format used herein implements the systematic planning process for environmental sampling and was developed via collaboration between the United States Environmental Protection Agency (USEPA), Department of Defense (DoD), and the Department of Energy. In 2010, a subgroup comprised of members from the participating agencies was established to review and optimize the UFP-QAPP workbook in close coordination with USEPA’s update of QA/G-5, *Guidance for Quality Assurance Project Plans* (CIO 2106-G-05 QAPP. Draft January 2012). The optimized workbook format is used for this UFP-QAPP. The information contained in the worksheets captures the elements that would be otherwise included in related project-planning documents, such as a Sampling and Analysis Plan and a Field Sampling Plan. Table 1 is a crosswalk between the optimized UFP-QAPP worksheet numbers and titles and the CIO 2106-G-05 QAPP Guidance (USEPA, 2012a).

| **Table 1. Crosswalk: UFP-QAPP Workbook to 2106-G-05 QAPP** | | | |
| --- | --- | --- | --- |
| **Optimized UFP-QAPP Worksheets** | | **2106-G-05 QAPP Guidance Section** | |
| 1 & 2 | Title and Approval Page | 2.2.1 | Title, Version, and Approval/Sign-Off |
| 3 & 5 | Project Organization and QAPP Distribution | 2.2.3 | Distribution List |
| 2.2.4 | Project Organization and Schedule |
| 4 , 7 & 8 | Personnel Qualifications and Sign-off Sheet | 2.2.1 | Title, Version, and Approval/Sign-Off |
| 2.2.7 | Special Training Requirements and Certification |
| 6 | Communication Pathways | 2.2.4 | Project Organization and Schedule |
| 9 | Project Planning Session Summary | 2.2.5 | Project Background, Overview, and Intended Use of Data |
| 10 | Conceptual Site Model | 2.2.5 | Project Background, Overview, and Intended Use of Data |
| 11 | Project/Data Quality Objectives | 2.2.6 | Data/Project Quality Objectives and Measurement Performance Criteria |
| 12 | Measurement Performance Criteria | 2.2.6 | Data/Project Quality Objectives and Measurement Performance Criteria |
| 13 | Secondary Data Uses and Limitations | Chapter  3 | QAPP Elements for Evaluating Existing Data |
| 14 & 16 | Project Tasks & Schedule | 2.2.4 | Project Organization and Schedule |
| 15 | Project Action Limits and Laboratory-Specific Detection / Quantitation Limits | 2.2.6 | Data/Project Quality Objectives and Measurement Performance Criteria |
| 17 | Sampling Design and Rationale | 2.3.1 | Sample Collection Procedure, Experimental Design, and Sampling Tasks |
| 18 | Sampling Locations and Methods | 2.3.1 | Sample Collection Procedure , Experimental Design, and Sampling Tasks |
| 2.3.2 | Sampling Procedures and Requirements |
| 19 & 30 | Sample Containers, Preservation, and Hold Times | 2.3.2 | Sampling Procedures and Requirements |
| 20 | Field QC | 2.3.5 | Quality Control Requirements |
| 21 | Field Standard Operating Procedures (SOPs) | 2.3.2 | Sampling Procedures and Requirements |
| 22 | Field Equipment Calibration, Maintenance, Testing, and Inspection | 2.3.6 | Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables |
| 23 | Analytical SOPs | 2.3.4 | Analytical Methods Requirements and Task Description |
| 24 | Analytical Instrument Calibration | 2.3.6 | Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables |
| 25 | Analytical Instrument and Equipment Maintenance, Testing, and Inspection | 2.3.6 | Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables |
| 26 & 27 | Sample Handling, Custody, and Disposal | 2.3.3 | Sample Handling, Custody Procedures, and Documentation |
| 28 | Analytical Quality Control and Corrective Action | 2.3.5 | Quality Control Requirements |
| 29 | Project Documents and Records | 2.2.8 | Documentation and Records Requirements |
| 31, 32 & 33 | Assessments and Corrective Action | 2.4 | Assessments and Corrective Action |
| 2.5.5 | Reports to Management |
| 34 | Data Verification and Validation Inputs | 2.5.1 | Data Verification and Validation Targets and Methods |
| 35 | Data Verification Procedures | 2.5.1 | Data Verification and Validation Targets and Methods |
| 36 | Data Validation Procedures | 2.5.1 | Data Verification and Validation Targets and Methods |
| 37 | Data Usability Assessment | 2.5.2 | Quantitative and Qualitative Evaluations of Usability |
| 2.5.3 | Potential Limitations on Data Interpretation |
| 2.5.4 | Reconciliation with Project Requirements |

**QAPP Attachments**

1. Field forms and Field SOPs
2. Laboratory Quality Assurance Management Plans, SOPs and Certifications

## Project Authorization

In accordance with (IAW) Contract No. W912DY-10-D-0025, Task Order DS02, Modification No. 1 PIKA-Pirnie Joint Venture, LLC (JV) will conduct a RCRA Facility Investigation (RFI) at SWMUs 14, 15, 33, and 74,and AOCs 89, 90, 91, and 92, within Parcel 3 of the Fort Wingate Depot Activity (FWDA). This QAPP is included as Appendix D of the Parcel 3 RFI Work Plan. Parcel 3 is located entirely within the boundaries of the Kickout Area (KOA). Removal actions to remove Munitions and Explosives of Concern (MEC) and Material Potentially Presenting an Explosive Hazard (MPPEH) within the KOA is currently performed IAW the New Mexico Environment Department (NMED)-approved *Final Work Plan Kickout Area Munitions and Explosives of Concern Removal and Surface Clearance* (PIKA-Pirnie JV, 2015a). The JV also plans to perform interim measures to remove waste military munitions (WMM) and WMM scrap in AOCs and SWMUs within the KOA IAW the *Interim Measures Work Plan* (PIKA-Pirnie JV, 2015b), currently under review by the United States Army Corps of Engineers (USACE). The RFI Work Plan is written for the Army to comply with and implement the FWDA RCRA Permit Number NM6213820974-1 (the Permit), which became effective December 31, 2005 and was modified in 2014. The JV will perform this work under the direction of the USACE, Tulsa District (CESWT), and USACE, Fort Worth District (CESWF) to implement the Army’s Base Realignment and Closure (BRAC) mission to close FWDA and revert this property to the Navajo Nation and Pueblo of Zuni. Throughout this work plan, the JV, the CESWT, the CEWSF, and the Army will be collectively referred to as the “Army”. An Explosive Safety Submission Amendment and Certificate of Risk Assessment have been approved by the USACE according to Army and DoD policy.

This UFP-QAPP was developed IAW USACE Data Item Description Worldwide Environmental Remediation Services 001.01, Work Plans, USACE Engineering Manual (EM) 385-1-97, Change 1, and the FWDA RCRA Permit (dated December 2005 and revised in 2014).

## Project Scope

The project scope is to assess the impact of previous site activities at SWMUs 14, 15, 33, and 74, and AOCs 89, 90, 91, and 92 within Parcel 3 at FWDA, as discussed in the RFI Work Plan, to which this QAPP is included as Appendix D. A separate Work Plan and QAPP covers confirmation soil sampling to be conducted within the burial pits of SWMUs 14, 15, and 33, and AOC 92 following munitions and explosives removal which is discussed in the *Interim Measures Work Plan AOCs and SWMUs in the KOA* (PIKA-Pirnie JV, 2015a).

## Project Setting

The FWDA installation is located approximately seven miles east of Gallup, New Mexico, and currently occupies approximately 24 square miles (approximately 15,277 acres) of land in in McKinley County in northwestern New Mexico. FWDA contained facilities used to operate a reserve storage activity providing for the care, preservation, and minor maintenance of assigned commodities, primarily conventional military munitions. FWDA is almost entirely surrounded by federally owned or administered lands, including both National Forest and Tribal lands. The installation can be divided into several sub-areas based on location and historical land use.

The FWDA installation was originally established by the U.S. Army in 1862 at the southern edge of the Navajo territory. The mission of the FWDA changed from tribal issues to World War I related activities. Beginning in 1940, the FWDA’s mission was primarily to receive, store, maintain, and ship explosives and military munitions, as well as to disassemble and dispose of unserviceable or obsolete explosives and military munitions. In 1975, the installation came under the administrative command of Tooele Army Depot, located near Salt Lake City, Utah.

In January 1993, the active mission of the FWDA ceased and the installation closed as a result of the Defense BRAC Act of 1990. Beginning in 2002, the U.S. Army reassigned many FWDA functions to the BRAC Division, including caretaker duties, property transfer, and performance of environmental compliance and restoration activities. Command and control responsibilities were retained by Tooele Army Depot until January 31, 2008, when these responsibilities were transferred to White Sands Missile Range.

An area known as the Closed Open Burn/Open Detonation (OB/OD) Area was used from 1948 to 1955. Residues and debris from OB/OD operations were placed at various locations within the Closed OB/OD Area. Because the period of operations in the Closed OB/OD Area predated RCRA by approximately 25 years, the Closed OB/OD Area was not permitted under RCRA. Therefore, when the Permit was issued, the area previously known as the Closed OB/OD Area was identified as three separate SWMUs.

* SWMU 14, also described as Old Burning Ground and Demolition Landfill Area;
* SWMU 15, also described as Old Demolition Area; and
* SWMU 33, also described as Waste Pile KP1.

From approximately 1948 until installation closure in January 1993, burning and detonation operations were performed within an area known as the Current OB/OD Area also located within Parcel 3. The OB/OD Hazardous Waste Management Unit is an area within the Current OB/OD Area. The current OB/OD area is not included within the scope of this RFI

In addition to the OB/OD Unit Hazardous Waste Management Unit and three Closed OB/OD Area SWMUs listed above, Parcel 3 contains one additional SWMU and four AOCs, as follows:

* SWMU 74, also described as Area 16 or Site 16 (Proposed Burning Ground);
* AOC 89, also described as Features 30 and 34 on the 1973 Aerial Photo API-5;
* AOC 90, also described as Feature 36 on the 1973 Aerial Photo API-5;
* AOC 91, also described as Feature 41 on the 1973 Aerial Photo API-5 and Feature 27 on the 1978 Aerial Photo API-7; and
* AOC 92, is also described as Feature 31 on the 1973 Aerial Photo API-5 and Feature 21 on the 1978 Aerial Photo API-7.

## Planned RFI

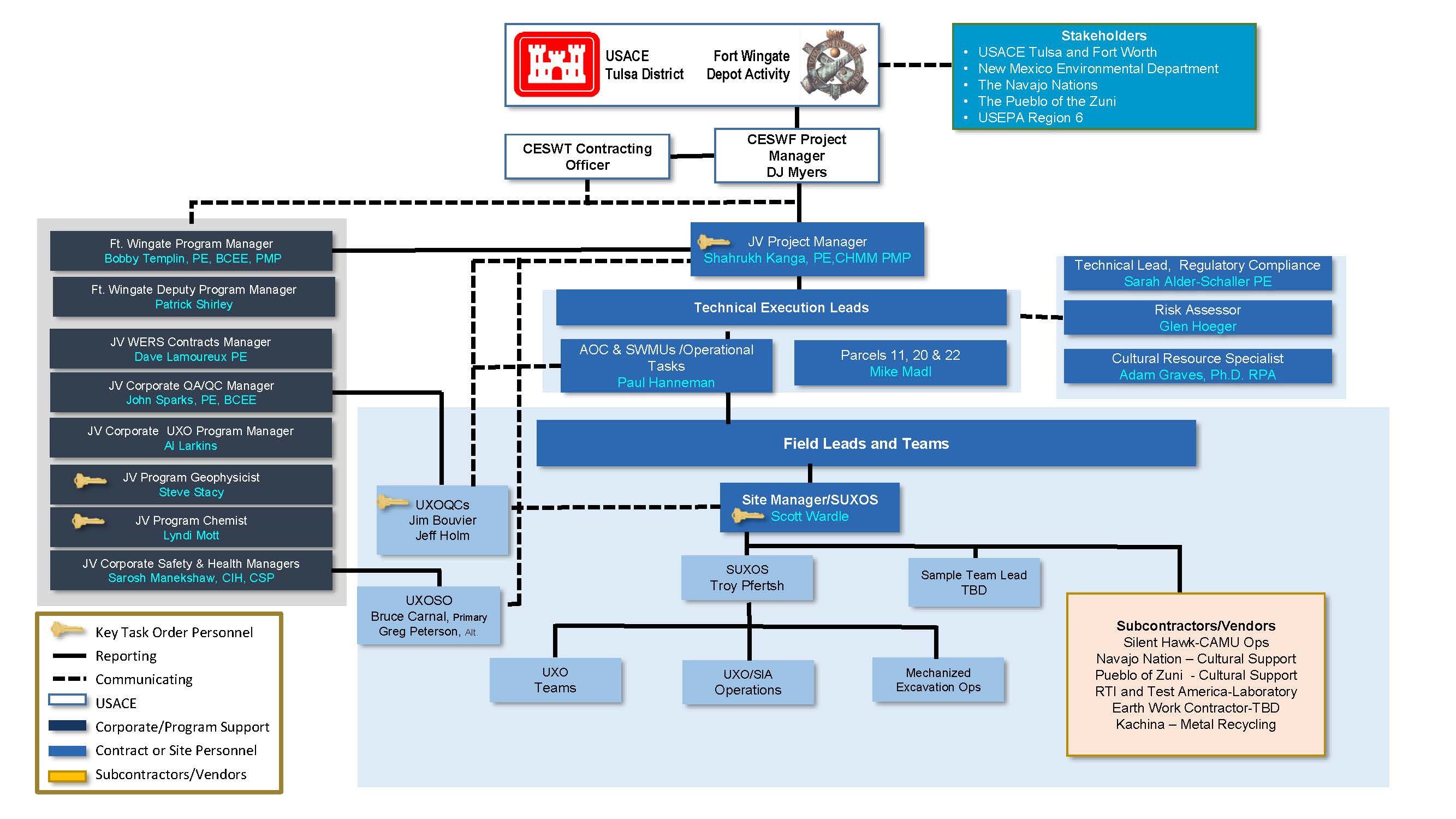
The JV will perform a RFI to determine the presence or absence of COPCs in SWMUs and AOCs identified within Parcel 3.

Data collected as part of this RFI effort will include surface soil samples used to complete the RCRA Facility Investigation Report and determine the presence and lateral extent of the COPCs at SWMUs 14, 15, 33, and 74 and AOCs 89, 90, 91, and 92. Analysis for metals will be limited to the RCRA 8 metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. The full suite of semi-volatile organic compounds (SVOCs), explosives and perchlorate will also be analyzed, as necessary. Samples will include both incremental sampling methodology (ISM) and composite samples.

| QAPP Worksheet #1&2 – Title and Approval Page | |
| --- | --- |
| **Project Identifying Information:** | Fort Wingate Depot Activity RCRA Facility Investigation, Parcel 3 SWMUs and AOCs  McKinley County, New Mexico  W912DY-10-D-0025, DS02, Modification No. 1 |
| **Lead Organization:** | USACE (Contract Executor and Project Technical Support) |
| **Contracting Organization Project Manager (PM):** |  |
| Signature/Date |
| Shahrukh Kanga, PE, PMP, PIKA-PIRNIE JV |
| **Contracting Organization Contracting Officer’s Representative (COR):** |  |
| Signature/Date |
| Dennis Myers, PM, USACE Fort Worth District |
| **State Regulatory Organization:** | New Mexico Environment Department |
| **State Regulatory Agency PM:** |  |
| Signature/Date |
| To Be Determined (TBD) |
| **List plans and reports from previous investigations relevant to this project:** | * Soil Background Study and Data Evaluation Report (Shaw, 2010) * Hydrogeologic Summary Report (TPMC, 2006) * Aerial Photographic Analysis (ERI, 2006) * Final Risk Assessment Technical Memorandum, Open Burning/Open Detonation Areas (PMC, 2000) * Final OE Location and Removal Report, Fort Wingate Depot Activity, New Mexico (EHSI, 2000) * Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IA – Characterization and Assessment of Site Conditions for the Soils/Solid Matrix (Phase IA Report) (PMC, 1999a) * Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IB – Characterization and Assessment of Site Conditions for the Groundwater Matrix (Phase IB Report) (PMC, 1999b) * Removal Report, OE Sampling and Removal Action, Fort Wingate Depot Activity (CMS, 1998) * Archive Search Report (USACE, 1995) * Unexploded Ordnance Survey Report, Fort Wingate Depot Activity, (ERM, 1994) * Interim Status Closure Plan (ERM, 1993 and 1994) * Final Work Plan Munitions and Explosives of Concern Removal and Surface Clearance Kickout Area (PIKA-Pirnie Joint Venture, 2015a) |
| **List dates that scoping sessions were held** | Army Kickoff Conference Call: September 22, 2014  FWDA Team Meeting: November 4, 2014 |
| **List organizational partners (stakeholders) and identify the connection with lead organization** | CESWF: Project Technical Support  US Army BRAC-D: BRAC oversight  JV: Contractor  NMED: State Regulatory Organization  The Navajo Nation: Stakeholder  The Pueblo of Zuni: Stakeholder  FWDA: Installation / Site Owner / RCRA Permittee |

# QAPP Worksheet #3&5: Project Organization and QAPP Distribution

|  | | | | |
| --- | --- | --- | --- | --- |
| **QAPP Recipients** | **Title** | **Organization** | **Telephone Number** | **E-mail Address** |
| Steve Smith | Program Manager | USACE, Fort Worth | 817.886.1879 | Steve.w.smith@usace.army.mil |
| Scottie Fiehler | COR | USACE, Tulsa | 918-669-7232 | Scottie.Fiehler@usace.army.mil |
| Dennis Myers | PM | USACE, Fort Worth | 817-609-5014 | Dennis.j.myers@usace.army.mil |
| Mark Patterson | FWDA BEC | U.S. Army BRACD | 330-358-7312 | mark.c.patterson.civ@mail.mil |
| TBD | PM | NMED |  |  |
| Shahrukh Kanga, CHMM, PMP | PM | JV | 281-340-5525 | skanga@pikainc.com |
| Mike Madl, PMP | Technical Lead | JV | 817-877-9978 ext. 102 | Mike.Madl@arcadis-us.com |
| Paul Hanneman | Technical Lead | JV | 303-770-1501 | phanneman@pikainc.com |
| Scott Wardle | Site Manager | JV | 713299-2918 | swardle@pikainc.com |
| Lyndi Mott | Program Chemist | JV | 713.953.4829 | Lyndi.Mott@arcadis-us.com |
| David Vesey | Laboratory PM | RTI Laboratories | 734.422.8000 | dvesey@rtilab.com |
| Charles O’Bryan | Laboratory QA Manager | RTI Laboratories | 734.422.8000 | cobryan@rtilab.com |
| Erika Gish | Laboratory PM | TestAmerica | 314.298.8566 | erika.gish@testamericainc.com |
| Marti Ward | Laboratory QA Manager | TestAmerica | 314.298.8566 | marti.ward@testamericainc.com |



# QAPP Worksheet #4, 7 & 8 – Personnel Qualifications and Sign-off Sheet

|  | | | |
| --- | --- | --- | --- |
| **Name** | **Project Title/Role** | **Education/Experience** | **Signature/Date** |
| ORGANIZATION: JV | | | |
| Bobby Templin, PE | Program Manager | B.S. / M.S. Civil/Environmental Engineering, 30 years of experience. Program/PM for numerous Military Munitions Response Program and Hazardous, Toxic and Radioactive Waste sites.  Involved with numerous projects for the Army, Navy, and Air Force. | Signature on file |
| Shahrukh Kanga, CHMM, PMP | PM | M.S., Civil/Environmental Engineering; M.B.A., Business Administration; M.M.M., Marketing Management; B.E., Mechanical Engineering, 19 years of experience.  Principal with PIKA International Inc., Program Manager, and PM on numerous munitions response projects including MEC Remedial Actions, Site Inspections, and Remedial Investigations / Feasibility Study projects for remediation and investigation projects with extensive working knowledge of Department of Transportation and Occupational Safety and Health administration regulations, federal, state, and local environmental compliance regulations, including Comprehensive Environmental Response, Compensation and Liability Act, RCRA, and TSCA, and USACE and U.S. Army health and safety requirements and quality assurance protocols. | Signature on file |
| Mike Madl, PMP | Technical Lead | B.S. Biology/Environmental Science, M.S. Environmental Engineering and Science, 15 years of experience. Project manager on numerous munitions response project, including Site Inspection and Remedial Investigations / Feasibility Study projects for Army sites. | Signature on file |

**QAPP Worksheet #4, 7 & 8 – Personnel Qualifications and Sign-off Sheet**

|  |  |  |  |
| --- | --- | --- | --- |
| Paul Hanneman | Technical lead | Mr. Paul Hanneman, Bachalors Degree, Biology, 35 years environmentala experience. Authored RFI Addendums for FWDA Parcels 21 and 22 and served as the PM on the NMED-accepted Parcel 16 RFI conducted in 2013. | Signature on file |
| Lyndi Mott | Program Chemist | B.S. Chemistry/M.B.A. Business Administration. 31 years of experience. | Signature on file |
| ORGANIZATION: RTI Laboratories (RTI) (primary laboratory) | | | |
| David Vesey | Laboratory PM | Representative for project laboratory. |  |
| Charles O’Bryan | Laboratory QA Manager | Representative for project laboratory.  M.S. Environmental and Industrial Health; B.S. Medical Technology; B.S. Biology; 37 years of experience |  |
| ORGANIZATION: TestAmerica (QA laboratory) | | | |
| Erika Gish | Laboratory PM | Representative for project laboratory.  B.A Biology; 10 years of experience |  |
| Marti Ward | Laboratory QA Manager | Representative for project laboratory.  B.S.; 25 years of experience |  |

\*Signatures indicate personnel have read and agree to implement this QAPP as written (signatures required for Final submittal only)

| QAPP Worksheet #6 – Communication Pathways | | | | |
| --- | --- | --- | --- | --- |
| **Communication Drivers** | **Organization** | **Name/Role** | **Phone Number** | **Procedure (timing, pathways, documentation, etc.)** |
| Point of Contact with USACE | USACE, CESWT | Dennis Myers, USACE PM | 817-609-5014 | USACE PM will be notified by JV if analytical data or field sampling irregularities are observed, or problems with analytical data or sampling are encountered. |
| Technical lead decisions and modifications | JV | Mike Madl  Paul Hanneman  Shahrukh Kanga  JV PM | 817-877-9978 ext. 102  303-770-1501  281-340-5525 | Communicate technical leads decisions and modifications to USACE and/or the JV, as necessary. All approved modifications will be included in the amendments to the UFP-QAPP by the JV and signed within 7 working days. |
| Project issues | JV | Mike Madl  Paul Hanneman  Shahrukh Kanga  JV PM | 817-877-9978 ext. 102  303-770-1501  281-340-5525 | Notify Scottie Fiehler (USACE COR) and Dennis Myers (USACE PM) of project issues within 7 days by telephone or email. |
| Point of Contact with NMED | NMED PM | TBD |  | NMED Project Manager will be notified by USACE PM if analytical data or field sampling irregularities are observed, or problems with analytical data or sampling are encountered. The USACE PM has the primary lead on coordination with NMED, unless otherwise directed. |
| Stop work due to safety issues | Mike Madl  JV | Mike Madl  JV | 817-877-9978 ext. 102  281-340-5525 | Work may be stopped at any time by any member of the field team for any safety concern. Refer to the Accident Prevention Plan (APP) for specifics related to health and safety. Persons other than the responsible entity may also stop work for safety concerns. All stop work issues will be recorded in the Daily Quality Control Report. The JV PM will notify USACE PM by phone, within 24 hours of a stop work situation. |
| UFP-QAPP changes prior to field work | JV | Mike Madl  Paul Hanneman or  Shahrukh Kanga  JV PM | 817-877-9978 ext. 102  303-770-1501  281-340-5525 | Submit documented amendments within 10 working days for transmittal to USACE for approval. |
| UFP-QAPP changes during project execution | JV | Mike Madl  Paul Hanneman or  Shahrukh Kanga  JV PM | 817-877-9978 ext. 102  303-770-1501  281-340-5525 | Secure same-day approval from Site Superintendent. JV will secure approval for modifications to the UFP-QAPP from the USACE technical manager. The JV will also contact the NMED to notify them of changes to field data collection procedures which differ from the procedures documented in the UFP-QAPP. |
| Field corrective actions | JV | Mike Madl  Paul Hanneman or  Shahrukh Kanga  JV PM | 817-877-9978 ext. 102  303-770-1501  281-340-5525 | Field corrective actions will be communicated by JV to the USACE PM (by phone followed by a confirming email) within 24 hours of the action. The USACE PM will contact the NMED to notify them of changes to field data collection procedures which differ from the procedures documented in the UFP-QAPP. |
| Sample receipt variances | RTI/ TestAmerica | David Vesey  RTI PM  Erika Gish  TestAmerica PM | 734.422.8000  314-298-8566 | All project field sample variance issues will be reported by the laboratory PM to the JV Program Chemist within two business days of identification of the technical concern. The JV PM will report all field sample variance issues to the USACE PM within 24 hours (by phone followed by a confirming email) of notification from the laboratory. |
| Laboratory quality control variances | RTI/ TestAmerica | David Vesey  RTI PM  Erika Gish  TestAmerica PM | 734.422.8000  314-298-8566 | All QA/QC issues with project field samples will be reported by the laboratory PM to the JV PM and Program Chemist within two business days of identification of the technical concern. The JV PM will report all QA/QC issues with project field samples to the USACE PM within 24 hours (by phone followed by a confirming email) of notification by the laboratory. |
| Data verification issues, e.g., incomplete records | JV | Lyndi Mott  JV Program Chemist | 713-953-4829 | All verification issues will be reported by the JV Program Chemist to the JV PM via email within 24 hours of identification of the technical concern. The JV PM will report verification issues to the USACE PM via email within 24 hours (by phone followed by a confirming email) of notification. |
| Data validation issues, e.g., non-compliance with procedures | JV | Lyndi Mott  JV Program Chemist | 713-953-4829 | All validation issues will be reported by the data validator to the JV PM and Program Chemist via email within 24 hours of identification of the technical concern. The JV PM will report all validation issues to the USACE PM within 24 hours (by phone followed by a confirming email) of notification. |
| Data review corrective actions | JV | Lyndi Mott  JV Program Chemist | 713-953-4829 | The need for data review corrective actions will be determined by the JV Program Chemist and/or data validator, as appropriate, and will be documented in a memorandum to the JV PM. Data review corrective actions will be reported by the JV PM to the USACE PM within 24 hours (by phone followed by a confirming email) of notification. |

# QAPP Worksheet #9 – Project Planning Session Summary

**FWDA Team Meeting: November 4, 2014**

**Environmental Remediation Efforts, Fort Wingate Depot Activity, New Mexico**

A project team meeting was held on 4 November 2014 at the FWDA, New Mexico.

The purpose of the meeting was to:

* Introduce JV and Army team members and define responsibilities
* Discuss project safety issues
* Discuss project schedule
* Review project challenges and risks

Meeting Attendees were:

Mark Patterson, BRACD Environmental Coordinator

DJ Myers, PM CESWF

Christy Esler, Sundance Angela Makin, Sundance

Steve Smith, FWDA Project Manager CESWF Jackie Smith, Lead OESS

Joseph Murphey, Historical Architect, CESWF Shahrukh Kanga, JV Project Manager

Eric Kirwan, Geophysicist & Technical lead, CESWF

Mike Madl, JV Technical Lead

Karan Holmes, JV Task Lead Sarah Alder-Schaller, JV Regulatory Specialist

Adam Graves, JV Cultural Resources Lead Shawn Corcoran, JV UXO Program Manager

Paul Hanneman, JV Technical Lead Scott Wardle, JV Site Manager

# QAPP Worksheet #10 – Conceptual Site Model

**Background information**

Background information for FDWA is discussed in detail in the RFI Work Plan – Parcel 3 SWMUs and AOCs.

**Nature and Extent of Contamination**

Visual inspection performed during the site reconnaissance found numerous MEC items and there have been a limited number of soil investigations conducted at the SWMUs and AOCs within Parcel 3, which have not fully characterized the parcel. The first task will be to perform surface and subsurface clearance of the KOA area MEC and MPPEH. This will be followed by the interim measures to remove WMM and WMM scrap at SWMUs 14, 15, 33, the arroyo adjacent to SWMUs 14 and 15, and AOC 92. Following the interim measures, confirmation samples will be collected for analysis from the burial pits in SWMU 14 and15, and the waste piles in SWMU 33.

The interim measures will be followed by RFI work within Parcel 3 SWMUs and AOCs. Following the completion of the RFI at AOC 92, soil removal activities will be performed and followed by soil confirmation sampling at AOC 92 within the soil removal areas.

**Fate and Transport**

If soils are affected at SWMUs 14, 15, 33, and 74, and AOCs 89, 90, 91, and 92, there is a potential for threat to human health and the environment through exposure to surface soils.

If munitions constituents (MC) are found to be present during the RFI activities, then a threat to human health and the environment exists.

**Data Gaps**

Surface soils where probable COPCs are present need to be investigated. Additional surface soil samples need to be collected to characterize the SWMUs and AOCs within Parcel 3.

Further subsurface investigation that may be required to characterize groundwater transport pathways is not covered under this RFI Work Plan and will be performed under a separate contract.

# QAPP Worksheet #11 – MC Project/Data Quality Objective

Parcel 3 and its associated SWMUs and AOCs are located entirely within the defined boundaries of the KOA. There are three primary environmental issues at the KOA from past operations are:

* MEC and MPPPEH contamination (all AOCs and SWMUs non-burial pit areas): The surface and subsurface oil of these areas are potentially contaminated with MEC and MPPEH resulting from past operations. The MEC and MPPEH items are currently being addressed via surface and subsurface clearance of MEC and munitions debris within the KOA IAW the NMED-approved *Final Work Plan MEC Removal and Surface Clearance KOA* (PIKA-Pirnie JV, 2015b).
* Burial pits contain waste debris, and are potentially contaminated with MEC, MPPEH and metallic scrap related to munitions disposal. This waste will be removed IAW the *Interim Measures Work Plan AOCs and SWMUs in the KOA* (PIKA-Pirnie JV, 2015a), currently under review by the USACE.
* Potential soil contamination in the burial pits resulting from long-term burial of waste and debris. The presence or absence of COPCs related to past operations at SWMUs and AOCs is currently unknown.

For the RFI work, data quality objectives (DQOs) have been developed for characterization of COPCs within surface soils at the SWMUs and AOCs at Parcel 3 and for reporting to NMED. For AOC 92, the characterization data will also be used to determine soil removal requirements (to be performed IAW the *Interim Measures Work Plan AOCs and SWMUs in the KOA, October 2015*.)

**Statement of Problem**

There is one primary problem associated with MC within the AOCs and SWMUs which will involve soil sampling activities: The presence or absence of MC in soil related to past site operations is unknown. If MC are present in soil, the current data is not sufficient to define the lateral and vertical extent of contamination.

**Identification of a Decision Addressing the Problem**

The decision addressing the primary problem is identified as follows:

To comply with Section VII of the RCRA Permit, the lateral extent of COPCs in the soils at the SWMUs and AOCs at Parcel 3 will be determined by collecting and analyzing surface soil samples and evaluating the presence and/or absence of COPCs at concentrations greater than approved screening levels. Soil characterization samples collected using ISM and composite sampling techniques will be analyzed for MC. The COPCs associated with MC include explosives, RCRA 8 metals, perchlorate, and SVOCs.

The COPCs identified above were determined based on planning documents approved by NMED for similar sites.

**Identification of Inputs Affecting the Decision**

Inputs affecting the decision of whether or not MC in soil samples from the SWMUs and AOCs exceed approved screening levels include the validated analytical results for collected soil samples, site specific background concentrations for metals, the NMED Residential Soil Screening Levels (SSLs) or USEPA Region 6 Regional Screening Levels (RSLs), and the two step approach for assessing arsenic in soils recommended by the NMED in their December 18, 2003 letter (Attachment C of the Soil Investigation Work Plan). The evaluation of metals background and the risk/hazard-based screening level for each analyte will be determined as follows:

**Metals Background**

The FWDA soil background for metals (with the exception of arsenic and antimony), are based on the Soil Background Study and Data Evaluation Report Version 2 (Shaw, 2010). IAW NMED’s Evaluation of Background Levels for Arsenic in Soil, dated December 18, 2013, 5.6 milligrams per kilogram (mg/kg) will be used for arsenic. If the arsenic value of 5.6 mg/kg is exceeded, then consideration of the detected site range compared to the background range of 0.2-11.2 mg/kg is appropriate. The background value (0.23 mg/kg) for antimony is the 95% Upper Tolerance Limit for soil unit 350ss based on the 2012 background study. Metals determined to be at or below background are eliminated from further consideration and are not considered for estimation of potential risk/hazard.

**Risk/Hazard-Based Screening Level Hierarchy**

The risk/hazard-based screening levels have been determined in accordance with the FWDA soil cleanup levels as defined by the Permit (December 2005, Revised April 2014). The following hierarchy will be used to determine the risk/hazard-based screening level for each analyte:

* The current NMED residential SSL per the NMED Risk Assessment Guidance for Site Investigations and Remediation (December 2014) is used (with the exception of arsenic) (<http://www.nmenv.state.nm.us/HWB/documents/RA_Guidance_for_SI_and_Remediation_12-24-2014.pdf> ) is used.
* A site-specific background level of 5.6 mg/kg will be used for arsenic in lieu of the NMED Residential SSL in accordance with NMED’s Evaluation of Background Levels for Arsenic in Soil, dated December 18, 2013. If the arsenic value of 5.6 mg/kg is exceeded, then consider the site range compared to the background range of 0.2-11.2 mg/kg. If it is determined arsenic is above background, the NMED residential SSL of 4.25 mg/kg (cancer endpoint) is used for assessment of potential risk.
* If an NMED Residential SSL has not been established, the most recent (currently January 2015) USEPA Residential RSL (<http://www.epa.gov/region9/superfund/prg/>) is used. USEPA RSLs based on a cancer endpoint are adjusted to a cancer risk of 1x10-5 consistent with NMED guidance.
* If an analyte does not have an NMED SSL or USEPA RSL, appropriate surrogates may be used with NMED approval.

**Potential Cumulative Risk/Hazard**

Potential cumulative risk/hazard is assessed as follows:

* For metals the initial comparison will be made to background levels. Metals determined to be at or below background will be eliminated from further consideration. If it is determined that background is exceeded then comparison will be made to the appropriate risk/hazard-based screening level (NMED Residential SSL or USEPA Residential RSL, as appropriate) to estimate potential cumulative risk/hazard.
* Potential cumulative risk is assessed by summing potential risks for each individual analyte. The risk threshold is 1x10-5.
* For potential cumulative hazard estimates, individual hazard quotients are summed to provide a cumulative hazard index (HI). The target hazard is 1. The HI is compared to 1. If the HI is less than 1 then unacceptable hazard is not expected. If the HI is greater than 1 then unacceptable hazard is possible. When the HI for a data set exceeds 1, but an individual hazard quotients does not exceed 1, then it may be appropriate to perform further assessment by assessing the toxic endpoint (target organ) of the analytes that contribute to the HI exceeding 1. The critical toxicity and secondary toxicity should be assessed.
* Lead is assessed separately.

**Specification of the Domain of the Decision**

The domain of the decision of whether or not soil at the SWMUs/AOCs have been negatively impacted is restricted to the evaluation of only those parameters for which samples are analyzed and for which a screening level has been defined (NMED SSL or USEPA RSLs).

**Development of a Logic Statement**

If the validated analytical data for samples collected during RFI exceed background and the NMED Residential SSL, the area from which the sample was collected will be considered affected. Additional horizontal and/or vertical delineation may then be required until data indicates non-contaminated soil is encountered.

**Establishment of Constraints on Uncertainty**

Uncertainty in the data used to evaluate the logic statement will be constrained by following the QA/QC guidelines specified in this UFP-QAPP; selecting the appropriate analytical support level for the soil sample data; and by adhering to both the field and laboratory data quality indicator objectives (precision, accuracy, representativeness, comparability, and completeness). All reasonable attempts will be made to ensure laboratory reporting limits and/or detection limits are below the SSLs.

**Optimization of Design for Obtaining Data**

To optimize the quality of data collected for evaluation, the RFI Work Plan has been developed to be used as guidance during field activities. QA/QC procedures associated with the field activities described in the RFI Work Plan are presented in this UFP-QAPP.

# QAPP Worksheet #12-1 – Measurement Performance Criteria (Semi-volatile Organic Compounds by SW846 8270D)1

|  |  |  |
| --- | --- | --- |
| Matrix: | Soil |  |
| Concentration Level: | Low |  |
| Analytical Method: | SW846 8270D |  |
| Laboratory SOP2: | L-1 (RTI) / L-6 (TestAmerica) |  |
| **Data Quality Indicators (DQIs)** | **QC Sample of Measurement Performance Activity** | **Measurement Performance Criteria** |
| Overall Precision | Field Duplicate | Relative percent difference (RPD) < 50% for soil |
| Sensitivity | Detection Limit (DL) / Limit of Quantitation (LOQ) | Sufficiently low to support project specified screening criteria as specified in QAPP Worksheet #15 |
| Accuracy/Bias | Laboratory control sample (LCS) containing all analytes to be prepared in the same manner as field samples. | Percent recovery (%R) %R, See Appendix C, Table 25 DoD Quality Systems Manual (QSM) V5.0 |
| Contamination | Method Blank (MB), Field Blank (FB), and Equipment Blank (EB) if collected | No target analyte > ½ LOQ. See QAPP Worksheet #15 for project specific LOQs |
| Accuracy/Bias | MS/MSD | %R %R, See Appendix C, Table 25 DoD QSM V5.0; RPD of all analytes ≤30% |
| Accuracy/Bias | Surrogate added to all field samples and QC samples | %R, See Table 25 DoD QSM V5.0 |

**QAPP Worksheet #12-1 – Measurement Performance Criteria (Semi-volatile Organic Compounds by SW846 8270D)1**

| Matrix: | Soil |
| --- | --- |
| Concentration Level: | Low |
| Analytical Method: | SW846 8270D |
| Laboratory SOP2: | L-1 (RTI) / L-6 (TestAmerica) |

| **Control Limits from Table 25 DoD QSM ver. 5.0** | | | |
| --- | --- | --- | --- |
| **Analyte** | **CAS Identification (ID)** | **Soil (8270D)** | |
| **Lower Control Limit** | **Upper Control Limit** |
| 1,2,4-Trichlorobenzene | 120-82-1 | 34 | 118 |
| 1,2-Dichlorobenzene | 95-50-1 | 33 | 117 |
| 1,2-Diphenylhydrazine [Azobenzene] | 122-66-7 | 41 | 125 |
| 1,3-Dichlorobenzene | 541-73-1 | 30 | 115 |
| 1,4-Dichlorobenzene | 106-46-7 | 31 | 115 |
| 1-Methylnaphthalene | 90-12-0 | 40 | 119 |
| 2,4,5-Trichlorophenol | 95-95-4 | 41 | 124 |
| 2,4,6-Trichlorophenol | 88-06-2 | 39 | 126 |
| 2,4-Dichlorophenol | 120-83-2 | 40 | 122 |
| 2,4-Dimethylphenol | 105-67-9 | 30 | 127 |
| 2,4-Dinitrotoluene | 121-14-2 | 48 | 126 |
| 2,6-Dinitrotoluene | 606-20-2 | 46 | 124 |
| 2-Chloronaphthalene | 91-58-7 | 41 | 114 |
| 2-Chlorophenol | 95-57-8 | 34 | 121 |
| 2-Methylnaphthalene | 91-57-6 | 38 | 122 |
| 2-Methylphenol (o-Cresol) | 95-48-7 | 32 | 122 |
| 2-Nitroaniline | 88-74-4 | 44 | 127 |
| 2-Nitrophenol | 88-75-5 | 36 | 123 |
| 3,3'-Dichlorobenzidine | 91-94-1 | 22 | 121 |
| 3-Nitroaniline | 99-09-2 | 33 | 119 |
| 3/4-Methylphenol [m/p-Cresol] | 65794-96-9 | 34 | 119 |
| 4,6-Dinitro-2-methylphenol | 534-52-1 | 29 | 132 |
| 4-Bromophenyl phenyl ether | 101-55-3 | 46 | 124 |
| 4-Chloro-3-methylphenol | 59-50-7 | 45 | 122 |
| 4-Chloroaniline [p-Chloroanlinie] | 106-47-8 | 17 | 106 |
| 4-Chlorophenyl phenyl ether | 7005-72-3 | 45 | 121 |
| 4-Nitrophenol | 100-02-7 | 30 | 132 |
| Acenaphthene | 83-32-9 | 40 | 123 |
| Acenaphthylene | 208-96-8 | 32 | 132 |
| Anthracene | 120-12-7 | 47 | 123 |
| Azobenzene | 103-33-3 | 39 | 125 |
| Benz(a)anthracene | 56-55-3 | 49 | 126 |
| Benzo(a)pyrene | 50-32-8 | 45 | 129 |
| Benzo(b)fluoranthene | 205-99-2 | 45 | 132 |
| Benzo(g,h,i)perylene | 191-24-2 | 43 | 134 |
| Benzo(k)fluoranthene | 207-08-9 | 47 | 132 |
| Benzyl alcohol | 100-51-6 | 29 | 122 |
| bis(2-Chloroethoxy)methane | 111-91-1 | 36 | 121 |
| Bis(2-chloroethyl) ether | 111-44-4 | 31 | 120 |
| bis(2-Chloroisopropyl) ether | 39638-32-9 | 33 | 131 |
| Bis(2-ethylhexyl) phthalate | 117-81-7 | 51 | 133 |
| bis(2-Ethylhexyl)adipate | 103-23-1 | 61 | 121 |
| Butyl benzyl phthalate | 85-68-7 | 48 | 132 |
| Carbazole | 86-74-8 | 50 | 123 |
| Chrysene | 218-01-9 | 50 | 124 |
| Di-n-butyl phthalate | 84-74-2 | 51 | 128 |
| Di-n-octyl phthalate | 117-84-0 | 45 | 140 |
| Dibenzo(a,h)anthracene | 53-70-3 | 45 | 134 |
| Dibenzofuran | 132-64-9 | 44 | 120 |
| Diethyl phthalate | 84-66-2 | 50 | 124 |
| Dimethyl phthalate | 131-11-3 | 48 | 124 |
| Fluoranthene | 206-44-0 | 50 | 127 |
| Fluorene | 86-73-7 | 43 | 125 |
| Hexachlorobenzene | 118-74-1 | 45 | 122 |
| Hexachlorobutadiene | 87-68-3 | 32 | 123 |
| Hexachloroethane | 67-72-1 | 28 | 117 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | 45 | 133 |
| Isophorone | 78-59-1 | 30 | 122 |
| N-Nitrosodi-n-propylamine | 621-64-7 | 36 | 120 |
| N-Nitrosodiethylamine | 55-18-5 | 41 | 124 |
| N-Nitrosodimethylamine | 62-75-9 | 23 | 120 |
| N-Nitrosodiphenylamine | 86-30-6 | 38 | 127 |
| Naphthalene | 91-20-3 | 35 | 123 |
| Nitrobenzene | 98-95-3 | 34 | 122 |
| Pentachlorophenol | 87-86-5 | 25 | 133 |
| Phenanthrene | 85-01-8 | 50 | 121 |
| Phenol | 108-95-2 | 34 | 121 |
| Pyrene | 129-00-0 | 47 | 127 |

**Notes:**

1. The laboratory is DoD Environmental Laboratory Accreditation Program (ELAP) accredited for the test method and is expected to meet the Measurement Performance Criteria specified in DoD QSM version 5.0.
2. Reference number from QAPP Worksheet #23. The laboratory SOPs are provided in Appendix B.

# QAPP Worksheet #12-2 – Measurement Performance Criteria (Explosives/Nitroaromatics and Nitramines by SW846 8330B)1

|  |  |  |
| --- | --- | --- |
| Matrix: | Soil (ISM) |  |
| Concentration Level: | Low |  |
| Analytical Method: | SW846 8330B |  |
| Laboratory SOP2: | L-2 (RTI) / L-7 (TestAmerica) |  |
| **Data Quality Indicators (DQIs)** | **QC Sample of Measurement Performance Activity** | **Measurement Performance Criteria** |
| Precision - Overall | Field Duplicate | All target compounds RPD ≤50% |
| Precision | Three subsamples taken from a sample expected to contain the highest levels of explosives within calibration range. | Relative Standard Deviation (RSD) <20% for detects in sample triplicates |
| Sensitivity | DL/LOQ | Sufficiently low to support project specified screening criteria as specified in QAPP Worksheet #15 |
| Accuracy/Bias | LCS containing all analytes to be prepared in the same manner as field samples. | %R See Appendix C, Table 37 DoD QSM V5.0 |
| Contamination | MB, FB, and EB if collected | No target analyte > ½ LOQ, includes grinding blanks between sample grinds, if required. See QAPP Worksheet #15 for project specific LOQs |
| Accuracy/Bias | MS/MSD | %R See Appendix C, Table 37 DoD QSM V5.0;  RPD of all analytes ≤20% |
| Accuracy/Bias | Surrogate added to all field samples and QC samples | %R See Appendix C, Table 37 DoD QSM V5.0 |
| Confirmation of positive results | All positive results must be confirmed on a second column | RPD between results ≤ 40% |

**QAPP Worksheet #12-2 – Measurement Performance Criteria (Explosives/Nitroaromatics and Nitramines by SW846 8330B1)**

| Matrix: | Soil (ISM) |  |
| --- | --- | --- |
| Concentration Level: | Low |  |
| Analytical Method: | SW846 8330B |  |
| Laboratory SOP2: | L-2 (RTI) / L-7 (TestAmerica) |  |

| **Control Limits from Table 37 DoD QSM ver. 5.0** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Analyte** | **CAS Identification (ID)** | **Soil (8330B)** | | |  |
| **Lower Control Limit** | | **Upper Control Limit** | |
| 1,3,5-Trinitrobenzene [1,3,5-TNB] | 99-35-4 | | 80 | 116 | |
| 1,3-Dinitrobenzene [1,3-DNB] | 99-65-0 | | 73 | 119 | |
| 2,4,6-Trinitrotoluene | 118-96-7 | | 71 | 120 | |
| 3,5-Dinitroaniline | 618-87-1 | | 86 | 118 | |
| 2,4-Dinitrotoluene | 121-14-2 | | 75 | 121 | |
| 2,6-Dinitrotoluene | 606-20-2 | | 79 | 117 | |
| 2-Amino-4,6-dinitrotoluene | 35572-78-2 | | 71 | 123 | |
| 2-Nitrotoluene [o-Nitrotoluene] | 88-72-2 | | 70 | 124 | |
| 3-Nitrotoluene [m-Nitrotoluene] | 99-08-1 | | 67 | 129 | |
| 4-Amino-2,6-dinitrotoluene | 19406-51-0 | | 64 | 127 | |
| 4-Nitrotoluene [p-Nitrotoluene] | 99-99-0 | | 71 | 124 | |
| Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) | 121-82-4 | | 67 | 129 | |
| Nitrobenzene | 98-95-3 | | 67 | 129 | |
| Nitroglycerin | 55-63-0 | | 73 | 124 | |
| Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) | 2691-41-0 | | 74 | 124 | |
| PETN | 78-11-5 | | 72 | 128 | |
| Tetryl | 479-45-8 | | 68 | 135 | |

**Notes:**

1. The laboratory is DoD ELAP accredited for the test method and is expected to meet the Measurement Performance Criteria specified in DoD QSM version 5.0.
2. Reference number from QAPP Worksheet #23. The laboratory SOPs are provided in Appendix B.

# QAPP Worksheet #12-3 – Measurement Performance Criteria (Perchlorate by SW846 6850)1

|  |  |  |
| --- | --- | --- |
| Matrix: | Soil (ISM) |  |
| Concentration Level: | Low |  |
| Analytical Method: | SW846 6850 |  |
| Laboratory SOP2: | L-3 (RTI) / L-8 (TestAmerica) |  |
| **Data Quality Indicators (DQIs)** | **QC Sample of Measurement Performance Activity** | **Measurement Performance Criteria** |
| Precision - Overall | Field Duplicate | RPD ≤50% |
| Sensitivity | DL/LOQ | Sufficiently low to support project specified screening criteria as specified in QAPP Worksheet #15 |
| Accuracy/Bias | Isotope ratio 35Cl/37Cl | Must fall within 2.3 to 3.8. |
| Accuracy/Bias | LCS containing all analytes to be prepared in the same manner as field samples. | Percent recovery (%R) See Appendix C, Table 7 DoD QSM V5.0 |
| Contamination | MB, FB, and EB if collected | No target analyte > ½ LOQ;  See QAPP Worksheet #15 for project specific LOQs |
| Accuracy/Bias | MS/MSD | %R See Appendix C, Table 7 DoD QSM V5.0;  RPD ≤30% |
| Accuracy/Bias | Interference Check Sample (ICS) | %R, See Table 13 DoD QSM V5.0 |
| Accuracy/Bias | Internal Standard | 18O IS area within ±50% of the value from the average of the IS area counts of the initial calibration; relative retention time of the perchlorate ion must be 1.0 ±2% (0.98-1.02) |

Notes:

1. The laboratory is DoD ELAP accredited for the test method and is expected to meet the Measurement Performance Criteria specified in DoD QSM version 5.0.
2. Reference number from QAPP Worksheet #23. The laboratory SOPs are provided in Appendix B.

**QAPP Worksheet #12-3 – Measurement Performance Criteria (Perchlorate by SW846 68501)**

| Matrix: | Soil (ISM) |  |
| --- | --- | --- |
| Concentration Level: | Low |  |
| Analytical Method: | SW846 6850 |  |
| Laboratory SOP2: | L-3 (RTI) / L-8 (TestAmerica) |  |

| **Control Limits from Tables 36 and 37 DoD QSM ver. 5.0** | | | | |
| --- | --- | --- | --- | --- |
| **Analyte** | **CAS Identification (ID)** | **Soil (6850)** | | |
| **Lower Control Limit** | | **Upper Control Limit** |
| Perchlorate | 14797-73-0 | | 84 | 121 |

**Notes:**

1. The laboratory is DoD ELAP accredited for the test method and is expected to meet the Measurement Performance Criteria specified in DoD QSM version 5.0.
2. Reference number from QAPP Worksheet #23. The laboratory SOPs are provided in Appendix B.

# QAPP Worksheet #12-4 – Measurement Performance Criteria (Metals by SW846 6010C/7471B)

| Matrix: | Soil (ISM) |  |
| --- | --- | --- |
| Concentration Level: | Low |  |
| Analytical Method: | SW846 6010C/7471B |  |
| Laboratory SOP3: | L-4, L-5 (RTI) / L-9, L-10 (TestAmerica) |  |
| **Data Quality Indicators (DQIs)** | **QC Sample of Measurement Performance Activity** | **Measurement Performance Criteria** |
| Precision - Overall | Field duplicate | RPD ≤50% |
| Sensitivity | DL/LOQ | Sufficiently low to support project specified screening criteria as specified in QAPP Worksheet #15 |
| Sensitivity | Low-level Calibration Check Standard [Low-level initial calibration verification (ICV)]. Low level calibration check standard should be less than or equal to the LOQ. | Recovery within ±20% of true value |
| Accuracy/Bias | LCS containing all analytes to be prepared in the same manner as field samples | %R See Appendix C, Table 3 (6010/6020) and Table 11 (7471), DoD QSM V5.0 |
| Contamination | MB, FB, and EB if collected | No target analyte > ½ LOQ, See QAPP Worksheet #15 for project specific LOQs |
| Accuracy/Bias | MS containing all analytes to be prepared in the same manner as field samples | %R See Appendix C, Table 3 (6010/6020) and Table 11 (7471), DoD QSM V5.0 |
| Precision | MSD or matrix duplicate | MSD: %R See Appendix C, Table 3 (6010/6020) and Table 11 (7471), DoD QSM V5.0  MSD or matrix duplicate: RPD of all analytes ≤ 20% |
| Accuracy/Bias | Interference check sample (A and AB) | See Table 8 DoD QSM V5.0 (6010) |
| Precision | Serial Dilution Test; (Only applicable for samples with concentrations > 50 x LOQ) | Five-fold dilution must agree within ±10% of the original measurement |
| Accuracy/Bias | Post-digestion spike addition | %R within 80-120% |

**Notes:**

1. Metals will include the RCRA metals list: arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver.
2. The laboratory is DoD ELAP accredited for the test method and is expected to meet the Measurement Performance Criteria specified in DoD QSM version 5.0.
3. Reference number from QAPP Worksheet #23. The laboratory SOPs are provided in Appendix B.

**QAPP Worksheet #12-4 – Measurement Performance Criteria (Metals1 by SW846 6010C/7471B)2**

| Matrix: | Soil (ISM) | |  | | |
| --- | --- | --- | --- | --- | --- |
| Concentration Level: | Low | |  | | |
| Analytical Method: | SW846 6010C/ 7471B | |  | | |
| Laboratory SOP2: | L-4, L-5 (RTI) / L-9, L-10 (TestAmerica) | | | | |
|  |  | | | | |
| **Control Limits from Tables 3 DoD QSM ver. 5.0** | | | | | | | |
| **Analyte** | | **CAS ID** | | **Soil (6010C)** | | | |
| **Lower Control Limit** | | | **Upper Control Limit** |
| Arsenic | | 7440-38-2 | | | 82 | | 111 |
| Barium | | 7440-39-3 | | | 83 | | 113 |
| Cadmium | | 7440-43-9 | | | 82 | | 113 |
| Chromium | | 7440-47-3 | | | 85 | | 113 |
| Lead | | 7439-92-1 | | | 81 | | 112 |
| Selenium | | 7782-49-2 | | | 78 | | 111 |
| Silver | | 7440-22-4 | | | 82 | | 112 |
| **Control Limits from Table 11 DoD QSM ver. 5.0** | | | | | | | |
| **Analyte** | | **CAS ID** | | | **Soil (7471B)** | | |
| **Lower Control Limit** | | **Upper Control Limit** |
| Mercury | | 7439-97-6 | | | 80 | | 124 |

**Notes:**

1. Metals will include the RCRA metals list: arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver for discrete and ISM samples.
2. The laboratory is DoD ELAP accredited for the test method and is expected to meet the Measurement Performance Criteria specified in DoD QSM version 5.0.
3. Reference number from QAPP Worksheet #23. The laboratory SOPs are provided in Appendix B.

# QAPP Worksheet #13 – Secondary Data Uses and Limitations

| **Secondary Data** | **Data Source**  **(originating organization, report title and date)** | **Data Generator(s)**  **(originating organization, data types, data generation / collection dates)** | **How Data Will Be Used** | **Limitations on Data Use** |
| --- | --- | --- | --- | --- |
| Past site uses | Final Report Installation Assessment of Fort Wingate Depot Activity, 1980 |  | Review of Historical Use | None |
| Past site uses | Environmental Survey of Ft. Wingate Depot Activity, Gallup, New Mexico, 1981 |  | This Environmental Assessment provided a summary of all facets of the FWDA which may have environmental significance | None |
| Past site uses | FWDA RCRA Facility Assessment Report,1990 |  | Review of historical use and historical reports of Functional Test Range (FTR). | None |
| Background concentrations | Fort Wingate Depot Activity, Gallup, New Mexico, Final Remedial Investigation/Feasibility Study & RCRA Corrective Action Program Document | ERM Program Management Company  November 1997 | Established background concentrations and Preliminary Remediation Goals. | None |
| Site clearance information | Final Removal Report OE Sampling and Removal Action, 1998 | CMS Environmental, Inc. | Completed unexploded ordnance clearance at FTR 1 in 1998 in which a 100% surface clearance and a subsurface clearance of over 16% of the site was performed. | None |
| Data gap review | Further Site Characterization of Functional Test Range 1, 2000 | Tetra Tech NUS, Inc. | Further Site Characterization at FTR 1 in 2000 to determine if explosives, metals, and diesel fuel had been released to soils and sediments.  Data Gap: To be implemented - Additional evaluation of the northern portion of FTR 1. | None |
| Site clearance information | Final Report on Airborne Geophysical Survey at Fort Wingate Depot Activity, McKinley County, New Mexico, January, 2009 |  | Summary of results of an airborne geophysical survey to acquire vertical magnetic gradient data to provide an indication of the level of unexploded ordnance contamination and areas of  pits and trenches, and to localize potential sources with sufficient positional accuracy to permit ground-based reacquisition of targets.  A high-resolution vertical magnetic gradient system was developed for FWDA. Anomalies were identified at FTR 1.  Data Gap: To be implemented - Ground truthing of anomalies.  Additional soil characterization. | None |
| Background concentrations | Soil Background Study and Data Evaluation Report, 2010 |  | Background Study of soil to be used to make a statistical determination on the  nature and occurrence of inorganic constituents in soil at the FWDA based on site-to-background comparisons. | None |

| QAPP Worksheet #14&16 – Project Tasks and Schedule | | | |
| --- | --- | --- | --- |
| **Activity** | **Responsible Party** | **Deliverable(s)** | **Deliverable Due Date** |
| Army Draft RFI Work Plan Submittal | JV | Army Draft RFI Work Plan Submittal | Upon completion of task |
| Draft Final (NMED/Tribal) RFI Work Plan Submittal | JV | Draft Final Work Plan Submittal | Four weeks after receipt of comments from USACE |
| Final RFI Work Plan Submittal | JV | Final RFI Work Plan Submittal | Five weeks after receipt of NMED/Tribal comments |
| RFI Field Work | JV | Field notes, weekly progress report, and daily QC report | Begin 90 days after receipt of NMED approval of Work Plan. Weekly submittals due Friday of the week following for which the activity was performed. |
| Army Draft RFI Report | JV | Army Draft RFI Report | 60 days following the receipt of validated laboratory data |
| Draft Final (NMED/Tribal) RFI Report | JV | Draft Final RFI Report | Four weeks after receipt of comments from USACE |
| Final RFI Report | JV | Final RFI Report | 30 days after receipt and resolution of comments on RFI Report from tribes and NMED |

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| **Summary of Project Tasks** |

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| **Data Management Tasks** |
| The purpose of data management is to confirm the necessary data are accurate and readily accessible to meet the analytical and reporting objectives of the project. The soil investigation activities will include a number of samples requiring a structured, comprehensive and efficient program for management of data.  The data management program established for the project includes field documentation and sample QA/QC procedures, methods for tracking and managing the data, and a system for filing all site-related information. More specifically, data management procedures will be employed to efficiently process the information collected, such that the data are readily accessible and accurate. These procedures are described in detail in the following section.  The data management plan has five elements: 1) sample designation system, 2) field activities, 3) sample tracking and management, 4) data management system, and 5) document control and inventory. |
| **Sample Designation System** |
| A concise and easily understandable sample designation system is an important part of project sampling activities. It provides a unique sample number that will facilitate both sample tracking and easy resampling of select locations to evaluate data gaps, if necessary. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events or conditions. A combination of letters and numbers will be used to yield a unique sample number for each field sampled collected, as outlined below. |
| **Sample Codes** |
| Each sample will be identified by a unique sample identification number in the logbook, sampling log, and chain-of-custody (COC) record using an alphanumeric code. Field samples will be linked to geographic location via location codes. Where possible, location codes will link historical sample data with new data. All field samples will be identified using the following convention in the order presented below.  The sample identification will consist of a combination of the Parcel number, SWMU or AOC number, additional site identifier, source of sample, Decision Unit (DU), type of sample, and depth of sample collection in accordance with the latest version of the FWDA Environmental Information Management Plan (USACE, 2007). Additional description of the proposed sample nomenclature system is as follows:  Parcel: 3  SWMU: 14  Additional Site Identifier: AF (arroyo floor), AW (arroyo wall), R (soil removal of DU)  Burial Pit Excavation No. (as needed): BP1  Source of Sample: SS (surface soil), SW (side wall), B (excavation bottom)  DU Number (as needed): XX or XXX, increment number as appropriate  Depth Range (as needed): 0.0-0.5 or 0.5-1.0 (applicable to discrete sampling only)  Type of Sample: IS (incremental sample), C (composite), ES (excavation screening), EC (excavation composite), ED (excavation discrete), D (discrete)  Matrix: SO (Soil)  QA/QC samples will carry the same sample nomenclature as the parent sample with a unique suffix and numeral (if required) to distinguish individual samples. The sampling point associations for field duplicates must be recorded in the field log. Blind duplicate samples will be labeled sequentially per sampling event, starting at 01 and followed with the date in “mmddyy” (e.g., FD01-013015). The collection time is for the field duplicate is not recorded on the COC so that the parent sample is blind to the laboratory. QA/QC designations are:   * Field Duplicate Sample – “FD” * Matrix Spike and Matrix Spike Duplicate – “MS” and MSD”   Sample identification and labeling procedures may be modified as needed to supplement specific investigation objectives and any deviations identified in site-specific work plans. |

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| **Field Activities** |
| Field activities require consistent documentation and accurate record keeping. During site activities, standardized procedures will be used for documentation of field activities, data security and QA/QC. These procedures are described in further detail in the following subsections.  **Field Documentation**  Complete and accurate record keeping is a critical component of the field investigation activities. When interpreting analytical results and identifying data trends, investigators realize that field notes are an important part of the review and assessment process. To confirm that the field investigation is thoroughly documented, several different information records, each with its own specific reporting requirements, will be maintained, including:   * Sample collection forms; * COC forms; and * instrument calibration records.   Each of these types of field documentation is described below.  **Field Logs**  Personnel performing the field activities will keep field logs that detail observations and measurements made during the site work. Data will be recorded directly into site-dedicated, bound notebooks, with each entry dated and signed. To determine, at a future date, that notebook pages are not missing, each page will be sequentially numbered. Erroneous entries will be corrected by crossing out the original entry, initialing it and then documenting the proper information.  **Chain-of-Custody Forms**  COC forms are used to document and track sample possession from time of collection to the time of disposal. A COC form will accompany each field sample collected, and one copy of the form will be filed in the project files. Field personnel will be briefed on the proper use of the COC procedure.  **Instrument Calibration Records**  As part of data QA procedures, field monitoring and detection equipment will be routinely calibrated. Instrument calibration confirms that equipment used is of the proper type, range, accuracy and precision to provide data compatible with the specified requirements and desired results. Calibration procedures for the various types of field instrumentation are described in Worksheet #22. To demonstrate that established calibration procedures have been followed, calibration records will be prepared and maintained to include, as appropriate, the following:   * calibration date and time; * type and identification number of equipment; * calibration frequency and acceptable tolerances; * identification of individual(s) performing calibration; * reference standards used; * calibration data; and * information on calibration success or failure.   The calibration record will serve as a written account of monitoring or detection equipment QA. Erratic behavior or failures of field equipment will be subsequently recorded in the calibration log.  **Data Security**  Measures will be taken during the field investigation to confirm that samples and records are not lost, damaged or altered. When not in use, field notebooks will be stored at the field office or locked in the field vehicle. Access to these files will be limited to the field personnel who use them. |
| **Sample Management and Tracking** |
| A record of all field documentation will be maintained to confirm the validity of data used in the site analysis. To effectively execute such documentation, specific sample tracking and data management procedures will be used throughout the sampling program.  Sample tracking will begin with the completion of COC forms. The completed COC forms associated with samples collected will be maintained by the appropriate Task Manager. Copies of all completed COC forms will be maintained in the project file. If samples are not hand delivered, the laboratory will verify receipt of the samples electronically (via e-mail) on the following day.  When analytical data are received from the laboratory, the Program Chemist will review the incoming analytical data packages against the information on the COCs to confirm that the correct analyses were performed for each sample and that results for all samples submitted for analysis were received. Any discrepancies noted will be promptly followed up by the Program Chemist. |
| **Data Management System** |
| In addition to the sample tracking system, a data management system will be implemented. The central focus of the data management system will be the development of a personal computer-based project database. The project database will combine pertinent geographical, field and analytical data. Information that will be used to populate the database will be derived from field observations and analytical results. Each of these sources is discussed in the following sections. |
| **Computer Hardware**  The database will be constructed on personal computer work stations connected through a network server. The network will provide access to various hardware peripherals, such as laser printers, backup storage devices, image scanners and modems. Computer hardware will be upgraded to industrial and corporate standards, as necessary, in the future.  **Computer Software**  The data will be warehoused in EQuIS 5 database and provided to USACE in Microsoft Access. Geographic information system applications will be developed in ESRI ArcGIS. Tables and other database reports will be generated through EQuIS in conjunction with Microsoft Excel. These software products will be upgraded to current industrial standards, as necessary.  **Field Observations**  An important part of the information that will ultimately reside in the data management system for use during the project will originate in the observations that are recorded in the field. Following each sampling event, the sample collection forms will be prepared by the field personnel who performed the sampling activities. The purpose of the sample collection forms is to summarize and provide a record of the sampling event. Topics to be discussed include the locations sampled, the sampling methodologies used, QA/QC procedures, blind duplicate and MS/MSD sample identification numbers, personnel involved in the activity, and any other noteworthy events that occurred.  Tables are typically attached to the memorandum or email and are used to summarize measurements that were recorded in the field books. It is anticipated that these tables will be developed using a personal computer spreadsheet program to reduce possible transcription error and to facilitate the transfer of information to the data management system.  All pertinent field data will be manually entered into the appropriate database tables from the COC forms and field notebooks.  **Analytical Results**  Analytical results will be provided by the laboratory in both a digital, and a hard copy or pdf format. The data packages will be examined to confirm that the correct analyses were performed for each sample submitted and that all of the analyses requested on the COC form were performed. If discrepancies are noted, the Program Chemist will be notified and will promptly follow up with the laboratory to resolve any issues.  Each data package will undergo a usability assessment in accordance with procedures outlined in Worksheet #37. Data that do not meet the specified standards will be flagged pending resolution of the issue. The flag will not be removed from the data until the issue associated with the sample results is resolved. Although flags may remain for certain data, the use of the data may not necessarily be restricted.  Following completion of the usability assessment, the digital files will be used to populate the appropriate database tables. This format specifies one data record for each constituent for each sample analyzed. Specific fields include:   * sample identification number; * date sampled; * date analyzed; * parameter name; * analytical result; * units; * detection limit; and * qualifier(s).   The individual electronic data deliverables (EDDs), supplied by the laboratory in Staged Electronic Data Delivery (SEDD) packages, and EQuIS 5 format, will be loaded into the appropriate database table. Any subcontracted laboratory is required to submit the same EDD formats. Any analytical data that cannot be provided by the laboratory in electronic format will be entered manually. After entry into the database, the EDD data will be compared to the field information previously entered into the database to confirm that all requested analytical data have been received.  **Data Analysis and Reporting**  The database management system will have several functions to facilitate the review and analysis of project data. Data entry screens will be developed to assist in the keypunching of field observations. Routines will also be developed to permit the user to scan analytical data from a given site for a given medium. Several output functions that have been developed will be appropriately modified for use in the data management system.  A valuable function of the data management system will be the generation of tables of analytical results from the project database. The capability of the data management system to directly produce tables reduces the redundant manual entry of analytical results during report preparation and precludes transcription errors that may occur otherwise. This data management system function creates the ability to process the data and generate a table of rows and columns. Tables of analytical data will be produced as part of data interpretation tasks, the reporting of data and generation of reports. The table will include the following information: Sample identification, date collected, analytical method, matrix, CAS number, analyte, result, reporting limit, units, lab qualifier, screening level source, screening level value, units, and if the screening level has been exceeded using a yes or no entry.  Another function of the data management system will be to create digital files of analytical results and qualifiers suitable for transfer to mapping/ presentation software. The digital file will consist of sample location number, state plane coordinates, sampling date and detected constituents, and associated concentrations and analytical qualifiers. The file is then transferred to an AutoCAD work station, where another program has been developed to plot a location’s analytical data in a "box" format at the sample location (represented by the state plane coordinates). This routine greatly reduces the redundant keypunching of analytical results and facilitates the efficient production of interpretative and presentation graphics.  The data management system also has the capability of producing a digital file of select parameters that exists in one or more of the databases. This type of custom function is accomplished on an interactive basis and is best used for transferring select information into a number of analysis tools, such as statistical or graphing programs. |
| **Documentation and Records** |
| **Field Sample Identification**. This is described above in the Sample Codes section.  **Field Documentation**. Field personnel will provide comprehensive documentation covering all aspects of field sampling, field analysis and sample COC. This documentation constitutes a record that allows reconstruction of all field events to aid in the data review and interpretation process. All documents, records and information relating to the performance of the field work will be retained in the project file. The various forms of documentation to be maintained throughout the project are described below.   * *Daily Production Documentation*. A field notebook consisting of a waterproof, bound notebook that will contain a record of all activities performed at the site. * *Sampling Information*. Detailed notes will be made as to the exact sampling location, physical observations and weather conditions (as appropriate). * *Sample COC*. The COC forms will provide the record of responsibility for sample collection, transport and submittal to the laboratory. COC forms will be filled out at each sampling site, at a group of sampling sites or at the end of each day of sampling by field personnel designated to be responsible for sample custody. If the samples are relinquished by the designated sampling person to other sampling or field personnel, the COC form will be signed and dated by the appropriate personnel to document the sample transfer. The original COC form will accompany the samples to the laboratory, and copies will be forwarded to the project files.   Persons will have custody of samples when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.   * + *Field Equipment, Calibration and Maintenance Logs*. To document the calibration and maintenance of field instrumentation, calibration and maintenance logs will be maintained for each piece of field equipment that is not factory-calibrated.   **Laboratory Project Files**. The laboratory will establish a file for pertinent data. The file will include correspondence, faxed information, phone logs and COC forms. The laboratory will retain project files and data packages for a period not less than five years.  **Laboratory Logbooks**. Workbooks, bench sheets, instrument logbooks and instrument printouts will be used to trace the history of samples through the analytical process and to document important aspects of the work, including the associated QCs. As such, logbooks, bench sheets, instrument logs and instrument printouts will be part of the permanent record of the laboratory. Each page or entry will be dated and initialed by the analyst at the time of entry. Errors in entry will be crossed out in indelible ink with one stroke, corrected without the use of white-out or by obliterating or writing directly over the erroneous entry, and initialed and dated by the individual making the correction. Pages of logbooks that are not used will be completed by lining out unused portions. Information regarding the sample, analytical procedures performed and results of the testing will be recorded on laboratory forms or personal notebook pages by the analyst. These notes will be dated and will also identify the analyst, instrument used and instrument conditions. Laboratory notebooks will be periodically reviewed by the laboratory group leaders for accuracy, completeness and compliance with this QAPP. All entries and calculations will be verified by the laboratory group leader. If all entries on the pages are correct, the laboratory group leader will initial and date the pages. Corrective action will be taken for incorrect entries before the laboratory group leader signs.  **Computer and Hard Copy Storage**. All electronic files and deliverables will be retained by the laboratory for not less than five years; hard copy data packages (or electronic copies) will also be retained for not less than five years.  **Field Data Reporting**. Information collected in the field through visual observation, manual measurement and/or field instrumentation will be recorded in field notebooks or data sheets and/or on forms. Such data will be reviewed by the Site Manager for adherence to the associated plan and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible and (as necessary) incorporated into the data evaluation process. If applicable, field data forms and calculations will be processed and included in appendices to the appropriate reports (when generated). The original field logs documents and data reductions will be kept in the project files.  **Laboratory Data Reporting**. Data reports for all parameters will include, at a minimum, the following:  **Narrative:** Summary of activities that took place during sample analysis including the following information:   * laboratory name and address; * date of sample receipt; * cross reference of laboratory identification number to contractor sample identification; * analytical methods used; * deviations from specified protocol; and * corrective actions (if any) taken.   Included with the narrative will be any sample handling documents, including field and internal COC forms, air bills, and shipping tags.  **Analytical Results:** These will be reported according to analysis type and include the following information, as applicable:   * sample ID; * laboratory ID; * date of collection; * date of receipt; * date of extraction; * date of analysis; and * detection limits, limit of detection, and limit of quantitation.   Sample results on the report forms will be corrected for dilutions. Soil data will be reported on a dry weight basis. Unless otherwise specified, all results will be reported uncorrected for blank contamination.  The analytical analyses will be performed using USEPA approved methodology. These data will be reported as Stage 3, as defined in DoD QSM Appendix A, Section 7.0.  Data reporting levels are as follows:   * Stage 3 as defined in DoD QSM Appendix A, Section 7.0 |
| **Assessment/Audit Tasks** |
| Performance and systems audits will be completed in the field and laboratory during the site investigations, as described below and in Worksheets #31 and #32.   1. **Field Audits. The following field performance and systems audits will be completed during this project.**   The Site Manager (or their designee), will monitor field performance. Field performance audit summaries will contain an evaluation of field activities to verify that the activities are performed according to established procedures as described in field sampling SOPs located in Appendix A of this QAPP. Field performance audits may also be performed by the appropriate PM (or their designee). The auditor(s) will review field reports and communicate concerns to the PM and/or Site Manager, as appropriate.  The number and frequency of field performance audits conducted will be determined independently by the Project Manager and Site Manager. The observations made during field performance audits and any recommended changes/deviations to the field procedures will be recorded and documented.  In addition, systems audits comparing scheduled QA/QC activities from this QAPP with actual QA/QC activities completed will be performed. The Site Manager and/or Program Chemist will periodically confirm that work is being performed consistent with this QAPP.   1. **Laboratory Audits**   Internal laboratory audits are conducted periodically by the Laboratory QA Manager. As part of the audit, the overall performance of the laboratory staff is evaluated and compared to the performance criteria outlined in the laboratory QA manual and SOPs. Results of the audits are summarized and issued to each department supervisor, Laboratory Manager and Laboratory Director. A systems audit of each laboratory may be performed by the Program Chemist to determine whether the procedures implemented by each laboratory comply with the QA manual and SOPs.  As a participant in state and federal certification programs, the laboratory(ies) are audited by representatives of the regulatory agency issuing certification, in addition to the laboratory’s internal audits. Audits are usually conducted annually and focus on laboratory conformance to the specific program protocols for which the laboratory is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action, if necessary.  The JV reserves the right to conduct an on-site audit of the laboratory(ies) prior to the start of analyses for the project. Additional audits may be performed during the project, as deemed necessary.   1. **Corrective Action**   Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP. Corrective actions include procedures to promptly investigate, document, evaluate and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for the actions are described below.   1. **Field Procedures**   If, during field work, a condition is noted by the field crew that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause and corrective action implemented by the Site Manager or a designee will be documented on a corrective action form and reported to the appropriate Project Manager.  Examples of situations that would require corrective actions are as follows:   * protocols as defined by the QAPP have not been followed; * equipment is not in proper working order or is not properly calibrated; * QC requirements have not been met; and * issues resulting from performance or systems audits have not been resolved.   Project personnel will continuously monitor ongoing work performance as part of daily responsibilities.   1. **Laboratory Procedures**   In the laboratory(ies), when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause and corrective action taken will be documented and reported to the Project Manager and Program Chemist.  Corrective action may be initiated, at a minimum, under the following conditions:   * protocols as defined by this QAPP have not been followed; * predetermined data acceptance standards are not obtained; * equipment is not in proper working order or calibrated; * sample and test results are not completely traceable; * QC requirements have not been met; and * issues resulting from performance or systems audits have not been resolved.   Laboratory personnel will continuously monitor ongoing work performance as part of daily responsibilities. Corrective action will be initiated at the point where the problem has been identified. At whatever level this occurs (analyst, supervisor, data review, or quality control), it will be brought to the attention of the Laboratory QA Manager and, ultimately, the Laboratory Director. Final approval of any action deemed necessary is subject to the approval of the Laboratory Director.  Any corrective action deemed necessary based on system or performance audits, the analytical results of split samples, or the results of data review will be implemented. The corrective action may include sample re-extraction, re-preparation, re-analysis, cleanup, dilution, matrix modification or other activities. |

# QAPP Worksheet #15-1 Project Action Limits-Specific Detection/Quantitation Limits

**(RTI Laboratory - Soil)**

|  |  | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Analyte** | | **CAS #** | **Soil Screening Levels1** | **Screening Level**  **Source** | **Laboratory**  **LOQ3** | **Laboratory**  **LOD** | | **Laboratory**  **DL4** | |
| **Semi-volatile Organic Compounds (8270D)5 (mg/kg)** | | | | | | | | | |
| Acenaphthene | | 83-32-9 | 3480 | NMED SSL | 0.160 | 0.0167 | | 0.0074 | |
| Acenaphthylene | | 208-96-8 | -- | -- | 0.160 | 0.0167 | | 0.0071 | |
| Aniline | | 62-53-3 | 93 | EPA RSL | 0.160 | 0.0333 | | 0.0246 | |
| Anthracene | | 120-12-7 | 17400 | NMED SSL | 0.160 | 0.0167 | | 0.0081 | |
| Benzo(a)anthracene | | 56-55-3 | 1.53 | NMED SSL | 0.160 | 0.0167 | | 0.0110 | |
| Benzo(a)pyrene | | 50-32-8 | 0.153 | NMED SSL | 0.160 | 0.0167 | | 0.0101 | |
| Benzo(b)fluoranthene | | 205-99-2 | 1.53 | NMED SSL | 0.160 | 0.0167 | | 0.0091 | |
| Benzo(g,h,i)perylene | | 191-24-2 | -- | NMED SSL | 0.160 | 0.0167 | | 0.0118 | |
| Benzo(k)fluoranthene | | 207-08-9 | 15.3 | NMED SSL | 0.160 | 0.0333 | | 0.0173 | |
| Benzoic acid | | 65-85-0 | 250,000 | EPA RSL | 1.000 | 0.333 | | 0.135 | |
| Benzyl alcohol | | 100-51-6 | 6200 | EPA RSL | 0.660 | 0.0167 | | 0.0080 | |
| 4-Bromophenyl phenyl ether | | 101-55-3 | -- | -- | 0.200 | 0.0833 | | 0.0425 | |
| Butyl benzyl phthalate | | 85-68-7 | 280 | EPA RSL | 0.160 | 0.0333 | | 0.0197 | |
| Carbazole | | 86-74-8 | -- | -- | 0.160 | 0.0167 | | 0.0115 | |
| 4-Chloro-3-methyl phenol | | 59-50-7 | 6200 | EPA RSL | 0.160 | 0.0167 | | 0.0085 | |
| 4-Chloroaniline | | 106-47-8 | 2.7 | EPA RSL | 0.160 | 0.0833 | | 0.0251 | |
| bis(2-Chloroethoxy)methane | | 111-91-1 | 180 | EPA RSL | 0.160 | 0.0167 | | 0.0069 | |
| bis(2-Chloroethyl)ether | | 111-44-4 | 3.11 | NMED SSL | 0.160 | 0.0333 | | 0.0179 | |
| bis(2-Chloroisopropyl)ether | | 108-60-1 | 99.3 | NMED SSL | 0.160 | 0.0167 | | 0.0076 | |
| bis(2-Ethylhexyl)phthalate | | 117-81-7 | 380 | NMED SSL | 0.160 | 0.0333 | | 0.0244 | |
| 2-Chloronaphthalene | | 91-58-7 | 6260 | NMED SSL | 0.160 | 0.0167 | | 0.0111 | |
| 2-Chlorophenol | | 95-57-8 | 391 | NMED SSL | 0.160 | 0.0167 | | 0.0069 | |
| 4-Chlorophenyl phenyl ether | | 7005-72-3 | -- | -- | 0.160 | 0.0167 | | 0.0101 | |
| Chrysene | | 218-01-9 | 153 | NMED SSL | 0.160 | 0.0167 | | 0.0094 | |
| Di-n-butyl phthalate | | 84-74-2 | 6160 | NMED SSL | 0.160 | 0.0333 | | 0.0180 | |
| Di-n-octylphthalate | | 117-84-0 | 620 | EPA RSL | 0.160 | 0.0167 | | 0.0114 | |
| Dibenzo(a,h)anthracene | | 53-70-3 | 0.153 | NMED SSL | 0.160 | 0.0333 | | 0.0264 | |
| Dibenzofuran | | 132-64-9 | 72 | EPA RSL | 0.160 | 0.0167 | | 0.0085 | |
| 1,2-Dichlorobenzene | | 95-50-1 | 2150 | NMED SSL | 0.160 | 0.0167 | | 0.0072 | |
| 1,3-Dichlorobenzene | | 541-73-1 | -- | -- | 0.160 | 0.0167 | | 0.0069 | |
| 1,4-Dichlorobenzene | | 106-46-7 | 32.8 | NMED SSL | 0.160 | 0.0167 | | 0.0053 | |
| 3,3'-Dichlorobenzidine | | 91-94-1 | 11.8 | NMED SSL | 1.000 | 0.667 | | 0.426 | |
| 2,4-Dichlorophenol | | 120-83-2 | 185 | NMED SSL | 0.160 | 0.0167 | | 0.0113 | |
| 2,6-Dichlorophenol | | 87-65-0 | -- | -- | 0.160 | 0.0167 | | 0.0057 | |
| Diethylphthalate | | 84-66-2 | 49300 | NMED SSL | 0.160 | 0.0167 | | 0.0122 | |
| Dimethyl phthalate | | 131-11-3 | -- | -- | 0.160 | 0.0167 | | 0.0111 | |
| 2,4-Dimethylphenol | | 105-67-9 | 1230 | NMED SSL | 0.160 | 0.0167 | | 0.0130 | |
| 4,6-Dinitro-2-methylphenol | | 534-52-1 | 4.93 | NMED SSL | 0.320 | 0.0833 | | 0.0479 | |
| 2,4-Dinitrophenol | | 51-28-5 | 123 | NMED SSL | 0.830 | 0.333 | | 0.225 | |
| 2,4-Dinitrotoluene | | 121-14-2 | 17.1 | NMED SSL | 0.160 | 0.0167 | | 0.0145 | |
| 2,6-Dinitrotoluene | | 606-20-2 | 3.56 | NMED SSL | 0.160 | 0.0167 | | 0.0158 | |
| Fluoranthene | | 206-44-0 | 2320 | NMED SSL | 0.160 | 0.0167 | | 0.0160 | |
| Fluorene | | 86-73-7 | 2320 | NMED SSL | 0.160 | 0.0167 | | 0.0094 | |
| Hexachlorobenzene | | 118-74-1 | 3.33 | NMED SSL | 0.160 | 0.0167 | | 0.0090 | |
| Hexachlorobutadiene | | 87-68-3 | 61.6 | NMED SSL | 0.160 | 0.0167 | | 0.0152 | |
| Hexachlorocyclopentadiene | | 77-47-4 | 370 | NMED SSL | 0.160 | 0.0833 | | 0.0385 | |
| Hexachloroethane | | 67-72-1 | 43.1 | NMED SSL | 0.160 | 0.0167 | | 0.0077 | |
| Indeno(1,2,3-c,d)pyrene | | 193-39-5 | 1.53 | NMED SSL | 0.160 | 0.0333 | | 0.0086 | |
| Isophorone | | 78-59-1 | 5600 | NMED SSL | 0.160 | 0.0167 | | 0.0069 | |
| 2-Methylnaphthalene | | 91-57-6 | 230 | EPA RSL | 0.160 | 0.0167 | | 0.0082 | |
| 2-Methylphenol | | 95-48-7 | 3100 | EPA RSL | 0.160 | 0.0167 | | 0.0065 | |
| 3 & 4-Methylphenol | | 108-39-4 /106-44-5 | 3100 | EPA RSL | 0.160 | 0.0333 | | 0.0158 | |
| **N-Nitrosodiethylamine** | | **55-18-5** | **0.0079** | NMED SSL | 0.160 | 0.0333 | | 0.0230 | |
| N-Nitrosodimethylamine | | 62-75-9 | 0.023 | NMED SSL | 0.160 | 0.0167 | | 0.0081 | |
| N-Nitrosodi-n-propylamine | | 621-64-7 | 0.076 | EPA RSL | 0.160 | 0.0167 | | 0.0093 | |
| N-Nitrosodiphenylamine (Diphenylamine) | | 86-30-6 | 1090 | NMED SSL | 0.160 | 0.0167 | | 0.0081 | |
| Naphthalene | | 91-20-3 | 49.7 | NMED SSL | 0.160 | 0.0167 | | 0.0065 | |
| 2-Nitroaniline | | 88-74-4 | 610 | EPA RSL | 0.320 | 0.0167 | | 0.0081 | |
| 3-Nitroaniline | | 99-09-2 | -- | -- | 0.320 | 0.0167 | | 0.0117 | |
| 4-Nitroaniline | | 100-01-6 | 27 | EPA RSL | 0.320 | 0.0833 | | 0.0240 | |
| Nitrobenzene | | 98-95-3 | 60.4 | NMED SSL | 0.160 | 0.0167 | | 0.0103 | |
| 2-Nitrophenol | | 88-75-5 | -- | -- | 0.160 | 0.0167 | | 0.0112 | |
| 4-Nitrophenol | | 100-02-7 | -- | -- | 0.830 | 0.333 | | 0.239 | |
| Pentachlorophenol | | 87-86-5 | 9.85 | NMED SSL | 0.160 | 0.0833 | | 0.0627 | |
| Phenanthrene | | 85-01-8 | 1740 | NMED SSL | 0.160 | 0.0167 | | 0.0088 | |
| Phenol | | 108-95-2 | 18500 | NMED SSL | 0.160 | 0.0167 | | 0.0089 | |
| Pyrene | | 129-00-0 | 1740 | NMED SSL | 0.160 | 0.0167 | | 0.0102 | |
| Pyridine | | 110-86-1 | 78 | EPA RSL | 0.160 | 0.0833 | | 0.0353 | |
| 1,2,4-Trichlorobenzene | | 120-82-1 | 82.9 | NMED SSL | 0.160 | 0.0167 | | 0.0093 | |
| 2,4,5-Trichlorophenol | | 95-95-4 | 6160 | NMED SSL | 0.160 | 0.0167 | | 0.0109 | |
| 2,4,6-Trichlorophenol | | 88-06-2 | 61.6 | NMED SSL | 0.160 | 0.0167 | | 0.0123 | |
| **Explosives (8330B)5 (mg/kg)** | | | | | | | | | |
| HMX | | 2691-41-0 | 3850 | NMED SSL | 0.080 | 0.040 | | 0.0027 | |
| RDX | | 121-82-4 | 60.4 | NMED SSL | 0.080 | 0.040 | | 0.0034 | |
| 1,3-Dinitrobenzene | | 99-65-0 | 6.2 | EPA RSL | 0.080 | 0.040 | | 0.0177 | |
| 2,4-Dinitrotoluene | | 121-14-2 | 17.1 | NMED SSL | 0.080 | 0.040 | | 0.0108 | |
| 2,6-Dinitrotoluene | | 606-20-2 | 3.56 | NMED SSL | 0.080 | 0.040 | | 0.0128 | |
| 2-Amino-4,6-dinitrotoluene | | 35572-78-2 | 150 | EPA RSL | 0.080 | 0.040 | | 0.0136 | |
| 4-Amino-2,6-dinitrotoluene | | 19406-51-0 | 150 | EPA RSL | 0.080 | 0.040 | | 0.0089 | |
| Nitrobenzene | | 98-95-3 | 60.4 | NMED SSL | 0.080 | 0.040 | | 0.0089 | |
| 2-Nitrotoluene | | 88-72-2 | 31.6 | NMED SSL | 0.080 | 0.040 | | 0.0103 | |
| 3-Nitrotoluene | | 99-08-1 | 6.16 | NMED SSL | 0.080 | 0.040 | | 0.0104 | |
| 4-Nitrotoluene | | 99-99-0 | 246 | NMED SSL | 0.080 | 0.040 | | 0.0147 | |
| Tetryl | | 479-45-8 | 156 | NMED SSL | 0.080 | 0.040 | | 0.0029 | |
| 1,3,5-Trinitrobenzene | | 99-35-4 | 2200 | EPA RSL | 0.080 | 0.040 | | 0.0070 | |
| 2,4,6-Trinitrotoluene | | 118-96-7 | 36.0 | NMED SSL | 0.080 | 0.040 | | 0.0045 | |
| Nitroglycerine | | 55-63-0 | 6.16 | NMED SSL | 0.160 | 0.080 | | 0.0185 | |
| PETN | | 78-11-5 | 120 | EPA RSL | 0.400 | 0.200 | | 0.050 | |
| **Perchlorate (6850)5 (mg/kg)** | | | | | | | | | |
| Perchlorate | | 14797-73-0 | 54.8 | NMED SSL | 0.0020 | 0.0010 | | 0.00047 | |
| **Metals (6010C)5 (mg/kg)** | | | | | | | | | |
| Arsenic 6 | | 7440-38-2 | 5.6 | Background | 2.0 | 1.0 | | 0.726 | |
| Barium | | 7440-39-3 | 15,560 | NMED SSL | 10.0 | 5.0 | | 0.297 | |
| Cadmium | | 7440-43-9 | 70.5 | NMED SSL | 0.25 | 0.05 | | 0.033 | |
| Chromium | | 7440-47-3 | 96.6 | NMED SSL | 0.50 | 0.40 | | 0.082 | |
| Lead | | 7439-92-1 | 400 | NMED SSL | 5.0 | 1.0 | | 0.623 | |
| Selenium | | 7782-49-2 | 391 | NMED SSL | 2.0 | 1.5 | | 1.16 | |
| Silver | | 7440-22-4 | 391 | NMED SSL | 1.0 | 0.25 | | 0.082 | |
| **Mercury (7471B)5 (mg/kg)** | | | | | | | | | |
| Mercury | | 7439-97-6 | 23.8 | NMED SSL | 0.010 | 0.005 | | 0.0007 | |
|  | |  |  |  |  | |  | |  |  |
|  | **Abbreviations:** | | | | | | | | |
|  | DL = detection limit | | | | | | | | |
|  | LOD = limit of detection | | | | | | | | |
|  | LOQ = limit of quantitation | | | | | | | | |
|  |  | | | | | | | | |
|  | mg/kg = milligrams per kilogram | | | | | | | | |
|  | |  |  |  |  | |  | |  |  |
| **Notes:** | |  |  |  |  | |  | |  |  |
|  | 1. Soil screening criteria reflect New Mexico Soil Screening Criteria for Resident Soil, December 2014. Soil screening criteria is from USEPA RSL for Resident Soil January 2015. The NMED Soil Screening Criteria is listed for all analytes. If screening criteria isn’t specified by NMED, then the USEPA RSL is listed as the soil screening level criteria. | | | | | | | | |
|  | 2. Screening levels shown as bold are less than the DL. | | | | | | | | |
|  | 3. The target reporting limits are based on wet weight. Actual reporting limits will vary based on sample weight and moisture content. | | | | | | | | |
|  | 4. Concentrations detected less than the LOQ but greater than the DL will be reported with the appropriate qualifier. | | | | | | | | |
|  | 5. USEPA. Office of Solid Waste and Emergency Response. *Test Methods for Evaluating Solid Waste SW-846* Third Edition, as updated by Updates I, II, IIA, IIB, III, IIIA, IIIB, IVA and IVB, Revision 6, February 2007. | | | | | | | | |
|  | 6. Arsenic screening value is the background value determined by December 18, 2013 NMED letter. The background value is used because it is higher than the NMED SSL. If the arsenic value of 5.6 is exceeded then consider the site range compared to 0.2-11.2mg/kg. If the result exceeds 5.6, then the NMED SSL of 4.25 will be used to estimate potential risk. | | | | | | | | |

|  | QAPP Worksheet #15-2 Project Action Limits-Specific Detection/Quantitation Limits **(TestAmerica - Soil)** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Analyte** | | **CAS #** | **Soil Screening Levels1** | **Screening**  **Level**  **Source** | **Laboratory**  **LOQ3** | | **Laboratory**  **LOD** | | **Laboratory**  **DL4** |
| **Semi-volatile Organic Compounds (8270D)5 (mg/kg)** | | | | | | | | | |
| Acenaphthene | | 83-32-9 | 3480 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Acenaphthylene | | 208-96-8 | -- | -- | 0.330 | | 0.0990 | | 0.0333 |
| Anthracene | | 120-12-7 | 17400 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Benzo(a)anthracene | | 56-55-3 | 1.53 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Benzo(a)pyrene | | 50-32-8 | 0.153 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Benzo(b)fluoranthene | | 205-99-2 | 1.53 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Benzo(g,h,i)perylene | | 191-24-2 | -- | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Benzo(k)fluoranthene | | 207-08-9 | 15.3 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 4-Bromophenyl phenyl ether | | 101-55-3 | -- | -- | 0.330 | | 0.0990 | | 0.0333 |
| Butyl benzyl phthalate | | 85-68-7 | 280 | EPA RSL | 0.330 | | 0.0990 | | 0.0333 |
| Carbazole | | 86-74-8 | -- | -- | 0.330 | | 0.0990 | | 0.0333 |
| 4-Chloro-3-methyl phenol | | 59-50-7 | 6200 | EPA RSL | 0.330 | | 0.0990 | | 0.0333 |
| 4-Chloroaniline | | 106-47-8 | 2.7 | EPA RSL | 0.330 | | 0.0990 | | 0.0333 |
| bis(2-Chloroethoxy)methane | | 111-91-1 | 180 | EPA RSL | 0.330 | | 0.0990 | | 0.0333 |
| bis(2-Chloroethyl)ether | | 111-44-4 | 3.11 | NMED SSL | 0.330 | | 0.0990 | | 0.0334 |
| bis(2-Chloroisopropyl)ether | | 108-60-1 | 99.3 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| bis(2-Ethylhexyl)phthalate | | 117-81-7 | 380 | NMED SSL | 0.330 | | 0.0990 | | 0.0453 |
| 2-Chloronaphthalene | | 91-58-7 | 6260 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 2-Chlorophenol | | 95-57-8 | 391 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 4-Chlorophenyl phenyl ether | | 7005-72-3 | -- | -- | 0.330 | | 0.0990 | | 0.0333 |
| Chrysene | | 218-01-9 | 153 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Di-n-butyl phthalate | | 84-74-2 | 6160 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Di-n-octylphthalate | | 117-84-0 | 620 | EPA RSL | 0.330 | | 0.0990 | | 0.0333 |
| Dibenzo(a,h)anthracene | | 53-70-3 | 0.153 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Dibenzofuran | | 132-64-9 | 72 | EPA RSL | 0.330 | | 0.0990 | | 0.0333 |
| 1,2-Dichlorobenzene | | 95-50-1 | 2150 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 1,3-Dichlorobenzene | | 541-73-1 | -- | -- | 0.330 | | 0.0990 | | 0.0333 |
| 1,4-Dichlorobenzene | | 106-46-7 | 32.8 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 3,3'-Dichlorobenzidine | | 91-94-1 | 11.8 | NMED SSL | 1.600 | | 0.660 | | 0.330 |
| 2,4-Dichlorophenol | | 120-83-2 | 185 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Diethylphthalate | | 84-66-2 | 49300 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Dimethyl phthalate | | 131-11-3 | -- | -- | 0.330 | | 0.0990 | | 0.0333 |
| 2,4-Dimethylphenol | | 105-67-9 | 1230 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 4,6-Dinitro-2-methylphenol | | 534-52-1 | 4.93 | NMED SSL | 1.600 | | 0.660 | | 0.330 |
| 2,4-Dinitrophenol | | 51-28-5 | 123 | NMED SSL | 1.600 | | 0.660 | | 0.330 |
| 2,4-Dinitrotoluene | | 121-14-2 | 17.1 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 2,6-Dinitrotoluene | | 606-20-2 | 3.56 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Fluoranthene | | 206-44-0 | 2320 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Fluorene | | 86-73-7 | 2320 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Hexachlorobenzene | | 118-74-1 | 3.33 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Hexachlorobutadiene | | 87-68-3 | 61.6 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Hexachlorocyclopentadiene | | 77-47-4 | 370 | NMED SSL | 1600 | | 660 | | 330 |
| Hexachloroethane | | 67-72-1 | 43.1 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Indeno(1,2,3-c,d)pyrene | | 193-39-5 | 1.53 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Isophorone | | 78-59-1 | 5600 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 2-Methylnaphthalene | | 91-57-6 | 230 | EPA RSL | 0.330 | | 0.0990 | | 0.0333 |
| 2-Methylphenol | | 95-48-7 | 3100 | EPA RSL | 0.330 | | 0.0990 | | 0.0333 |
| 3 & 4-Methylphenol | | 108-39-4 /106-44-5 | 3100 | EPA RSL | 660 | | 99.0 | | 66.6 |
| N-Nitrosodi-n-propylamine | | 621-64-7 | **0.076** | EPA RSL | 0.330 | | 0.0990 | | 0.0333 |
| N-Nitrosodiphenylamine (Diphenylamine) | | 86-30-6 | 1090 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Naphthalene | | 91-20-3 | 49.7 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 2-Nitroaniline | | 88-74-4 | 610 | EPA RSL | 1.600 | | 0.0990 | | 0.0333 |
| 3-Nitroaniline | | 99-09-2 | -- | -- | 1.600 | | 0.0990 | | 0.0333 |
| 4-Nitroaniline | | 100-01-6 | 27 | EPA RSL | 1.600 | | 0.660 | | 0.330 |
| Nitrobenzene | | 98-95-3 | 60.4 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 2-Nitrophenol | | 88-75-5 | -- | -- | 0.330 | | 0.0990 | | 0.0333 |
| 4-Nitrophenol | | 100-02-7 | -- | -- | 1.600 | | 0.660 | | 0.330 |
| Pentachlorophenol | | 87-86-5 | 9.85 | NMED SSL | 1.600 | | 0.330 | | 0.330 |
| Phenanthrene | | 85-01-8 | 1740 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Phenol | | 108-95-2 | 18500 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| Pyrene | | 129-00-0 | 1740 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 1,2,4-Trichlorobenzene | | 120-82-1 | 82.9 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 2,4,5-Trichlorophenol | | 95-95-4 | 6160 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| 2,4,6-Trichlorophenol | | 88-06-2 | 61.6 | NMED SSL | 0.330 | | 0.0990 | | 0.0333 |
| **Explosives (8330)5 (microgram per kilogram)** | | | | | | | | | |
| HMX | | 2691-41-0 | 3850 | NMED SSL | 0.250 | | 0.0800 | | 0.0388 |
| RDX | | 121-82-4 | 60.4 | NMED SSL | 0.250 | | 0.0800 | | 0.0622 |
| 1,3-Dinitrobenzene | | 99-65-0 | 6.2 | EPA RSL | 0.250 | | 0.0800 | | 0.0435 |
| 2,4-Dinitrotoluene | | 121-14-2 | 17.1 | NMED SSL | 0.250 | | 0.0800 | | 0.0377 |
| 2,6-Dinitrotoluene | | 606-20-2 | 3.56 | NMED SSL | 0.250 | | 0.0800 | | 0.0637 |
| 2-Amino-4,6-dinitrotoluene | | 35572-78-2 | 150 | EPA RSL | 0.250 | | 0.0800 | | 0.0428 |
| 4-Amino-2,6-dinitrotoluene | | 19406-51-0 | 150 | EPA RSL | 0.300 | | 0.120 | | 0.0933 |
| Nitrobenzene | | 98-95-3 | 60.4 | NMED SSL | 0.250 | | 0.0800 | | 0.0432 |
| 2-Nitrotoluene | | 88-72-2 | 31.6 | NMED SSL | 0.250 | | 0.0800 | | 0.0651 |
| 3-Nitrotoluene | | 99-08-1 | 6.16 | NMED SSL | 0.250 | | 0.0800 | | 0.0556 |
| 4-Nitrotoluene | | 99-99-0 | 246 | NMED SSL | 0.250 | | 0.120 | | 0.0813 |
| Tetryl | | 479-45-8 | 156 | NMED SSL |  | |  | |  |
| 1,3,5-Trinitrobenzene | | 99-35-4 | 2200 | EPA RSL | 0.250 | | 0.0800 | | 0.0274 |
| 2,4,6-Trinitrotoluene | | 118-96-7 | 36.0 | NMED SSL | 0.250 | | 0.0800 | | 0.0357 |
| Nitroglycerine | | 55-63-0 | 6.16 | NMED SSL | 1.250 | | 0.375 | | 0.270 |
| PETN | | 78-11-5 | 120 | EPA RSL | 2.500 | | 0.375 | | 0.344 |
| **Perchlorate (6850)5 (mg/kg)** | | | | | | | | | |
| Perchlorate | | 14797-73-0 | 54.8 | NMED SSL | 0.0050 | | 0.0050 | | 0.0020 |
| **Metals (6010C)5 (mg/kg)** | | | | | | | | | |
| Arsenic 6 | | 7440-38-2 | 5.6 | Background | 1.0 | | 1.0 | | 0.236 |
| Barium | | 7440-39-3 | 15,560 | NMED SSL | 5.0 | | 0.7 | | 0.110 |
| Cadmium | | 7440-43-9 | 70.5 | NMED SSL | 0.5 | | 0.1 | | 0.034 |
| Chromium | | 7440-47-3 | 96.6 | NMED SSL | 1.5 | | 1.0 | | 0.138 |
| Lead | | 7439-92-1 | 400 | NMED SSL | 1.0 | | 0.5 | | 0.129 |
| Selenium | | 7782-49-2 | 391 | NMED SSL | 1.5 | | 0.8 | | 0.206 |
| Silver | | 7440-22-4 | 391 | NMED SSL | 1.0 | | 0.7 | | 0.070 |
| **Mercury (7471B)5 (mg/kg)** | |  |  |  |  | |  | |  |
| Mercury | | 7439-97-6 | 23.8 | NMED SSL | 0.04 | | 0.03 | | 0.011 |
|  | |  |  |  |  |  | |  | |  |
|  | **Abbreviations:** | | | | | | | | |
|  | DL = detection limit | | | | | | | | |
|  | LOD = limit of detection | | | | | | | | |
|  | LOQ = limit of quantitation | | | | | | | | |
|  | mg/kg = milligrams per kilogram | | | | | | | | |
|  | |  |  |  |  |  | |  | |  |
| **Notes:** | |  |  |  |  |  | |  | |  |
|  | 1. Soil screening criteria reflect New Mexico Soil Screening Criteria for Resident Soil, December 2014. Soil screening criteria is from USEPA RSL for Resident Soil November 2014. The NMED Soil Screening Criteria is listed for all analytes. If screening criteria isn’t specified by NMED, then the USEPA RSL is listed as the soil screening level criteria. | | | | | | | | |
|  | 2. Screening levels shown as bold are less than the DL. | | | | | | | | |
|  | 3. The target reporting limits are based on wet weight. Actual reporting limits will vary based on sample weight and moisture content. | | | | | | | | |
|  | 4. Concentrations detected less than the LOQ but greater than the DL will be reported with the appropriate qualifier. | | | | | | | | |
|  | 5. USEPA. Office of Solid Waste and Emergency Response. *Test Methods for Evaluating Solid Waste SW-846* Third Edition, as updated by Updates I, II, IIA, IIB, III, IIIA, IIIB, IVA and IVB, Revision 6, February 2007. | | | | | | | | |
|  | 6. Arsenic screening value is the background value determined by December 18, 2013 NMED letter. The background value is used because it is higher than the NMED SSL. If the arsenic value of 5.6 is exceeded then consider the site range compared to 0.2-11.2mg/kg. If the result exceeds 5.6, then the NMED SSL of 4.25 will be used to estimate potential risk. | | | | | | | | |

# QAPP Worksheet #17 –Sampling Design and Rationale

**Sampling Design and Rationale**

The soil investigation field activities are intended to determine the presence and lateral extent of the presence of COPCs in surface soil at SWMUs 14, 15, 33, and 74, and AOCs 89, 90, 91, and 92. For SWMUs 14, 15, and 33, the investigation will be focused only on those areas located outside of the burial pits and waste piles. Applicable field SOPs are located in Appendix A of this UFP-QAPP.

**Sampling Design**

ISM samples will be collected in the areas suspected to be impacted by historical uses. The ISM sampling program will follow the guidance provided in Interim Guidance 09-02: Implementation of Incremental Sampling of Soil for the Military Munitions Response Program (USACE, 2009) and Technical and Regulatory Guidance Incremental Sampling Methodology (ITRC, 2011). Collecting and combining a large number of increments from a DU to produce one incremental sample is the physical analog of collecting and separately analyzing an equal number of discrete samples from the DU and arithmetically averaging the results. The ISM provides an unbiased and representative estimate of the mean concentration of COPCs in the DU.

Composite soil sampling will be conducted during ISM sampling activities to determine the presence and lateral extent the presence of SVOCs in surface soils at SWMUs 14, 15, 33, and 74, and AOCs 89, 90, 91, and 92. The composite sample will be comprised of 6 subsamples, collected from within the DU.

Sampling procedures for the above are discussed in the RFI Work Plan, and the Field Sampling SOPs located in Appendix A of this UFP-QAPP.

**Chemistry Analyses**

Project-specific DQOs (QAPP Worksheet #11) for sampling and analysis and the QA/QC objectives by collecting the proper quantities and types of samples will be met by using the correct analytical methodologies, implementing field and laboratory QA/QC procedures, and using various data validation and evaluation processes.

**Analytical Methods**

Analytical reference limits are included in QAPP Worksheet #15.  Sampling locations are included in QAPP Worksheet #18.  Analytical SOP references are listed in QAPP Worksheet #23.

**Quality Assurance/Quality Control Samples**

The QA and QC procedures are documented in QAPP Worksheets #12 and #28. Samples are analyzed for the purpose of assessing the quality of the sampling effort and the analytical data.

**Field Quality Control Samples**

The QC for any analytical samples will be provided through the use of temperature blanks, EBs (if applicable), duplicates (composite samples), and replicates (ISM samples). The QC samples will be handled as regular samples.

* Equipment Blanks: EB will be collected for ISM and discrete sampling when non-dedicated equipment is used for sample collection. Samples will be taken during each sampling episode (one per day) to verify that decontamination procedures being employed are effective. The samples will be collected by pouring laboratory provided deionized water through decontaminated sampling equipment into the appropriate sample container. The COPCs for this sampling method include semi-volatile organic compounds (8270D), explosives (8330B), perchlorate (6850, when appropriate), and metals (6010B/7471A) which include arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver.
* Field Duplicates:Blind Field Duplicate samples will be collected for composite samples in a quantity equal to at least 10 percent of the DUs for the study area. The Blind Field Duplicate will be analyzed for SVOCs.
* Triplicates: For ISM sampling, QC samples will be collected at a frequency of 10% of the DUs in the form of triplicate samples. The triplicate sample will include the primary ISM sample plus two replicate ISM samples. The replicate samples will be collected from the DU at the same time as the primary ISM sample is being collected.

**Quality Assurance Samples**

For composite characterization samples (see Worksheet #18), a QA sample will be taken as a split from the same primary sample each QC field duplicate is taken from (i.e., the sample will be homogenized and split into three aliquots: the primary sample, the Blind Field Duplicate (QC) sample, and the QA sample). The QA split sample will be sent to the secondary laboratory and analyzed for SVOCs.

| QAPP Worksheet #18 –Sampling Locations and Methods/Standard Operating Procedure Requirements | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Matrix** | **Depth (ft bgs)** | **Type** | **Analyte/**  **Analytical Group** | **Sampling SOP** | **Comments** | |
| **SWMU 14** | | | | | | | |
| Example for DU Location 30:  Primary: 314SS-30-IS-SO  R1: 314SS-30-IS-SO-R1  R2: 314SS-30-IS-SO-R2 | Soil | 0-0.5 | ISM | Explosives,  RCRA 8 metals, and perchlorate | MC SOP 1 through  MC SOP 7 | ISM samples to be collected from 33 DUs  [10% of DUs to be sampled in triplicate comprised of the Primary sample and two Replicate samples (R1/R2)] | |
| Example for DU Location 5:  314SS-5-C-SO  QC: 314SS-x-C-SO-FD1  QA: 314SS-5-C-SO-QA1 | Soil | 0-0.5 | Composite | SVOCs | MC SOP 2 through  MC SOP 7 | 1 composite sampled to be collected from 33 DUs  (for 10% of DUs, the sample will be split into 3 aliquots: Primary, Field Duplicate, and QA) | |
| **SWMU 15** | | | | | | | |
| Example for DU Location 10:  Primary: 3-15-SS-10-IS-SO  R1: 315SS-10-IS-SO-R1  R2: 315SS-10-IS-SO-R2 | Soil | 0-0.5 | ISM | Explosives,  RCRA 8 metals, and perchlorate | MC SOP 1  through  MC SOP 7 | ISM samples to be collected from 14 DUs  [10% of DUs to be sampled in triplicate comprised of the Primary sample and two Replicate samples (R1/R2)] | |
| Example for DU Location 5:  315SS-5-C-SO  QC: 315SS-x-C-SO-FD1  QA: 315SS-5-C-SO-QA1 | Soil | 0-0.5 | Composite | SVOCs | MC SOP 2  through  MC SOP 7 | 1 composite sampled to be collected from 14 DUs  (for 10% of DUs, the sample will be split into 3 aliquots: Primary, Field Duplicate, and QA) | |
| **SWMU 33** | | | | | | | |
| Example for DU Location 1:  Primary: 333SS-1-IS-SO | Soil | 0-0.5 | ISM | Explosives,  RCRA 8 metals, and perchlorate | MC SOP 1 through  MC SOP 7 | ISM samples to be collected from 1 DU | |
| **SWMU 74** | | | | | | | |
| Example for DU Location 4:  Primary: 3-74-SS-4-IS-SO  R1: 374SS-4-IS-SO-R1  R2: 374SS-4-IS-SO-R2 | Soil | 0-0.5 | ISM | Explosives,  RCRA 8 metals, and perchlorate | MC SOP 1 through  MC SOP 7 | ISM samples to be collected from 4 DUs  [10% of DUs to be sampled in triplicate comprised of the Primary sample and two Replicate samples (R1/R2)] | |
| Example for DU Location 4:  374SS-4-C-SO  QC: 374SS-x-C-SO-FD1  QA: 374SS-4-C-SO-QA1 | Soil | 0-0.5 | Composite | SVOCs | MC SOP 2 through  MC SOP 7 | 1 composite sampled to be collected from 4 DUs  (for 10% of DUs, the sample will be split into 3 aliquots: Primary, Field Duplicate, and QA) | |
| **AOC 89** | | | | | | | |
| Example for DU Location 4:  Primary: 389SS-4-IS-SO  R1: 389SS-4-IS-SO-R1  R2: 389SS-4-IS-SO-R2 | Soil | 0-0.5 | ISM | Explosives,  RCRA 8 metals, and perchlorate | MC SOP 1 through  MC SOP 7 | ISM samples to be collected from 6 DUs  [10% of DUs to be sampled in triplicate comprised of the Primary sample and two Replicate samples (R1/R2)] | |
| Example for DU Location 4:  389SS-4-C-SO  QC: 389SS-x-C-SO-FD1  QA: 389SS-4-C-SO-QA1 | Soil | 0-0.5 | Composite | SVOCs | MC SOP 2 through  MC SOP 7 | 1 composite sampled to be collected from 6 DUs  (for 10% of DUs, the sample will be split into 3 aliquots: Primary, Field Duplicate, and QA) | |
| **AOC 90** | | | | | | | |
| Example for DU Location 4:  Primary: 390SS-4-IS-SO  R1: 390SS-4-IS-SO-R1  R2: 390SS-4-IS-SO-R2 | Soil | 0-0.5 | ISM | Explosives, RCRA 8 metals, and perchlorate | MC SOP 1 through  MC SOP 7 | ISM samples to be collected from 4 DUs  [10% of DUs to be sampled in triplicate comprised of the Primary sample and two Replicate samples (R1/R2)] | |
| Example for DU Location 4:  390SS-4-C-SO  QC: 390SS-x-C-SO-FD1  QA: 390SS-4-C-SO-QA1 | Soil | 0-0.5 | Composite | SVOCs | MC SOP 2 through  MC SOP 7 | 1 composite sampled to be collected from 4 DUs  (for 10% of DUs, the sample will be split into 3 aliquots: Primary, Field Duplicate, and QA) | |
| **AOC 91** | | | | | | | |
| Example for DU Location 20:  Primary: 391SS-20-IS-SO  R1: 391SS-20-IS-SO-R1  R2: 391SS-20-IS-SO-R2 | Soil | 0-0.5 | ISM | Explosives,  RCRA 8 metals, and perchlorate | MC SOP 1  through  MC SOP 7 | ISM samples to be collected from 32 DUs  [10% of DUs to be sampled in triplicate comprised of the Primary sample and two Replicate samples (R1/R2)] | |
| Example for DU Location 4:  391SS-20-C-SO  QC: 391SS-x-C-SO-FD1  QA: 391SS-20-C-SO-QA1 | Soil | 0-0.5 | Composite | SVOCs | MC SOP 2  through  MC SOP 7 | 1 composite sampled to be collected from 32 DUs  (for 10% of DUs, the sample will be split into 3 aliquots: Primary, Field Duplicate, and QA) | |
| **AOC 92** |  |  |  |  |  |  | |
| Example for DU Location 20:  Primary: 392SS-20-IS-SO  R1: 392SS-20-IS-SO-R1  R2: 392SS-20-IS-SO-R2 | Soil | 0-0.5 | ISM | Explosives,  RCRA 8 metals, and perchlorate | MC SOP 1  through  MC SOP 7 | ISM samples to be collected from 80 DUs  [10% of DUs to be sampled in triplicate comprised of the Primary sample and two Replicate samples (R1/R2)] | |
| Example for DU Location 4:  392SS-20-C-SO  QC: 392SS-x-C-SO-FD1  QA: 392SS-20-C-SO-QA1 | Soil | 0-0.5 | Composite | SVOCs | MC SOP 2  through  MC SOP 7 | 1 composite sampled to be collected from 80 DUs  (for 10% of DUs, the sample will be split into 3 aliquots: Primary, Field Duplicate, and QA) | |

**Notes:**

1. One blind duplicate sample will be collected for every 10 samples. FD = Field duplicate
2. One QA sample will be collected for every 10 samples and submitted to the QA lab. QA = Quality Assurance
3. Triplicate samples will be comprised of the Primary sample and two Replicate samples (R1/R2)]
4. Sampling SOP reference number from QAPP Worksheet #21.
5. ft bgs = feet below ground surface

# 

# QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Holding Times

This worksheet is applicable to the MC investigation only.

|  |
| --- |
| Laboratory (Name, sample receipt address, POC, email, and phone numbers) |
|  |
| RTI Laboratories (Primary Laboratory) |
| 31628 Glendale Street |
| Livonia, MI 48150 |
| 31628 Glendale Street |
| Contact: David Vesey |
| Phone: 734.422.8000 |
| Email: dvesey@rtilab.com |
|  |
| TestAmerica St. Louis (QA Laboratory) |
| 13715 Rider Trail North |
| Earth City, MO 63045 |
| 13715 Rider Trail North |
| Contact: Erika Gish |
| Phone: 314.787.8276 |
| Email: Erika.gish@testamericainc.com |
|  |
| DoD QSM Stage 3 data packages to be delivered within 21 calendar days |
| Sample Delivery Method: Federal Express |
| RTI will serve as the primary laboratory. TestAmerica St. Louis will serve as the QA laboratory and will analyze 10% of samples. |
| DoD ELAP and National Environmental Laboratory Accreditation Program Certifications are included in Attachment B. |

| **Parameter** | **Analytical and Preparation Method/SOP Reference** | **Method** | **Bottle Type** | **Preservation** | **Holding Time 2** |
| --- | --- | --- | --- | --- | --- |
| **Soil** | | | | | |
| Semi-volatile Organic Compounds (SVOCs) | SW846 8270D/L-1 (RTI), L-6 (TA) | 8270D 1 | 1 x 4-oz glass jar with Teflon®-lined lid | Cool to <6°C | 14 days to extraction |
| 40 days to analysis |
| Explosives | SW846 8330B/L-2 (RTI)/L-7 (TA) | 8330B 1 | 1 x 4-oz glass jar with Teflon®-lined lid | Cool to <6°C; store in dark | 14 days to extraction |
| 40 days to analysis |
| Explosives (ISM preparation) | SW846 8330B/L-2 (RTI)/L-7 (TA) | 8330B 1 | 1 x 1-gal plastic zip-lock bag | Cool to <6°C; store in dark | 14 days to extraction |
| 40 days to analysis |
| Perchlorate | SW846 6850/L-3 (RTI)/L-8 (TA) | 6850 1 | 1 x 4-oz glass jar with Teflon®-lined lid | Cool to <6°C;  store in dark.  containers should only be filled 2/3s of the way | 28 days to extraction and analysis |
| Metals | SW846 6010C/L-4 (RTI)/L-9 (TA) | 6010C 1 | 1 x 4-oz glass jar with Teflon®-lined lid | Cool to <6°C | 180 days to analysis |
| Mercury | SW846 7471B/L-5 (RTI)/L-10 (TA) | 7471B 1 | 28 days to analysis |
| Metals (ISM preparation) | SW846 6010C/L-4 (RTI)/L-9 (TA) | 6010C 1 | 1 x 1-gal plastic zip-lock bag | Cool to <6°C | 180 days to analysis |
| Mercury (ISM preparation) | SW846 7471B/L-5 (RTI)/L-10 (TA) | 7471B 1 | 28 days to analysis |
| Cyanide | SW846 9012/L-14 | 9012 1 | 1 x 8-oz glass jar with Teflon®-lined lid | Cool to <6°C | 14 days to analysis |
| Nitrate-N | SW846 9056A/L-15 | 9056A 1 | 14 days to extraction; 48 hours from extraction to analysis |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Abbreviations:** |  |  |  | |
| °C = degree Celsius |  | |  | |
| oz = ounce |  | |  | |
| ISM = incremental sampling method |  |  |  | |
|  |  |  |  | |
| **Notes:** |  |  |  | |
| 1. USEPA. Office of Solid Waste and Emergency Response. *Test Methods for Evaluating Solid Waste SW-846.* Third Edition, as updated by Updates I, II, IIA, IIB, III, IIIA, IIIB, IVA and IVB, Revision 6, February 2007. | | | |
| 2. All holding times are measured from date of collection. | | | |
|  | | |  | |

| QAPP Worksheet #20 –Sample Quantities and Control Frequencies | | | | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Matrix/ Analysis** | **Laboratory1** | | **Analytical and Preparation SOP2** | | **Estimated Environ. Sample Quantity3** | | **Field QC samples** | | | | | | | **Laboratory QC Samples** | | | | | | | **Total** |
| **Field Duplicate** | | | | **Field Replicates - ISM only** | | | **MS** | | | | **MSD** | | |
| **Freq. 5** | | **No.** | | **Freq. 5** | **No.** | | **Freq. 4** | | **No.** | | **Freq. 4** | **No.** | |
| **Soils-Composite** | | | | | | | | | | | | | | | | | | | | | |
| SVOCs | RTI | | L-1 | | 174 | | 1/10 | | 20 | | NA | -- | | 1/20 | | 12 | | 1/20 | 12 | | 218 |
| TA | | L-5 | | 20 | | 1/10 | | -- | | NA | -- | | 1/20 | | -- | | 1/20 | -- | | 20 |
| **Soils-ISM** | | | | | | | | | | | | | | | | | | | | | |
| Explosives | RTI | | L-2 | | 174 | | 1/10 | | 20 | | 1/10 | 20 | | 1/20 | | 12 | | 1/20 | 12 | | 238 |
| Perchlorate | RTI | | L-3 | | 174 | | 1/10 | | 20 | | 1/10 | 20 | | 1/20 | | 12 | | 1/20 | 12 | | 238 |
| RCRA Metals | RTI | | L-4 | | 174 | | 1/10 | | 20 | | 1/10 | 20 | | 1/20 | | 12 | | 1/20 | 12 | | 238 |
| Mercury | RTI | | L-5 | | 174 | | 1/10 | | 20 | | 1/10 | 20 | | 1/20 | | 12 | | 1/20 | 12 | | 238 |
|  | | | | | | | | | | | | | | | | | | | | | |
| **Abbreviations:** | | | | | | | | | | | | | | | | | | | | | |
| Freq. = frequency | | | | | | | | | | | | | | | | | | | | | |
| QC = quality control | | | | | | | | | | | | | | | | | | | | | |
| NA = not applicable | | | | | | | | | | | | | | | | | | | | | |
| TBD = to be determined | | | | | | | | | | | | | | | | | | | | | |
| No. = number of samples | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | |
| **Notes:** | |  | |  | |  | |  | |  |  | |  | |  | |  |  | |  |  |
| 1. See QAPP Worksheet #19/30 for contact information. | | | | | | | | | | | | | | | | | | | | | |
| 2. See QAPP Worksheet #23 for SOP title, revision number, date details. | | | | | | | | | | | | | | | | | | | | | |
| 3. Sample quantities are approximate | | | | | | | | | | | | | | | | | | | | | |
| 4. Frequency for MS/MSD samples is 1 per 20 field samples. | | | | | | | | | | | | | | | | | | | | | |
| 5. Frequency of field duplicates, and ISM replicate samples is 1 per 10 samples. | | | | | | | | | | | | | | | | | | | | | |

| QAPP Worksheet #21 –Field Standard Operating Procedure References | | | | | |
| --- | --- | --- | --- | --- | --- |
| **SOP# or Reference** | **Title, Revision, Date and URL (if available)** | **Originating Organization** | **SOP Option of Equipment Type (if SOP provides different options)** | **Modified for**  **Project Work?**  **(Yes/No)** | **Comments** |
| MC SOP 1 | Incremental Sampling Methodology, January 2015 | JV | Incremental Sampling Tool | No | NA |
| MC SOP 2 | Surface and Subsurface Soil Sampling Using Manual Methods, Revision 1, March 6, 2009 | ARCADIS | Stainless Steel Hand Augers | No | NA |
| MC SOP 3 | Documenting Sample Locations with a Global Positioning System (GPS) | NA | NA | No | NA |
| MC SOP 4 | Field Log Book Entries, Revision 0, August 11, 2009. | ARCADIS | Field Log Book | No | NA |
| MC SOP 5 | Chain of Custody, Revision 0, March 31, 2004. | NA | Chain of Custody Record Form | No | NA |
| MC SOP 6 | Investigation-Derived Waste Handling and Storage, Revision 2, March 6, 2009 | ARCADIS | 55-gallon steel drums, Department of Transportation 1A2 or equivalent | No | NA |
| MC SOP 7 | Sample Handling, Packaging and Shipping, Revision 0, March 31, 2004. | NA | Analysis Request and Chain of Custody Record | No | NA |

Note: All field SOPs are listed for discrete, ISM and confirmation sampling for continuity.

# QAPP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing and Inspection

| Field equipment will be maintained, inspected, and tested as presented in the table below. | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Field Equipment** | **Activity** | **Frequency** | **Acceptance Criteria** | **Corrective Action** | **Responsible Person** | **SOP Reference1** |
| GPS | Number of satellites acquired and quality of data will be checked periodically while collecting GPS data. | Daily, prior to use | Per equipment manual | Contact the JV equipment facility manager for direction. | Field Team Leader | MC SOP 3 |
| Hand trowel | Daily instrument check | Daily, prior to use | Per equipment manual | Contact the JV equipment facility manager for direction. | Field Team Leader | MC SOP 2 |
| Incremental Sampling Method sampling equipment (use of hand trowel based on surface conditions) | Daily instrument check | Daily, prior to use | Per equipment manual | Contact the JV equipment facility manager for direction. | Field Team Leader | MC SOP 1 |

**Notes:**

1SOP reference numbers correspond to the field sampling SOPs in QAPP Worksheet #21.

# QAPP Worksheet #23 – Analytical Standard Operating Procedure References

|  | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **SOP #** | **Title, Revision Date and/or Number** | **Definitive or Screening Data** | **Matrix/Analytical Group** | **Instrument** | **Organization Performing Analysis** | **Modified for Project Work? (Yes/No)** |
| **RTI Laboratories (Primary laboratory)** | | | | | | |
| L-1 | SOP 8270D\_110713\_R13: Analysis of Semi-Volatile Organics by SW-846 270D, 11/7/2013, and SOP 3550C\_022814\_R8: Sonication Extraction Procedure for Semi-volatile organic compounds by EPA SW-846 3550C, 2/28/2014 | Definitive | SVOCs in soil | Gas chromatography/ Mass spectroscopy (GC/MS) | RTI | No |
| L-2 | SOP 8330B\_022114\_R4.1: Analysis of Explosives by HPLC, SW-846 8330B, 8/28/2013.  The sample preparation procedure for all ISM samples is located in Section 9.0 Sample Preparation of this SOP. | Definitive | Explosives in soil | High performance liquid chromatography (HPLC) | RTI | No |
| L-3 | SOP 6850\_071513)R0.1: Analysis of Perchlorate by HPLC/MS/MS, SW-846 6850, 7/15/2013 | Definitive | Perchlorate in soil | HPLC with a tandem mass spectrometry (HPLC/MS/MS) | RTI | No |
| L-4 | SOP 6010C\_100713\_R3.2: Analysis of Elements by Inductively Coupled Plasma – Optical Emission Spectrometry by SW-846 6010C, 8/11/2014, and SOP 3050\_110512\_R11: Acid Digestion of Solid Samples for the Analysis of Total Metals by SW-846 3050B, 11/05/2012  The sample preparation procedure for all ISM samples is located in Section 9.0 Sample Preparation of SOP 8330B\_022114\_R4.1. | Definitive | Metals in soil | Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES) | RTI | No |
| L-5 | SOP 7470A\_7471B\_022014\_R7: Analysis for Mercury by SW-846 7470A, 7471B, 2/20/2014 | Definitive | Mercury in soil | Cold vapor atomic absorption (CVAA) | RTI | No |
| **TestAmerica St. Louis (QC laboratory)** | | | | | | |
| L-6 | SOP ST-MS-0001: GC/MS Semi-volatiles Analysis [SW-846 8270D: EPA 625], Rev 17, 9/16/2014 and SOP ST-OP-0002: Extraction and Cleanup of Organic Compounds from Waters and Soils, Rev 23, 9/16/2014 | Definitive | SVOCs in soil | GC/MS | TestAmerica  St. Louis | No |

Note: All analytical SOPs are listed for discrete, ISM and confirmation samples for continuity.

| QAPP Worksheet #24 – Analytical Instrument Calibration | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Instrument** | **Calibration Procedure** | **Frequency of Calibration** | **Acceptance Criteria** | **Corrective Action** | **Person Responsible for Corrective Action** | **SOP Reference1** |
| GC/MS (SW846 8270D) | Instrument performance check (tune). | Prior to initial and continuing calibration. | Specific ion abundance criteria of BFB (8260) or DFTPP (8270) from method. | Retune instrument. | Laboratory Analyst | L-1, L-6 |
| Initial Calibration (ICAL): Minimum of 5 calibration levels for linear and 6 calibration levels for quadratic. | At instrument setup and after ICV or continuing calibration verification (CCV) failure, prior to sample analysis. | ICAL must meet one of the three options below:  *Option 1:* RSD for each analyte ≤15%;  *Option 2:* linear least squares regression for each analyte: r2 ≥0.99;  *Option 3:* non-linear least squares regression (quadratic) for each analyte: r2 ≥0.99. | Correct problem, then repeat ICAL. |
| ICV | Once after each ICAL, analysis of a second source standard prior to sample analysis. | All reported analytes and surrogates within ±20% of true value. | Correct problem. Rerun ICV. If that fails, repeat ICAL. |
| CCV | Before sample analysis, after every 12 hours of analysis time, and at the end of the analysis sequence. | All reported analytes and surrogates within ±20% of true value.  All reported analytes and surrogates within ± 50% for end of analytical batch CCV. | Recalibrate, and reanalyze all affected samples since the last acceptable CCV;  or  Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV. |
| HPLC (SW846 8330B) | ICAL: Minimum of 5 calibration levels for linear and 6 calibration levels for quadratic. | At instrument setup and after i ICV or CCV failure, prior to sample analysis. | ICAL must meet one of the three options below:  *Option 1:* RSD for each analyte ≤15%;  *Option 2:* linear least squares regression for each analyte: r2 ≥0.99;  *Option 3:* non-linear least squares regression (quadratic) for each analyte: r2 ≥0.99. | Correct problem, then repeat ICAL. | Laboratory Analyst | L-2, L-7 |
| ICV | Once after each ICAL, analysis of a second source standard prior to sample analysis. | All reported analytes and surrogates within ±20% of true value. | Correct problem. Rerun ICV. If that fails, repeat ICAL. |
| CCV | Before sample analysis, after every 10 field samples, and at the end of the analysis sequence. | All reported analytes and surrogates within ±20% of true value. | Recalibrate, and reanalyze all affected samples since the last acceptable CCV;  or  Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV. |
| HPLC/MS/MS (SW846 6850) | Mass Calibration | Instrument must have a valid mass calibration prior to any sample analysis. The mass calibration is updated on an as-needed basis (e.g., QC failures, ion masses show large deviations from known masses, major instrument maintenance is performed, or the instrument is moved). | Mass calibration range must bracket the ion masses of interest. The most recent mass calibration must be used for an analytical run, and the same mass calibration must be used for all data files in an analytical run. Mass calibration must be verified by acquiring a full scan continuum mass spectrum of a perchlorate stock standard. | If the mass calibration fails, recalibrate. If it still fails, consult manufacture instructions on corrective maintenance. | Laboratory Analyst | L-3, L-8 |
| Tune Check | Prior to ICAL and after any mass calibration or maintenance is performed. | Tuning standard must span the mass range of the analytes of interest and meet acceptance criteria outlined in the laboratory SOP. | Retune instrument and verify. If the tune check will not meet acceptance criteria, an instrument mass calibration must be performed and the tuning redone. |
| ICAL: Minimum of 5 calibration levels for linear and 6 calibration levels for quadratic. | At instrument setup or after ICV or CCV failure, prior to sample analysis. | ICAL must meet one of the two options below:  *Option 1:* RSD for each analyte ≤15%;  *Option 2:* linear least squares regression for each analyte: r2 ≥0.995. | Correct problem then repeat ICAL. |
| ICV | Once after each ICAL. | Perchlorate concentration must be within ±15% of true value. | Correct problem. Rerun ICV. If that fails, repeat ICAL. |
| CCV | On days an ICAL is performed, after every 10 field samples and at the end of the analytical sequence.  On days an ICAL is performed, at the beginning of the sequence, after every 10 field samples, and at the end of the analytical sequence. | Perchlorate concentration must be within ±15% of true value. | Recalibrate, and reanalyze all affected samples since the last acceptable CCV;  or  Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV. |
| HPLC/MS/MS (SW846 6850)  continued | Isotope Ratio 35Cl/37Cl | Every sample, batch QC sample, and standard. | Monitor for either the parent ion at masses 99/101 or the daughter ion at masses 83/85 depending on which ions are quantitated. Must fall within 2.3 to 3.8. | If criteria are not met, the sample must be rerun. If the sample was  not pretreated, the sample must be reextracted using cleanup procedures.  If, after cleanup, the ratio still fails, use alternative techniques toconfirm presence of perchlorate, e.g, a post spike sample or dilution to reduce any interference. | Laboratory Analyst | L-3, L-8 |
| ICP-AES (SW846 6010C) | ICAL Minimum one high standard and a calibrationblank. | Daily ICAL prior to sample analysis. | If more than one calibration standard is used, r2 ≥0.99. | Correct problem, then repeat ICAL. | Laboratory Analyst | L-4, L-9 |
| ICV | Once after each ICAL, analysis of a second source standard prior to sample analysis. | All reported analytes within ±10% of true value. | Correct problem. Rerun ICV. If that fails, repeat ICAL. |
| ICP-AES (SW846 6010C)  continued | CCV | After every 10 field samples, and at the end of the analysis sequence. | All reported analytes within ±10% of true value. | Recalibrate, and reanalyze all affected samples since the last acceptable CCV;  or  Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV. | Laboratory Analyst | L-4, L-9 |
| Low-Level Calibration Check Standard (Low-Level ICV) | Daily | All reported analytes within ±20% of true value. | Correct problem and repeat ICAL. |
| Initial and Continuing Calibration Blank (ICB/CCB) | Before beginning a sample run, after every 10 field samples, and at the end of the analysis sequence. | No analytes detected > LOD. | Correct problem and repeat ICAL. All samples following the last acceptable calibration blank must be reanalyzed. |
| Interference Check Sample (ICS) | After ICAL and prior to sample analysis. | *ICS-A:* Absolute value of concentration for all non-spiked project analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes);  *ICS-B:* Within ±20% of true value. | Terminate analysis; locate and correct problem; reanalyze ICS and all samples. |
| CVAA (SW846 7471B) | ICAL: Minimum of 5 calibration levels and a calibration blank | Daily ICAL prior to sample analysis. | r2 ≥0.99. | Correct problem, then repeat ICAL. | Laboratory Analyst | L-5, L-10 |
| ICV | Once after each ICAL, analysis of a second source standard prior to sample analysis. | All reported analytes within ±10% of true value. | Correct problem. Rerun ICV. If that fails, repeat ICAL. |
| CVAA (SW846 7471B)  continued | CCV | After every 10 field samples, and at the end of the analysis sequence. | All reported analytes within ±10% of true value. | Recalibrate, and reanalyze all affected samples since the last acceptable CCV;  or  Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV. | Laboratory Analyst | L-5, L-10 |
| ICB/CCB | Before beginning a sample run, after every 10 field samples, and at the end of the analysis sequence. | No analytes detected > LOD. | Correct problem and repeat ICAL. All samples following the last acceptable calibration blank must be reanalyzed. |
| Note:  1SOP reference numbers correspond to analytical SOPs in QAPP Worksheet #23. | | | | | | |

| QAPP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing and Inspection | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Instrument/ Equipment** | **Maintenance Activity** | **Testing Activity** | **Inspection Activity** | **Frequency** | **Acceptance Criteria** | **Corrective Action** | **Responsible Person** | **SOP Reference1** |
| GC/MS | * Replace pump oil as needed * Change gas line dryers as needed * Perform ion source cleaning and filament replacement * Replace injection port liner weekly or as needed * Clip column * Replace gas chromatography (GC) column as needed * Manual tuning * Replace electron multiplier * Check that gas supply is sufficient and delivery pressure is adequate * Bake out lines and column | Semi-volatile Organic Compounds by SW846 8270D | Check connections, replace worn equipment | Daily or as needed | Acceptable instrument quality control and sensitivity | Inspect system, correct problem, rerun calibration and affected samples | Analyst | L-1, L-6 |
| HPLC  HPLC/MS/MS | * Check column flow * Check gas and liquid lines for leaks * Check or replace solvent inlet filters * Check pump seals * Check for injector leaks * Check and clean liquid lines and detector * Check and replace pump oil | Explosives by SW846 8330B  Perchlorate by SW846 6850 | Check connections, replace worn equipment | Daily or as needed | Acceptable instrument quality control and sensitivity | Inspect system, correct problem, rerun calibration and affected samples | Analyst | L-2, L-3,  L-7, L-8 |
| ICP-AES  ICP-OES | * Inspect torch, peristaltic pump tubing, and nebulizer * Inspect and clean spray chamber * Evaluate profile performance * Check electronics | Metals by SW846 6010C | Check connections, replace worn equipment | Daily or as needed | Acceptable instrument quality control and sensitivity | Inspect system, correct problem, rerun calibration and affected samples | Analyst | L-4, L-9 |
| CVAA | * clean tubing and quartz cell as needed * clean aspirator as necessary * check level of mercury scrubber solution * replace lamps * provide that gas supply is sufficient and delivery pressures are adequate | Mercury by SW846 7471B | Check connections, replace worn equipment | Daily or as needed | Acceptable instrument quality control and sensitivity | Inspect system, correct problem, rerun calibration and affected samples | Analyst | L-5, L-10 |

**Abbreviations:**

CVAA = cold vapor atomic absorption

GC/MS = gas chromatography/mass spectrometry

HPLC = high performance liquid chromatography

HPLC/MS/MS = high performance liquid chromatography with tandem mass spectrometers

ICP-AES = inductively coupled plasma atomic emission spectrometry

ICP-OES = inductively coupled plasma optimcal emission spectrometry

SOP = Standard Operating Procedure

**Note:**

1SOP reference numbers correspond to analytical SOPs in QAPP Worksheet #23.

| QAPP Worksheet #26 & 27– Sample Handling, Custody and Disposal This worksheet is applicable to the MC investigation only. | | |
| --- | --- | --- |
| Sampling organization:  Laboratory:  Method of sample delivery (shipper/carrier):  Number of days from reporting until sample disposal: | PIKA – Pirnie JV  RTI and TestAmerica St. Louis  Federal Express  At least 60 days | |
| **Activity** | **Organization and title or position of person responsible for the activity** | **SOP reference** |
| Sample labeling | Field team leader (TBD)  JV | See Worksheet #14/16. |
| Chain of custody form completion | Field team leader (TBD)  JV | See MC SOP 5, Worksheet #14/16 and see below. |
| Packaging | Field team leader (TBD)  JV | See MC SOP 7, Worksheet #14/16 and see below |
| Shipping coordination | Field team leader (TBD)  JV | See MC SOP 5 and Worksheet #14/16. |
| Sample receipt, inspection, and log-in | RTI  TestAmerica St Louis | See Worksheet #14/16 and see below |
| Sample custody and storage | RTI  RTI to subcontract Dioxins/Furans to Cape Fear Analytical  TestAmerica St Louis | See Worksheet #14/16 and see below |
| Sample disposal | RTI  TestAmerica St Louis | Samples must be held for 60 days from date of reporting results. Disposal must follow all Federal and State regulations. |

**Sample Handling and Custody**

Sample custody procedures ensure the timely, correct, and complete analysis of each sample for all parameters requested. A sample is considered to be in someone’s custody if it:

* Is in his/her possession.
* Is in his/her view, after being in his/her possession.
* Is in his/her possession and has been placed in a secure location.
* Is in a designated secure area.

Sample custody documentation provides a written record of sample collection and analysis. The sample custody procedures provide for specific identification of samples associated with an exact location, the recording of pertinent information associated with the sample, including time of sample collection and any preservation techniques, and a chain of custody record that serves as physical evidence of sample custody.

The chain of custody documentation system provides the means to individually identify, track, and monitor each sample from the time of collection through final data reporting. Chain of custody procedures document pertinent sampling data and all transfers of custody until the samples reach the analytical laboratory. All chain of custody forms must be filled out and signed in ink. The following information is typically recorded on manual chain of custody forms.

* Project name and/or project number.
* Signature of Site Superintendent or designee.
* Date and time of sample collection.
* Discrete sample designation.
* Sample matrix.
* Analyses required.
* Preservation technique.
* Signatures and dates for transfer of custody.
* Air express/shipper’s bill of lading identification number.

The chain of custody form serves as an official communication to the laboratory detailing the particular analyses required for each sample. The chain of custody record will accompany the samples from the time of sampling through all transfers of custody. It will be kept on file at the laboratory where samples are analyzed and archived. Two copies of the chain of custody form are created: one copy is retained by the Site Superintendent and one is sent to the laboratory. The Site Superintendent or designee completes a chain of custody record to accompany each shipment from the field to the laboratory. The completed chain of custody is put in a zip-lock bag and taped to the inside cover of the sample shipping container. If there is more than one container in a shipment, copies of the chain of custody form will be placed in each container. The container is then sealed with custody seals and custody is transferred to the laboratory. Commercial carriers are not required to sign off on the chain-of-custody form as long as the forms are sealed inside the sample cooler and the custody seals remain intact.

Samples will be packaged for shipment as outlined below:

* Securely affix the sample label to the container with clear packing tape.
* Check the cap on the sample container to confirm that it is properly sealed.
* Wrap the sample container cap with clear packing tape to prevent the label from becoming loose.
* Complete the chain-of-custody form with the required sampling information and confirm that the recorded information matches the sample labels. **Note:** If the designated sampler relinquishes the samples to other sampling or field personnel for packing or other purposes, the sampler will complete the chain-of-custody prior to this transfer. The appropriate personnel will sign and date the chain-of-custody form to document the sample custody transfer.
* Using duct tape, secure the outside drain plug at the bottom of the cooler.
* Wrap sample containers in bubble wrap or other cushioning material.
* Place 1 to 2 inches of cushioning material at the bottom of the cooler.
* Place the sealed sample containers into the cooler.
* Place ice in plastic bags and seal. Place loosely in the cooler.
* Fill the remaining space in the cooler with cushioning material.
* Place chain-of-custody forms in a plastic bag and seal. Tape the forms to the inside of the cooler lid.
* Close the lid of the cooler, lock and secure with duct tape.
* Wrap strapping tape around both ends of the cooler at least twice.
* Mark the cooler on the outside with the shipping address and return address, affix “Fragile” labels and draw (or affix) arrows indicating “this side up.” Cover the labels with clear plastic tape.
* Place a signed custody seal over the sample cooler lid.

**Field Procedures**

The field sampler is personally responsible for the care and custody of samples until they are transferred to the Site Superintendent or until they are properly dispatched. As few people as possible should handle the samples.

The Site Superintendent, or designee, is responsible for entering the proper information in the field logbook, including all pertinent information such as sample identification number, date and time of sample collection, type of analysis, and description of sample location. The information entered into the field logbook will be used to generate a chain of custody. Field logbooks will provide the means of recording the data collecting activities that are performed. As such, entries will be described in as much detail as possible so that persons going to the site could reconstruct a particular situation without reliance on memory. Entries will be made in ink, with no erasures. If an incorrect entry is made, the information will be crossed out with one strike mark.

All sample containers will be labeled with the project identification, sample number, matrix, analysis required, and preservation used. Sample labels will be completed using waterproof ink. The completed sample labels will be affixed to each sample bottle and covered with clear tape.

The Site Superintendent or designee will review all field activities to determine whether proper custody procedures were followed during the field work and if additional samples are required.

**Transfer of Custody and Shipment**

The custody of samples must be maintained from the time of sampling through shipment and relinquishment to the laboratory. Instructions for transferring custody are given below.

All samples are accompanied by a chain of custody. When transferring custody of sample, the individuals relinquishing and receiving will sign, date, and note the time on the chain of custody. This form documents sample custody transfer from the Site Superintendent or designee, through the shipper, to the analytical laboratory. Since a common carrier will usually not accept responsibility for handling chain of custody forms, the name of the carrier is entered under “Received by”, the bill-of-lading number is recorded in the comments section, and the chain of custody form is placed in a zip-lock plastic bag and taped to the inside lid of the shipping cooler. Copies of the chain of custody forms will be placed in each cooler included in the shipment. Copies of the COC and bill of lading will be retained by the Site Superintendent and placed into the project files.

Samples will be packaged for shipment and dispatched by the appropriate laboratory via overnight delivery service. Samples will be shipped within 24 hours of sampling. Shipping containers will be sealed for shipment to the laboratory. Two custody seals will be applied to each cooler to document that the container was properly sealed and to determine if the container was tampered with during shipment. The custody seals will be placed on the coolers in such a manner that the custody seal would be broken if the cooler were opened.

**Laboratory Custody Procedures**

A designated sample custodian accepts custody of the samples and verifies that all information on the sample labels matches that on the COC. The sample custodian will document any discrepancies and will sign and date all appropriate receiving documents. The sample custodian will also document the condition of the samples upon receipt by the laboratory.

Once the samples have been accepted by the laboratory, checked and logged in, they must be maintained in accordance with laboratory custody and security requirements.

To assure traceability of samples while in the possession of the laboratory, a unique laboratory identification number will be assigned to each sample.

The following stages of analysis must be documented by the laboratory:

* Sample extraction/preparation.
* Sample analysis.
* Data reduction.
* Data reporting.

Laboratory personnel are responsible for the custody of the samples until they are returned to the sample custodian.

**Final Evidence Files**

This is the final phase of sample custody. The COC records are archived in the project file. Laboratory custody forms, sample preparation and analysis logbook, and data packages will become part of the laboratory final evidence file. Other relevant documentation including records, reports, correspondence, logs, photographs, and data review reports will be archived by JV personnel.

| QAPP Worksheet #28-1 – Analytical Quality Control and Corrective Action (Semi-volatile Organic Compounds by SW846 8270D) | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Matrix: | Soil |  |  |  |  |  |
| Concentration Level: | Low |  |  |  |  |  |
| Analytical Method: | SW846 8270D |  |  |  |  |  |
| Laboratory SOP: | L-1 (RTI) / L-6 (TA) | |  |  |  |  |
| **QC Sample** | **Frequency/Number** | **Method/SOP QC Acceptance Limits** | **Corrective Action** | **Person(s) Responsible for Corrective Action** | **DQI** | **Measurement Performance Criteria** |
| Field duplicate | 1 per 10 field samples | RPD of all analytes ≤ 50% | Qualify the specific analyte(s) in the parent sample and field duplicate. | Data validator | Precision | RPD of all analytes ≤ 50% |
| Method blanks | One per preparatory batch up to 20 samples of the same matrix. | No analytes detected > ½ LOQ | Correct problem. If required, re-prepare and reanalyze method blank and all samples processed with the contaminated blank. | Lab analysts and/or data validator | Accuracy/bias  Contamination | No target analytes detected > ½ LOQ |
| LCS | One per preparatory batch up to 20 samples of the same matrix. | %R, See Appendix C, Table 25 DoD QSM V5.0 | Correct problem. If required, re-prepare and reanalyze all samples in the associated preparatory batch for the failed analytes, if sufficient sample material is available. | Laboratory analyst and/or data validator | Accuracy/bias | %R, See Appendix C, Table 25 DoD QSM V5.0 |
| MS | One per preparatory batch up to 20 samples of the same matrix. | %R, See Appendix C, Table 25 DoD QSM V5.0 | Qualify the specific analyte(s) in the parent sample and explain in the case narrative. | Laboratory analyst and/or data validator | Accuracy/bias | %R, See Appendix C, Table 25 DoD QSM V5.0 |
| MSD | One per preparatory batch up to 20 samples of the same matrix. | RPD of all analytes ≤ 20% | Qualify the specific analyte(s) in the parent sample and explain in the case narrative. | Laboratory analyst and/or data validator | Precision | RPD ≤ 20% |
| Surrogates | Add to all field and QC samples | %R, See Appendix C, Table 25 DoD QSM V5.0 | Correct problem, the re-prepare and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary. | Laboratory analyst and/or data validator | Accuracy/bias | %R, See Appendix C, Table 25 DoD QSM V5.0 |
| Internal standards | Six per sample and QC samples | Area response and retention times, See Table 4 DoD QSM V5.0 | Inspect mass spectrometer and GC for malfunctions and correct problem. Reanalysis of samples analyzed while system was malfunctioning is mandatory. If corrective action fails in field samples, data must be qualified and explained in the case narrative | Laboratory analyst | Precision | Area response and retention times, See Table 4 DoD QSM V5.0 |

| QAPP Worksheet #28-2 – Analytical Quality Control and Corrective Action (Explosives/Nitroaromatics and Nitramines by SW846 8330B) | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Matrix: | Soil | |  |  |  |  |
| Concentration Level: | Low |  |  |  |  |  |
| Analytical Method: | SW846 8330B |  |  |  |  |  |
| Laboratory SOP: | L-2 (RTI) / L-7 (TA) | |  |  |  |  |
| **QC Sample** | **Frequency/Number** | **Method/SOP QC Acceptance Limits** | **Corrective Action** | **Person(s) Responsible for Corrective Action** | **DQI** | **Measurement Performance Criteria** |
| Soil grinding blank | Prior to grinding samples; after every 10 samples; and at the end of the batch. | A grinding blank using clean solid matrix (such as Ottawa sand) must be prepared (e.g., ground and subsampled) and analyzed in the same manner as a field sample. No reported analytes must be detected > ½ LOQ. | Blank results must be reported and the affected samples must be flagged accordingly if blank criteria are not met. | Laboratory analyst and/or data validator | Contamination | No target analytes detected greater than ½ the LOQ |
| Soil sample triplicate | At the subsampling step, one sample per batch. Cannot be performed on any sample identified as a blank. | Three 10 gram subsamples are taken from a sample expected to contain the highest level of explosives within the quantitation range of the method. The RSD for results above the LOQ must not exceed 20%. | Qualify the specific analyte(s) in the parent sample and explain in the case narrative. | Laboratory analyst and/or data validator | Representativeness | RSD <20% for results above the LOQ |
| Field duplicate | 1 per 10 field samples | RPD of all analytes ≤ 50% | Qualify the specific analyte(s) in the parent sample and field duplicate. | Data validator | Precision | RPD ≤ 50% |
| Method blanks | One per preparatory batch up to 20 samples of the same matrix. | No target analytes detected > ½ LOQ | Correct problem. If required, re-prepare and reanalyze method blank and all samples processed with the contaminated blank. | Laboratory analyst and/or data validator | Accuracy/bias  Contamination | No target analytes detected > ½ LOQ |
| LCS | One per preparatory batch up to 20 samples of the same matrix. | %R, See Appendix C, Table 37 DoD QSM V5.0 | Correct problem. If required, re-prepare and reanalyze all samples in the associated preparatory batch for the failed analytes, if sufficient sample material is available. | Laboratory analyst and/or data validator | Accuracy/bias | %R, See Appendix C, Table 37 DoD QSM V5.0 |
| MS | One per preparatory batch up to 20 samples of the same matrix. | %R See Appendix C, Table 37 DoD QSM V5.0 | Qualify the specific analyte(s) in the parent sample and explain in the case narrative. | Laboratory analyst and/or data validator | Accuracy/bias | %R See Appendix C, Table 37 DoD QSM V5.0 |
| MSD | One per preparatory batch up to 20 samples of the same matrix. | RPD of all analytes ≤ 20% | Qualify the specific analyte(s) in the parent sample and explain in the case narrative. | Laboratory analyst and/or data validator | Precision | RPD ≤ 20% |
| Surrogates | Add to all field and QC samples | %R, See Appendix C, Table 37 DoD QSM V5.0 | Correct problem, the re-prepare and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary. | Laboratory analyst and/or data validator | Accuracy/bias | %R, See Appendix C, Table 37 DoD QSM V5.0 |
| Confirmation of positive results (second column) | All positive results must be confirmed. | QC criteria are the same for the confirmation analysis as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%. | Qualify the specific analyte(s) in the sample and explain in the case narrative. | Laboratory analyst and/or data validator | Precision | RPD ≤ 40% |

| QAPP Worksheet #28-3 – Analytical Quality Control and Corrective Action (Perchlorate by SW846 6850) | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Matrix: | Soil |  |  |  |  |  |
| Concentration Level: | Low |  |  |  |  |  |
| Analytical Method: | SW846 6850 |  |  |  |  |  |
| Laboratory SOP: | L-3 (RTI) / L-8 (TA) | |  |  |  |  |
| **QC Sample** | **Frequency/Number** | **Method/SOP QC Acceptance Limits** | **Corrective Action** | **Person(s) Responsible for Corrective Action** | **DQI** | **Measurement Performance Criteria** |
| Isotope ratio 35Cl/37Cl | Every sample, batch QC sample, and standard | Monitor for either the parent ion at masses 99/101 or the daughter ion at masses 83/85 depending on which ions are quantitated. Must fall within 2.3 to 3.8. | If criteria are not met, the sample must be rerun. If the sample was not pretreated, the sample must be re-extracted using cleanup procedures. If, after cleanup, the ratio still fails, use alternative techniques to confirm presence of perchlorate, e.g., a post spike sample or dilution to reduce any interference. | Laboratory analyst | Accuracy/bias | Must fall within 2.3 to 3.8 |
| Interference Check Sample | One per preparatory batch up to 20 samples of the same matrix. | Perchlorate concentration within ±20% of its true value. | Correct problem. Reanalyze all samples and QC samples in the batch. If poor recovery from the cleanup filters is suspected, a different lot of filters must be used to re-extract all samples in the batch. If column degradation is suspected, a new column must be calibrated before the samples can be reanalyzed. | Laboratory analyst | Accuracy/bias | Concentration with ±20% of its true value |
| Field duplicate | 1 per 10 field samples | RPD of all analytes ≤ 50% | Qualify the specific analyte(s) in the parent sample and field duplicate. | Data validator | Precision | RPD ≤ 50% |
| Laboratory Reagent Blank | Prior to calibration and at the end of the analytical sequence. | No perchlorate detected > ½ LOQ. | Reanalyze reagent blank (until no carryover is observed) and all samples processed since the contaminated blank. | Laboratory analyst and/or data validator | Accuracy/bias  Contamination | No perchlorate detected > ½ LOQ |
| Method blank | One per preparatory batch up to 20 samples of the same matrix. | No perchlorate detected > ½ LOQ. | Correct problem. If required, re-prepare and reanalyze method blank and all samples processed with the contaminated blank. | Laboratory analyst and/or data validator | Accuracy/bias  Contamination | No target analytes detected > ½ LOQ |
| LCS | One per preparatory batch up to 20 samples of the same matrix. | %R, See Appendix C, Table 7 DoD QSM V5.0. | Correct problem. If required, re-prepare and reanalyze all samples in the associated preparatory batch for the failed analytes, if sufficient sample material is available. | Laboratory analyst and/or data validator | Accuracy/bias | %R, See Appendix C, Table 7 DoD QSM V5.0. |
| MS | One per preparatory batch up to 20 samples of the same matrix. | %R, See Appendix C, Table 7 DoD QSM V5.0. | Qualify the specific analyte(s) in the parent sample and explain in the case narrative. | Laboratory analyst and/or data validator | Accuracy/bias | %R, See Appendix C, Table 7 DoD QSM V5.0. |
| MSD or matrix duplicate | One per preparatory batch up to 20 samples of the same matrix. | RPD of all analytes ≤ 15% (between MS and MSD or sample and matrix duplicate). | Qualify the specific analyte(s) in the parent sample and explain in the case narrative. | Laboratory analyst and/or data validator | Precision | RPD ≤ 15% |
| Internal Standard | Addition of 18O-labeled perchlorate to every sample, batch QC sample, standard, instrument blank, and method blank. | Measured 18O IS area within ±50% of the value from the average of the IS area counts of the initial calibration. Relative retention time of the perchlorate ion must be 1.0 ±2% (0.98-1.02). | Rerun the samples are increasing dilutions until the ±50% acceptance criteria are met. If criteria cannot be met with dilution, the interference is suspected and the sample must be re-prepared using additional pretreatment steps. | Laboratory analyst | Accuracy/bias | IS area within ±50% and relative retention time 1.0±2% (0.98-1.02) |

| QAPP Worksheet #28-4 – Analytical Quality Control and Corrective Action (Metals1 by SW846 6010C/7471B) | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Matrix: | Soil |  |  |  |  |  |
| Concentration Level: | Low |  |  |  |  |  |
| Analytical Method: | SW846 6010C/7471B |  |  |  |  |  |
| Laboratory SOP: | L-4, L-5 (RTI) / L-9, L-10 (TA) | |  |  |  |  |
| **QC Sample** | **Frequency/Number** | **Method/SOP QC Acceptance Limits** | **Corrective Action** | **Person(s) Responsible for Corrective Action** | **DQI** | **Measurement Performance Criteria** |
| Linear dynamic range or high-level check standard | At initial set up and checked every six months with a high standard at the upper limit of the range. | %R within ±10% of true value. | Dilute samples within the calibration range, or reestablish/verify the linear dynamic range. | Laboratory analyst | Accuracy/bias | %R within ±10% of true value |
| Method blanks | One per preparatory batch up to 20 samples of the same matrix. | No analytes detected > ½ LOQ | Correct problem. If required, re-prepare and reanalyze method blank and all samples processed with the contaminated blank. | Laboratory analyst and/or data validator | Accuracy/bias  Contamination | No target analytes detected > ½ LOQ |
| LCS | One per preparatory batch up to 20 samples of the same matrix. | %R, See Appendix C, Table 3 (6010) and Table 11 (7471), DoD QSM V5.0 | Correct problem. If required, re-prepare and reanalyze all samples in the associated preparatory batch for the failed analytes, if sufficient sample material is available. | Laboratory analyst and/or data validator | Precision | %R, See Appendix C, Table 3 (6010) and Table 11 (7471), DoD QSM V5.0 |
| MS | One per preparatory batch up to 20 samples of the same matrix. | %R, Same as LCS | Qualify the specific analyte(s) in the parent sample and explain in the case narrative. | Laboratory analyst and/or data validator | Accuracy/bias | %R, Same as LCS |
| MSD or matrix duplicate | One per preparatory batch up to 20 samples of the same matrix. | RPD of all analytes ≤ 20% (between MS and MSD or sample and matrix duplicate). | Qualify the specific analyte(s) in the parent sample and explain in the case narrative. | Laboratory analyst and/or data validator | Precision | RPD ≤ 20% |
| Serial Dilution test | One per preparatory batch if MS or MSD fails. Only applicable for samples with concentrations > 50x LOQ. Use with MS/MSD and PDS to confirm matrix effects. | Five-fold dilution must agree within ±10% of the original measurement. | Qualify the specific analyte(s) in the parent sample and explain in the case narrative. | Laboratory analyst and/or data validator | Accuracy/bias | %R within ±10% of original measurement |
| Post Digestion Spike | One per preparatory batch if MS or MSD fails (using the same sample as used for the MS/MSD if possible). | %R within 80-120% | Qualify the specific analyte(s) in the parent sample and explain in the case narrative. | Laboratory analyst and/or data validator | Accuracy/bias | %R within 80-120% |
| Field duplicate | 1 per 10 field samples | RPD of all analytes  ≤ 50% | Qualify the specific analyte(s) in the parent sample and field duplicate. | Data validator | Precision | RPD of all analytes  ≤ 50% |

**Notes:**

1. RCRA metals include: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

| QAPP Worksheet #29 – Project Documents and Records | | | | |
| --- | --- | --- | --- | --- |
| **Record** | **Generation** | **Verification** | **Storage location/archival** |
| **Sample Collection and Field Records** | | | |
| Field logbook or data collection sheets  COC forms  Air bills  Contractor daily QC reports  Deviations  Corrective action reports  Correspondence  Field audit checklists | Dewey Thedford  Site Manager  JV | Mike Madl, Technical Lead  JV | Project file |
| Data verification checklists | Lyndi Mott, Program Chemist  JV | Mike Madl, PM  JV | Project file |
| Data validation report  Data usability assessment report | JV Data Validator, TBD | Lyndi Mott, Program Chemist  JV | Project file |
| **Laboratory Records** | | | |
| COC records  Sample receipt records  Electronic data deliverables  Analytical results and supporting data  Sample data packages | David Vesey, PM  RTI  Erika Gish, PM  TestAmerica St. Louis | Charles O’Bryan, QA Manager  RTI  Marti Ward, QA Manager  TestAmerica St. Louis | Project file |
| Records of sample preparation  Records of sample analysis  Instrument calibration records  Raw data files | David Vesey, PM  RTI  Erika Gish, PM  TestAmerica St. Louis | Charles O’Bryan, QA Manager  RTI  Marti Ward, QA Manager  TestAmerica St. Louis | Project file |

# QAPP Worksheet #31, 32, & 33 – MC Assessments and Corrective Actions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Assessments:** See Worksheet 14&16 for estimated dates | | | | | |
|  | | | | | |
| **Assessment Type** | **Responsible Party & Organization** | **Number/Frequency** | **Estimated Dates** | **Assessment Deliverable** | **Deliverable Due Date** |
| Review of QAPP, SOPs, and daily QC report with field staff | Field Team Leader  JV | Prior to sampling start up | Prior to sampling | Contained within daily QC report. | Prior to sampling |
| Daily logbook and field forms | Field Team Leader  JV | Daily | During field activities | Contained within written report. | As part of Draft Report |
| Laboratory assessment for appropriate certifications and capacity; QAPP review with laboratory staff | Lyndi Mott, Program Chemist  JV | Prior to sampling start up | Prior to sampling | Receipt of copies of certifications. Email traffic concerning laboratory capacity prior to sampling start up. QAPP sign-off sheet received from laboratory. | Prior to sampling |
| Daily tailgate safety meeting | Field Team Leader  JV | Daily | During field activities | Verbal debriefing and daily sign off log. If a safety violation occurs, an incident report is completed. | Last deliverable received no later than one week after field activities |
| Field sampling and COC review against QAPP requirements | Field Team Leader  JV | Daily | During field activities | Communication in the form of an email. | Last email received no later than 24 hours after last sampling event |
| Laboratory report deliverables and analytical results review against QAPP requirements | Lyndi Mott, Program Chemist  JV | Per sample delivery group | Immediately following field sampling | Communication if the form of an email. | Three weeks after receipt of data |
| Data verification | Lyndi Mott, Program Chemist  JV | Per sample delivery group | Following analytical report | Communication in the form of an email requesting additional laboratory forms, backup data that may be missing and/ or clarification of the analytical report. | Three weeks after receipt of data |
| Data validation | Lyndi Mott, Program Chemist  JV | Per sample delivery group | Following analytical report | Communication in the form of an email requesting additional laboratory forms, backup data that may be missing and/ or clarification of the analytical report. | Three weeks after receipt of data |
| **Assessment Response and Corrective Action:** | | | | | |
| **Assessment Type** | **Responsibility for Responding to Assessment Findings** | **Assessment Response Documentation** | **Timeframe for Response** | **Responsibility for Implementing Corrective Action** | **Responsibility for Monitoring Corrective Action Implementation** |
| Review of QAPP, SOPs, and daily QC report with field staff | Mike Madl, Technical Lead  JV | Daily QC report will be amended with corrective action | Within 24 hours | Dewey Thedford, Site Manager  JV | Mike Madl, Technical Lead, JV |
| Daily logbook and field forms | Field Team Leader  JV | Daily QC report will be amended with corrective action | Within 24 hours | Dewey Thedford, Site Manager  JV | Mike Madl, Technical Lead, JV |
| Laboratory assessment for appropriate certifications and capacity; QAPP review with laboratory staff | Charles O’Bryan, QA Manager  RTI  Marti Ward, QA Manager  TestAmerica St. Louis | Response to email | Within 48 hours after notification | Charles O’Bryan, QA Manager  RTI  Marti Ward, QA Manager  TestAmerica St. Louis | Lyndi Mott, Program Chemist  JV |
| Daily tailgate safety meeting | Mike Madl, Technical Lead  JV | Included as part of the Incident Report | Within 48 hours after notification | Dewey Thedford, Site Manager  JV | Mike Madl, Technical Lead, JV |
| Field sampling and COC review against QAPP requirements | Mike Madl, Technical Lead  JV | Response to email | Within 24 hours after sampling | Dewey Thedford, Site Manager  JV | Mike Madl, Technical Lead, JV |
| Laboratory report deliverables and analytical results review against QAPP requirements | Charles O’Bryan, QA Manager  RTI  Marti Ward, QA Manager  TestAmerica St. Louis | If required, laboratory reports will be amended and corrections noted in the case narrative | Within 72 hours of notification | Charles O’Bryan, QA Manager  RTI  Marti Ward, QA Manager  TestAmerica St. Louis | Lyndi Mott, Program Chemist  JV |
| Data verification | Charles O’Bryan, QA Manager  RTI  Marti Ward, QA Manager  TestAmerica St. Louis | If required, laboratory reports will be amended and corrections noted in the case narrative | Up to 7 days | Charles O’Bryan, QA Manager  RTI  Marti Ward, QA Manager  TestAmerica St. Louis | Lyndi Mott, Program Chemist  JV |
| Data validation | David Vesey, PM  RTI  Erika Gish, PM  TestAmerica St. Louis | If required, laboratory reports will be amended and corrections noted in the case narrative and documented in the validation report | Up to 7 days | David Vesey, PM  RTI  Erika Gish, PM  TestAmerica St. Louis | Lyndi Mott, Program Chemist  JV |

| QAPP Worksheet #34 – MC Data Verification and Validation Inputs | | | |
| --- | --- | --- | --- |
| **Item** | **Description** | **Verification (completeness)** | **Validation (conformance to specifications)** |
| **Planning Documents/Records** | | | |
| 1 | Approved QAPP | X |  |
| 2 | Contract | X |  |
| 3 | Field SOPs | X |  |
| 4 | Laboratory SOPs | X |  |
| **Field Records** | | | |
| 5 | Field logbooks | X |  |
| 6 | Equipment calibration records | X |  |
| 7 | COC forms | X |  |
| 8 | Sampling diagrams/surveys | X |  |
| 9 | MEC Dig Results | X |  |
| 10 | Relevant correspondence | X |  |
| 11 | Change orders/deviations | X |  |
| 12 | Field audit reports | X |  |
| 13 | Field corrective action reports | X |  |
| **Analytical Data Package** | | | |
| 14 | Cover sheet (laboratory identifying information) | X | X |
| 15 | Case narrative | X | X |
| 16 | Internal laboratory chain of custody | X | X |
| 17 | Sample receipt records | X | X |
| 18 | Sample chronology (i.e., dates and times of receipt, preparation, and analysis) | X | X |
| 19 | Communication records | X | X |
| 20 | Project-specific proficiency testing sample results | X | X |
| 21 | LOD/LOQ establishment and verification | X | X |
| 22 | Standards traceability | X | X |
| 23 | Instrument calibration records | X | X |
| 24 | Definition of laboratory qualifiers | X | X |
| 25 | Results reporting forms | X | X |
| 26 | QC sample results | X | X |
| 27 | Corrective action reports | X | X |
| 28 | Raw data | X | X |
| 29 | EDD | X | X |

| QAPP Worksheet #35 – MC Data Verification Procedures | | | |
| --- | --- | --- | --- |
| **Records Reviewed** | **Required Documents** | **Process Description** | **Responsible Person, Organization** |
| Field logbook (sampling methods and procedures) | UFP-QAPP  Field SOPs | Establish that required sampling methods were used and documented. Establish that any required field monitoring was performed and results are documented. Verify that the sampling procedures and field measurements met performance criteria and that any deviations were documented in the field logbook. | *Daily –*  Dewey Thedford, Site Manager, JV  *At conclusion of field activities –*  Lyndi Mott, Program Chemist, JV |
| Field logbook (documentation) | UFP-QAPP  Field SOPs | Verify the records are present and complete for each day of field activities. Verify that all planned samples, including field QC samples, were collected and the sample collection locations are documented. Verify that meteorological data were provided for each day of field activities. Verify that changes/exceptions are documented and were reported in accordance with requirements. | *Daily –*  Dewey Thedford, Site Manager, JV *At conclusion of field activities –*  Lyndi Mott, Program Chemist, JV |
| COC forms | UFP-QAPP  Field SOPs  Laboratory SOPs/QA Manual | All samples to be analyzed by the laboratory will be shipped via overnight delivery service under COC. Prior to shipment of the samples to the laboratory, the COC will be checked by the Site Superintendent or representative for completeness and correctness. Upon receipt at the laboratory, the sample custodian will check the COC forms and shipping documentation for verification against the sample coolers they represent, and will sign and data the COC to acknowledge sample receipt. The laboratory is responsible for verifying the integrity of the custody seals and that the sample containers are received in good condition. The Laboratory Information Management System will provide evidence of sample custody from receipt by the laboratory until appropriate disposal. | *Daily –*  Dewey Thedford, Site Manager, JV  *Upon receipt –*  Sample Custodian, RTI  Sample Custodian, TestAmerica St. Louis |
| Laboratory corrective action and report procedure | UFP-QAPP  Laboratory SOPs/QA Manual | Routine corrective actions apply to all analytical quality control parameters and analytical system specification as defined in the laboratory SOPs. Bench analysts have full responsibility and authority for performing routine corrective action, which are documented as part of the analytical record. Defective processes, holding time violations, systematic errors and quality defects that occur are to be reported by the analyst to the laboratory supervisor and a non-conformance record initiated. The Laboratory PM will then notify the JV Program Chemist and PM. All notifications must be made in a timely manner. The non-conformance record should become part of the analytical record. | *Before release –*  Charles O’Bryan, QA Manager, RTI  Marti Ward, QA Manager, TestAmerica St. Louis  *Upon receipt –*  Lyndi Mott, Program Chemist, JV |
| Analytical data package | UFP-QAPP  Laboratory SOPs/QA Manual | All data produced by the laboratory will be required to undergo several levels of review, which will include two levels of management review at the laboratory. The laboratory will review the data packages internals for completeness and verification that all of the required forms and raw data are included for each data package type. The laboratory QA Manager may also select to review randomly chosen data packages for additional internal audits. Any deviations should be documented in the report narrative. | Charles O’Bryan, QA Manager, RTI  Marti Ward, QA Manager, TestAmerica St. Louis |
| Analytical data package | UFP-QAPP  Laboratory SOPs  DOD QSM, ver 5.0 (July 2013)  USACE EM 200-1-10, June 2005 | The Program Chemist or Data Validator will verify that data have been received for all samples sent to the laboratory. An evaluation of the data will be performed to determine whether the laboratory met the QC requirements for the analysis as stated in the analytical method, laboratory SOPs, UFP-QAPP, DoD QSM, ver 5.0 (July 2013), and USACE EM 200-1-10 (June 2005).. This verification should include (at a minimum): (1) review of dates of sample preparations and analyses to verify they have been performed within applicable holding times, (2) review of associated blanks for potential contamination, (3) determination that project quantitation limits were achieved, and (4) review of QC sample performance criteria. Any deviations should be documented in the report narrative. | Lyndi Mott, Program Chemist, JV  Data Validator, JV |
| Laboratory EDD | UFP-QAPP  Automated Data Review (ADR) specifications | The laboratory will provide EDDs in accordance with the Staged Electronic Data Deliverable (SEDD) version 5.2 (or the most recent format). The EDD will be reviewed using ADR software for correctness and completeness with 90% Stage 2b ADR, 10% Stage 3 ADR. | Lyndi Mott, Program Chemist, JV  Data Validator, JV |

|  |  |
| --- | --- |
| Data Validator: JV |  |
| *Analytical group/method:* | SVOCs, Explosives, Perchlorate, RCRA 8 Metals |
| *Data deliverable requirements:* | SEDD Stage 2B XML file |
| *Analytical specifications:* | SVOCs by SW846 8270D  Explosives by SW846 8330B  Perchlorate by SW846 6850  Metals by SW846 6010C/7471B |
| *Measurement performance criteria:* | DoD QSM version 5.0 (see Worksheets #12 and #28) |
| *Percent of data packages to be validated1:* | 90% Stage 2  10% Stage 4 |
| *Percent of raw data reviewed:* | 10% |
| *Percent of results to be recalculated:* | 10% |
| *Validation procedures:* | WP/UFP-QAPP, DoD QSM version 5.0 (July 2013), and USACE EM 200-1-10 Guidance for Evaluating Performance Based Chemical Data (June 2005) |
| *Electronic validation program/version:* | ADR |

# QAPP Worksheet #36 – MC Data Validation Procedures

**Notes:**

1 100% of the data will be reviewed and verified. 100% of the data packages/EDDs will be reviewed using ADR.

| QAPP Worksheet #37 – MC Usability Assessment |
| --- |
| The Data Usability Assessment will be performed by JV for data associated with the Parcel 3, Fort Wingate Depot Activity, New Mexico. Data validation will be performed by JV personnel in the information management/data validation group whom are not directly involved in the project, sample/data collection, or analysis in order to keep the data validation independent of the JV project team. Documentation generated during the Data Usability Assessment will consist of data validation report with a summary of overall data usability and a summary table of qualified results, as described by the USACE Guidance, EM 200-1-10. 100% of the data collected will be reviewed and verified at a Stage 2 using ADR to complete the data review. Ten percent of all samples, critical and non-critical, will undergo a full data validation (i.e., Stage 4).  The Data Usability Assessment process involves data verification and validation. Data verification is the process by which laboratory results are checked to provide that the proper QC steps were performed and key items have met QC objectives (both analytical and contractual). Key steps of the data verification include:   * identifying sample collection, handling and analysis procedures * documenting handling and analysis activities (e.g., QC checklist) * verifying (internally, at the data generator level) all sampling, handling, on-site analytical laboratory data * verifying laboratory data (e.g., laboratory-qualified data) * verifying sampling, on-site analytical laboratory data * verifying data package deliverable completeness * reviewing the case narrative * presenting all analytical results * summarizing QC sample data * evaluating applicable raw data   All required data deliverables must be present in the data package in order to proceed to the next step of data validation.  Data validation entails a review of the sample collection, handling, QC data, and the raw data to verify that the laboratory was operating within required limits, analytical results were correctly transcribed from the instrument read-outs and which (if any) environmental samples were related to out-of-control QC samples. The objective of data validation is to identify any questionable or invalid laboratory measurements.  The DQIs used to evaluate conformance with the project DQOs are presented below.  DQIs are generally defined in terms of six parameters:   1. representativeness 2. comparability 3. completeness 4. precision 5. accuracy 6. sensitivity   Each parameter is defined below. Specific objectives for the site actions are presented in other sections of this QAPP, as referenced below.  **Representativeness**  Representativeness is the degree to which sampling data accurately and precisely represent site conditions, and is dependent on sampling and analytical variability and the variability of environmental media at the site. Actions have been designed to assess the presence of chemical constituents at the time of sampling. The QAPP presents the rationale for sample quantities and location. This QAPP presents field sampling and laboratory analytical methodologies. Use of the prescribed field and laboratory analytical methods with associated holding times and preservation requirements are intended to provide representative data.  **Comparability**  Comparability is the degree of confidence with which one data set can be compared to another. Comparability between phases of the actions (if additional phases are required) will be maintained through consistent use of the sampling and analytical methodologies set forth in this QAPP, established QA/QC procedures and use of appropriately trained personnel.  **Completeness**  Completeness is defined as a measure of the amount of valid data obtained from an event and/or investigation compared to the total amount that was obtained. This will be determined upon final assessment of the analytical results. Completeness of a field or laboratory data set will be calculated by comparing the number of valid sample results generated to the total number of results generated.  Completeness = Number valid results x 100  Total number of results generated  As a general guideline, overall project completeness is expected to be at least 90 percent. The assessment of completeness will require professional judgment to determine data usability for intended purposes.  **Precision**  Precision is a measure of the reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the objectives of the action. To maximize precision, sampling and analytical procedures will be followed. All work for the site actions will adhere to established protocols presented in the QAPP. Checks for analytical precision will include the analysis of matrix spike/matrix spike duplicates, laboratory duplicates and field duplicates. Checks for field measurement precision will include duplicate field measurements.  The precision of data will be measured by calculating the RPD by the following equation:  RPD = (A-B) x 100  (A+B)/2  Where:  A = Analytical result from one of two duplicate measurements.  B = Analytical result from the second measurement.  **Accuracy**  Accuracy is a measure of how close a measured result is to the true value. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, reference standards, MSs, blank spikes and surrogate standards will be used to assess the accuracy of the analytical data.  Accuracy will be calculated in terms of percent recovery as follows:  % Recovery = A-X x 100  B  Where:  A = Value measured in spiked sample or standard.  X = Value measured in original sample.  B = True value of amount added to sample or true value of standard.  **Sensitivity**  Sensitivity is a quantitative measurement to determine if the analytical laboratory’s procedures/methodologies and their associated detection limits (DLs) and limit of quantitation (LOQs) can satisfy the project requirements as they relate to the project action limits. DLs are updated annually by the laboratory. The current DLs for the analytical laboratories are presented in QAPP Worksheet #15.  **Data Validation and Usability**  JV will validate data generated using WP/UFP-QAPP, DOD QSM version 5.0 (July 2013) and USACE EM 200-1-10 Guidance for Evaluating Performance Based Chemical Data (June 2005). These procedures and criteria may be modified, as necessary, to address project-specific and method-specific criteria, control limits and procedures. Data validation will consist of data screening, checking, reviewing, editing and interpretation to document analytical data quality and to determine whether the quality is sufficient to meet the DQOs.  The data validator will verify that reduction of laboratory measurements and laboratory reporting of analytical parameters is in accordance with the procedures specified for each analytical method and/or as specified in this QAPP. Any deviations from the analytical method or any special reporting requirements apart from those specified in this QAPP will be detailed on COC forms.  Upon receipt of laboratory data, the following procedures will be executed by the data validator:   * Evaluate completeness of data package. * Verify that field COC forms were completed and that samples were handled properly. * Verify that holding times were met for each parameter. Holding time exceedances, should they occur, will be documented. Data for all samples exceeding holding time requirements will be flagged as either estimated or rejected. The decision as to which qualifier is more appropriate will be made on a case-by-case basis. * Verify that parameters were analyzed according to the methods specified. * Review QA/QC data (i.e., confirm that duplicates, blanks and spikes were analyzed on the required number of samples, as specified in the method and verify that duplicate and MS recoveries are acceptable). * Investigate anomalies identified during review. When anomalies are identified, they will be discussed with the Project Manager and/or Laboratory Manager, as appropriate. * If data appear suspect, investigate the specific data of concern. Calculations will be traced back to raw data. If calculations do not agree, the cause will be determined and corrected.   Deficiencies discovered as a result of the data review, as well as the corrective actions implemented in response, will be documented and submitted in the form of a written report addressing the following topics, as applicable to each method:   * assessment of the data package * description of any protocol deviations * failures to reconcile reported and/or raw data * assessment of any compromised data * overall appraisal of the analytical data * table of site name, sample quantities, matrix and fractions analyzed   It should be noted that qualified results do not necessarily invalidate data. The goal to produce the best possible data does not necessarily mean that data must be produced without QC qualifiers. Qualified data can provide useful information.  During the review process, laboratory qualified and unqualified data are verified against the supporting documentation. Based on this evaluation, qualifier codes may be added, deleted or modified by the data reviewer. Results will be qualified with the following codes in accordance with the USACE guidance:  U Not detected: Analysis for the analyte was performed, but the analyte was not detected above the level of the associated value. The associated value is the LOD.  J Estimated: The analyte was detected and identified. The associated numerical value is the approximate concentration of the analyte in the sample.  UJ Not detected, LOD is estimated: The analyte was not detected above the reported LOD. The numerical value of the LOD is estimated and may be inaccurate.  NJ Tentatively identified, reported concentration is estimated: The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification and the associated numerical value represents the approximate concentration. For example, analyte not included in the calibration or second column confirmation not performed.  R Rejected: The data are unusable.  X Tentatively rejected. project-specific data quality objectives (e.g., for sensitivity, accuracy, or precision) were not met or were not demonstrated  J+ Estimated (quantitatively) with high bias.  J- Estimated (quantitatively) with low bias.  Two facts will be noted to all data users. First, the "R" flag means that the associated value is unusable. In other words, due to significant QC problems, the analysis is invalid and provides no information as to whether the compound is present or not. Analytes with "R" values should not appear on data tables because they cannot be relied upon for any reason. The second fact is that no compound concentration, even if it has passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.  Resolution of any issues regarding laboratory performance or deliverables will be handled between the laboratory and the data validator. Suggestions for reanalysis may be made by the Program Chemist at this point.  **Validation Reports**  The data validation reports will identify all deficiencies and the potential impact on the results. The JV Program Chemist (or his designee) will amend qualifiers generated during the validation process to the database. The validation checklists and the database will be the primary location of all applicable data qualifiers. Qualifiers will not be applied to the hard copy analytical reports.  **Field Data Review**  Field data are generated from in-field measurement, which may include a geophysical survey, well development and groundwater sampling. The quality objective for the in-field measurement activities is to obtain accurate measurements of sample characteristics, including aqueous pH, conductivity, temperature, turbidity and dissolved oxygen, using appropriate equipment. Data are recorded in field logbooks or on field sampling sheets and calibration logs. Calibration logs will be reviewed by the JV Site Manager, or designee with other field documentation to identify any potential impacts to data quality and usability. Field logbooks are reviewed as part of the QC inspections.  **Reconciliation with Data Usability Requirements**  Data results will be examined to determine the performance that was achieved for each data usability criterion. The performance will then be compared with the project objectives and DQOs. Deviations from objectives will be noted. Data that has been rejected will not be used. Data that has been qualified but not rejected will be considered useable (i.e., qualified as estimated) and definitive data. If there is an instance where further limitations must be placed on qualified data, the associated data is non-definitive data and should be used for screening purposes only.  Additional action may be warranted when performance does not meet performance objectives for critical data. Options for corrective action relating to incomplete information, questionable results or inconsistent data may include any or all of the following:   * retrieval of missing information * request for additional explanation or clarification * reanalysis of sample from extract (when appropriate) * recalculation or reinterpretation of results by the laboratory   These actions may improve the data quality, reduce uncertainty and eliminate the need to qualify or reject data. If these actions do not improve the data quality to an acceptable level, the following additional actions may be taken:   * extrapolation of missing data from existing data points * use of historical data * evaluation of the critical/noncritical nature of the sample   If the data gap cannot be resolved by these actions, the data bias and potential for false negatives and positives can be evaluated. If the resultant uncertainty level is unacceptable, the following action must be taken:   * additional sample collection and analysis |

# References

CMS, 1998. Removal Report, OE Sampling and Removal Action, Fort Wingate Depot Activity. CMS Environmental, Inc., December 1998.

Department of Defense, 2013. Quality Systems Manual for Environmental Laboratories. Version 5.0. July 2013

EHSI, 2000. Final OE Location and Removal Report, Fort Wingate Depot Activity, New Mexico.

ERM, 1994. Unexploded Ordnance Survey Report, Fort Wingate Depot Activity.

ERM, 1993. Final Interim Status Closure Plan.

ITRC, 2012. Technical and Regulatory Guidance Incremental Sampling Methodology.

NMED, 2014. Risk Assessment Guidance for Site Investigations and Remediation. <http://www.nmenv.state.nm.us/HWB/documents/RA_Guidance_for_SI_and_Remediation_12-24-2014.pdf>

PIKA-Pirnie JV, 2015a. Final Work Plan Kickout Area Munitions and Explosives of Concern Removal and Surface Clearance

PIKA-Pirnie JV, 2015b. Interim Measures Work Plan Areas of Concern and Solid Waste Management Units in the Kickout Area.

PMC, 1999a. Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IA – Characterization and Assessment of Site Conditions for the Soils/Solid Matrix.

PMC, 1999b. Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IB – Characterization and Assessment of Site Conditions for the Ground Water Matrix.

PMC, 2000. Final Risk Assessment Technical Memorandum, Open Burning/Open Detonation Areas, Fort Wingate Depot Activity.

Shaw Environmental, Inc., 2010. *Soil Background Study and Data Evaluation Report*.

TPMC, 2006a. Hydrogeologic Summary Report.

USACE, 1995. Archives Search Report, Fort Wingate. U.S. Army Corps of Engineers, St. Louis District, July 1995.

USACE, 2005. Guidance for Evaluating Performance-Based Chemical Data. EM 200-1-10. June 2005.

USACE, 2007. Environmental Information Management Plan, Fort Wingate Depot Activity. U.S. Army Corps of Engineers. December 21, 2007.

USACE, 2008. Explosives Safety and Health Requirements Manual.

USACE, 2009. Implementation of Incremental Sampling of Soil for the Military Munitions Response Program.

USEPA, 1996. SW-846, Test Methods for Evaluating Solid Waste, including Promulgated Final Update IV. 3rd Edition. February 2007.

USEPA, 2001. Requirements for Quality Assurance Project Plans. USEPA QA/R-5. March 2001.

USEPA, 2002. Guidance for Quality Assurance Project Plans. USEPA QA/G-5. December 2002.

USEPA, 2005a. Intergovernmental Data Quality Task Force, Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual. EPA-505-B-04-900A, Final Version 1. March 2005.

USEPA, 2005b. Intergovernmental Data Quality Task Force, Uniform Federal Policy for Quality Assurance Project Plans, Part 2A: UFP-QAPP Workbook. EPA-505-B-04-900C, Final Version 1. March 2005.

USEPA, 2005c. Intergovernmental Data Quality Task Force, Uniform Federal Policy for Quality Assurance Project Plans, Part 2B: Quality Assurance/Quality Control Compendium: Minimum QA/QC Activities. EPA-505-B-04-900B, Final Version 1. March 2005.

USEPA, 2006. Guidance for the Data Quality Objectives Process. QA/G-4. February 2006.

USEPA, 2012a. Guidance for Quality Assurance Project Plans. CIO 2106-G-05 QAPP. January 2012.

USEPA. 2012b. Intergovernmental Data Quality Task Force, Optimized UFP-QAPP Worksheets. March 2012