USACE Contract No.:
W912DQ-11-D-3004

US Army Corps of Engineers
Kansas City District

Draft Quality Assurance Project Plan

Rolling Knolls Landfill Superfund Site

Data Gap Investigation Oversight

Chatham, New Jersey

Task Order No. 019

November 13, 2014

CDM Smith

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November 13, 2014

U.S. Department of the Army
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Attn: CENWK- PM-E/Amy Darpinian
Project: Contract No. W912DQ-11-D-3004
Task Order No. 019
Rolling Knolls Landfill Superfund Site
Chatham, New Jersey

Subject: Draft Quality Assurance Project Plan

Dear Amy:

CDM Federal Programs Corporation (CDM Smith) is pleased to submit an electronic copy of the Draft Quality Assurance Project Plan for Oversight of the Data Gap Investigation at the Rolling Knolls Landfill Superfund Site, located in Chatham, New Jersey.

If there are questions concerning this submittal, please contact me at (732) 590-4663.

Very truly yours,

CDM FEDERAL PROGRAMS CORPORATION

Paul Hagerman, P.E
Project Manager

Enclosure

cc: Tanya Mitchell, EPA
Jeniffer Oxford, CDM Smith
Field Team Leader, CDM Smith
K. Tan, CDM Smith
file: 6424-019

TABLE OF CONTENTS

Introduction vii

QAPP Worksheets #1 & 2	Title and Approval Page	1
	QAPP Crosswalk/Identifying Information	3
QAPP Worksheets #3 & 5	Project Organization and QAPP Distribution	5
QAPP Worksheets #4, 7 & 8	Personnel Qualifications and Sign-Off Sheet	6
QAPP Worksheet #6	Communication Pathways	9
QAPP Worksheet #9	Project Planning Session Summary	12
QAPP Worksheet #10	Conceptual Site Model	13
QAPP Worksheet #11	Project Data Quality Objectives	14
QAPP Worksheet #12	Measurement Performance Criteria Table	19
QAPP Worksheets #14 & 16	Project Tasks & Schedule	40
QAPP Worksheet #17	Sampling Design and Rationale	42
QAPP Worksheet #18	Sampling Locations and Methods	44
QAPP Worksheets #19 & 30	Sample Containers, Preservation, and Hold Times	45
QAPP Worksheet #20	Field Quality Control Summary	49
QAPP Worksheet #21	Field SOPs	52
QAPP Worksheet #23	Analytical SOPs	54
QAPP Worksheet #24	Analytical Instrument Calibration	55
QAPP Worksheet #25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	58
QAPP Worksheets #26 &27	Sample Handling, Custody, and Disposal	59
QAPP Worksheet #28	Analytical Quality Control and Corrective Action	60
QAPP Worksheet #29	Project Documents and Records	91
QAPP Worksheets #19 & 30	Sample Containers, Preservation, and Hold Times	94
QAPP Worksheets #31, 32, & 33	Assessments and Corrective Action	95
QAPP Worksheet #34	Data Verification and Validation Inputs	96
QAPP Worksheet #35	Data Verification Procedures	98
QAPP Worksheet #36	Data Validation Procedures	100
QAPP Worksheet #37	Data Usability Assessment	102

Tables

Table 1 The Group's Sample Locations, Depths and Analyses Table

List of Attachments

Attachment 1 Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Worksheet#15)
Attachment 2 1-3b Figure excerpts from the Group's Sampling and Analysis Plan
Attachment 3 Planning Meeting Summary

List of Appendices

Appendix A The Group's QAPP
Appendix B The Group's SAP
Appendix C DESA Generic QAPP Worksheets
Appendix D Field Forms
Appendix E CDM Smith TSOP and Sampler Guides

This QAPP is prepared in accordance with the UFP-QAPP manual (EPA 2005) and is compliant with EPA's QAPP guidance document EPA QA/R-5 (EPA 2002). The project will be implemented in accordance with the quality procedures in CDM Smith's Quality Assurance (QA) Manual (CDM Smith 2012) and this governing QAPP.

All worksheets are included herein.

References

Foster Wheeler Environmental Corporation. 2000. Expanded Site Inspection Report: Rolling Knolls Landfill, Green Village, Chatham Township, Morris County, New Jersey. Volume I of IV. Prepared for the USEPA.

NUS Corporation. 1986. Report of Soil Sampling and Drilling Program at the Green Village Disposal Site. Prepared for the USEPA, Region II Edison, New Jersey.

USFWS Fish and Wildlife Enhancement. 1991. Technical Assistance Report, Contaminants in Fish and Sediments of Great Swamp National Wildlife Refuge, Morris County, New Jersey. Results of 1988 Sampling Efforts. Prepared for the USFWS Refuges and Wildlife (region 5), Massachusetts.

Weston. 2003. CLP Analytical Data of Soil and Sediment Samples Rolling Knolls Landfill Green Village Chatham Township, Morris County, New Jersey. Prepared for the USEPA. (Weston, August 2003); PCB Field Screening Analytical Data of Soil and Sediment Samples Rolling Knolls Landfill Green Village Chatham, Morris County, New Jersey. Prepared for the USEPA. (Weston, April 2003); Sampling Trip Report – Rolling Knolls Landfill. Prepared for the USEPA. April.

Acronyms

ABS	absolute difference
AES	atomic emission spectrophotometry
ANSETS	Analytical Services Tracking System
ASC	analytical services coordinator
CCV	continuing calibration verification
CDM Smith	CDM Federal Programs Corporation
CHMM	Certified Hazardous Materials Manager
CIH	certified industrial hygienist
CLP	contract laboratory program
COC	contaminant of concern
CoC	chain of custody
CQCP	contractor quality control plan
CRQL	contract required quantitation limit
CSM	conceptual site model
CVAFS	cold vapor atomic fluorescence spectrometry
DESA	Division of Environmental Science and Assessment
DO	dissolved oxygen
DPT	Direct-Push Technology
DQI	data quality indicator
DQO	data quality objective
DV	data validation
DMC	deuterated monitoring compound
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EPA	United States Environmental Protection Agency
eV	electron volt
FAR	Federal Acquisition Regulations
FASTAC	Field and Analytical Services Teaming Advisory Committee
FCR	field change request
FID	flame ionization detector
FLPE	fluorinated polyethylene
FOS	field team leader
GC/MS	gas chromatograph/mass spectroscopy
GWQS	Groundwater Quality Standards
HASP	Health and Safety Plan
H&S	health and safety
HCl	hydrochloric acid
HDPE	high density polyethylene
ICP	inductively coupled plasma
ICP-AES	inductively coupled plasma atomic emission spectroscopy
ICP-MS	inductively coupled plasma mass spectrophotometer
ID	identification
IDW	Investigation Derived Waste
IR	infra-red
LCS	laboratory control sample
LOQ	limit of quantitation
MCAWW	Method for Chemical Analysis of Water and Wastes
MDL	minimum detection limit

MEE	methane, ethane, ethane
mg/kg	milligram per kilogram
mg/L	milligram per liter
mL	milliliter
MPC	measurement performance criteria
MW	monitoring well
MS	mass spectrophotometer
MSA	Master Services Agreement
MS/ MSD	matrix spike /matrix spike duplicate
NA	not applicable
N/A	not available
NELAP	National Environmental Laboratory Accreditation Program
NIST	National Institute of Standards and Technology
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
OSHA	Occupational Safety and Health Administration
OSRTI	Office of Superfund Remediation and Technology Innovation
OU	operable unit
%D	percent difference
%R	percent recovery
PAL	project action limit
PB	preparation blank
PM	project manager
POC	point of contact
ppb	parts per billion
ppm	parts per million
PQL	project quantitation limit
PQLG	project quantitation limit goal
PQO	project quality objective
PTFE	polytetrafluoroethylene
QA	quality assurance
QAS	quality assurance specialist
QAPP	quality assurance project plan
QC	quality control
QL	quantitation limit
QP	Quality Procedure
RA	remedial action
RAC	Remedial Action Contract
RAO	Remedial Action Objective
RAS	routine analytical service
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RPD	relative percent difference
RPM	remedial project manager
RRF	relative response factor
RSCC	Regional Sample Control Coordinator
RSD	relative standard deviation
SAP	sampling and analysis plan
SDG	sample delivery group
SF	square feet

SIM	selected ion monitoring
SOP	standard operating procedure
SOW	Statement of Work
SSHO	site health and safety officer
SSHP	site safety and health plan
SVOC	semi-volatile organic compound
TAL	target analyte list
TAT	turnaround time
TBD	to be determined
TCL	target compound list
TSOP	Technical Standard Operating Procedure
UFP	Uniform Federal Policy
µg	microgram
µg/kg	microgram per kilogram
µg/L	microgram per liter
USGS	United States Geologic Survey
USACE	United States Army Corps of Engineers
VOC	volatile organic compound
VTSR	verified time of sample receipt
^{o}C	degree Celsius

1.0 Introduction

Under the United States Army Corps of Engineers (USACE), Kansas City District, Contract No. W912DQ-11-D-3004, Task Order No. 0019, CDM Federal Programs Corporation (CDM Smith) was directed to perform oversight of the Data Gap Investigation for the Rolling Knolls Landfill Superfund Site located in Chatham, New Jersey.

This Quality Assurance Project Plan (QAPP) addresses oversight of Rolling Knolls Landfill Settling Parties (the Group's) activities performed in support of the Data Gap Investigation which involve sampling and analysis of soil, sediment, surface water, groundwater and porewater to further characterize and delineate the site contamination.

This QAPP has been prepared in accordance with the Uniform Federal Policy (UFP)-QAPP manual (EPA 2005) and optimized worksheets (EPA 2012) and is compliant with EPA's QAPP Requirements document EPA QA/R-5 (EPA 2001). This task order will be implemented in accordance with the quality procedures in CDM Smith's Quality Assurance (QA) Manual (CDM Smith 2012). This QAPP is the governing document for execution of this oversight. CDM Smith will use the various documents prepared by the Group's contractor to verify proper execution of the data gap investigation. The QAPP covers the oversight tasks currently assigned to CDM Smith.

1.1 Site Description

The Rolling Knolls Landfill is an approximately 200-acre, unlined, former municipal landfill located at 35 Britten Road in the Green Village section of Chatham Township. The facility is bounded by the Great Swamp National Wildlife Refuge to the east, south and west; Loantaka Brook and private property to the west; and private residential properties to the north and northwest. The southern and eastern portions of the landfill lie within the boundaries of the Refuge, which is a designated national wildlife refuge and has habitat known to be used by state- and federally designated or proposed endangered or threatened species. The facility is minimally accessible and is not covered by an impenetrable material.

The Rolling Knolls landfill operated as a municipal landfill from the early 1930s through December 1968. During that time, it received municipal solid waste, as well as construction and demolition debris, from surrounding municipalities. Chatham Township Board of Health records indicate that the types of wastes deposited at Rolling Knolls included tree stumps, scrap metal, tires, household refuse, residential septic wastes, and industrial waste. In order to comply with health code regulations adopted in 1959, operational procedures at the facility included the application of herbicides and pesticides to control weeds, insects, and rodents, as well as the application of oil on facility roadways to control dust and daily cover over all exposed surfaces.

Analytical results of surface and subsurface soil samples taken in May 1999 indicated elevated levels of metals, phthalates, and polychlorinated biphenyls (PCBs) at the site. Additional sampling conducted in March 2003 confirmed the presence of elevated levels of PCBs in both the site soil and wetland sediment, on both the privately and federally owned portions of the landfill. Elevated levels of mercury were also detected in the sediment in the southeast portion of the landfill. Additional sampling was needed to further define the nature and extent of contamination at the site.

Notice of liability letters were sent to several potentially responsible parties (the Group). An Administrative Settlement Agreement and Order on Consent (AOC) for Remedial Investigation and Feasibility Study (RI/FS) was reached on 30 September 2005 between U.S. Environmental Protection Agency (EPA) and the "Settling Parties". Approximately twenty percent of the site is owned by the U.S. Department of the Interior, Fish and Wildlife Service. The Settling Parties are listed as follows: Chevron Environmental Management Company, for itself and on behalf of Kewanee industries, Inc.; Lucent Technologies Inc.; and Novartis Pharmaceuticals Corporation as successor to Ciba-Geigy Corporation.

In 2007, on behalf of the Rolling Knolls Landfill Settling Parties (the Group), ARCADIS U.S., Inc., conducted an RI/FS investigation to determine the nature and extent of contamination in groundwater, soil, sediment, surface water and to characterize the chemical constituents of industrial waste, if any, or other waster material identified as potential source material present at the site. The investigation culminated in a Site Characterization Summary Report (SCSR 2012, February).

In March 2013, the USEPA identified several data gaps related to delineation of constituents in environmental media. To address these data gaps, ARCADIS will perform a data gap investigation to:

- Assess the data gaps identified by EPA in August 2014
- Further delineate the extent of the site constituents in soil, groundwater, surface water and sediment
- Characterize surface water and sediment in ponds that were not sampled during previous events
- Characterize the pore water chemistry downgradient of monitoring well MW-10
- Characterize the current groundwater constituent concentrations via monitoring well sampling events
- Investigate the connection between groundwater and surface water on site
- Assess the conditions at the existing Hunt Club well HC-1

1.2 Summary and Purpose of the QAPP

This QAPP serves to detail activities and procedures required to determine the accuracy of the Group's data for the Data Gap Investigation, and to verify that they perform the investigation study activities in accordance with their approved plans. Split samples will be accepted during the following activities:

Phase 1 Field Work

- Soil sampling
- Temporary monitoring well installation and sampling
- Surface water and sediment sampling
- Recovery of pore-water samplers and sample collection
- Redevelopment and sampling of existing wells

Phase 2 Field Work

- Second groundwater sampling event (all new monitoring wells, and selected existing monitoring wells based on the results of the first groundwater sampling event)
- Third groundwater sampling event (all new monitoring wells)

The Data Gap Investigation field activities will be performed by the Group. CDM Smith will perform oversight of the Data Gap Investigation Field Activities. Additionally, CDM Smith will collect split samples at a rate of 10% for analysis of all matrices for Target Compound List (TCL) volatile organic compounds (VOCs), semi- volatile organic compounds (SVOCs) plus selected ion monitoring (SIM), Pesticides, polychlorinated biphenyls (PCBs), target analyte list (TAL) Metals, Mercury and Cyanide and Trace Mercury, Dioxins/Furans and PCB Congeners; and submit a Data Evaluation Report.

QAPP Worksheets #1 and 2: Title and Approval Page
(UFP-QAPP Manual Section 2.1)
(EPA 2106-G-05 Section 2.2.1)

1. **Project Identifying Information**
   a. **Site name**: Rolling Knolls Landfill Superfund Site
   b. **Site location: Chatham, New Jersey**
   c. **Contract/Work assignment number:** W912DQ-11-D-3004/Task Order 0019

2. **Lead Organization:**
   United States Army Corps of Engineers (USACE), Kansas City District

   a. **Project Manager:** Amy Darpinian

   Signature_____ Date_____

3. **Federal Regulatory Agency (name/title/signature/date)**
   United States Environmental Protection Agency (EPA) Region 2

   a. **Remedial Project Manager:** Tanya Mitchell

   Signature_____ Date_____

4. **Other Stakeholders**: CDM Smith

   a. **CDM Smith Project QA Specialist:** Jeniffer Oxford

   Signature J Oxford Date 11-13-14

   b. **CDM Smith Project Manager:** Paul Hagerman

   Signature Paul R Hagerman Date 11/13/2014

5. **List plans and reports from previous investigations relevant to this project**

   a. Quality Assurance Project Plan for Data Gaps Sampling and Analysis Plan, Rolling Knolls Landfill Superfund Site. Arcadis, October 2014
   b. Data Gaps Sampling and Analysis Plan, Rolling Knolls Landfill Superfund Site. Arcadis, October 2014
   c. Foster Wheeler Environmental Corporation. 2000. Expanded Site Inspection Report: Rolling Knolls Landfill, Green Village, Chatham Township, Morris County, New Jersey. Volume I of IV. Prepared for the USEPA.
   d. NUS Corporation. 1986. Report of Soil Sampling and Drilling Program at the Green Village Disposal Site. Prepared for the USEPA, Region II Edison, New Jersey.
   e. USFWS Fish and Wildlife Enhancement. 1991. Technical Assistance Report, Contaminants in Fish and Sediments of Great Swamp National Wildlife Refuge, Morris County, New Jersey. Results of 1988 Sampling Efforts. Prepared for the USFWS Refuges and Wildlife (region 5), Massachusetts.
   f. Weston. 2003. CLP Analytical Data of Soil and Sediment Samples Rolling Knolls Landfill Green Village Chatham Township, Morris County, New Jersey. Prepared for the USEPA. (Weston, August 2003); PCB Field Screening Analytical Data of Soil and Sediment Samples Rolling Knolls Landfill Green Village Chatham, Morris County, New Jersey. Prepared for the USEPA. (Weston, April 2003); Sampling Trip Report – Rolling Knolls Landfill. Prepared for the USEPA. April.

QAPP CROSSWALK
Identifying Information

The following table provides a "cross-walk" between the QAPP elements outlined in the UFP-QAPP Manual, the necessary information, and the location of the information within the text document and corresponding QAPP Worksheet.

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 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

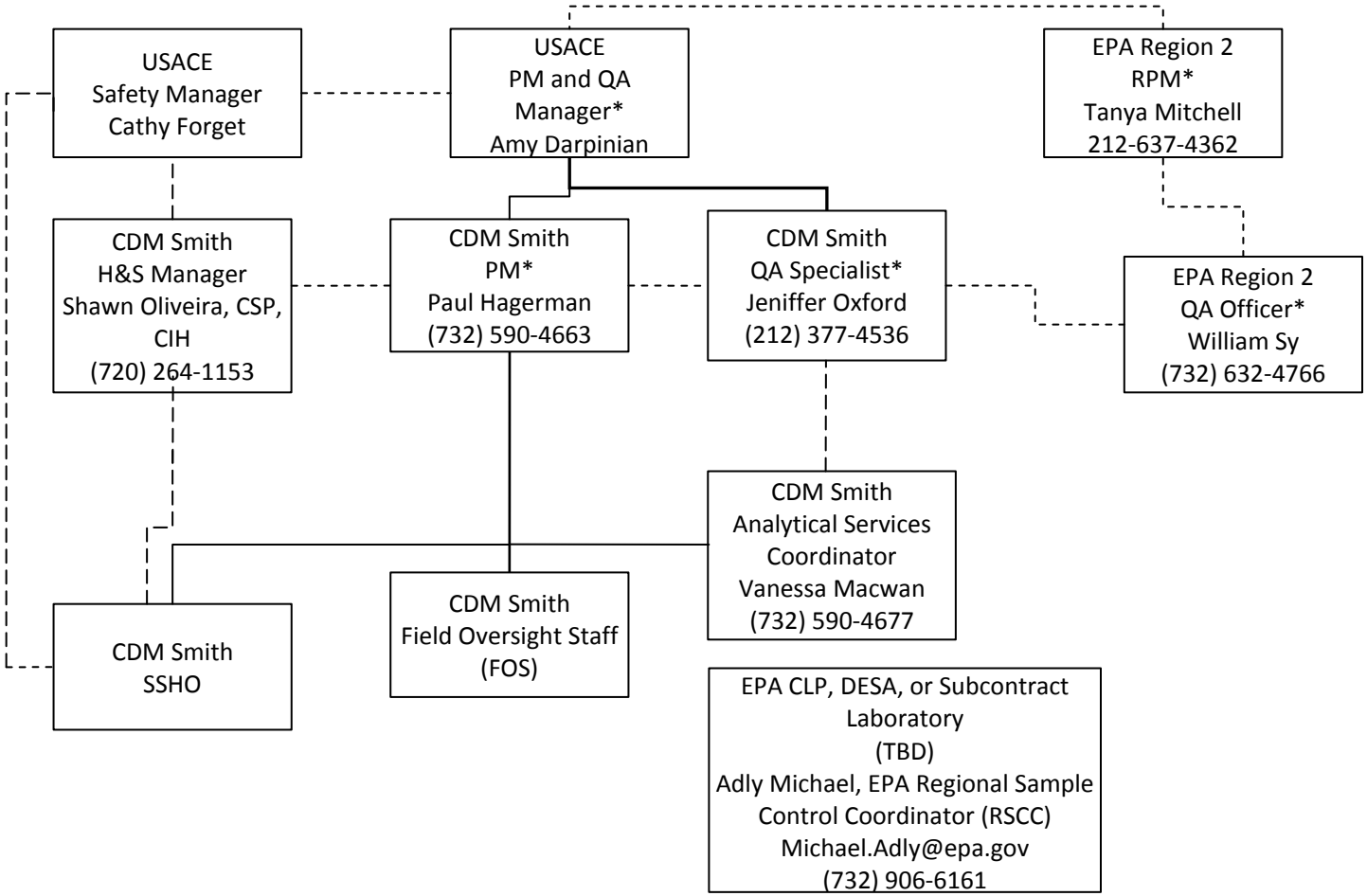
QAPP CROSSWALK
Identifying Information

The following table provides a "cross-walk" between the QAPP elements outlined in the UFP-QAPP Manual, the necessary information, and the location of the information within the text document and corresponding QAPP Worksheet.

Optimized UFP-QAPP Worksheets		**2106-G-05 QAPP Guidance Section**	
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 Data Review
		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 Worksheet #3 & 5: Project Organization and QAPP Distribution
(UFP-QAPP Manual Section 2.3 and 2.4)
(EPA 2106-G-05 Section 2.2.3 and 2.2.4)

*QAPP recipient Lines of authority _____ Lines of Communication ----------



QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

ORGANIZATION: CDM Smith

Name	Project Title/Role	Education /Experience	Specialized Training/Certifications	Signature/Date
Paul Hagerman	**PM** - Oversees project and responds to USACE PM and EPA RPM. Manages subcontractors. Responsible for implementing and maintaining QA program. Determine the need for any corrective action.	B.S. – Mechanical Engineering M.S. – Mechanical Engineering; over 20 years of project management and engineering experience	P.E.; Internal PM training modules;	
TBD	**FOS -** Oversee all field investigation activities		OSHA 40 hour training, annual 8 hour refresher, annual medical monitoring	

QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

Name	Project Title/Role	Education /Experience	Specialized Training/Certifications[1]	Signature/Date[2]
Shawn Oliveira	**Health and Safety Manager** - Oversees adherence to Health and Safety requirements	M.S., Environmental Engineering B.S., Chemistry	Certified Industrial Hygienist (CIH)	
Scott Kirchner	**Project Chemist -** Overall responsibility for laboratory services and data management and evaluating analytical data	B.S., Chemistry B.S, Environmental Science	CHMM	
Vanessa Macwan	**ASC** - Coordinates with EPA RSCC, Division of Environmental Science and Assessment (DESA) laboratory and subcontract laboratories	B.S., Environmental Science B.S., Engineering Technologies		
Jo Nell Mullins	**Quality Assurance Manager -** develops and implements the CDM Smith QA program and assesses the implementation of the quality requirements for all projects	M.S., Environmental Health B.S. – Biology/Chemistry 15 years of experience	ASQ Certified Quality Auditor; ISO 14001 Lead Auditor Certified; NQA-1 Lead Auditor Certified; OSHA 40 training and annual 8 hour refresher	
Jeniffer Oxford	**QA Specialist** - Oversees adherence to QA requirements	B.S., Natural Sciences	CHMM	
Christine Julias	**Database Manager** - Oversees data management; coordinates with data coordinators and validation staff	B.S., Chemical Engineering M.B.A., Marketing Management	P.E.	

QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

ORGANIZATION: Laboratory

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date[2]
EPA CLP Laboratory (TBD)	QA Officer	TBD (Experience vetted by accreditation body)	National Environmental Laboratory Accreditation Program (NELAP)/CLP	
DESA - Sumy Cherukara	QA Officer	TBD (Experience vetted by accreditation body)	NELAP/Trained in EPA and standard analytical methods	
CDM Smith subcontract Laboratory - TBD	QA Officer	TBD (Experience vetted by accreditation body)	NELAP and Environmental Laboratory Accreditation (ELAP)	

Notes:
1. CPR/First Aid- Red Cross or CINTAS- periodically as required (1-3 years).
2. Signatures indicate personnel have read and agree to implement this QAPP as written.
3. EPA Headquarters staff reviews and maintains the resumes of education and experience for key laboratory staff. This information is not available for the QAPP.

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathways, Documentation, etc.)
Regulatory agency interface	USACE Project Manager (PM)	Amy Darpinian	816-389-3897	The USACE PM will send all information about the project to the EPA PM. Major changes will be discussed with the EPA PM prior to implementation.
	EPA RPM	Tanya Mitchell	212-637-4362	
Point of Contact with USACE	CDM Smith PM	Paul Hagerman	732-590-4663	All information about the project will be sent to USACE PM by CDM Smith PM.
Manage field tasks				Act as liaison to USACE PM and EPA RPM concerning investigation activities. Daily communication with project team and PM. Communicate implementation issues to FOS.
QAPP changes: prior to field work , in the field, and during project execution	CDM Smith FOS	TBD	TBD	Notify CDM Smith PM immediately and promptly complete a Field Change Request (FCR) form and/or corrected worksheets. Send FCR forms to Quality Assurance Specialist (QAS).
	CDM Smith PM	Paul Hagerman	732-590-4663	Notify EPA RPM, USACE PM and ASC of delays or changes to field work. Prepare QAPP Addendums or revisions in consultation with the client.
Field corrective actions	CDM Smith FOS	TBD	TBD	CDM Smith FOS will oversee implementation of corrective action and notify auditor, PM by email. CDM Smith PM will complete the corrective action report form.
Daily Quality Control Report (DCQR)				Complete on a daily basis and submit to CDM Smith PM and PE. CDM Smith PM will forward to USACE PM and EPA RPM upon request.
Booking of Analytical Services				Submit request to ASC before the timeframe below.
	CDM Smith ASC	Vanessa Macwan	732-590-4706	Coordinate DESA and Contract Laboratory Program (CLP) analytical services through Regional Sample Control Center (RSCC) 3 weeks prior to sampling.

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathways, Documentation, etc.)
Facilitate Database Setup and Data Management Planning	CDM Smith FOS	TBD	TBD	Provide sample and analytical information prior to sample collection to CDM Smith ASC and DC. Provide information on sample and analytical reporting groups, and types of report tables required for project.
Facilitate Data Management				Provide electronic survey data, sample ID, locations and analyses. Transmit completed sample tracking information to data manager by the completion of each sampling case.
Incomplete Electronic Data Deliverables (EDDs) or other EDD issues	CDM Smith Data Manager and Data Coordinator	Christine Julius	732-590-4610	Personnel identifying the issue will request resubmittal of corrected EDD by email.
Data verification issues, e.g., incomplete records	CDM Smith Data Coordinator	Tonya Bennett	212-377-4532	Data Coordinator will send an email to the FOS when an issue is found. FOS will address questions or any discrepancies.
Field Corrective Action	CDM Smith QAS, auditor, FOS	Jeniffer Oxford TBD	212-377-4536 TBD	PM, Task Manager, and FOS, per QA manual requirement corrective actions may also be identified by the field team. FOS initiates corrective action on identified field issues immediately or within QA manager (QAM) recommended timeframe.
Procurement of analytical services	CDM Smith FOS/ASC	TBD	TBD	FOS will prepare laboratory request; ASC will review and send email to RSCC. If needed they will prepare an analytical SOW and submit for project chemist review. FOS initiates laboratory kick-off call with subcontract laboratory (ies) and email agenda.
Analytical Services Support	CDM Smith ASC	Vanessa Macwan	732-590-4706	Act as liaison with RSCC for CLP laboratories, with John Birri for DESA, and with subcontract laboratory (ies).
Laboratory Quality Control Variances and Analytical Corrective Actions	Laboratory Project Manager or QC Officer	TBD	TBD	Communicate with the laboratory staff and regular communication with the CDM Smith ASC, QAS or designee. Provide oversight and direction on technical issues as needed.
Notification of Analytical Issues Sample receipt variances	CDM Smith ASC	Vanessa Macwan	732-590-4706	Notify FOS of any sample collection/shipment issues. Notify RSCC, DESA laboratory or subcontract laboratories to initiate corrective action.

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathways, Documentation, etc.)
Data validation issues, e.g., Non-compliance with procedures; Data review corrective actions	CDM Smith data validator or data assessor	TBD	TBD	Submit a list of questions or issues to USACE and EPA or the subcontract laboratory as appropriate for correction or other appropriate response.
Reporting of Issues Relating to Analytical Data Quality (including ability to meet reporting limits, and usability of data)	CDM Smith ASC	Vanessa Macwan	732-590-4706	Communicate to CDM Smith PM as appropriate.
	CDM Smith Data Assessor	TBD	TBD	Communicate to CDM Smith PM as appropriate. Document situation and effect in a data quality report prepared prior to evaluation of remedial design report.
Release of Analytical Data	CDM Smith ASC	Vanessa Macwan	732-590-4706	Receive and review data packages before data is used. Coordinate validation if a subcontract laboratory is procured.
Site Health and Safety Issues	CDM Smith FOS	TBD	TBD	Make decisions regarding health and safety issues and upgrading PPE. Communicate to CDM smith PM and Health and Safety Manager, as appropriate.

QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

CDM Smith will accept ten percent of samples for analyses of the main contaminants of concern for all matrices collected during the Data Gap Investigation Oversight. Attachment 3 of this QAPP provides additional detail of the project planning session summary.

QAPP Worksheet #10: Conceptual Site Model
(UFP-QAPP Manual Section 2.5.2)
(EPA 2106-G-05 Section 2.2.5)

*Refer to the Group's QAPP **(Appendix A)** for information on the Conceptual Site Model (CSM). This Data Gap Investigation will further characterize the CSM; CDM Smith's oversight activities will facilitate verification of compliance with the Group's approved plans and accuracy of the data collected. Ten percent of the Group's samples including all matrices will be accepted and analyzed for definitive level TLC VOCs, SVOC +SIM, Pesticides, PCBs, TAL Metals, Mercury and Cyanide, Trace Mercury, Dioxins/Furans and PCB Congeners to meet the project action limits specified in the Group's document and shown on **Appendix A** of this QAPP. The split sample results will be compared with the Group's results using the measurement performance criteria described on Worksheet 37, section on Precision.*

QAPP Worksheet #11: Project Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

The Group's QAPP addresses the Project data quality objective (DQOs). Split samples will be used to support the goals of the oversight program by generating definitive level data for comparison with the Group's data. The problem and framework for oversight are:

1. State the Problem – The field investigation is being led by the Group; USACE and EPA need to determine the accuracy of the Group generated data and to evaluate whether the field work is executed in compliance with approved documents. Oversight will include field observation and acceptance of split samples from the Group's to further delineate the extent of contaminants of concern in soil, groundwater, sediment and surface water.

CDM Smith will assist USACE/ EPA in the oversight of the field activities and will provide field oversight and analysis of split samples accepted from the Group's contractor to verify compliance with their approved project plans and the accuracy of their data. To evaluate the Group's data accuracy, CDM Smith will accept 10 percent split samples of all matrices for analysis at locations determined by coordination with the Group and in consultation with the USACE PM/ EPA RPM.

CDM Smith oversight of the Group's field investigation will include the following activities:

- Technical Review and evaluation of the Group's project plans and reports
- Documentation of field activities observations and deficiencies
- Review of the Group's-selected sampling locations
- Acceptance of split samples
- Sample handling, packaging and shipping to off-site laboratories
- Comparison of data sets to determine any analytical bias

2. Identify Study Goals – The goals are to verify, through independent oversight and split sampling analysis, that the Group's activities are in accordance with their Contractor's SAP, QAPP, and HASP and that the Group's data are representative of the site conditions and contaminant concentrations. Oversight and split sample data will be used to answer the environmental questions below:

- Is the Group contractor complying with the approved plans or approved deviations?
- Does the Group data adequately characterize the site, and are the data representative and useful for project decisions?
- Are the Group and CDM Smith data complete and accurate?
- Are data sets comparable as defined on Worksheet #37?
- Does the data show any analytical bias?
- Do the relative percent differences (RPDs) calculated for the Group and CDM Smith data fall within the measurement performance criteria?

QAPP Worksheet #11: Project Data Quality Objectives (Oversight)
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

3. Identify Information inputs – The primary required data types will be analytical results from soil, sediment, groundwater, surface water and porewater samples collected from the selected locations.

CDM Smith, in consultation with the USACE PM/ EPA RPM, will determine sample locations to be split. CDM Smith will accept samples during the Group field program and send to a DESA, CLP or sub-contract laboratory to assess data accuracy. The analyses selected to be split are determined to be more critical for oversight evaluation. Chemical analyses will be obtained for the contaminants of concern; physical data will not be obtained unless determined critical to the investigation or as directed by USACE and EPA. The oversight will be used to verify data accuracy and whether the study questions listed in Step 2, Identify Study Goals, are adequately addressed.

4. Boundaries of the Study – CDM Smith will only be collecting split samples at a frequency of 10 percent (%) during Data Gap Investigation field activities. Samples locations are to be determined in consultation with the USACE PM and EPA RPM. Samples selected for split sampling data will cover a range of locations and concentrations, will cover critical items such as areas of potential contamination, and will be collected from each media type. The analyte group to be split is: *TLC VOCs, SVOC +SIM, Pesticides, PCBs, TAL Metals, Mercury and Cyanide, Trace Mercury, Dioxins/Furans and PCB Congeners.*

Sampling oversight will be performed according to the Group's schedule.

5. Analytical Approach – Analytical data and reports will be used to qualitatively assess any potential bias in the Group dataset. Sample results will be evaluated against the Group's project action limits on Worksheet #15 and against the Group's data using the split samples measurement performance criteria on worksheets #12 and 28 (**Appendix A**). Field implementation will be measured against procedures in the Group's field plans. The project decision criteria below will apply.

QAPP Worksheet #11: Project Data Quality Objectives (Oversight)
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

Project Decision Conditions ("If..., then..." statements):

- If field work is inconsistent with the Group QAPP and SAP, then the field oversight staff will verify tasks with respect to the Group's QAPP, SAP, and HASP and note deviations with the Group's field project leader and document such discussions in the Weekly Oversight Summary Reports submitted to USACE and EPA. The CDM Smith PM, USACE PM and EPA RPM will be informed verbally of via email within 24 hours if there are deviations.
- If the Group team needs to relocate sampling locations, or there are any changes to the planned field program, CDM Smith will communicate this change to USACE and EPA and document it on the Daily Quality Control Reports.

CDM Smith will present data findings and submit it to USACE and EPA, who will then determine if any additional actions are required.

6. Performance and Acceptance Criteria –

- CDM Smith's QC data will be used to determine split sample data quality and whether sample results are acceptable based on the established project DQOs. Sample results will be compared to the measurement performance criteria (MPC) of the data quality indicators (DQIs).
- EPA's Field and Analytical Services Teaming Advisory Committee (FASTAC) policy for obtaining laboratory resources will be utilized for sampling events. Laboratory analysis will be performed through the DESA and CLP laboratories.
- Definitive level data is required for full validation of the data.
- The project-specific action limits and quantitation limits are specified on Worksheet #15 (**Attachment 1**) for all contaminants of concern. Analytical data generated will be compared to these limits. Data must meet the DQOs that have been specified for the site. Refer to Worksheets #12, 15 and 28.
- Laboratory reporting limits (contract required quantitation limits (CRQLs)) need to be below or equal to the Group's project action limits (PALs).
- In addition, to ensure that measurement performance criteria for usability (criteria for measures of precision, accuracy, representativeness, comparability, completeness, and sensitivity) are met, all data will be subject to validation and the outputs used to perform a data usability assessment.

QAPP Worksheet #11: Project Data Quality Objectives (Oversight)
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

7. Detailed Plan for Obtaining Data –

Field sampling and field procedures are described in the Group's QAPP and SAP. Sampling oversight will be performed according to the Group's schedule, unless unanticipated delays occur. See the Group's Figures in Attachment A for potential split sample locations.

The Group Contractor's representative will collect and fill the sample containers and CDM Smith's field personnel will prepare the split samples for shipment. CDM Smith will perform sample management, prepare, package, and ship the split samples to the assigned laboratory. DESA, CLP or subcontract laboratory will generate the data. EPA's RSCC will communicate laboratory assignments to CDM Smith.

CDM Smith field personnel will observe the implementation of field and sampling activities and note any deviations from their Work Plan and QAPP. Deviations will be brought to the attention of the Group's contractor, and reported to the CDM Smith PM who will communicate this information to the USACE PM and EPA RPM. These will be documented in the daily communications and in the CDM Smith data comparability report. The data report will include a discussion of the impact of the deviation(s) on the data quality. CDM Smith will field oversight staff will document the Group contractor's activities will be documented in the field logbook.

Data Reporting

- CDM Smith will prepare a field oversight report for each split sampling event on a monthly basis. Sampling method, number of split samples collected, and documented compliance with the Group's sampling activities will be recorded along with the title of approved plans, USACE and EPA requirements.
- Sampling data results will be emailed to CDM Smith from DESA or the EPA for evaluation and data comparasion. Final validated data will be submitted to CDM Smith in electronic format and/or hard copies.
- Following completion of laboratory analyses and receipt of all electronic and hardcopy data, CDM Smith will prepare a report and submit it to EPA and USACE. The report will include tabulated results and a discussion of the data quality and its comparability with the Group's data. This review will be used to evaluate the accuracy of the Group's data.

Data archiving

- Data will be downloaded from the EPA website or emailed to CDM Smith.
- Final CLP validated data will be submitted to CDM Smith in electronic format consistent with CLP deliverables
- Electronic data will be input into the project's EQuIS database.

QAPP Worksheet #11: Project Data Quality Objectives (Oversight)
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

- EPA will archive CLP laboratory raw data in its document control system.
- Hard copies of field data including field logs will be archived in the project files.
- Hard copies of analytical data received by CDM Smith will be archived in the project files for 10 years after contract expiration.

QAPP Worksheet #12a: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group TCL VOCs/SOM01.2
Concentration Level Trace or Low (µg/L)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Overall Precision	Split Samples	≤50% RPD when VOCs in both samples ≥ CRQL ABS ≤ 5xQL when one or both results < CRQL
Overall Accuracy/bias (contamination)	Trip Blank*	No analyte > CRQL No target analyte concentrations ≥ CRQL
Precision	Matrix spike(MS)/Matrix spike duplicate (MSD)**	See Worksheet #28 for compound specific values
Accuracy	***Deuterated Monitoring Compounds (DMC); MS/MSD**	See Worksheet #28 for list of compound specific values and range of acceptable %Rs
Sensitivity	Method Blank	Results ≤ CRQL
Completeness	Data Assessment Also See Worksheet #34	≥90% Valid Data versus Total Data Collected and ≥90% Planned Data versus Data Collected Also See Worksheet #34

*Reference EPA Region 2 SOP No. 34 for Trace/ Low VOA - Blank Type Criteria Table
**Optional MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 6 for Criteria – Not typically required for CLP in Region 2
***DMCs – Reference CLP SOM01.2, Exhibit D, Table 5 for Criteria

QAPP Worksheet #12b: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group TCL SVOCs/SOM01.2
Concentration Level Low/Medium (µg/L)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Overall Precision	Split Samples	≤50% RPD when SVOCs in both samples ≥ CRQL otherwise ABS ≤ 5xCRQL
Precision	MS/MSD**	See Worksheet #28 for compound specific values
Accuracy	***DMCs; MS/MSD**	See Worksheet #28 for list of compound specific values and range of acceptable %Rs
Sensitivity	LOQ verification or Method Blank	Results ≤ CRQL
	Data Assessment	CRQLs meet project quantitation limit goals (PQLGs)
Completeness	Data Assessment Also See Worksheet #34	≥90% Valid Data versus Total Data Collected and ≥90% Planned Data versus Data Collected Also See Worksheet #34

*Reference EPA Region 2 /Low/Medium Semivolatile SOP shown on Worksheet # 36 or most recent revision http://www.epa.gov/region2/qa/documents.htm
**Optional MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 6 for Criteria – Not typically required for Region 2
***(DMCs) – Reference CLP SOM01.2, Exhibit D, Table 5 for Criteria

QAPP Worksheet #12c: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group Dioxin/Furans/ EPA 1613B
Concentration Level Low (µg/L)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Split Samples	RPD ≤ 40% if concentration ≥5 QL
Precision	Laboratory duplicate	±20% of mean if concentration >10QL
Accuracy/Bias Precision	Ongoing precision and recovery	RPD ≤ 40%
Accuracy/ Representativeness	Temperature Blank checks/ DV	0 to 6 °C 10 °C (DV)
Precision	Initial precision and recovery standard	Per laboratory SOP
Accuracy/Bias		Various % recovery per laboratory SOP
Accuracy/Bias	Ongoing precision and recovery standard (OPR)	70-130 %recovery, RPD ≤ 40%
Accuracy/Bias	Surrogate standards	17-130% recovery
Comparability	Evaluated during DQA	Comparable units, and methods
Completeness	Evaluated during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

QAPP Worksheet #12d: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group TCL Pesticides/ SOM01.2
Concentration Level Low/Medium (µg/L)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Overall Precision	Split Samples	50% RPD when pesticides in both samples ≥ CRQL ABS ≤ 5xQL when one or both results < CRQL
Precision	MS/MSD**	See Worksheet #28 for compound specific values
Accuracy	***LCS; MS/MSD**	See Worksheet #28 for list of compound specific values
Sensitivity	Method Blank	Results ≤ CRQL
	Data Assessment	CRQLs meet PQLGs
Completeness	Data Assessment Also See Worksheet #34	≥90% Valid Data versus Total Data Collected and ≥90% Planned Data versus Data Collected Also See Worksheet #34

*Reference EPA Region 2 Low/Medium Pesticide Data Validation SOP shown on Worksheet # 36 or most recent revision http://www.epa.gov/region2/qa/documents.htm
**MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 3 for Criteria
***LCS – Reference CLP SOM01.2, Exhibit D, Table 2 for Criteria

QAPP Worksheet #12e: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group TCL PCBs/SOM01.2
Concentration Level Low/Medium (µg/L)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Overall Precision	Split Samples	≤50% RPD when PCBs in both samples ≥ CRQL ABS ≤ 5xQL when one or both results < CRQL
Analytical accuracy/bias (contamination)	Method Blank	No analyte > CRQL No target analyte concentrations ≥ ½ CRQL
Precision	MS/MSD**	See Worksheet #28 for compound specific values
Accuracy	***LCS; MS/MSD** Surrogates	See Worksheet #28 for the list of compound specific values
Sensitivity	Method Blank	Results ≤ CRQL
	Data Assessment	CRQLs meet PQLGs
Completeness	Data Assessment Also See Worksheet #34	≥90% Valid Data versus Total Data Collected and ≥90% Planned Data versus Data Collected Also See Worksheet #34

*Reference EPA Region Low/Medium Aroclor Data Validation SOP on Worksheet # 36 or most recent revision http://www.epa.gov/region2/qa/documents.htm
**MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 1 for Criteria – Not typically required for Region 2
***LCS – Reference CLP SOM01.2, Exhibit D, Table 2 for Criteria

QAPP Worksheet #12f: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group PCB Congeners/EPA 1668A
Concentration Level Low (µg/L)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Split Samples	RPD ≤ 40% if concentration ≥5 QL otherwise ABS ≤QL
Precision	Laboratory duplicate	±20% of mean if concentration >10 xQL
Accuracy/Bias	Calibration Verification Sample	Per laboratory or method SOP (70-130% of native analytes and 50-150% for surrogates)
Accuracy/Bias Precision	Initial Precision and Recovery	60-140 %recovery RSD ≤ 40%
Accuracy/Bias	LCS or OPR	Per laboratory SOP Warning 70-130%R; Accept 50-150 %recovery
Accuracy/ Representativeness	Temperature Blank checks DV	0 to 6 ^{o}C 10 ^{o}C (DV)
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

QAPP Worksheet #12g: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group TAL Metals, /ISM01.3
Concentration Level ICP-AES (µg/L)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Split Samples *	≤50% RPD[1] when both results ≥ CRQL otherwise, ABS ≤ 5xCRQL The validation SOP requires qualification of results ≤20% RPD. For the purpose of data use the 50% RPD criterion is satisfactory.
Precision	Laboratory Duplicate Sample **	≤ 20% RPD**
Accuracy	Matrix Spike ***; LCSW ****	75–125% R; 70–130% R (except Ag and Sb)
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Field rinsate/ Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

*Reference EPA Region 2 ICP-AES Data Validation SOP or most recent revision http://www.epa.gov/region2/qa/documents.htm (includes absolute difference criteria)
**Reference EPA CLP ISM01.3, Exhibit D of inductively coupled plasma (ICP) atomic emission spectrophotometry (AES) for Duplicate Sample Criteria (page D-22) (include absolute difference criteria)
***Reference EPA CLP ISM01.3, Exhibit D of ICP-AES for Spike Sample Criteria (page D-21)
****Reference EPA CLP ISM01.3, Exhibit D of ICP-AES for aqueous LCS (LCSW) Criteria (page D-23) w/exception of silver (Ag) and antimony (Sb)

QAPP Worksheet #12h: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group TAL –Total Mercury/ISM01.3 - Cold Vapor Atomic Absorption (CVAA)
Concentration Level Low (µg/L)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Split Samples	≤50% RPD ABS ≤ 5xCRQL when either result ≤ CRQL The validation SOP requires qualification of results ≤20% RPD. For the purpose of data use the 50% RPD criterion is satisfactory.
Precision	Laboratory Duplicate Sample **	≤ 20% RPD*
Accuracy	Matrix Spike***	75–125 %R
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

* Reference EPA Region Hg & CN Data Validation SOP or most recent revision http://www.epa.gov/region2/qa/documents.htm (include absolute difference criteria)
**Reference EPA CLP ISM01.3, Exhibit D of Mercury for Duplicate Sample Analysis, (page D-19) (includes absolute difference criteria)
***Reference EPA CLP ISM01.3, Exhibit D of Mercury for Spike Sample Analysis, (page D-18)

QAPP Worksheet #12i: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group TAL Metals, /ISM01.3
Concentration Level ICP-MS (µg/L)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Split Samples*	≤50% RPD[1] when both results ≥ 5*CRQL ABS ≤ CRQL when either result ≤ 5*CRQL ([1]Important Note. The validation SOP requires qualification of results ≤20% RPD. For the purpose of data use the 50% RPD criterion is satisfactory)
Precision	Laboratory Duplicate Sample **	≤ 20% RPD**
Accuracy	Matrix Spike ***; LCSW ****	75–125% R; 80–120% R (except Ag and Sb)
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

*Reference EPA Region 2 ICP-MS Data Validation SOP or most recent revision http://www.epa.gov/region2/qa/documents.htm (include absolute difference criteria)
**Reference EPA CLP ISM01.3, Exhibit D of (ICP) atomic emission spectrophotometry (AES) for Duplicate Sample Analysis (page D-25) (includes absolute difference criteria)
***Reference EPA CLP ISM01.3, Exhibit D of ICP-MS for Spike Sample Analysis (page D-24)
****Reference EPA CLP ISM01.3, Exhibit D of ICP-MS for aqueous LCS (LCSW) Analysis (page D-26)

QAPP Worksheet #12j: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group Mercury (trace)/EPA 1631
Concentration Level Trace (nanogram per liter (ng/L))

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Split Samples *	RPD ≤ 40% if concentration ≥5 CRQL or ABS≤ QL
Accuracy	Laboratory duplicate	RPD ≤ 25% for values ≥10 MDL. No more than 35% of RSDs >25%
Accuracy/Bias	MS/MSD	70-130 %R
Precision	MS/MSD; Initial Precision and Recovery (IPR)	MS/MSD - Laboratory SOP or RPD ≤ 35%; 70-130% R IPR - RSDs <20%; 75-125% R
Accuracy	OPR	Laboratory SOP or 70-130%R
Accuracy/ Representativeness	Temperature Blank checks DV	0 to 6 ^{o}C 10 ^{o}C (DV)
Comparability	Evaluated during Data Quality Assessment (DQA)	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

QAPP Worksheet #12k: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group TAL –Total Cyanide/ISM01.3 - Colorimeter or Spectrophotometer
Concentration Level Low (µg/L)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Split Samples *	≤50% RPD ABS ≤ 5xCRQL when either result ≤ CRQL ([1]Important Note. The validation SOP requires qualification of results ≤20% RPD. For the purpose of data use the 50% RPD criterion is satisfactory)
Precision	Laboratory Duplicate Sample **	≤ 20% RPD*
Accuracy	Matrix Spike ***	75–125 %R
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

* Reference EPA Region Hg & CN Data Validation SOP or most recent revision http://www.epa.gov/region2/qa/documents.htm (include absolute difference criteria)
**Reference EPA CLP ISM01.3, Exhibit D of Cyanide for Duplicate Sample Analysis, (page D-20) (includes absolute difference criteria)
***Reference EPA CLP ISM01.3, Exhibit D of Cyanide for Spike Sample Analysis, (page D-19)

QAPP Worksheet #12l: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Soil/Sediment
Analytical Group TCL VOCs/SOM01.2
Concentration Level Low/Medium (µg/kg)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Split Samples	≤100% RPD ABS ≤ 5xQL when either result < 2X CRQL
Precision	MS/MSD**	%RPD – see worksheet #28
Accuracy	***DMCs; MS/MSD**	Compound specific %Rs are on worksheet #28
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

*Reference EPA Region 2 Low/ Medium VOCs Data Validation SOP shown on Worksheet # 36 or most recent revisionhttp://www.epa.gov/region2/qa/documents.htm
**Optional MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 6 for Criteria – Not typically required for Region 2
***(DMCs) – Reference CLP SOM01.2, Exhibit D, Table 5 for Criteria

QAPP Worksheet #12m: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Soil/Sediment
Analytical Group TCL SVOCs/SOM01.2
Concentration Level Low/Medium (µg/kg)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Split Samples	≤100% RPD ABS ≤ 5xCRQL when either results ≤ 2*CRQL
Precision	Laboratory Duplicate; MS/MSD**	Worksheet #28 lists compound specific RPDs
Accuracy	***DMCs; MS/MSD**	Worksheet #28 lists compound specific %Recoveries
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

*Reference EPA Region 2 Low/Medium SVOCs Data Validation SOP shown on Worksheet # 36 or most recent revision http://www.epa.gov/region2/qa/documents.htm
**Optional MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 6 for Criteria – Not typically required for Region 2
***(DMCs) – Reference CLP SOM01.2, Exhibit D, Table 5 for Criteria

QAPP Worksheet #12n: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Soil/Sediment
Analytical Group PCDD/PCDF/EPA 1613B
Concentration Level Low (µg/kg)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Split Samples	RPD ≤ 40% if concentration ≥5 CRQL
Precision	Laboratory duplicate	±20% of mean if concentration >10DL
Accuracy/Bias	LCS; MS/MSD	70-130 %recovery or per laboratory SOP
Precision	MS/MSD	RPD ≤ 20% if >10 QL
Accuracy/ Representativeness	Temperature Blank checks DV	0 to 6°C 10 °C (DV)
Precision	Initial precision and recovery	15-50% RSD or per laboratory SOP
Accuracy/Bias		Various % recovery per laboratory SOP
Accuracy/Bias	Ongoing precision and recovery	15-50% RSD or per laboratory SOP
Accuracy/Bias	Surrogate standards	17-130% R
Comparability	Evaluated during Data Quality Assessment	Comparable units, and methods
Completeness	Evaluated during Data Quality Assessment	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks/DV and DQA	≤ QLs (WS#15)

Laboratory and SOPs TBD. Laboratory is assigned per FASTAC policy.

QAPP Worksheet #12o: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Soil/Sediment
Analytical Group TCL Pesticides/SOM01.2
Concentration Level Low/Medium (µg/kg)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Sample Splits	≤100% RPD ABS ≤ 5xCRQL when either results ≤ 2X CRQL
Precision	Laboratory Duplicate; MS/MSD**	See list of compound specific RPDs on Worksheet #28
Accuracy	***LCS; MS/MSD**	See list of compound specific %Rs on Worksheet #28
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

*Reference EPA Region 2 Low/Medium Pesticide Data Validation SOP shown on Worksheet # 36 or most recent revision http://www.epa.gov/region2/qa/documents.htm
**MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 3 for Criteria – Not typically required for Region 2
***LCS – Reference CLP SOM01.2, Exhibit D, Table 2 for Criteria

QAPP Worksheet #12p: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Soil/Sediment
Analytical Group TCL PCBs/SOM01.2
Concentration Level Low/Medium (µg/kg)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Sample Splits	≤100% RPD ABS ≤ 5xCRQL when either result is ≤2X CRQL
Precision	MS/MSD**	See list of compound specific RPDs and %Rs on Worksheet #28
Accuracy	LCS***	
	MS/MSD**	
	Surrogates	
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

*Reference EPA Region 2 Low/Medium Pesticide Data Validation SOP shown on Worksheet # 36 or most recent revision http://www.epa.gov/region2/qa/documents.htm
**MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 3 for Criteria – Not typically required for Region 2
***LCS – Reference CLP SOM01.2, Exhibit D, Table 2 for Criteria

QAPP Worksheet #12q: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Soil/Sediment
Analytical Group PCB Congeners/EPA 1668A
Concentration Level Low (µg/kg)

DQIs	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria
Precision	Sample Splits	RPD ≤ 40% if concentration ≥5 CRQL
Precision	Laboratory duplicate	≤20% RPD; ±QL for samples <10x QL
Accuracy/Bias	Certified Reference Material; Calibration Verification Sample (QC Sample)	70 -130 %R
Accuracy/Bias	Initial Precision and Recovery	60-140 %R
Precision	Initial Precision and Recovery	RSD ≤ 40%
Accuracy/Bias	LCS or Ongoing Precision and Recovery	Per laboratory SOP Warning 70-130%R; Accept 50-150 %R
Accuracy/ Representativeness	Temperature Blank checks Data validation (DV)	0 to 6 ^{0}C 10 ^{o}C (DV)
Comparability	Data Quality assessment	Comparable units, and methods
Completeness	Data Quality Assessment	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks/ DV and DQA	≤ QLs (WS#15)

QAPP Worksheet #12r: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Soil/Sediment
Analytical Group TAL Metals/ISM01.3
Concentration Level ICP-AES (mg/kg)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Sample Splits *	≤100% RPD when both results ≥ 5*CRQL ABS ≤ 5xCRQL when either result ≤ 2xCRQL ([1]Important Note. The validation SOP requires qualification of results ≤50% RPD. For the purpose of data use the 100% RPD criterion is satisfactory for most projects)
Precision	Laboratory Duplicate Sample **	≤ 35% RPD* (DV action based on this value)
Accuracy	Matrix Spike***; LCS****	75–125%R 70–130%R
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

*Reference EPA Region 2 ICP-AES Data Validation SOP or most recent revision http://www.epa.gov/region2/qa/documents.htm (include absolute difference criteria)
**Reference EPA CLP ISM01.3, Exhibit D of ICP-AES for Duplicate Sample Analysis, (page D-22) includes absolute difference criteria
***Reference EPA CLP ISM01.3, Exhibit D of ICP-AES for Spike Sample Analysis (page D-21)
****Reference EPA CLP ISM01.3, Exhibit D of ICP-AES for LCS Sample Criteria (page D-23) with the exception of Ag and Sb

QAPP Worksheet #12s: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Soil/Sediment
Analytical Group TAL Metals/ISM01.3
Concentration Level ICP-MS (mg/kg)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Sample Splits *	≤100% RPD when both results ≥ 5*CRQL ABS ≤ 5xCRQL when either result ≤ 2x CRQL ([1]Important Note. The validation SOP requires qualification of results ≤50% RPD. For the purpose of data use the 100% RPD criterion is satisfactory)
Precision	Laboratory Duplicate Sample **	≤ 35% RPD* (DV action based on this value)
Accuracy	Matrix Spike***; LCS****	75–125%R 70–130%R
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

*Reference EPA Region 2 ICP-MS Data Validation SOP or most recent revision http://www.epa.gov/region2/qa/documents.htm (include absolute difference criteria)
**Reference EPA CLP ISM01.3, Exhibit D of ICP-MS for Duplicate Sample Analysis, (page D-25) includes absolute difference criteria
***Reference EPA CLP ISM01.3, Exhibit D of ICP-MS for Spike Sample Analysis (page D-24)
****Reference EPA CLP ISM01.3, Exhibit D of ICP-MS for LCS Sample Criteria (page D-26)

QAPP Worksheet #12t: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Soil/Sediment
Analytical Group TAL –Total Mercury/ISM01.3 or current method-Cold Vapor Atomic Absorption (CVAA)
Concentration Level Low (mg/kg)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Sample Splits *	≤100% RPD when both results ≥ 5*CRQL ABS ≤ 5xCRQL when either result ≤2*CRQL ([1]Important Note. The validation SOP requires qualification of results ≤50% RPD. For the purpose of data use the 100% RPD criterion is satisfactory)
Precision	Laboratory Duplicate Sample **	≤ 35% RPD* (DV action based on this value)
Accuracy	Matrix Spike***	75–125% recovery
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥ 90% collection and analysis
Sensitivity/ accuracy	Field rinsate/ Method blanks assessed during DV and DQA	≤ QLs (WS#15 and laboratory SOP)

*Reference EPA Region 2 Hg &CN Data Validation SOP or most recent revision http://www.epa.gov/region2/qa/documents.htm (include absolute difference criteria)
**Reference EPA CLP ISM01.3, Exhibit D of Mercury for Duplicate Sample Analysis (page D-19) (include absolute difference criteria)
***Reference EPA CLP ISM01.3, Exhibit D of Mercury for Spike Sample Analysis (page D-18)

QAPP Worksheet #12u: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Soil/Sediment
Analytical Group Total Cyanide /ISM01.3
Concentration Level Low (mg/kg)

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision	Split Samples	RPD ≤ 100% if concentration ≥5 CRQL otherwise ABS ≤2*CRQL
Accuracy	Laboratory duplicate	≤35% RPD if Results >5xCRQL
Accuracy/Bias	MS/MSD	75-125%R
Precision	MS/MSD; LCS	Laboratory SOP or RPD ≤ 35%; Method: RSDs <20%
Accuracy	MS/MSD; LCS	Laboratory SOP or 75-125% 70-130%R
Accuracy/ Representativeness	Temperature Blank checks DV	0 to 6 ^{o}C and 10 ^{o}C (DV)
Comparability	Evaluated during Data Quality Assessment	Comparable units, and methods
Completeness	Evaluated during Data Quality Assessment	≥ 90% Collection and ≥ 90% Valid data
Sensitivity/ accuracy	Method blanks/DV and DQA	≤ QLs (WS#15)

QAPP Worksheet #14 &16: Project Tasks & Schedule
(UFP-QAPP Manual Section 2.8.2)
(EPA 2106-G-05 Section 2.2.4)

The Group's Proposed Schedule

Phase 1 Field Work

Submittal of permit equivalencies – November 7, 2014
Soil sample collection – November 17 through December 2, 2014
Installation of pore-water samplers – November 18, 2014
Temporary monitoring well installation and sampling – December 1 through December 5, 2014
Surface water and sediment sampling – December 2 through December 11, 2014
Recovery of pore-water samplers and sample collection – December 3, 2014
Assessment of Hunt Club well HC-1 – December 5, 2014
Redevelopment and sampling of existing wells – December 8 through December 19, 2014
Sample analysis – November 18, 2014 through January 19, 2015

Data Review and Document Preparation

Data validation – January 13, 2015 through February 12, 2015
Preparation of Interim Technical Memorandum – December 12, 2014 through February 12, 2015
Submit Interim Technical Memorandum to USEPA – February 13, 2015
USEPA review of Interim Technical Memorandum – February 16 through March 6, 2015
Receive USEPA approval of proposed permanent well locations – March 6, 2015

Phase 2 Field Work

Obtain well permits – March 9 through March 27, 2015
Install and develop proposed permanent wells – March 30 through April 10, 2015
Second groundwater sampling event (all new monitoring wells, and selected existing monitoring wells based on the results of the first groundwater sampling event) – April 27 through May 7, 2015
Third groundwater sampling event (all new monitoring wells) – July 27 through August 7, 2015
Groundwater sample analysis – April 28 through September 7, 2015
Evaluation of connection between northern ponds and groundwater – April 10 through August 14, 2015
Final Reporting
Data validation – June 7 through September 21, 2015
Begin preparation of final report – September 22, 2015
Submit final report to USEPA – October 30, 2015

QAPP WORKSHEET # 15a
Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

See Attachment 1

QAPP Worksheet # 17a - Sampling Design and Rationale
Oversight Split Sampling
(UFP-QAPP Manual Section 3.1.1)
(EPA 2106-G-05 Section 2.3.1)

Procurement of Technical Services
CDM Smith will procure an analytical laboratory for PCB Congeners, Dioxins/Furans and Trace Mercury in accordance with the Federal Acquisition Regulation and CDM Smith procedures. A scope of work will be prepared and will include the project's technical and quality requirements to meet the requirements established herein.

Field Planning Meetings
Prior to field activities, each field team member will review all CDM Smith project plans QAPPs, Health and Safety Plans (HASPs), etc., the Group's project plans, and participate in a field planning meeting conducted by the CDM Smith PM or designee to become familiar with the history of the Site, roles and responsibilities, field procedures, field data collection and management procedures, sample naming ,split sample acceptance, communication procedures, and related QC requirements. Field oversight staff will also attend an onsite tailgate kick-off meeting immediately prior to the commencement of each stage or step of field activities. All new field oversight staff will receive comparable briefing if they were not at the initial field planning meeting and/or tailgate kick-off meeting. Supplemental meetings may be necessary as required by any changes in site conditions or to review field operation procedures.

The CDM Smith PM will identify any required field electronic data deliverable (EDDs) and assign the team member to be responsible for its preparation. The FOS will review the analytical method codes to be used in Scribe to ensure that they are consistent with EQuIS.

Field Equipment and Supplies
Equipment and field supply mobilization, governed by CDM Smith's Quality Procedures (QP) section 2.1, *Procuring Measurement and Test Equipment* and Section 5.3, *Inspection of Items*, will entail ordering, renting, and purchasing all supplies needed for each part of the Data Gap Investigation. This will also include staging and transferring all supplies to and from the site.

Field Procedures for these Activities are detailed in the Technical Standard Operating Procedures (TSOPs) below:
- TSOP 4-1 Field Logbook Content and Control*
- TSOP 4-2 Photographic Documentation of Field Activities

*- Logbook notes should include field procedures used, descriptions of photos taken, problems encountered and notes of conversations with the Group'sfield staff. Details of samples collected including CLP numbers and visual observations.

QAPP Worksheet # 17b - Sampling Design and Rationale
Oversight Split Sampling
(UFP-QAPP Manual Section 3.1.1)
(EPA 2106-G-05 Section 2.3.1)

Describe and provide a rationale for choosing the sampling approach:
As part of the Project, the Group is implementing an investigation and field sampling program in support of the Data Gap Investigation. On behalf of the USACE and EPA, CDM Smith will provide oversight and will accept and analyze split samples. The oversight program is designed to provide technical review and evaluation of associated the Group's-implemented QAPPs and SAPs. Worksheet 10 of this QAPP states the oversight activities to occur during the field sampling programs, and Worksheet #11 provides details on the collection of split samples. Oversight forms are provided in Appendix D.

CDM Smith will accept split samples at a rate of approximately 10 percent to ensure that the Group's data is accurate. Locations for the split samples will be selected to cover a range of locations and concentrations, will address critical items such as areas of potential contamination, and will be from each media types samples (i.e. groundwater, surface water, porewater, sediment and soil) and in consultation with EPA/USACE if they provide any directions to split specific locations.

Field activities will be conducted according to the TSOPs below.

Describe the Sampling Action and Rationale in terms of: Matrix to be sampled and Frequency (including seasonal considerations):
Refer to Worksheets #10, 11, Table 1 and the text above for sampling and analysis rationale, matrices to be sampled, and analytical groups to be analyzed. Refer to Worksheets # 11 and 18 for number of samples to be taken and sampling frequency. CDM Smith will accept split samples from the Group at a rate of approximately 10 percent to verify accuracy of the Group's generated data and to ensure their results are comparable.

Decontamination Procedures
Equipment decontamination procedures will be implemented by the Group in accordance with their QAPP, SAP and HASP to prevent cross contamination. CDM Smith will follow the Group's HASP prepared by their contractor.

Field Procedures for these Activities are detailed in:
- TSOP 1-2 Sample Custody
- TSOP 2-1 Packaging and Shipping Environmental Samples
- TSOP 4-1 Field Logbook Content and Control
- TSOP 4-2 Photographic Documentation of Field Activities, Sections 5.2.2 General Guidelines for Still Photography and 5.2.4 Photographic Documentation

QAPP Worksheet #18: Sampling Locations and Methods
(UFP-QAPP Manual Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.1 and 2.3.2)

See Table 1

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times
(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

Laboratory – CLP/DESA
List of required accreditations/certifications: DESA QAPP
Sample Delivery Method: FedEx Overnight

Analyte/ Analyte Group	Matrix	Analytical & Preparation Method/ SOP	Accreditation Expiration Date	Container(s) (number, size, and type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time	Data Package Turnaround Time
VOCs	Soil/Sediment	SOM01.2	Maintained by EPA	3-40 ml VOC vials with spin bars	0-6° C; store in dark	None	10 days	42 days
Soil Moisture				1-2oz jar	0-6° C; store in dark	None	10 days	42 days
SVOCs + SIM				1-8 oz wide-mouth glass jar	0-6° C; store in dark	14 days	40 days	42 days
					<-10° C; store in dark	1 year	40 days	42 days
Pesticides				1-8 oz wide-mouth glass jar	0-6° C; store in dark	None	14 days	42 days
PCBs				1-8 oz wide-mouth glass jar	0-6° C; store in dark	None	14 days	42 days
Metals		ISM01.3		1-8 oz wide-mouth glass jar	0-6° C; store in dark	6 months	None	42 days
Mercury					0-6° C	None	28 days	42 days
Cyanide, total				1-4 oz glass jar	0-6° C	None	14 days`	30 days

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times
(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

Laboratory – Subcontract Laboratory (TBD)
List of required accreditations/certifications: *Provided upon procurement of laboratory*
Sample Delivery Method: *FedEx Overnight*

Analyte/ Analyte Group	Matrix	Analytical & Preparation Method/ SOP	Accreditation Expiration Date	Container(s) (number, size, and type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time	Data Package Turnaround Time
PCB Congeners and homologs	Soil/Sediment	1668A	TBD	1-8 oz wide-mouth glass jar	0-6° C; or <-10° C; store in dark	1 year	None	42 days
Dioxin/Furans		1613B		1-8 oz wide-mouth glass jar	0-6° C; <-10° C; store in dark	1 year	None	42 days

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times
(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

Laboratory – CLP/DESA
List of required accreditations/certifications: *DESA QAPP*
Sample Delivery Method: *FedEx Overnight*

Analyte/ Analyte Group	Matrix	Analytical & Preparation Method/ SOP	Accreditation Expiration Date	Container(s) (number, size, and type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time	Data Package Turnaround Time
VOCs	Aqueous	SOM01.2	TBD	3- 40-ml voa vials	0-6°C, HCL to pH<2	7 days	40 days	42 days
SVOCs + SIM				2- 1-L amber glass with PTFE-lined lid	0-6°C; store in the dark	7 days	40 days	42 Days
Pesticides				2- 1-L amber glass with PTFE-lined lid	0-6°C; store in the dark	7 days	40 days	42 Days
PCBs				2- 1-L amber glass with PTFE-lined lid	0-6°C; store in the dark	7 days	40 days	42 Days
Metals		ISM01.3		1-1L HDPE	0-6°C; field filter samples or within 24 hours; HNO_3 to pH <2	None	6 months	42 Days
Cyanide				1-500ml HDPE	0-6°C; NaOH to pH >12	14 days	28 days	42 Days

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times
(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

Laboratory – Subcontract Laboratory (TBD)
List of required accreditations/certifications: *Provided upon procurement of laboratory*
Sample Delivery Method: *FedEx Overnight*

Analyte/ Analyte Group	Matrix	Analytical & Preparation Method/ SOP	Accreditation Expiration Date	Container(s) (number, size, and type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time	Data Package Turnaround Time
PCB congeners and Homologs	Aqueous	1668A	TBD	2-1L amber glass PTFE lid	0-6°C; store in the dark	None	1 year	30 days
Dioxin/ Furans		1613		2-1L amber glass PTFE lid	0-6°C; store in the dark	None	1 year	30 days
Total mercury		1631E		1-250 mL FLPE	0-6°C, HCL to pH <2, no headspace	28 days	90 days	30 days

QAPP Worksheet #20: Field Quality Control Summary
(UFP-QAPP Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix	Analyte/Analytical Group	Method/ SOP	The Group's Total Analyses	CDM Smith Split Samples	Matrix Spike/Matrix Spike Duplicate (MS/MSD)	Trip Blanks	Total
Soil	VOCs	SOM01.2	48	5	NA*	NA	5
	SVOCs + SIM	SOM01.2	46	5	NA		5
	Pesticides	SOM01.2	46	5	1		5
	PCBs Aroclors	SOM01.2	46	5	1		5
	TAL Metals, Mercury, Cyanide	ISM01.3	46	5	1		5
	PCB Congeners	EPA 1668	18	2	1		2
	Dioxins and Furans	EPA 1613	18	2	1		2
Groundwater (temporary wells)	VOCs	SOM01.2	15	2	NA	2	4
	SVOCs + SIM	SOM01.2	13	1	NA	NA	1
	Pesticides	SOM01.2	13	1	1		1
	PCBs Aroclors	SOM01.2	13	1	1		1
	TAL Metals, Mercury and Cyanide (unfiltered)	ISM01.3	13	1	1		1
	TAL Metals, Mercury and Cyanide (filtered)	ISM01.3	13	1	1		1
Groundwater (permanent wells)	VOCs	SOM01.2	63	6	NA	3	9
	SVOCs+ SIM	SOM01.2	58	6	NA	NA	6
	Pesticides	SOM01.2	58	6	1		6
	PCB Aroclors	SOM01.2	58	6	1		6
	TAL Metals, Mercury and Cyanide (unfiltered)	ISM01.3	58	6	1		6
	TAL Metals, Mercury and Cyanide (filtered)	ISM01.3	58	6	1		6

QAPP Worksheet #20: Field Quality Control Summary
(UFP-QAPP Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix	Analyte/Analytical Group	Method/ SOP	The Group's Total Analyses	CDM Smith Split Samples	Matrix Spike/Matrix Spike Duplicate (MS/MSD)	Trip Blanks	Total
Porewater	VOCs	SOM01.2	4	1	NA	1	2
	SVOCs+ SIM	SOM01.2	3	1	NA	NA	1
	Pesticides	SOM01.2	3	1	1		1
	PCBs Aroclors	SOM01.2	3	1	1		1
	TAL Metals, Mercury and Cyanide (unfiltered)	ISM01.3	3	1	1		1
	TAL Metals, Mercury and Cyanide (filtered)	ISM01.3	3	1	1		1
Surface Water	VOCs	SOM01.2	17	2	NA	1	3
	SVOCs + SIM	SOM01.2	15	2	NA	NA	2
	Pesticides	SOM01.2	15	2	1		2
	PCBs Aroclors	SOM01.2	15	2	1		2
	TAL Metals and Cyanide (unfiltered)	ISM01.3	15	2	1		2
	TAL Metals and Cyanide (Filtered)	ISM01.3	15	2	1		2
	Trace Mercury	EPA 1631E	15	2	1		2
Sediment	VOCs	SOM01.2	17	2	NA		2
	SVOCs + SIM	SOM01.2	15	2	NA		2
	Pesticides	SOM01.2	15	2	1		2
	PCBs Aroclors	SOM01.2	15	2	1		2
	TAL Metals, Mercury and Cyanide	ISM01.3	15	2	1		2

QAPP Worksheet #20: Field Quality Control Summary
(UFP-QAPP Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.2.6)

Notes:
*No extra volume required but may need to be designated on chain of custody depending on laboratory assigned. MS/MSDs are not counted as an extra sample they are additional volumes provided for laboratory QC.

Abbreviations
NA- not applicable
NS- no split

QAPP Worksheet #21: Field SOPs
(UFP-QAPP Manual Section 3.1.2)
(EPA 2106-G-05 Section 2.3.2)

SOP # or reference	Title, Revision, Date, and URL (if available)	Originating Organization	SOP option or Equipment Type (if SOP provides different options)	Modified for Project? Y/N	Comments
1-2	Sample Custody, Rev. 7, January 2012	CDM Smith	*NA*	N	- Sample tags are not required. - Scribe generated COCs will be used. - Use waterproof ink for any handwritten labels.
2-1	Packaging and Shipping Environmental Samples, Rev. 5, January 2012	CDM Smith	*TSOP Section 1.3 lists materials needed*	N	Vermiculite shall not be used
4-1	Field Logbook Content and Control, Rev. 7, January 2012	CDM Smith	*NA*	N	Logbook notes should include decontamination procedures; descriptions of photographs taken; problems encountered and notes of conversations with PM, USACE, EPA, the Group's contractor; and details of samples collected including CLP numbers and visual observations[1].
4-2	Photographic Documentation of Field Activities, January 2012	CDM Smith	*Camera*	N	

QAPP Worksheet #21: Field SOPs
(UFP-QAPP Manual Section 3.1.2)
(EPA 2106-G-05 Section 2.3.2)

The following information will be recorded (at a minimum) in the field logbook for each sample collected and shipped:

- Name of field personnel
- CDM Smith assigned sample number/location
- Date sampled
- Date shipped
- Sample location number
- Corresponding CLP routine analytical services (RAS) sample number
- Media type
- Type of analysis to be performed
- Sample volume and containers
- Any unusual discoloration or evidence of contamination
- Field parameter measurements
- Preservatives added to sample
- Courier airbill number and means of delivery to the laboratory
- General observations

QAPP Worksheet #23: Analytical SOPs
(UFP-QAPP Manual Section 3.2.1)
(EPA 2106-G-05 Section 2.3.4)

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/ Analytical Group	SOP Option or Equipment Type	‡Modified for Project? Y/N
SOM01.2	*Multi-Media, Multi-Concentration, Organic Analytical Service for Superfund.* EPA 2005, amended 4.11.2007	Definitive	VOC, SVOC, Pesticides	GC/MS GC/ECD; FID	
EPA 1613B	*Analytical Method for the Determination of Polychlorinated Dibenzodioxins and Dibenzofurans.* Revision 20. March 2011.		PCDD/PCDF	High resolution (HR) GC/HRMS	
EPA 1668A	*Chlorinated Biphenyl Congeners in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS*. November 2008.		PCB Congeners	HRGC/HRMS	
EPA 1631E	*Total Mercury Using Atomic Fluorescence Spectroscopy*. Revision 2. August 28, 2009.		Mercury (trace)	cold vapor atomic fluorescence spectrometry (CVAFS)	
ISM01.3	CLP SOW for *Multi-Media, Multi-Concentration Inorganic Analysis.* December 2006. *Inductively Coupled Plasma – Mass Spectrometry Analysis*. Revision 2. April 1, 2011.		Target Analyte List (TAL) Metals	ICP-AES/ICP-MS	
			Mercury	CVAA	
			Cyanide	Colorimeter	

Notes:

1. EPA reviews CLP laboratories SOPs. DESA laboratory SOPs will apply and not these generic SOPs when the DESA laboratory is able to perform the analyses. CDM Smith subcontract laboratory specific SOPs are not available (NA) at this stage since the Region 2 FASTAC Policy will be implemented for procuring laboratory services. However, some of the listed analyses will be sent to a MSA subcontract laboratory to match the Respondents specific and unique analytical requirements and facilitate comparison of the data. Subcontract Laboratory SOPs are TBD.
2. For non-routine analytical services (RAS) data, the ASC will submit the electronic "Analytical Services Tracking System (ANSETS) Data Requirement" form to the RSCC by the first day of each month for the previous month's sampling.

QAPP Worksheet #24: Analytical Instrument Calibration
(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Title/Position Responsible for Corrective Action	SOP Reference
HRGC/ HRMS and HRGC/LRMS	Initial Calibration and calibration verification check: Per laboratory SOP	After set up, prior to run and after instrument changes or failures of checks.	% RSD and % recovery per laboratory SOPs.	Check, correct; re-calibrate and rerun all samples analyzed after last valid calibration check	Laboratory analyst / QA officer - TBD	TBD
	Calibration checks: CCVs per laboratory SOP	Daily: Beginning of run and after every 10 samples and at end of analytical run	% recovery per laboratory SOP	Check, correct; re-calibrate and rerun all samples analyzed after last valid cal check	Laboratory analyst / QA officer - TBD	
GC/MS GC GC/FID	Initial calibration: 5 points standards	Upon award of the contract, whenever the laboratory takes corrective action which may change or affect the initial calibration criteria (e.g., ion source cleaning or repair, column replacement, etc.), or if the continuing calibration acceptance criteria have not been met.	Relative response factor (RRF) ≥ minimum acceptable RRF listed in Table 5 of procedure. All target compounds, initial relative standard deviation (RSD) ≤ 10% or 20% and correlation coefficient (r)> 0.995. %RSD ≤ value in Table 5 of SOM01.2 or other laboratory SOP as applicable.	Inspect system for problems (e.g., clean ion source, change the column, service the purge and trap device), correct problem, re-calibrate.	Laboratory Technician	TBD
GC/MS	Calibration Standards Verification	Each lot of standards	As per laboratory established control limits	Inspect system; correct problem; re-run standard and affected samples	Laboratory GC/MS Technician	TBD
GC/MS	Tuning	Daily: every 12 hours	Response factors and RRF as method specified	Inspect system; correct problem; re-run standard and affected samples	Laboratory GC/MS Technician	
GC/FID	Mass Discrimination Check	Every 12 hours	RF ratio of C32/C20 should be >0.8	Per laboratory SOP	Laboratory GC/FID Technician	

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Title/Position Responsible for Corrective Action	SOP Reference
CVAFS	Per method and laboratory SOP	Calibration	Per method/ laboratory SOP. ICAL ≤15%RSD.	Inspect the system, correct problem, re-calibrate, and re-analyze samples.	Assigned laboratory personnel	TBD
		ICV: Check daily when instrument is in use	85-115% R for Total mercury			
		CCV: Beginning and after every 10 samples	77-123% R for total mercury			
CV-GAS	Calibration; 3 point st andards	After instrument set up	$R^3 \geq 0.995$	Inspect system; correct problem	Laboratory Technician	TBD
	Initial Calibration Verification (ICV)	Before sample analysis	80-120% R; source of standard separate from calibration standards	Do not analyze samples until problem is corrected		
	CCV	10% or every 2 hours, whichever is more frequent	80-120% R	Inspect system, re-calibrate and rerun associated samples		
ICP-MS / AES ISM01.3	See ISM01.3/ per instrument manufacturer's procedures	Initial calibration: daily or once every 24 hours and each time the instrument is set up	ICP-MS: As per instrument manufacturer's procedures, at least 2 standards	Inspect the system, correct problem, re-calibrate, and re-analyze samples	Laboratory ICP-AES / ICP-MS Technician or DESA Laboratory analyst / QA officer	TBD
	Initial calibration	Daily; after tuning and optimizing instrument	Correlation coefficient >0.995 with a minimum of 3 standards and a blank	Repeat analysis; re-prepare calibration standards and reanalyze		
	ICV	Before sample analysis	90-110% R; source of standard separate from calibration standards	Re-calibrate instrument; prepare fresh ICV standards; do not analyze samples until problem is corrected		
	Reporting Limit Standard	After initial calibration verification standard	80-120% R or concentration ≤ 30% difference (from true value)	Re-analyze failed standard		
	CCV	Every 10 samples and at end of analytical sequence	90-110% R; source of standard separate from calibration standards	Re-check; re-calibrate and rerun all samples analyzed after last valid CCV		

QAPP Worksheet #24: Analytical Instrument Calibration
(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Title/Position Responsible for Corrective Action	SOP Reference
Colorimeter	Initial Calibration; 4 - 9 point standards	Every 3 months or as per Laboratory SOP	90-110 % R	Re-check; re-calibrate	Laboratory analyst / QA officer - TBD	TBD
	Calibration check (Cal Check)	Every 10 samples and at end of analytical run	80-120 % R	Re-check; re-calibrate and rerun all samples analyzed after last valid Calibration Check		
Thermometer	Calibration	Quarterly; serviced annually	±1°C of true value of National Institute of Standards and Technology traceable thermometer	Replace defective thermometer		
pH meter	Daily buffer checks (2 point bracketing sample pH)	Before use/per batch; other checks as per rental company and manufacturer's recommendations	± 0.1 pH units or ± 0.05 pH units	Recheck; replace bufferlutions and recheck. If still fails perform instrument check or place out of service	Laboratory analyst / QA officer - TBD	TBD

Notes:
1. The FASTAC decision process will be used for procuring laboratory services. CLP, DESA and CDM Smith subcontract laboratory's calibration and/or method SOPs will be utilized to meet calibration criteria. Specific instrument information (Manufacturer and model) is not available at this time.
2. To be determined (TBD) - Reference SOP depends on the laboratory assignment. EPA maintains the CLP laboratory SOP information. If a subcontract laboratory is needed, CDM Smith will submit their SOP as a field change request.
3. R represents the correlation coefficient.
4. The laboratory SOP will include the calibration range information.
5. NJDEP=New Jersey Department of Environmental Protection http://www.nj.gov/dep/srp/guidance/fspm/pdf/chapter06e.pdf).

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection (UFP-QAPP Manual Section 3.2.3) (EPA 2106-G-05 Section 2.3.6)

Instrument/ Equipment	Maintenance Activity	Testing Activity Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title/Position Responsible for Corrective Action	Reference
Analytical instrument maintenance, testing and inspection information and availability of spare parts are not available since the FASTAC decision process will be utilized for analytical services. Information is provided in CDM Smith MSA subcontract laboratories' QA Manuals. The MSA laboratory to be utilized (if DESA is not available) is not determined at this time. Maintenance, testing and inspection frequencies are documented in the MSA laboratories SOPs.							
ICP-MS/AES	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable re-calibration; see ISM01.3	Inspect the system, correct problem, re-calibrate and/or reanalyze samples	EPA CLP Laboratory ICP-MS/AES Technician	ISM01.3
GC/MS	See SOM01.2; as per instrument manufacturer's recommendations	See SOM01.2; as per instrument manufacturer's recommendations	See SOM01.2; as per instrument manufacturer's recommendations	Acceptable re-calibration; see SOM01.2	Inspect the system, correct problem, re-calibrate and/or reanalyze samples	EPA CLP Laboratory GC/MS Technician	SOM01.2
GC/ECD	See SOM01.2; as per instrument manufacturer's recommendations	See SOM01.2; as per instrument manufacturer's recommendations	See SOM01.2; as per instrument manufacturer's recommendations	Acceptable re-calibration; see SOM01.2	Inspect the system, correct problem, re-calibrate and/or reanalyze samples	EPA CLP Laboratory GC/ECD Technician	SOM01.2
CVAFS	Replace disposables, Flush lines	Sensitivity check Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	EPA 1631

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal
(UFP-QAPP Manual Section 3.3)
(EPA 2106-G-05 Section 2.3.3)

Sampling Organization: CDM Smith
Laboratory: DESA, CLP
Method of sample delivery (shipper/carrier): FedEx
Number of days from reporting until sample disposal: DESA 30 days or CLP as per contract or subcontract laboratory 60-90 days as specified in SOW

Activity	Organization and title or position of person responsible for the activity	SOP reference
Sample labeling	CDM Smith - FOS	TSOP 2-1
Chain-of-custody form completion	CDM Smith – Sample manager	TSOP 1-2
Packaging	CDM Smith – Sample manager	TSOP 1-2 and 2-1; EPA CLP Guidance for Field Samplers
Shipping coordination	CDM Smith - FOS, CDM Smith ASC/ CLP coordinator	TSOP 2-1
Sample receipt, inspection, & log-in	Laboratory custodian (DESA, CLP, or Subcontract)	Analytical Scope of work and Laboratory SOP
Sample custody and storage	CDM Smith and Laboratories (DESA, CLP, or Subcontract)	TSOP 1-2; Analytical SOW or Laboratory TSOP
Sample disposal	Laboratory Custodian (DESA, CLP, or Subcontract)	Laboratory TSOP

Notes:

Trip blanks will be identified using the abbreviation TB followed by the date. For example, TB-070108 indicates that the trip blank was collected on July 1, 2008.
Split samples will be identified using the abbreviation CDM- followed by the Group sample name
Filtered samples will be identified by adding the letter F to the end of the location identifier. For example, CDM-xxxx-F would indicate a split filtered sample

QAPP Worksheet #28a: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous

Analytical Group TCL VOCs Low (µg/L)**

Analytical Method/SOP Reference SOM01.2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
Split Samples	1 per 20 samples	None		Notify PM and flag duplicate results	CDM Smith ASC and FOS	≤50% RPD when both samples ≥ CRQL otherwise ABS ≤ 5xQL	
Temperature Blank	1 per cooler	0 to 6 degrees C		Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation	
Trip Blank	1 per cooler	≤ CRQL		Verify results; re-analyze. Flag outliers	Laboratory analyst	≤ CRQL	
Method Blank	1 every 12 hours	No analyte > CRQL*		Suspend analysis unit source recertified	DESA or EPA CLP Laboratory GC/MS Technician	No analyte > CRQL*	
Deuterated Monitoring Compounds	all samples	Vinyl chloride-d3	65-131 %R	Check calculations and instruments, reanalyze affected samples		Vinyl chloride-d3	65-131 %R
		Chloroethane-d5	71-131 %R			Chloroethane-d5	71-131 %R

*with the exception of methylene chloride, 2-butanone and acetone which can be up to 2 times the CRQL.

QAPP Worksheet #28a: Analytical Quality Control and Corrective Action
(TCL VOCs Aqueous continued)

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
TCL Low VOCs Continued							
Deuterated Monitoring Compounds [cont'd]	all samples	1,1-Dichloroethene-d2	55-104 %R	Check calculations and instruments, reanalyze affected samples; up to 3 DMCs per sample may fail to meet recovery limits	DESA or EPA CLP Laboratory GC/MS Technician	1,1-Dichloroethene-d2	55-104 %R
		2-Butanone-d5	49-155 %R			2-Butanone-d5	49-155 %R
		Chloroform-d	78-121 %R			Chloroform-d	78-121 %R
		1,2-Dichloroethane-d4	78-129 %R			1,2-Dichloroethane-d4	78-129 %R
		Benzene-d6	77-124 %R			Benzene-d6	77-124 %R
		1,2-Dichloropropane-d6	79-124 %R			1,2-Dichloropropane-d6	79-124 %R
		Toluene-d8	77-121 %R			Toluene-d8	77-121 %R
		trans-1,3-Dichloropropene-d4	73-121 %R			trans-1,3-Dichloropropene-d4	73-121 %R
		2-Hexanone-d5	28-135 %R			2-Hexanone-d5	28-135 %R
		1,4-Dioxane-d8	50-150 %R			1,4-Dioxane-d8	50-150 %R
		1,1,2,2-Tetrachloroethane-d2	73-125 %R			1,1,2,2-Tetrachloroethane-d2	73-125 %R
		1,2-Dichlorobenzene-d4	80-131 %R			1,2-Dichlorobenzene-d4	80-131 %R
Internal Standards	all samples	60-140%		Check calculations and instruments, reanalyze affected samples		± 40% of response area, ± 20 sec retention time shift	

QAPP Worksheet #28a: Analytical Quality Control and Corrective Action (TCL VOCs Aqueous continued)

Matrix Aqueous

Analytical Group TCL VOCs

Analytical Method/SOP Reference SOM01.2

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
Matrix Spike (Not Required)	1 per 20 samples or less (if requested)	1,1-Dichloroethene	61-145 %R	Flag outliers	DESA/ CLP Laboratory GC/MS Technician	1,1-Dichloroethene	61-145 %R
		Trichloroethene	76-127 %R			Trichloroethene	76-127 %R
		Benzene	71-120 %R			Benzene	71-120 %R
		Toluene	76-125 %R			Toluene	76-125 %R
		Chlorobenzene	75-130 %R			Chlorobenzene	75-130 %R
Matrix Spike Duplicate (Not Required)	1 per 20 samples or less (if requested)	1,1-Dichloroethene	0-14 %RPD	Flag outliers		1,1-Dichloroethene	0-14 %RPD
		Trichloroethene	0-11 %RPD			Trichloroethene	0-11 %RPD
		Benzene	0-14 %RPD			Benzene	0-14 %RPD
		Toluene	0-13 %RPD			Toluene	0-13 %RPD
		Chlorobenzene	0-13 %RPD			Chlorobenzene	0-13 %RPD

QAPP Worksheet #28b: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous
Analytical Group TCL SVOCs
Analytical Method/SOP Reference SOM01.2

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Split Samples	1 per 20 samples	None	Notify PM and flag duplicate results	CDM Smith ASC and PM	≤50% RPD when both results ≥ CRQL otherwise ABS ≤ 5xQL
Temperature Blank	1 per cooler	0 to 6 degrees C	Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation
Method Blank	1 per ≤20 samples or batch	No analyte > CRQL*	Stop analysis, re-extract and reanalyze affected samples	DESA or CLP Laboratory GC/MS Technician	≤ CRQL

*with the exception of bis (2-Ethylhexyl) phthalate which can be up to 5 times the CRQL. (EPA CLP National Functional Guidelines)

QAPP Worksheet #28b: Analytical Quality Control and Corrective Action (continued)

Laboratory QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
TCL SVOCs [cont'd]							
Deuterated Monitoring Compounds	all samples	Phenol-d5	39-106 %R	Check calculations and instruments, reanalyze affected samples; up to 4 DMCs may fail to meet recovery limits	DESA or CLP Laboratory GC/MS Technician	Phenol-d5	39-106 %R
		Bis(2-chloroethyl)ether-d8	40-105 %R			Bis(2-chloroethyl)ether-d8	40-105 %R
		2-Chlorophenol-d4	41-106 %R			2-Chlorophenol-d4	41-106 %R
		4-Methylphenol-d8	25-111 %R			4-Methylphenol-d8	25-111 %R
		Nitrobenzene-d5	43-108 %R			Nitrobenzene-d5	43-108 %R
		2-Nitrophenol-d4	40-108 %R			2-Nitrophenol-d4	40-108 %R
		2,4-Dichlorophenol-d3	37-105 %R			2,4-Dichlorophenol-d3	37-105 %R
		4-Chloroaniline-d4	1-145 %R			4-Chloroaniline-d4	1-145 %R
		Dimethylphthalate-d6	47-114 %R			Dimethylphthalate-d6	47-114 %R
		Acenaphthylene-d8	41-107 %R			Acenaphthylene-d8	41-107 %R
		4-Nitrophenol-d4	33-116 %R			4-Nitrophenol-d4	33-116 %R
		Fluorene-d10	42-111 %R			Fluorene-d10	42-111 %R
		4,6-Dinitro-2-methylphenol -d2	22-104 %R			4,6-Dinitro-2-methylphen ol-d2	22-104 %R
		Anthracene-d10	44-110 %R			Anthracene-d10	44-110 %R
		Pyrene-d10	52-119 %R			Pyrene-d10	52-119 %R
		Benzo(a)pyrene-d12	32-121 %R			Benzo(a)pyrene-d12	32-121 %R
Internal Standards	all samples	50-100% of area, ± 20 second retention time shift		Check calculations/instru ments reanalyze affected samples	DESA or CLP Laboratory GC/MS Technician	50-100% of area, ± 20 second retention time shift	

QAPP Worksheet #28b: Analytical Quality Control and Corrective Action (TCL SVOCs Aqueous continued)

Matrix Aqueous

Analytical Group TCL SVOCs

Analytical Method/SOP Reference SOM01.2

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
Matrix Spike (Not Required)	1 per 20 samples or less (if requested)	Phenol	12-110 %R	Flag outliers	DESA/ CLP Laboratory GC/MS Technician	Phenol	12-110 %R
		2-Chlorophenol	27-123 %R			2-Chlorophenol	27-123 %R
		N-Nitroso-di-n-propylamine	41-116 %R			N-Nitroso-di-n-propylamine	41-116 %R
		4-Chloro-3-methylphenol	23-97 %R			4-Chloro-3-methylphenol	23-97 %R
		Acenaphthene	46-118 %R			Acenaphthene	46-118 %R
Matrix Spike Duplicate (Not Required)	1 per 20 samples or less (if requested)	4-Nitrophenol	29-94 %R	Flag outliers		4-Nitrophenol	29-94 %R
		2,4-Dinitrotoluene	24-96 %R			2,4-Dinitrotoluene	24-96 %R
		Pentachlorophenol	9-103 %R			Pentachlorophenol	9-103 %R
		Pyrene	26-127 %R			Pyrene	26-127 %R
		Phenol	0-42 %RPD			Phenol	0-42 %RPD

QAPP Worksheet #28c: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous
Analytical Group Dioxins/Furans
Analytical Method/SOP Reference EPA 1613B

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Method Blank	1 per 20 samples	TCDD/F <0.5 pg/sample, PeCDD/F, HxCDD/F, HpCDD/F <1.0 pg/sample, OCDD/F <5 pg/sample unless sample concentrations > 10* blank levels (per SOP)	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise redigest and reanalyze	Laboratory Analyst	No analyte > QL
Laboratory Duplicate	1 per 20 samples	± 20% mean for concentrations >10*QL	Investigate and correct; Flag outliers	Laboratory Analyst	± 20% of mean if sample concentration >10x DL[1]
Initial Precision and Recovery	Prior to sample analysis	Per laboratory SOP	Investigate and correct	Laboratory Analyst	Per method/laboratory SOP
Ongoing Precision and Recovery	1 per batch of 20 samples	Per laboratory SOP or 70-130%R	Identify source of problem, make other adjustments; redigest if needed and reanalyze	Laboratory Analyst	Individual laboratory established limits per SOP
Split Samples	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; address in data quality assessment	CDM Smith ASC	≤ 40% RPD (for results ≥ 5QL)
Surrogates	1 per 20 samples	25-120%R-warning limit 17-130%R-control limit	Investigate and correct	Laboratory Analyst	25-120%R-warning limit 17-130%R-control limit
Temperature Blank	1 per cooler	0 to 6 degrees C	Note outlier in laboratory narrative. Inform CDM Smith of failure and need for additional coolant; check packing procedure	Laboratory Analyst	≤ 10 degrees C for data validation

The DLs referenced in laboratory SOP are equivalent to the QLs or sample reporting limits.

QAPP Worksheet #28e: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous
Analytical Group TCL Pesticides
Analytical Method/SOP Reference SOM01.2

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
Split Samples	1 per 20 samples	None		Notify PM and flag duplicate results	CDM Smith ASC and PM	≤50% RPD when both samples ≥ CRQL otherwise ABS ≤ 5xQL	
Temperature Blank	1 per cooler	0 to 6 degrees C		Laboratory - inform RSCC/CDM Smith and note in data narrative. CDM Smith - check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation	
Method Blank	1 per ≤20 samples or whenever samples extracted	No analyte > CRQL		Suspend analysis; re-extract and reanalyze blank and affected samples	DESA or CLP Laboratory GC/ECD Technician	Analyte ≤ CRQL	
Matrix Spike	1 per ≤20 samples; if requested	gamma-BHC (Lindane)	56-123 %R	Flag outliers	DESA or CLP Laboratory GC/ECD Technician	gamma-BHC	56-123 %R
		Heptachlor	40-131 %R			Heptachlor	40-131 %R
		Aldrin	40-120 %R			Aldrin	40-120 %R
		Dieldrin	52-126 %R			Dieldrin	52-126 %R
		Endrin	56-121 %R			Endrin	56-121 %R
		4,4'-DDT	38-127 %R			4,4'-DDT	38-127 %R
Matrix Spike Duplicate	1 per ≤20 samples; if requested	gamma-BHC	0-15 %RPD	Flag outliers		gamma-BHC	0-15 %RPD
		Heptachlor	0-20 %RPD			Helptachlor	0-20 %RPD
		Aldrin	0-22 %RPD			Aldrin	0-22 %RPD
		Dieldrin	0-18 %RPD			Dieldrin	0-18 %RPD
		Endrin	0-21 %RPD			Endrin	0-21 %RPD
		4,4'-DDT	0-27 %RPD			4,4'-DDT	0-27 %RPD

QAPP Worksheet #28e: Analytical Quality Control and Corrective Action (continued)

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
LCS [cont'd]	1 per 20 samples	Heptachlor epoxide	50-150 %R	Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	Heptachlor epoxide	50-150 %R
		Dieldrin	30-130 %R			Dieldrin	30-130 %R
		gamma-BHC	50-120 %R			gamma-BHC	50-120 %R
		4,4'-DDE	50-150 %R			4,4'-DDE	50-150 %R
		Endrin	50-120 %R			Endrin	50-120 %R
		Endosulfan sulfate	50-120 %R			Endosulfan sulfate	50-120 %R
		gamma-Chlordane	30-130 %R			gamma-Chlordane	30-130 %R
Surrogate	all samples	30-150 %R		Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	30-150 %R	

QAPP Worksheet #28f: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous
Analytical Group TCL PCBs
Analytical Method/SOP Reference SOM01.2

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
Split Samples s	1 per 20 samples	None		Notify PM and flag duplicate results	CDM Smith ASC and PM	50% RPD when PCBs in both samples ≥ QL Otherwise ABS ≤ 5xQL	
Temperature Blank	1 per cooler	0 to 6 degrees C		Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation	
Method Blank	1 per ≤20 samples or whenever samples extracted	No analyte > CRQL		Suspend analysis – reextract and reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	No analyte > CRQL No target analyte concentrations ≥ ½ CRQL	
Matrix Spike	1 per ≤20 samples; if requested	Aroclor-1016	29-135 %R	Flag outliers	DESA or CLP Laboratory GC/ECD Technician	Aroclor-1016	29-135 %R
		Aroclor-1260	29-135 %R			Aroclor-1260	29-135 %R
Matrix Spike Duplicate		Aroclor-1016	0-15 %RPD			Aroclor-1016	0-15 %RPD
		Aroclor-1260	0-20 %RPD			Aroclor-1260	0-20 %RPD
LCS	1 per ≤20 samples	Aroclor-1016	50-150 %R	Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	Aroclor-1016	50-150 %R
		Aroclor-1260	50-150 %R			Aroclor-1260	50-150 %R
Surrogate	all samples	30-150 %R		Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	30-150 %R	

QAPP Worksheet #28g: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous
Analytical Group PCB Congeners
Analytical Method/SOP Reference EPA 1668A

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Method Blank	1 per 20 samples	Concentration < 2 pg, 10 pg or 50 pg/sample-See SOP. Sum of all congeners < 300 pg /sample unless sample concentrations > 10* blank levels	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise redigest and reanalyze	Laboratory Analyst	No analyte > QL
Analysis (Laboratory) Duplicate	1 per 20 samples	± 20% mean for concentrations >10*QL	Flag outliers	Laboratory Analyst	RPD ≤ 40% for concentrations >10x DL[1]; otherwise ABS<QL
Quality Control Sample	Periodically at least quarterly	50-150%R;	Check standards; recalibrate if required	Laboratory Analyst	70-130%R;
Calibration Verification Sample	Beginning of each 12-hour shift	70-130%R;	Adjust and/or recalibrate	Laboratory Analyst	70-130%R
Initial Precision and Recovery	Prior to sample analysis	Per laboratory SOP	Investigate and correct	Laboratory Analyst	60-140%R ≤ 40% RSD
Ongoing Precision and Recovery	1 per batch of 20 samples	Per laboratory SOP	Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze	Laboratory Analyst	Warning 70-130%R; Accept 50-150%R
Split Samples	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; address in data quality assessment	CDM Smith ASC	RPD ≤ 40%; ABS<QL for samples <5x QL
Temperature Blank	1 per cooler	0 to 6 degrees C	Note outlier in laboratory narrative. Inform CDM Smith of failure and need for additional coolant; check packing procedure	Laboratory Analyst	≤ 10 degrees C for data validation

Notes:
1. The DLs referenced in the laboratory SOP are equivalent to the QLs or sample reporting limits.

QAPP Worksheet #28h: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous

Analytical Group TAL Metals ICP MS/AES

Analytical Method/SOP Reference ISM01.3 or current method

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Split Samples	1 per 20 samples	None	Notify PM and flag duplicate results	CDM Smith ASC and PM	≤50%RPD, ABS ≤ 5xCRQL when any result ≤ CRQL
Temperature Blank	1 per cooler	0 to 6 ^{o}C	Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation
Preparation Blank	1 per ≤20 samples	No constituent > CRQL	Suspend analysis rectify source; redigest and reanalyze affected samples	DESA or CLP Laboratory ICP Technician	No constituent > CRQL
Spike	1 per ≤20 samples	75-125%R*	Flag outliers	DESA or CLP Laboratory ICP Technician	75-125%R*
Laboratory Duplicate	1 per ≤20 samples	± 20% RPD**	Flag outliers	DESA or CLP Laboratory ICP Technician	≤20% RPD**
Post-Digestion Spike	after any analyte (except Ag) fails spike %R	75-125%R	Flag outliers	DESA or CLP Laboratory ICP Technician	75-125%R
Interference Check Sample [ICP Analysis Only]	Beginning of each run	± CRQL + true value or ± 20% of true value, whichever is greater	Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory ICP Technician	± 2 times CRQL of true value or ± 20% of true value, whichever is greater
LCS	1 per ≤20 samples	70-130%R	Suspend analysis until source rectified; redigest and reanalyze affected samples	DESA or CLP Laboratory ICP Technician	70-130%R

*except when the sample concentration is greater than 4 times the spike concentration, then disregard the recoveries; no data validation action taken

** except when the sample and/or duplicate concentration is less than 5 times the CRQL, then ± CRQL.

QAPP Worksheet #28i: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous
Analytical Group TAL – Total Mercury
Analytical Method/SOP Reference ISM01.3Cold Vapor Atomic Absorption (CVAA)

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Split Samples	1 per 20 samples	None	Notify PM and flag duplicate results	CDM Smith ASC and PM	≤50% RPD, ABS ≤ 5xCRQL when either result ≤ CRQL
Temperature Blank	1 per cooler	0 to 6 degrees C	Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation
Preparation Blank (PB)	1 per ≤20 samples	No analyte > CRQL	Suspend analysis; redigest and reanalyze	DESA or CLP Laboratory Technician	No analyte > CRQL
Laboratory Duplicate	1 per ≤20 samples	± 20% RPD*	Flag outliers	DESA or CLP Laboratory Technician	± 20% RPD
Spike Sample	1 per ≤20 samples	75 – 125 %R	Flag outliers	DESA or CLP Laboratory Technician	75 – 125 %R

*Reference EPA Region 2 SOP No. HW-2c, Revision 15 - (include ABS criteria)

QAPP Worksheet #28j: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous
Analytical Group Mercury
Analytical Method/SOP Reference EPA 1631 – Atomic fluorescence spectroscopy

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Split Samples	1 per 20 samples	20% RPD	Notify PM and address in data quality report	CDM Smith ASC and PM	≤ 40% RPD (for results ≥ 5QL) or ABS≤QL
Temperature Blank	1 per cooler	0 to 6 degrees C	Note in laboratory narrative. CDM Smith will use more coolant; check packing procedure	CDM Smith FOS	≤ 10 degrees C for data validation
Preparation Blank (PB)	1 per 20 samples	No analyte > QL (greater of 0.4 ng or <0.1xsample)	Suspend analysis; redigest and reanalyze if sample<10*blank result	Laboratory Analyst	No analyte > QL
Laboratory duplicate	1 per 20 samples	Per laboratory SOP	Investigate and correct; Flag outliers; Note in case narrative. Multiple failures require re-distillation and reanalysis.		≤ 35% RPD if result >5QL
Ongoing Precision and Recovery Samples	1 per 20 samples or 12-hour shift	Per laboratory SOP	Check calculations and instruments, reanalyze affected samples. Report in case narrative.		70-130%R for OPR <20 RSD for IPR 75-125%R for IPR
MS/MSD	1 per 20 samples or with each group of field samples	Per laboratory SOP	Investigate matrix effects and note in data narrative.		70-130%R RPD ≤35% (30 per method)

QAPP Worksheet #28k: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous
Analytical Group TAL - Total Cyanide
Analytical Method/SOP Reference ISM01.3 or current method – Colorimeter or Spectrophotometer

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Split Samples	1 per 20 samples	None	Notify PM and flag duplicate results	CDM Smith ASC and PM	≤50% RPD, ABS ≤ 5xCRQL when either result ≤ CRQL
Temperature Blank	1 per cooler	0 to degrees 6 C	Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation
Preparation Blank (PB)	1 per ≤ 20 samples	No analyte > CRQL	Suspend analysis; redistill and reanalyze	DESA or CLP Laboratory Technician	No analyte > CRQL
Laboratory Duplicate	1 per ≤ 20 samples	± 20% RPD*	Flag outliers	DESA or CLP Laboratory Technician	≤ 20% RPD
Spike Sample	1 per ≤ 20 samples	75 – 125 %R	Flag outliers	DESA or CLP Laboratory Technician	75 – 125 %R

*Reference EPA Region 2 SOP No. HW-2c, Revision 15 - (include ABS criteria)

QAPP Worksheet #28l: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Soil/Sediment

Analytical Group TCL VOCs

Analytical Method/SOP Reference SOM01.2

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Sample Splits	1 per 20 samples	None	Notify PM and flag duplicate results	CDM Smith ASC and PM	≤100% RPD ABS ≤ 5xQL when either result < 2*CRQL
Temperature Blank	1 per cooler	0 to 6 ^{o}C	Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation
Method Blank	1 every 12 hours	No analyte > CRQL*	Suspend analysis unit source recertified	DESA/ CLP Laboratory GC/MS Technician	No analyte > CRQL*

*With the exception of methylene chloride, 2-butanone & acetone which can be up to 2 times the CRQL. (EPA CLP National Functional Guidelines, Final, July 2007)

QAPP Worksheet #28l: Analytical Quality Control and Corrective Action (TCL VOCs Soils continued)

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
Deuterated Monitoring Compounds	all samples	Vinyl chloride-d3	68-122 %R	Check calculations and instruments, reanalyze affected samples; up to 3 DMCs per sample may fail to meet necessary limits (Section 11.3.4, Page D45 of SOM01.2)	DESA/ CLP Laboratory GC/MS Technician	Vinyl chloride-d3	68-122 %R
		Chloroethane-d5	61-130 %R			Chloroethane-d5	61-130 %R
		1,1-Dichloroethene-d2	45-132 %R			1,1-Dichloroethene-d2	45-132 %R
		2-Butanone-d5	20-182 %R			2-Butanone-d5	20-182 %R
		Chloroform-d	72-123 %R			Chloroform-d	72-123 %R
		1,2-Dichloroethane-d4	79-122 %R			1,2-Dichloroethane-d4	79-122 %R
		Benzene-d6	80-121 %R			Benzene-d6	80-121 %R
		1,2-Dichloropropane-d6	74-124 %R			1,2-Dichloropropane-d6	74-124 %R
		Toluene-d8	78-121 %R			Toluene-d8	78-121 %R
		trans-1,3-Dichloropropene-d4	72-130 %R			trans-1,3-Dichloropropene-d4	72-130 %R
		2-Hexanone-d5	17-184 %R			2-Hexanone-d5	17-184 %R
		1,4-Dioxane-d8	50-150 %R			1,4-Dioxane-d8	50-150 %R
		1,1,2,2-Tetrachloroethane-d2	56-161 %R			1,1,2,2-Tetrachloroethane-d2	56-161 %R
		1,2-Dichlorobenzene-d4	70-131 %R			1,2-Dichlorobenzene-d4	70-131 %R
Internal Standards	all samples	50-200% of area, ± 30 second retention time shift		Check calculations/ instruments reanalyze affected samples	DESA or CLP Laboratory GC/MS Technician	50-100% of area, ± 30 second retention time shift	

QAPP Worksheet #28m: Analytical Quality Control and Corrective Action (TCL VOCs Soils continued)

Matrix Soil/Sediment

Analytical Group TCL VOCs

Analytical Method/SOP Reference SOM01.2

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
Matrix Spike (Not Required)	1 per 20 samples or less (if requested)	1,1-Dichloroethene	59-172 %R	Flag outliers	DESA/ CLP Laboratory GC/MS Technician	1,1-Dichloroethene	59-172 %R
		Trichloroethene	62-137 %R			Trichloroethene	62-137 %R
		Benzene	66-142 %R			Benzene	66-142 %R
		Toluene	59-139 %R			Toluene	59-139 %R
		Chlorobenzene	60-133 %R			Chlorobenzene	60-133 %R
Matrix Spike Duplicate (Not Required)	1 per 20 samples or less (if requested)	1,1-Dichloroethene	0-22 %RPD	Flag outliers		1,1-Dichloroethene	0-22 %RPD
		Trichloroethene	0-24 %RPD			Trichloroethene	0-24 %RPD
		Benzene	0-21 %RPD			Benzene	0-21 %RPD
		Toluene	0-21 %RPD			Toluene	0-21 %RPD
		Chlorobenzene	0-21 %RPD			Chlorobenzene	0-21 %RPD

QAPP Worksheet #28n: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Soil/Sediment
Analytical Group TCL SVOCs
Analytical Method/SOP Reference SOM01.2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Sample Splits	1 per 20 samples	None	Notify PM and flag duplicate results	CDM Smith ASC and PM	≤100% RPD ABS ≤ 5xCRQL when either results≤ 2*CRQL
Temperature Blank	1 per cooler	0 to 6 degrees C	Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation
Method Blank	1 per 20 samples or less whenever samples are extracted	No analyte > CRQL*	Suspend analysis and reanalyze blank and affected sample	DESA or CLP Laboratory GC/MS Technician	No analyte > CRQL*

*with the exception of bis (2-Ethylhexyl) phthalate which can be up to 5 times the CRQL. (EPA CLP National Functional Guidelines, Final, July 2007)

QAPP Worksheet #28n: Analytical Quality Control and Corrective Action (TCL SVOC Soils continued)

QC Sample	Frequency /Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria	
TCL SVOCs – Soil Continued								
Deuterated Monitoring Compounds	all samples	Phenol-d5	17-103 %R	Check calculations and instruments, reanalyze affected samples; up to 4 DMCs may fail to meet recovery limits (Section 11.3.4, Page D48/SVOC of SOM01.2)	DESA or CLP Laboratory GC/MS Technician	Accuracy	Phenol-d5	17-103 %R
		Bis(2-chloroethyl)ether-d8	12-98 %R				Bis(2-chloroethyl)ether-d8	12-98 %R
		2-Chlorophenol-d4	13-101 %R				2-Chlorophenol-d4	13-101 %R
		4-Methylphenol-d8	8-100 %R				4-Methylphenol-d8	8-100 %R
		Nitrobenzene-d5	16-103 %R				Nitrobenzene-d5	16-103 %R
		2-Nitrophenol-d4	16-104 %R				2-Nitrophenol-d4	16-104 %R
		2,4-Dichlorophenol-d3	23-104 %R				2,4-Dichlorophenol-d3	23-104 %R
		4-Chloroaniline-d4	1-145 %R				4-Chloroaniline-d4	1-145 %R
		Dimethylphthalate-d6	43-111 %R				Dimethylphthalate-d6	43-111 %R
		Acenaphthylene-d8	20-97 %R				Acenaphthylene-d8	20-97 %R
		4-Nitrophenol-d4	16-166 %R				4-Nitrophenol-d4	16-166 %R
		Fluorene-d10	40-108 %R				Fluorene-d10	40-108 %R
		4,6-Dinitro-2-methylphenol-d2	1-121 %R				4,6-Dinitro-2-methylphenol-d2	1-121 %R
		Anthracene-d10	22-98 %R				Anthracene-d10	22-98 %R
		Pyrene-d10	51-120 %R				Pyrene-d10	51-120 %R
		Benzo(a)pyrene-d12	43-111 %R				Benzo(a)pyrene-d12	43-111 %R
Internal Standards	all samples	50-200% of area, ± 30 second retention time shift		Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/MS Technician	Accuracy	50-200% of area, ± 30 second retention time shift	

QAPP Worksheet #28n: Analytical Quality Control and Corrective Action (TCL SVOCs Soils continued)

Matrix Soil/Sediment

Analytical Group TCL SVOCs

Analytical Method/SOP Reference SOM01.2

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
Matrix Spike (Not Required)	1 per 20 samples or less (if requested)	Phenol	26-90 %R	Flag outliers	DESA/ CLP Laboratory GC/MS Technician	Phenol	26-90 %R
		2-Chlorophenol	25-102 %R			2-Chlorophenol	25-102 %R
		N-Nitroso-di-n-propylamine	41-126 %R			N-Nitroso-di-n-propylamine	41-126 %R
		4-Chloro-3-methylphenol	26-103 %R			4-Chloro-3-methylphenol	26-103 %R
		Acenaphthene	31-137 %R			Acenaphthene	31-137 %R
Matrix Spike Duplicate (Not Required)	1 per 20 samples if requested (if requested)	Phenol	0-35 %RPD	Flag outliers		Phenol	0-35 %RPD
		2-Chlorophenol	0-50 %RPD			2-Chlorophenol	0-50 %RPD
		N-Nitroso-di-n-propylamine	0-38 %RPD			N-Nitroso-di-n-propylamine	0-38 %RPD
		4-Chloro-3-methylphenol	0-33 %RPD			4-Chloro-3-methylphenol	0-33 %RPD
		Acenaphthene	0-19 %RPD			Acenaphthene	0-19 %RPD

QAPP Worksheet #28o: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix	Soil/Sediment
Analytical Group	PCDD/PCDF
Analytical Method/SOP Reference	EPA 1613B

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Method Blank	1 per 20 samples	Per laboratory SOP	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise redigest and reanalyze	Laboratory Analyst	No analyte > QL
Laboratory Duplicate	1 per 20 samples	Per laboratory SOP	Investigate and correct; Flag outliers	Laboratory Analyst	± 20% of mean if sample concentration >10x DL
Initial Precision and Recovery	Prior to sample analysis	Per laboratory SOP	Investigate and correct	Laboratory Analyst	Per method/laboratory SOP
Ongoing Precision and Recovery	1 per batch of 20 samples	Per laboratory SOP	Identify source of problem, make other adjustments; redigest if needed and reanalyze	Laboratory Analyst	Individual laboratory established limits per SOP
Sample splits	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; address in data quality assessment	CDM Smith ASC	≤ 40% RPD (for results ≥ 5QL)
Temperature Blank	1 per cooler	0 to 6 degrees C	Note outlier in laboratory narrative. Inform CDM Smith of failure and need for additional coolant; check packing procedure	Laboratory Analyst	≤ 10 degrees C for data validation

Laboratory and SOPs are TBD. The laboratory will be assigned per FASTAC policy.

QAPP Worksheet #28q: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Soil/Sediment
Analytical Group TCL Pesticides
Analytical Method/SOP Reference SOM01.2

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
Sample Splits	1 per 20 samples	None		Notify PM and flag duplicate results	CDM Smith ASC and PM	≤100% RPD ABS ≤ 5xCRQL when a results ≤ 2*CRQL	
Temperature Blank	1 per cooler	0 to 6 degrees C		Laboratory will inform and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation	
Method Blank	1 per 20 samples or whenever samples extracted	No analyte > CRQL		Suspend analysis unit source recertified	DESA or CLP Laboratory GC/ECD Technician	No analyte > CRQL	
Matrix Spike	1 per 20 samples	gamma-BHC (Lindane)	46-127 %R	Flag outliers	DESA or CLP Laboratory GC/ECD Technician	gamma-BHC (Lindane)	46-127 %R
		Heptachlor	35-130 %R			Heptachlor	35-130 %R
		Aldrin	34-132 %R			Aldrin	34-132 %R
		Dieldrin	31-134 %R			Dieldrin	31-134 %R
		Endrin	42-139 %R			Endrin	42-139 %R
		4,4-DDT	23-134 %R			4,4-DDT	23-134 %R
Matrix Spike Duplicate	1 per 20 samples	gamma-BHC	0-50 %RPD	Flag outliers	DESA or CLP Laboratory GC/ECD Technician	gamma-BHC	0-50 %RPD
		Heptachlor	0-31 %RPD			Heptachlor	0-31 %RPD
		Aldrin	0-43 %RPD			Aldrin	0-43 %RPD
		Dieldrin	0-38 %RPD			Dieldrin	0-38 %RPD
		Endrin	0-45 %RPD			Endrin	0-45 %RPD
		4,4-DDT	0-50 %RPD			4,4-DDT	0-50 %RPD

QAPP Worksheet #28q: Analytical Quality Control and Corrective Action (continued)

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
LCS	all samples	gamma-BHC	50-120 %R	Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	gamma-BHC	50-120 %R
		Heptachlor epoxide	50-150 %R			Heptachlor epoxide	50-150 %R
		Dieldrin	30-130 %R			Dieldrin	30-130 %R
		4,4'-DDE	50-150 %R			4,4'-DDE	50-150 %R
		Endrin	50-120 %R			Endrin	50-120 %R
		Endosulfan sulfate	50-120 %R			Endosulfan sulfate	50-120 %R
		gamma-Chlordane	30-130 %R			gamma-Chlordane	30-130 %R
Surrogate	all samples	30–150 %R		Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	30-150 %R	

QAPP Worksheet #28r: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Soil/Sediment
Analytical Group TCL PCBs
Analytical Method/SOP Reference SOM01.2

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria	
Sample Splits	1 per 20 samples	None		Notify PM and flag duplicate results	CDM Smith ASC and PM	≤100% RPD ABS ≤ 5xCRQL when either results≤ 2xCRQL	
Temperature Blank	1 per cooler	0 to 6 degrees C		Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation	
Method Blank	1 per 20 samples or whenever samples extracted	No analyte > CRQL		Suspend analysis unit source recertified	DESA or CLP Laboratory GC/ECD Technician	No analyte > CRQL	
Matrix Spike	1 per 20 samples	Aroclor-1016	29-135 %R	Flag outliers	DESA or CLP Laboratory GC/ECD Technician	Aroclor-1016	29-135 %R
		Aroclor-1260	29-135 %R			Aroclor-1260	29-135 %R
Matrix Spike Duplicate	1 per 20 samples	Aroclor-1016	0-15 %RPD	Flag outliers	DESA or CLP Laboratory GC/ECD Technician	Aroclor-1016	0-15 %RPD
		Aroclor-1260	0-20 %RPD			Aroclor-1260	0-20 %RPD
LCS	all samples	Aroclor-1016	50-150 %R	Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	Aroclor-1016	50-150 %R
		Aroclor-1260	50-150 %R			Aroclor-1260	50-150 %R
Surrogate	all samples	30-150%R		Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	30-150%R	

QAPP Worksheet #28s: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Soil/Sediment
Analytical Group PCB Congeners
Analytical Method/SOP Reference EPA 1668A

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Method Blank	1 per 20 samples	< QL	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise redigest and reanalyze	Laboratory Analyst	No analyte > QL
Laboratory Duplicate	1 per 20 samples	≤ 20% RPD; ±QL for samples <10x QL	Flag outliers	Laboratory Analyst	RPD ≤ 20%
Quality Control Sample	Periodically at least quarterly	70-130%R;	Check standards; recalibrate if required	Laboratory Analyst	70-130%R;
Calibration Verification Sample	Beginning of each 12-hour shift	70-130%R;	Adjust and/or recalibrate	Laboratory Analyst	70-130%R;
Initial Precision and Recovery	Prior to sample analysis	Per laboratory SOP	Investigate and correct	Laboratory Analyst	60-140%R ≤ 40% RSD
Ongoing Precision and Recovery	1 per batch of 20 samples	Per laboratory SOP	Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze	Laboratory Analyst	Warning 70-130%R; Accept 50-150%R
Sample splits	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; address in data quality assessment	CDM Smith ASC	≤ 40% RPD (for results ≥ 5QL)
Temperature Blank	1 per cooler	0 to 6 degrees C	Note outlier in laboratory narrative. Inform CDM Smith of failure and need for additional coolant; check packing procedure	Laboratory Analyst	≤ 10 degrees C for data validation

Laboratory and SOPs are TBD. The laboratory will be assigned per FASTAC policy.

QAPP Worksheet #28t: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Soil/Sediment
Analytical Group TAL Metals
Analytical Method/SOP Reference ISM01.3 or current method

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Sample Splits	1 per 20 samples	None	Notify PM and flag duplicate results	CDM Smith ASC and PM	≤100% RPD ABS ≤ 5xCRQL when either result ≤ 2xCRQL
Temperature Blank	1 per cooler	0 to 6 degrees C	Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation
Preparation Blank	1 per 20 samples	No constituent > CRQL	Suspend analysis until source rectified; re-digest and reanalyze affected samples	DESA or CLP Laboratory ICP-AES/ICP-MS Technician	No constituent > CRQL
Spike	1 per 20 samples	75-125%R*	Flag outliers		75-125%R*
Laboratory Duplicate	1 per 20 samples	≤35% RPD**	Flag outliers		≤ 35% RPD**
Post-Digestion Spike	after any analyte (except Ag and Hg) fails spike %R	75-125%R	Flag outliers		75-125%R
Interference Check Sample [ICP Analysis Only]	beginning, end and periodically during run (2 times every 8 hours)	Within ± 2 times CRQL of true value or ± 20% of true value, whichever is greater	Check calculations and instruments, reanalyze affected samples		Within ± 2 times CRQL of true value or ± 20% of true value, whichever is greater
LCS	1 per 20 samples	Control limits established by EPA*	Suspend analysis rectify source; re-digest and reanalyze affected samples		Control limits established by EPA*

*except when the sample concentration is greater than 4 times the spike concentration, then disregard the recoveries; no data validation action taken.
**Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include ABS criteria)
except when the sample and/or duplicate concentration is less than 5 times the CRQL.
*** If the EPA LCS is unavailable, other EPA QC samples or other certified materials may be used. In such cases, control limits for the LCS must be documented and provided.

QAPP Worksheet #28u: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix	Soil/Sediment
Analytical Group	TAL –Total Mercury
Analytical Method/SOP Reference	ISM01.3, or current method – Cold Vapor Atomic Absorption (CVAA)

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Sample Splits	1 per 20 samples	None	Notify PM and flag duplicate results	CDM Smith ASC and PM	≤100% RPD ABS ≤ 5xCRQL when either result ≤ 2xCRQL
Temperature Blank	1 per cooler	0 to 6 degrees C	Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation
Preparation Blank (PB)	1 per ≤20 samples	No analyte > CRQL	Suspend analysis; redigest and reanalyze	DESA or CLP Laboratory Technician	No analyte > CRQL
Laboratory Duplicate	1 per ≤20 samples	≤ 20% RPD	Flag outliers	DESA or CLP Laboratory Technician	≤ 35% RPD
Spike Sample	1 per ≤20 samples	75 – 125 %R	Flag outliers	DESA or CLP Laboratory Technician	75 – 125 %R

QAPP Worksheet #28v: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix	Soil/Sediment
Analytical Group	Total Mercury
Analytical Method/SOP Reference	EPA 1631

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Sample splits and field duplicates	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; address in data quality assessment	CDM Smith ASC	≤ 40% RPD (for results ≥ 5QL)
Preparation Blank	3 per 20 samples or batch	Per laboratory SOP	Reanalyze. Suspend analysis until source rectified; re-distill and reanalyze affected samples if results are <10 times the blank	Laboratory Analyst	No result > 5MDL
Laboratory duplicate	1 per 20 samples	Per laboratory SOP	Investigate and correct; Flag outliers; Note in case narrative. Multiple failures require re-distillation and reanalysis.	Laboratory Analyst	≤ 35% RPD if result >5CRQL
Ongoing Precision and Recovery Samples	1 per 20 samples or with each group of field samples	Per laboratory SOP	Check calculations and instruments, reanalyze affected samples. Report in case narrative.	Laboratory Analyst	70-130%R for OPR <20 RSD for IPR 75-125%R for CRM/IPR
MS/MSD	1 per 20 samples or with each group of field samples	Per laboratory SOP	Investigate matrix effects and note in data narrative.	Laboratory Analyst	70-130%R
				Laboratory Analyst	RPD ≤35% (30 per method)

Laboratory and SOPs are TBD. The laboratory will be assigned per FASTAC policy.

QAPP Worksheet #28w: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

Matrix Soil/Sediment

Analytical Group TAL – Total Cyanide

Analytical Method/SOP Reference ISM01.3 or current method– Colorimeter or Spectrophotometer

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Sample Splits	1 per 20 samples	None	Notify PM and flag duplicate results	CDM Smith ASC and PM	≤100% RPD ABS ≤ 5xCRQL when either result ≤ 2*CRQL
Temperature Blank	1 per cooler	0 to 6 degrees C	Laboratory will inform RSCC/CDM Smith and note in data narrative. CDM Smith will check packing procedure and increase coolant	Laboratory Analyst and CDM Smith FOS	≤ 10 degrees C for data validation
Preparation Blank (PB)	1 per ≤20 samples	No analyte > CRQL	Suspend analysis; redigest and reanalyze	DESA or CLP Laboratory Technician	No analyte > CRQL
Laboratory Duplicate	1 per ≤20 samples	± 20% RPD	Flag outliers	DESA or CLP Laboratory Technician	≤ 35% RPD
Spike Sample	1 per ≤20 samples	75 – 125 %R	Flag outliers	DESA or CLP Laboratory Technician	75 – 125 %R

QAPP Worksheet #28x: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

PROCEDURE FOR FIELD BLANK COLLECTION/ FIELD RINSATE BLANK COLLECTION
(Continued)

Cooler Temperature Indicators
One cooler temperature indicator or "temperature blank" will be placed in each cooler containing samples (solid and aqueous) being sent to the laboratory for analysis. The temperature blank will consist of a sample container filled with non-preserved water (potable or distilled). The container will be labeled "COOLER TEMPERATURE INDICATOR" and dated.

Matrix Spikes
Matrix spikes (MS) are laboratory QC samples drawn from excess volumes of existing samples to demonstrate the accuracy of laboratory analysis. In accordance with EPA Region 2, matrix spikes will be designated on environmental samples at a rate of one per sample delivery group (SDG). This designation will be noted on the sample container labels and the sample paperwork. An SDG is defined as one of the following:

1. All samples of an analytical case if the sample number is less than 20 (including environmental duplicates and QC blanks) and if sampling is completed within 7 calendar days.
2. Each group of 20 samples within an analytical case (including environmental duplicates, but excluding QC blanks) if the number is greater than 20.
3. Each 7-day calendar day period during which samples within an analytical case are received. This period begins with the receipt of the first sample in the SDG.

QAPP Worksheet #29: Project Documents and Records
(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

Sample Collection and Field Records			
Record	**Generation (CDM Smith)**	**Verification (CDM Smith)**	**Storage location/archival**
Air Bills	FOS	FOS or Designee	Project File
ANSETS	CDM Smith Project Manager	ASC	Project File
Audit plans and reports	Auditor	QA Manager or Designee	Project File
Corrective Action Reports	Project Manager	PM Designee	Project File
Correspondence	Project Manager	Project Manager or Designee	Project File
Daily QC Reports	FOS or Designee	PM Designee	Project File
Daily Sign-In Sheet	FOS or Designee	PM	Project File
Data usability assessment report	ASC or Designee	Chemist	Project File
Data validation report	Data validator	Chemist	Project File
Data verification checklists	FOS	ASC	Project File
Deviations – Field Change Request	FOS	PM	Project File
Field logbook or data collection sheets	FOS	FOS	Project File

Note: field forms see Appendix D.

QAPP Worksheet #29: Project Documents and Records
(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

Project Assessments			
Record	**Generation**	**Verification**	**Storage location/archival**
Photographic log	FOS or Designee	Task Manager or Designee	Project File
Sample Tracking Forms	Sample Manager or Designee	FOS or Designee	Project File
Scribe Chain-of-Custody Forms	Sample Manager or Designee	FOS or Designee	Project File
Self-Assessment Checklist	Site Manager or Designee	QA Specialist	Project File
Subcontractor Laboratory Sample Tracking Log	Sample Manager or Designee	FOS or Designee	Project File
Laboratory Records			
Record	**Generation**	**Verification**	**Storage location/archival**
Bid Sheets, scopes of work	PM or Designee	Technical Reviewer and Procurement Specialist	Procurement File
Subcontract Laboratory certifications	Laboratory QA Officer	Chemist or QA Specialist	Procurement File
Subcontract Laboratory QA Plans	Laboratory QA Officer	Chemist or QA Specialist	Procurement File
SOPs	Laboratory QA Officer	Chemist or QA Specialist	Procurement File

Note: field forms see Appendix D.

QAPP Worksheet #29: Project Documents and Records
(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

	Laboratory Data Deliverables			
Record	**SOM01.2-VOCS, SVOC, Pesticides, PCBs**	**ISM01.3 -TAL Metals**	**PCB Congeners and Dioxin/Furans**	**Trace Mercury**
Narrative	X	X	X	X
COC	X	X	X	X
Summary Results	X	X	X	X
Analytical sample results	X	X	X	X
QC Results	X	X	X	X
Chromatograms	X	NA	X	NA
Sample Preparation Log	X	X	X	X
Sample Run Log	X	X	X	X
Tentatively Identified Compounds (TICs)	NA	NA	NA	NA
Raw Data	X	X	X	X

QAPP Worksheet #30:
COMBINED WITH WORKSHEET #19

QAPP Worksheet #31, 32 & 33: Assessments and Corrective Action
(UFP-QAPP Manual Sections 4.1.1 and 4.1.2)
(EPA 2106-G-05 Section 2.4 and 2.5.5)

Assessment Type	Number/ Frequency	Organization	Responsible Party	Assessment Deliverable and Due Dates	Party to Identify and Implement Corrective Actions	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions
					Title and Organizational Affiliation	
Project Readiness Review	Prior to field work	CDM Smith	FOS	Immediately; to within 24 hours of review	PM, CDM Smith	Paul Hagerman (PM), CDM Smith
Sample Collection and Documentation	Once	CDM Smith	FOS	Email within 24 hours	PM, CDM Smith	Jeniffer Oxford (QAS) or field auditor, CDM Smith
Health and Safety	Once if warranted	CDM Smith	FOS and PM, CDM Smith	Memorandum & Checklist (Notify by phone immediately. Report 1 week after audit)	PM, CDM Smith	Shawn Oliveira, H&S Manager or designee, SSHO, CDM Smith
QAPP	Annually	CDM Smith	Approved CDM Smith QA Staff or QA Coordinator	E-mail / FCR if required.	PM, CDM Smith	Paul Hagerman (PM), CDM Smith
Data Review	Once	CDM Smith	Vanessa Macwan (ASC) or designee,	Memorandum based on project requirements	Project Chemist, FOS, or PM depending on nature of issue	Paul Hagerman (PM), CDM Smith

Notes:
1. The CDM Smith QA Manager (QAM) will determine if an office audit is required. If CDM Smith PM requests self-assessments in lieu of the project audit, the QAM will review and approve or reject the self-assessments being considered.
2. Office audits are performed by trained and approved QA Staff members.
3. Findings and deviations from plans will require corrective actions which will be documented and discussed appropriately. The USACE PM and EPA RPM will be notified by CDM Smith PM.

QAPP Worksheet #34: Data Verification and Validation Inputs
(UFP-QAPP Manual Section 5.2.1 and Table 9)
(EPA 2106-G-05 Section 2.5.1)

Item	Input	Description	Verification (completeness)	Validation (conformance to specifications)
Planning Documents/Records				
1	QAPP	All planning documents will be available to reviewers to allow reconciliation with planned activities and objectives.	X	X
2	Contractor Quality Control Plan (CQCP)		X	
3	Field TSOPs, The Group's QAPP and SAP		X	X
4	Laboratory SOPs		X	X
Field Records				
5	Field logbooks	Field notes will be prepared daily by the Field Team and will be complete, appropriate to the project tasks, and legible. The FOS will review logbooks and records for accuracy and completeness. Upon completion of field work, logbooks and records will be placed in the project files. Field reports will be verified to ensure correct reporting of information. Review will be conducted prior to completion of each report.	X	X
6	Equipment calibration records		X	X
7	COC	Sample manager, FOS or designee will review the COC forms against the samples packed in the each cooler prior to shipment. COCs will be sent with the samples to the laboratory and copies retained for the Trip Report and project files. The data validator will be review upon completion of analytical activities and verified against the laboratory report.	X	X
8	Sampling Trip Reports	FOS or designee; Laboratory coordinator will review these for each case of field sampling for which samples are sent to a CLP laboratory. Information will be reviewed against the COC forms, and potential discrepancies will be discussed with field personnel to verify locations, dates, etc.	X	X
9	Sampling Figures/ Diagrams/Surveys	Data user will review during evaluation and completion of data report.	X	X
12	Correspondence	Relevant correspondence will be used to reconcile field records and data.	X	X

QAPP Worksheet #34: Data Verification and Validation Inputs
(UFP-QAPP Manual Section 5.2.1 and Table 9)
(EPA 2106-G-05 Section 2.5.1)

Item	Input	Description	Verification (completeness)	Validation (conformance to specifications)
13	Field Change Requests	ASC and data evaluator will review during completion of each data usability assessment/measurement report.	X	X
Analytical Data Package				
14	Laboratory analytical data packages	Laboratory analyst and QA officer will review/verify internally the completeness and technical accuracy of data prior to submittal. All laboratory data will be verified by the laboratory performing the analysis prior to submittal. EPA DV contractor-data validator or CDM Smith data validator will review data packages for content and sample information upon receipt. Data packages will be evaluated for completeness and compliance. Table 9 of the IDQTF UFP-QAPP shows items for compliance review.	X	X
15	Communication Records	Relevant correspondence will be used to reconcile analytical data.	X	X
16	Electronic Data Deliverables (EDDs) fields	Data Manager will determine whether required EQuIS compatible EDD fields and format were provided.	X	X
17	Outputs of the EQuIS database	Project task leader and team will compile the project data results in a sample project report. Data tables, figures and reported entries will be reviewed/ verified against hardcopy information or EQuIS output.	X	X
18	Data validation and audit reports, QAPP, and FCRs	Data assessor will prepare the project data quality and usability assessment report. The data will be evaluated against project DQOs and measurement performance criteria, such as completeness. Evaluate whether field sampling procedures were followed with respect to equipment and proper sampling support.	X	X

QAPP Worksheet #35: Data Verification Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Requirement Documents	Records Reviewed	Process Description	Responsible Person /Organization
QAPP, TSOP 4-1	Field logbook	Verify that records are present and complete for each day of field activities. Verify that all planned samples including field QC samples were collected and that 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. Verify that any required field monitoring was performed and results are documented.	Daily - FOS At conclusion of field activities - Project QC staff
SOPs	Field logbook and FCRs	Ensure that the sampling methods/procedures outlined in QAPP were followed, and that any deviations were noted/approved. Determine potential impacts from noted/approved deviations, in regard to PQOs.	FOS
QAPP, TSOP 1-2	Chain-of-custody forms	Verify the completeness of chain-of-custody records. Examine entries for consistency with the field logbook. Check that appropriate methods and sample preservation have been recorded. Verify that the required volume of sample has been collected and that sufficient sample volume is available for QC samples (e.g., MS/MSD). Verify that all required signatures and dates are present. Check for transcription errors.	Daily - FOS At conclusion of field activities - Project Chemist or Data Assessor
QAPP, TSOP 1-2	COC	Examine traceability of data from sample collection to generation of project reported data. Provides sampling dates and time; verification of sample ID; and QC sample information.	At conclusion of field activities - Project QC staff (data coordinator, data validator)
QAPP	Laboratory data package	Examine packages against QAPP and laboratory contract requirements, and against COC forms (e.g., holding times, sample handling, analytical methods, sample identification, data qualifiers, QC samples, etc.). Determine potential impacts from noted/approved deviations, in regard to PQOs.	ESAT Data Validation Personnel, EPA Region 2 or CDM Smith Data validator

QAPP Worksheet #35: Data Verification Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Requirement Documents	Records Reviewed	Process Description	Responsible Person /Organization
QAPP	Laboratory Deliverable	Verify that the laboratory deliverable contains all records specified in the subcontract SOW. Check sample receipt records to ensure sample condition upon receipt was noted, and any missing/broken sample containers were noted and reported according to plan. Compare the data package with the COCs to verify that results were provided for all collected samples. Review the narrative to ensure all QC exceptions are described. Check for evidence that any required notifications were provided to project personnel as specified in the QAPP. Verify that necessary signatures and dates are present.	Before release – Laboratory QAM Upon receipt - Project Chemist or Data Validator [ESAT or CDM Smith Data Validation Personnel or ASC]
	Audit Reports, Corrective Action Reports	Verify that all planned audits were conducted. Examine audit reports. For any deficiencies noted, verify that corrective action was implemented according to plan.	Contract QAS
	Field duplicates	Compare results of field duplicate (or replicate) analyses with RPD criteria.	CDM Smith ASC, Data Validator or Data Assessor
	Methods	Verify that records support implementation of the SOP - sampling and analysis.	
	Data Narrative	Determine deviations from methods and contract and the impact.	
	Audit Report	Confirm reports are used to validate compliance of field sampling, handling and analysis activities with the QAPP.	
	Project Quantitation Limit	Verify achievement of PQLG as established in the QAPP and that the laboratory successfully analyzed a standard at the QL.	
	Field and Laboratory data and QC report	A summary of all QC samples and results will be verified for measurement performance criteria, completeness, and 10 percent verified to field and laboratory data reports from vendors. A report on meeting the established criteria shall be prepared within 30 days of receipt.	

QAPP Worksheet #36: Data Validation Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Validation Code and Label Identifier Table

Validation Code*	Validation Label	Description/Reference	
S2BVM	Stage 2b Validation Manual	Stage 2B Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions and BOTH sample-related and instrument-related QC results.	EPA 540-R-08-005
S4VEM	Stage 4 Validation Electronic and Manual	Stage 4 Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related QC results, AND recalculation checks.	
NV	Not Validated		
S3VEM	Stage 3 Validation Electronic and Manual	Stage 3 Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related QC results, AND recalculation checks.	
S2bVEM	Stage 2b Validation Electronic and Manual	Stage 2B Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions and BOTH sample-related and instrument-related QC results.	

Note:
The following data qualifiers will be applied during data validation by a third party. Potential impacts on project data quality objectives will be discussed in the data validation report.

- NM – Measurement Performance Criteria contained in WS 12 were not met.
- J – The result is an estimated value. The nature of the bias will be discussed in the data validation report.
- E – Erroneous result (e.g., improper calculation, peak integration, etc.)
- R- rejected data

QAPP Worksheet #36: Data Validation Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Analytical Group/Method	Data deliverable requirements	Analytical specifications	Measurement performance criteria	Percent of data packages to be validated [1]	Percent raw data review/% results to recalculate	Validation Procedure[3]	Validation code	Electronic validation program/version	Data Validator
FASTAC Tiers 1 and 2 (DESA or CLP)									
VOCs	SEDD Stage 3	SOM01.2	Appendix A	100%	100%/10%	SOP HW-34, Rev 3, DESA Worksheet #35 or NFG	S3VEM	EXES	ESAT DV Staff, or DESA
SVOCs + SIM	SEDD Stage 3	SOM01.2				SOP HW-35, Rev 2, DESA Worksheet #35	S3VEM	EXES	ESAT DV Staff, or DESA
TAL Metals, Mercury (ICP-AES)	SEDD Stage 2B	ISM01.3				SOP HW-2 a, Rev 15 or NFG	S2BVEM	EXES	ESAT/DESA or CDM Smith DV Staff
TAL Metals, Mercury (ICP-MS)	SEDD Stage 2B	ISM01.3				SOP HW-2 b, Rev 15 or NFG	S2BVEM	EXES	
Cyanide	SEDD Stage 2B	ISM01.3				SOP HW-2 c, Rev 15 or NFG	S2BVEM	EXES	

Tier 4 (CDM Smith Subcontract Laboratory)									
Trace mercury	EQuIS Region 2 compliant EDD	EPA 1631E	Appendix A	100%	100%/1 SDG	NFG modified by WS #12, 28, 15, 19 and 24	S2BVM	NA[4]	CDM Smith ASC/ designee
Dioxin/Furans	SEDD Stage 3	WS 28, & EPA 1613B (Isotope dilution)	Appendix A	100%	100%/1 SDG	EPA SOP HW-25, Revision 3 or NFG	S3VEM	EXES	CDM Smith
PCB Congeners + homologs	SEDD Stage 3	EPA 1668				SOP HW-46 or NFG	S3VEM	EXES	ESAT DV Staff, or CDM Smith

QAPP Worksheet #37: Data Usability Assessment
(UFP-QAPP Manual Section 5.2.3 including Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

The Data Comparability Report in lieu of data usability assessment will be prepared by CDM Smith. Paul Hagerman, CDM Smith Project Manager, will be responsible for its content and for assigning work to the CDM Smith personnel who will be supporting this assessment. The Data Comparability Report presents the overall comparison of the split sample data and the Groups parent sample data. Data comparison will be conducted on parameters that were analyzed and detected by both sample pairs. Data quality will be evaluated in the data validation reports.
Split samples for the selected parameters will be compared using the following criteria:

- Average ratio criteria: average ratio of the Groups s to CDM Smith split sample. Ration criteria of 30% will be used to evaluate the data pairs.
- Percent difference criteria: percent difference of the Respondents to CDM Smith split sample. Percent difference of 50% will be used to evaluate the data pairs.
- Statistical test criteria: Paired Prentice-Wilcoxon test will be employed at significance level (p-value) of 0.05. A p-value greater than or equal to 0.05 indicating that there is no significant statistical difference between the data pairs.

The sample parameter being evaluated is considered comparable if at least two of the three criteria are met.

TABLES

Table 1
Sample Locations, Depths, and Analyses
Data Gaps Sampling and Analysis Plan
Rolling Knolls Landfill Superfund Site
Chatham, New Jersey

Sample ID	Sample Media	Depth Interval (Feet)	Sample Collection Method	PRP Laboratory Analyses													Notes
				VOCs	SVOCs	SVOCs - SIM	PCBs (as Aroclors)	Pesticides	TAL Metals and Cyanide	PCB Congeners, Dioxins, Furans	Full TCL/TAL	TAL Metals and Cyanide (unfiltered)	TAL Metals and Cyanide (filtered)	Low-Level Mercury	Hardness	pH, TOC, Grain Size	
Soil Samples																	
SS-125	Soil	0.0-1.0	Macrocore			X	X				X						
SS-126	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-125
SS-127	Soil	0.0-1.0	Macrocore			X	X			X	X						
SS-128	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-127
SS-129	Soil	0.0-1.0	Macrocore			X	X			X	X						
SS-130	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-129
SS-131	Soil	0.0-1.0	Macrocore			X	X				X						
SS-132	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-131
SS-133	Soil	0.0-1.0	Macrocore			X	X				X						
SS-134	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-133
SS-135	Soil	0.0-1.0	Macrocore			X	X				X						
SS-136	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-135
SS-137	Soil	0.0-1.0	Macrocore			X	X			X	X						
SS-138	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-137
SS-139	Soil	0.0-1.0	Macrocore			X	X			X	X						
SS-140	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-139
SS-141	Soil	0.0-1.0	Macrocore			X	X				X						
SS-142	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-141
SS-143	Soil	0.0-1.0	Macrocore			X	X				X						

Table 1
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Rolling Knolls Landfill Superfund Site
Chatham, New Jersey

Sample ID	Sample Media	Depth Interval (Feet)	Sample Collection Method	Laboratory Analyses													Notes
				VOCs	SVOCs	SVOCs - SIM	PCBs (as Aroclors)	Pesticides	TAL Metals and Cyanide	PCB Congeners, Dioxins, Furans	Full TCL/TAL	TAL Metals and Cyanide (unfiltered)	TAL Metals and Cyanide (filtered)	Low-Level Mercury	Hardness	pH, TOC, Grain Size	
SS-144	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-143
SS-145	Soil	0.0-1.0	Macrocore			X	X				X						
SS-146	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-145
SS-147	Soil	0.0-1.0	Macrocore			X	X				X						
SS-148	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-147
SS-149	Soil	0.0-1.0	Macrocore			X	X				X						
SS-150	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-149
SS-151	Soil	0.0-1.0	Macrocore			X	X				X						
SS-152	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-151
SS-153	Soil	0.0-1.0	Macrocore			X	X				X						
SS-154	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-153
SS-155	Soil	0.0-1.0	Macrocore			X	X				X						
SS-156	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-155
SS-157	Soil	0.0-1.0	Macrocore			X	X				X						
SS-158	Soil	0.0-1.0	Macrocore														*Contingent on sample SS-157
SS-159	Soil	0.0-1.0	Macrocore			X	X			X	X						Congeners, dioxins, and furans will be analyzed on up to 2 samples if PCBs are detected in the TAL analysis.
SS-160	Soil	0.0-1.0	Macrocore			X	X			X	X						
SS-161	Soil	0.0-1.0	Macrocore			X	X			X	X						
SS-162	Soil	0.0-1.0	Macrocore			X	X			X	X						
SS-163	Soil	0.0-1.0	Macrocore			X	X			X	X						
SS-164	Soil	0.0-1.0	Macrocore			X	X			X	X						

Table 1
Sample Locations, Depths, and Analyses
Data Gaps Sampling and Analysis Plan
Rolling Knolls Landfill Superfund Site
Chatham, New Jersey

Sample ID	Sample Media	Depth Interval (Feet)	Sample Collection Method	Laboratory Analyses													Notes
				VOCs	SVOCs	SVOCs - SIM	PCBs (as Aroclors)	Pesticides	TAL Metals and Cyanide	PCB Congeners, Dioxins, Furans	Full TCL/TAL	TAL Metals and Cyanide (unfiltered)	TAL Metals and Cyanide (filtered)	Low-Level Mercury	Hardness	pH, TOC, Grain Size	
Temporary Monitoring Wells																	
TWP-1	Groundwater	TBD	Macrocore			X					X		X				
TWP-2	Groundwater	TBD	Macrocore			X					X		X				
TWP-3	Groundwater	TBD	Macrocore			X					X		X				
TWP-4	Groundwater	TBD	Macrocore			X					X		X				
TWP-5	Groundwater	TBD	Macrocore			x					X		X				
TWP-6	Groundwater	TBD	Macrocore			X					X		X				
TWP-7	Groundwater	TBD	Macrocore			X					X		X				
TWP-8	Groundwater	TBD	Macrocore			X					X		X				
TWP-9	Groundwater	TBD	Macrocore			X					X		X				
Permanent Monitoring Wells (Existing)																	
MW-1	Groundwater	14.5	Low flow			X					X		X				
MW-2	Groundwater	12.5	Low flow			X					X		X				
MW-3	Groundwater	12.5	Low flow			X					X		X				
MW-4	Groundwater	12.5	Low flow			X					X		X				
MW-5	Groundwater	12.5	Low flow			X					X		X				
MW-6	Groundwater	12.5	Low flow			X					X		X				
MW-7	Groundwater	12.5	Low flow			X					X		X				
MW-8	Groundwater	12.5	Low flow			X					X		X				
MW-9	Groundwater	12.5	Low flow			X					X		X				
MW-10	Groundwater	12.5	Low flow			X					X		X				
X-1	Groundwater	18	Low flow			X					X		X				

Table 1
Sample Locations, Depths, and Analyses
Data Gaps Sampling and Analysis Plan
Rolling Knolls Landfill Superfund Site
Chatham, New Jersey

Sample ID	Sample Media	Depth Interval (Feet)	Sample Collection Method	Laboratory Analyses													Notes
				VOCs	SVOCs	SVOCs - SIM	PCBs (as Aroclors)	Pesticides	TAL Metals and Cyanide	PCB Congeners, Dioxins, Furans	Full TCL/TAL	TAL Metals and Cyanide (unfiltered)	TAL Metals and Cyanide (filtered)	Low-Level Mercury	Hardness	pH, TOC, Grain Size	
X-2	Groundwater	20	Low flow			X					X		X				
X-3	Groundwater	23	Low flow			X					X		X				
X-4	Groundwater	15.5	Low flow			X					X		X				
X-5	Groundwater	13.2	Low flow			X					X		X				This well was not sampled during previous sampling activities due to a
X-6	Groundwater	13	Low flow			X					X		X				
X-7	Groundwater	8.7	Low flow			X					X		X				This well was not sampled during previous sampling activities due to a
Permanent Monitoring Wells (Proposed)																	
MW-11	Groundwater	TBD	Low flow			X					X		X				
MW-12	Groundwater	TBD	Low flow			X					X		X				
MW-13	Groundwater	TBD	Low flow			X					X		X				
MW-14	Groundwater	TBD	Low flow			X					X		X				
MW-15	Groundwater	TBD	Low flow			X					X		X				
MW-16	Groundwater	TBD	Low flow			X					X		X				
MW-17	Groundwater	TBD	Low flow			X					X		X				
Pore Water Samples																	
PW-1	Pore Water	0.0-0.5	PDB			X					X		X				
PW-2	Pore Water	0.0-0.5	PDB			X					X		X				
Surface Water Samples																	
SW-34	Surface Water	TBD	Teflon-lined bailer/direct dip			X					X		X	X	X		

Table 1
Sample Locations, Depths, and Analyses
Data Gaps Sampling and Analysis Plan
Rolling Knolls Landfill Superfund Site
Chatham, New Jersey

Sample ID	Sample Media	Depth Interval (Feet)	Sample Collection Method	Laboratory Analyses													Notes
				VOCs	SVOCs	SVOCs - SIM	PCBs (as Aroclors)	Pesticides	TAL Metals and Cyanide	PCB Congeners, Dioxins, Furans	Full TCL/TAL	TAL Metals and Cyanide (unfiltered)	TAL Metals and Cyanide (filtered)	Low-Level Mercury	Hardness	pH, TOC, Grain Size	
SW-35	Surface Water	TBD	Teflon-lined bailer/direct dip			X					X		X	X	X		
SW-36	Surface Water	TBD	Teflon-lined bailer/direct dip			X					X		X	X	X		
SW-37	Surface Water	TBD	Teflon-lined bailer/direct dip			X					X		X	X	X		
SW-38	Surface Water	TBD	Teflon-lined bailer/direct dip			X					X		X	X	X		
SW-39	Surface Water	TBD	Teflon-lined bailer/direct dip			X					X		X	X	X		
SW-40	Surface Water	TBD	Teflon-lined bailer/direct dip			X					X		X	X	X		
SW-41	Surface Water	TBD	Teflon-lined bailer/direct dip			X					X		X	X	X		
SW-42	Surface Water	TBD	Teflon-lined bailer/direct dip			X					X		X	X	X		
SW-43	Surface Water	TBD	Teflon-lined bailer/direct dip			X					X		X	X	X		
SW-44	Surface Water	TBD	Teflon-lined bailer/direct dip			X					X		X	X	X		

Table 1
Sample Locations, Depths, and Analyses
Data Gaps Sampling and Analysis Plan
Rolling Knolls Landfill Superfund Site
Chatham, New Jersey

Sample ID	Sample Media	Depth Interval (Feet)	Sample Collection Method	Laboratory Analyses													Notes
				VOCs	SVOCs	SVOCs - SIM	PCBs (as Aroclors)	Pesticides	TAL Metals and Cyanide	PCB Congeners, Dioxins, Furans	Full TCL/TAL	TAL Metals and Cyanide (unfiltered)	TAL Metals and Cyanide (filtered)	Low-Level Mercury	Hardness	pH, TOC, Grain Size	
Sediment Samples																	
SD-34	Sediment	0.0 - 1.0	Grab sample – Encore sampler			X					X					X	
SD-35	Sediment	0.0 - 1.0	Grab sample – Encore sampler			X					X					X	
SD-36	Sediment	0.0 - 1.0	Grab sample – Encore sampler			X					X					X	
SD-37	Sediment	0.0 - 1.0	Grab sample – Encore sampler			X					X					X	
SD-38	Sediment	0.0 - 1.0	Grab sample – Encore sampler			X					X					X	
SD-39	Sediment	0.0 - 1.0	Grab sample – Encore sampler			X					X					X	
SD-40	Sediment	0.0 - 1.0	Grab sample – Encore sampler			X					X					X	
SD-41	Sediment	0.0 - 1.0	Grab sample – Encore sampler			X					X					X	
SD-42	Sediment	0.0 - 1.0	Grab sample – Encore sampler			X					X					X	
SD-43	Sediment	0.0 - 1.0	Grab sample – Encore sampler			X					X					X	
SD-44	Sediment	0.0 - 1.0	Grab sample – Encore sampler			X					X					X	

Abbreviations:

VOCs = volatile organic compounds
SVOCs = semivolatile organic compound
PCBs = polychlorinated biphenyls
PDB = passive diffusion bag
TCL = Target Compound List
TOC = total organic carbon
TAL= Target Analyte List

Sample analyses will be conducted using the following analytical methods:
Target Compound List organics (VOCs, SVOCs, PCBs and pesticides) via SOM01.2, *Contract Laboratory Program (CLP Statement of Work for Organic An*
Target Analyte List metals and cyanide via ISM01.3, *CLP Statement of Work for Inorganic Analyses*
PCB Congeners via USEPA Method 1668A, *Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS*
Dioxins and furans via USEPA Method 1613, *Dioxins and Furans in Water, Soil, Sediment and Tissue by HRGC/HRMS.*
Low-level mercury via USEPA Method 1631, Revision E.
Hardness via SM 2340C.
pH via USEPA Method 9045D.
TOC via the Lloyd Kahn method.
Grain size via ASTM D-422.

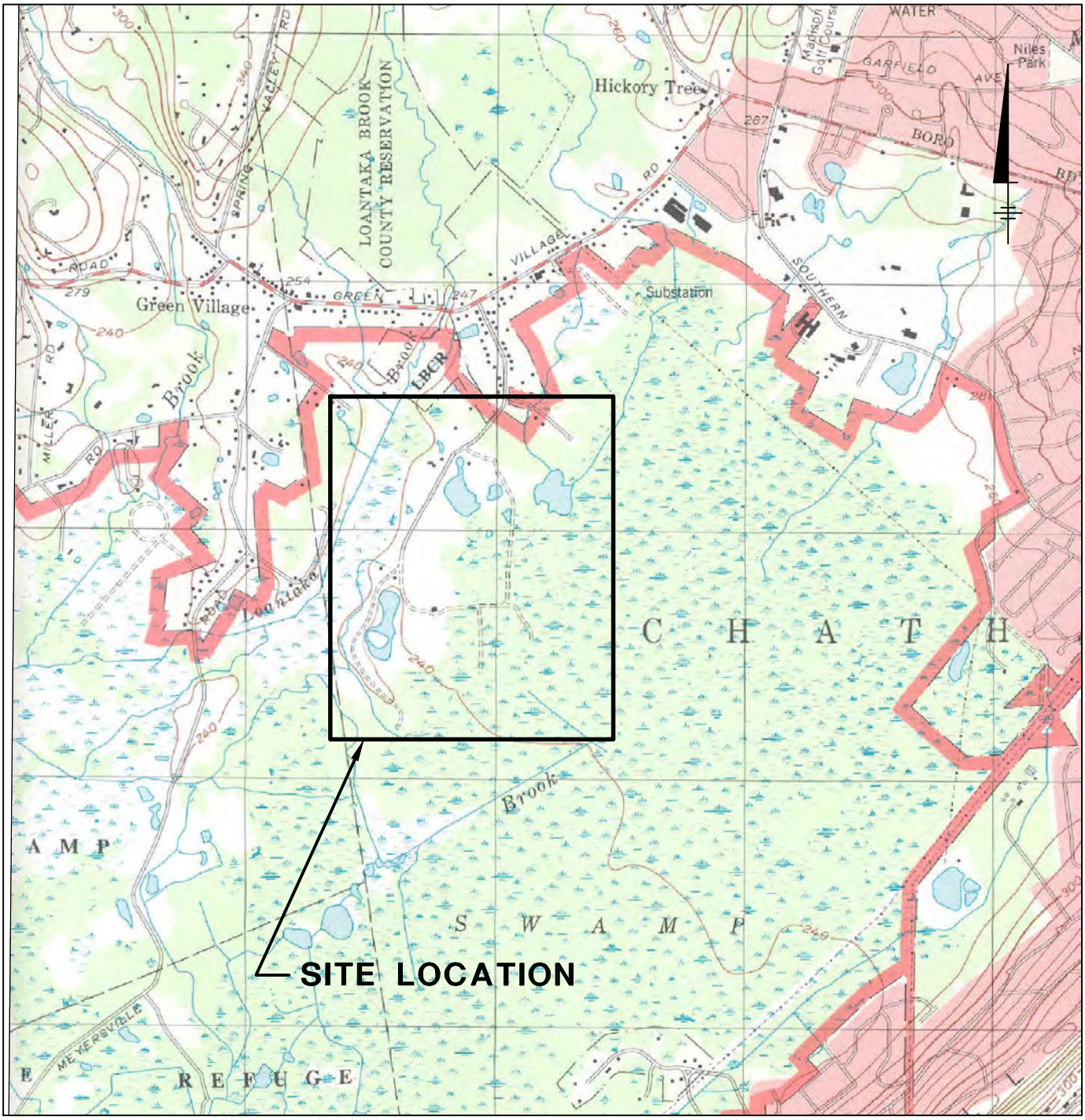
ATTACHMENTS

Attachment 1
QAPP WORKSHEET # 15a - VOCs
Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

		Soil/Sediment						Water			
Analyte (method)	**CAS Number**	**Sediment PAL (mg/kg)**	**Soil PAL (mg/kg)**	**DESA MDL (LOW) (mg/kg)**	**DESA RL (LOW) (mg/kg)**	**DESA MDL (MEDIUM)**	**DESA RL (MEDIUM) (mg/kg)**	**Surface Water PAL**	**Groundwater PAL (µg/L)**	**DESA TRACE MDL (µg/L)**	**DESA TRACE RL (µg/L)**
TCL - Volatiles (SOM01.2)											
1,1,1-Trichloroethane	71-55-6	0.213	0.005	0.70	5.00	13.600	250.00	76	30	0.30	0.5
1,1,2,2-Tetrachloroethane	79-34-5	0.850	0.127	0.50	5.00	8.800	250.00	4.7	1.0	0.20	0.5
1,1,2-Trichloro-1,2,2-	76-13-1	NA	NA	0.60	5.00	45.000	250.00	NA	5500	0.30	0.5
1,1,2-Trichloroethane	79-00-5	0.518	2.0	0.50	5.00	14.900	250.00	13	3.0	0.40	0.5
1,1-Dichloroethane	75-34-3	0.027	8.0	0.50	5.00	14.700	250.00	0.29	50	0.60	0.5
1,1-Dichloroethene	75-35-4	0.019	8.3	0.70	5.00	30.700	250.00	4.7	1.0	0.30	0.5
1,2,3-Trichlorobenzene	87-61-6	NA	20	0.80	5.00	24.700	250.00	NA	0.70	0.20	0.5
1,2,4-Trichlorobenzene	120-82-1	5.1	20	1.00	5.00	21.000	250.00	21	9.0	0.30	0.5
1,2-Dibromo-3-	96-12-8	NA	0.080	N/A	N/A	N/A	N/A	NA	0.02	N/A	N/A
1,2-Dibromoethane	106-93-4	NA	0.008	0.40	5.00	14.700	250.00	NA	0.03	0.30	0.5
1,2-Dichlorobenzene	95-50-1	0.294	3.0	0.80	5.00	13.000	250.00	14	600	0.20	0.5
1,2-Dichloroethane	107-06-2	0.260	0.90	0.70	5.00	12.800	250.00	0.29	2.0	0.30	0.5
1,2-Dichloropropane	78-87-5	0.333	2.0	0.40	5.00	6.800	250.00	0.50	1.0	0.20	0.5
1,3-Dichlorobenzene	541-73-1	1.3	38	0.70	5.00	11.000	250.00	38	600	0.20	0.5
1,4-Dichlorobenzene	106-46-7	0.318	20	0.60	5.00	12.500	250.00	9.4	75	0.20	0.5
1,4-Dioxane	123-91-1	NA	7.0	N/A	N/A	N/A	N/A	NA	0.78	N/A	N/A
2-Butanone	78-93-3	0.270	3100	1.10	10.00	28.500	500.00	14000	300	1.90	5.0
2-Hexanone	591-78-6	0.022	20	0.60	10.00	18.200	500.00	99	3.8	2.20	5.0
4-Methyl-2-pentanone	108-10-1	0.033	630	0.80	10.00	19.300	500.00	170	120	2.30	5.0
Acetone	67-64-1	0.009	70000	1.70	10.00	34.000	500.00	1500	6000	1.80	5.0
Benzene	71-43-2	0.142	0.26	0.60	5.00	8.700	250.00	0.15	1.0	0.30	0.5
Bromochloromethane	74-97-5	NA	15	0.80	5.00	23.400	250.00	NA	8.3	0.30	0.5
Bromodichloromethane	75-27-4	NA	0.54	0.50	5.00	16.500	250.00	0.55	1.0	0.20	0.5
Bromoform	75-25-2	0.492	16	0.80	5.00	13.000	250.00	4.3	4.0	0.30	0.5
Bromomethane	74-83-9	0.001	0.24	0.90	5.00	42.400	250.00	16	10	0.90	0.5
Carbon Disulfide	75-15-0	NA	7800	0.50	5.00	21.500	250.00	0.92	700	0.20	0.5
Carbon Tetrachloride	56-23-5	1.5	0.60	0.60	5.00	24.800	250.00	0.33	1.0	0.30	0.5
Chlorobenzene	108-90-7	0.291	13	0.70	5.00	9.600	250.00	47	50	0.30	0.5
Chloroethane	75-00-3	NA	220	0.90	5.00	35.600	250.00	NA	NA	0.30	0.5
Chloroform	67-66-3	0.121	0.60	0.60	5.00	19.900	250.00	68	70	0.30	0.5
Chloromethane	74-87-3	NA	4.0	0.80	5.00	13.700	250.00	NA	19	0.40	0.5
cis-1,2-Dichloroethene	156-59-2	NA	230	0.70	5.00	24.500	250.00	NA	70	0.30	0.5
cis-1,3-Dichloropropene	10061-01-	NA	2.0	0.40	5.00	15.900	250.00	0.34	1.0	0.20	0.5
Cyclohexane	110-82-7	NA	650	0.90	5.00	33.000	250.00	NA	1300	0.30	0.5
Dibromochloromethane	124-48-1	NA	2.1	0.30	5.00	17.800	250.00	0.40	1.0	0.30	0.5
Dichlorodifluoromethane	75-71-8	NA	490	N/A	N/A	N/A	N/A	NA	1000	N/A	N/A
Ethylbenzene	100-41-4	0.175	5.2	0.80	5.00	17.300	250.00	14	700	0.30	0.5
Isopropylbenzene	98-82-8	NA	NA	0.90	5.00	11.300	250.00	NA	NA	0.30	0.5
m,p-Xylene	108-38-3 /	NA	NA	N/A	N/A	N/A	N/A	NA	NA	N/A	N/A
Methyl Acetate	79-20-9	NA	78000	9.90	5.00	26.500	250.00	NA	7000	0.40	0.5
Methyl tert-Butyl Ether		NA	110	N/A	N/A	N/A	N/A	70	70	N/A	N/A
Methylcyclohexane	108-87-2	NA	NA	0.70	5.00	38.000	250.00	NA	NA	0.30	0.5
Methylene Chloride	75-09-2	0.159	4.1	N/A	N/A	N/A	N/A	2.5	3.0	N/A	N/A
o-Xylene	95-47-6	NA	65	0.80	5.00	13.500	250.00	NA	19	0.30	0.5
Styrene	100-42-5	0.254	4.7	0.60	5.00	13.800	250.00	32	100	0.30	0.5
Tetrachloroethene	127-18-4	1.0	2.0	0.50	5.00	13.100	250.00	0.34	1.0	0.30	0.5
Toluene	108-88-3	1.2	200	0.50	5.00	7.400	250.00	253	600	0.20	0.5
trans-1,2-Dichloroethene	156-60-5	0.654	0.78	0.80	5.00	13.000	250.00	590	100	0.30	0.5
trans-1,3-Dichloropropene	10061-02-	NA	2.0	0.80	5.00	15.800	250.00	0.34	1.0	0.20	0.5
Trichloroethene	79-01-6	0.112	7.0	N/A	N/A	N/A	N/A	1.0	1.0	N/A	N/A
Trichlorofluoromethane	75-69-4	NA	23000	0.60	5.00	39.500	250.00	NA	2000	0.30	0.5
Vinyl Chloride	75-01-4	0.202	0.65	N/A	N/A	N/A	N/A	0.08	1.0	N/A	N/A
Xylenes (Total)	1330-20-7	0.433	10	N/A	N/A	N/A	N/A	27	1000	N/A	N/A

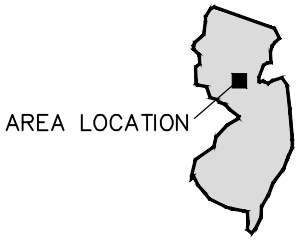
Notes:
Minimum screening levels for the respective medium were derived from the following EBSLs and human health criteria, in the following order
Sediment: NJDEP Ecological Screening Criteria; ORNL Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Sediment- Associated Biota (Jones et al. 1997
Soil: NJDEP Ecological Screening Criteria or NJ Soil Remediation Standards; USEPA (2014) Regional Screening Level (RSL) Residential Soil (Cancer Risk = 1x10-6; NonCancer Hazard = 0.1
Surface Water: NJ GWQC (Freshwater Chronic or Human Health Criteria); ORNL Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota (Suter and Tsao 1996
Groundwater: NJDEP Groundwater Qualtiy Standards N.J.A.C. 7:9C; USEPA (2014) Regional Screening Level (RSL) Tapwater (Cancer Risk = 1x10-6; NonCancer; Hazard = 0.1).
Additional screening levels may be included based on site characterization information.

µg/L - microgram per liter
EBSL - Ecologically-Based Screening Level
MDL - Method Detection Limit
mg/kg - milligram per kilogram
NA - Not Available
NJ GWQC - New Jersey Groundwater Quality Criteria
NJDEP - New Jersey Department of Environmental Protection
ORNL - Oak Ridge National Laboratory
RL - Reporting Limit
TCL - Target Compound List



SOURCE:
CHATHAM QUADRANGLE, NJ
7.5 MINUTE SERIES
CONTOUR INTERVAL 20 FEET

0 2000' 4000'
GRAPHIC SCALE



NEW JERSEY

ROLLING KNOLLS LANDFILL SUPERFUND SITE
CHATHAM, NEW JERSEY
DATA GAPS SAMPLING AND ANALYSIS PLAN

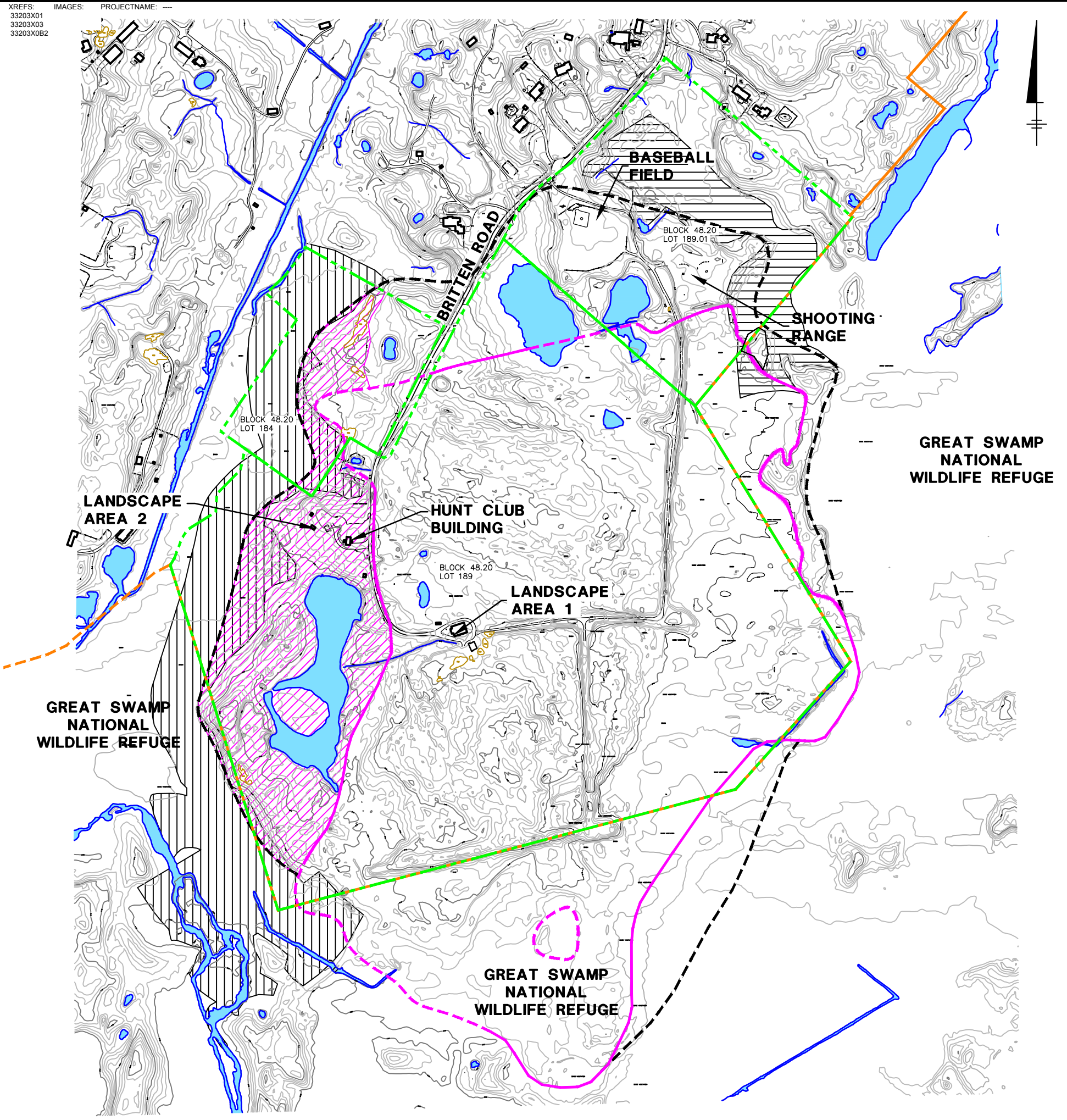
SITE LOCATION

ARCADIS

FIGURE
1

CITY: CRANBURY-NJ DIV/GROUP: ENVCAD DB: TFATTO LD: TFATTO PIC: PM: K.ROMAINE TM: K.ROMAINE LYR: ON=*;OFF=*REF*
G:\ENVCAD\CRANBURY\ACT\B0033203\0003\00110\33203N01.dwg LAYOUT: 1 SAVED: 9/16/2014 11:41 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/16/2014 11:41 AM BY: MEYER, JULIE
XREFS: IMAGES: 33203X01.jpg PROJECTNAME: ----

XREFS: IMAGES: PROJECTNAME: ----
33203X01
33203X03
33203X0B2



LEGEND:

- OPEN WATER
- PRE-REMEDIAL INVESTIGATION PROJECTED EDGE OF LANDFILLED MATERIALS
- EDGE OF LANDFILLED WASTES OBSERVED DURING TEST PIT ACTIVITIES (DASHED WHERE APPROXIMATE)
- GREAT SWAMP NATIONAL WILDLIFE REFUGE PROPERTY BOUNDARY (DASHED WHERE APPROXIMATE)
- TAX PARCELS
- WASTE AND DEBRIS OBSERVED ON GROUND SURFACE BUT NOT OBSERVED OR ANTICIPATED TO BE BELOW GROUND SURFACE
- POTENTIAL BOG TURTLE HABITAT AREA A (35.31 ACRES)
- POTENTIAL BOG TURTLE HABITAT AREA B (10.89 ACRES)

NOTES:

1. THE PRE-REMEDIAL INVESTIGATION PROJECTED EDGE OF LANDFILLED MATERIALS ON THIS FIGURE IS APPROXIMATE AS DRAWN AND IS BASED ON VISUAL OBSERVATIONS OF THE GROUND SURFACE MADE DURING SITE VISITS CONDUCTED JUNE 20, 2006 THROUGH JULY 14, 2006.
2. THE EDGE OF LANDFILLED WASTES OBSERVED DURING TEST PIT ACTIVITIES IS DRAWN BASED ON OBSERVATIONS OF MATERIALS EXCAVATED DURING TEST PIT ACTIVITIES CONDUCTED FROM JULY 26, 2007 TO SEPTEMBER 6, 2007 AND MARCH 26, 2008.
3. THE PORTION OF THE GREAT SWAMP NATIONAL WILDLIFE REFUGE (GSNWR) PROPERTY BOUNDARY ON THIS FIGURE WITHIN CHATHAM TOWNSHIP, NJ WAS OBTAINED FROM CHATHAM TOWNSHIP TAX PARCEL DATA PROVIDED BY CIVIL SOLUTIONS. THE PORTION OF THE GSNWR PROPERTY BOUNDARY ON THIS FIGURE OUTSIDE OF CHATHAM TOWNSHIP IS APPROXIMATE AND WAS OBTAINED FROM THE UNITED STATES FISH AND WILDLIFE SERVICE (GEOGRAPHIC INFORMATION SYSTEMS AND SPATIAL DATA).
4. BLOCK 48.20, LOTS 184 AND 189 ARE OWNED BY ROBERT J. MIELE AS TRUSTEE FOR THE TRUST CREATED BY THE LAST WILL AND TESTAMENT OF ANGELO J. MIELE. BLOCK 48.20, LOT 189.01 IS OWNED BY THE GREEN VILLAGE FIRE DEPARTMENT.

SOURCES:

1. BASEMAP FROM JAMES M. STEWART INC., LAND SURVEYORS, PHILADELPHIA, PA., (ELECTRONIC FILE: 292406.DWG DATED: 6/30/06)
2. TAX PARCEL DATA FOR CHATHAM TOWNSHIP WAS PROVIDED BY CIVIL SOLUTIONS.

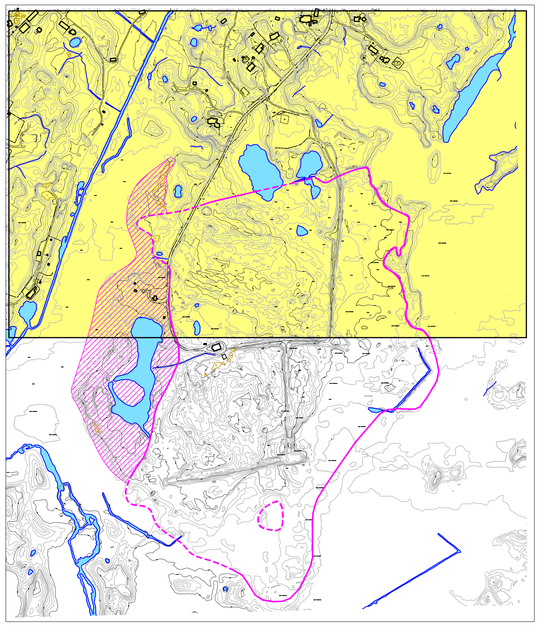
0 500' 1000'
GRAPHIC SCALE

ROLLING KNOLLS LANDFILL SUPERFUND SITE
CHATHAM, NEW JERSEY
DATA GAPS SAMPLING AND ANALYSIS PLAN

SITE PLAN

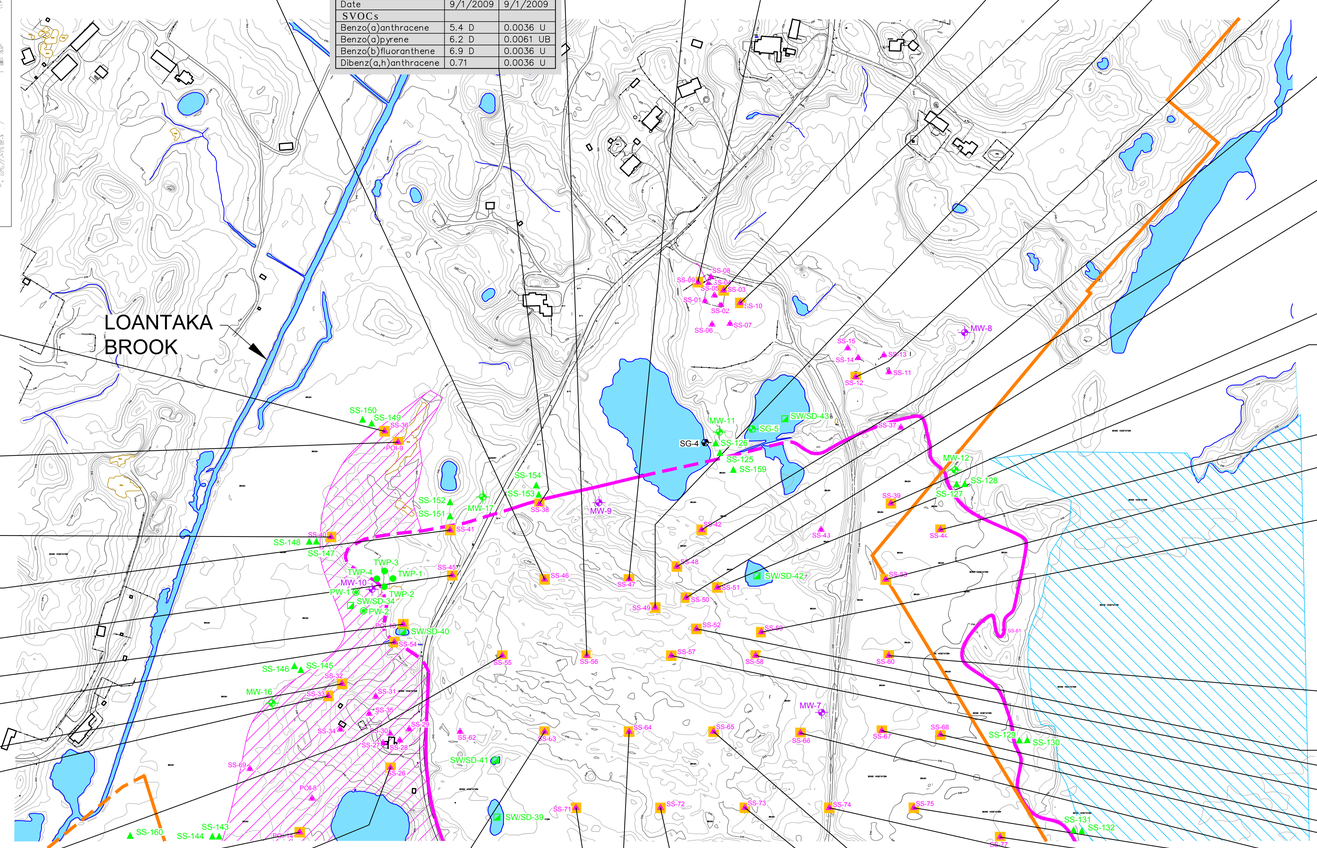
ARCADIS

FIGURE
2



SITE MAP

0 500' 1000'
GRAPHIC SCALE



SS-36	
Depth(Feet)	(0 – 1)
Date	8/31/2009
SVOCs	
Benzo(a)anthracene	2.2
Benzo(a)pyrene	2.3
Benzo(b)fluoranthene	3.1
Dibenz(a,h)anthracene	0.51 EJ
PCBs (Aroclors)	
Aroclor–1254	1.5 DJ
Total PCBs (Aroclors)	2.06 J
Metals	
Lead	2,910

SS-40	
Depth(Feet)	(0 – 1)
Date	8/31/2009
SVOCs	
Benzo(a)pyrene	0.25 J
PCBs (Aroclors)	
Aroclor–1254	1.3 D
Total PCBs (Aroclors)	1.56
Pesticides	
alpha–Chlordane	2.5 D
gamma–Chlordane	2.3 D
Metals	
Lead	825

POI-10	
Depth(Feet)	(0 – 1)
Date	8/26/2009
PCBs (Aroclors)	
Aroclor–1254	3.6 JN
Aroclor–1260	88 D
Total PCBs (Aroclors)	91.6 J
PCBs (Congeners)	
Total PCBs (Congeners)	2.05 J
Metals	
Copper	49,900 J
Lead	1,510 J

SS-32	
Depth(Feet)	(0 – 1)
Date	11/6/2007
SVOCs	
Benzo(a)pyrene	1 J

SS-55		
Depth(Feet)	(0 – 1)	(2 – 3)
Date	9/1/2009	9/1/2009
SVOCs		
Benzo(a)pyrene	0.3 J	0.17 J
PCBs (Aroclors)		
Aroclor–1248	1.5 DJ	0.049 U
Aroclor–1254	1.4 D	0.73
Total PCBs (Aroclors)	3.54 J	1.81
Metals		
Antimony	1,960 J	2.8 J
Arsenic	529 J	8.4 J
Lead	16,500	934

POI-9	
Depth(Feet)	(0 – 1)
Date	8/27/2009
SVOCs	
Benzo(a)anthracene	30 DJ
Benzo(a)pyrene	33 DJ
Benzo(b)fluoranthene	42 DJ
Benzo(k)fluoranthene	24 DJ
Dibenz(a,h)anthracene	5 J
Indeno(1,2,3–cd)pyrene	13 J
PCBs (Aroclors)	
Total PCBs (Aroclors)	1.97 J
Metals	
Lead	7,900 J

SS-41	
Depth(Feet)	(0 – 1)
Date	8/27/2009
SVOCs	
Benzo(a)pyrene	0.26

SS-45		
Depth(Feet)	(0 – 1)	(9 – 10)
Date	8/31/2009	8/31/2009
SVOCs		
Benzo(a)pyrene	0.77	0.006

SS-54	
Depth(Feet)	(0 – 1)
Date	8/31/2009
SVOCs	
Benzo(a)pyrene	0.22 [0.24]

SS-33	
Depth(Feet)	(0 – 1)
Date	11/6/2007
SVOCs	
Benzo(a)pyrene	0.39

POI-14	
Depth(Feet)	(0 – 1)
Date	8/24/2009
Metals	
Arsenic	31.7 J
Lead	9,210 J

SS-26	
Depth(Feet)	(0 – 1)
Date	11/5/2007
SVOCs	
Benzo(a)pyrene	0.23 J

SS-46		
Depth(Feet)	(0 – 1)	(6 – 7)
Date	9/1/2009	9/1/2009
SVOCs		
Benzo(a)pyrene	0.54 J	0.25 EJ
PCBs (Aroclors)		
Aroclor–1242	16 DJ	0.054 U
Aroclor–1254	12 DJ	1.2 D
Aroclor–1260	1.2 J	0.14
Aroclor–1268	2.8 J	0.067
Total PCBs (Aroclors)	32 J	2.03
PCBs (Congeners)		
Total PCBs (Congeners)	95 J	NA
Metals		
Arsenic	7 J	24.5 J
Lead	665	1,460

SS-56		
Depth(Feet)	(0 – 1)	(2 – 3)
Date	8/26/2009	8/26/2009
PCBs (Aroclors)		
Aroclor–1242	3 D	4.1 D
Aroclor–1254	7.2 D	4 D
Aroclor–1260	1.2	0.97
Total PCBs (Aroclors)	11.4	9.07
Pesticides		
Dieldrin	0.3 D	0.041 J
Metals		
Arsenic	14.6 J	20.6 J
Lead	2,060 J	1,120 J

SS-38		
Depth(Feet)	(0 – 1)	(9 – 10)
Date	9/1/2009	9/1/2009
SVOCs		
Benzo(a)anthracene	5.4 D	0.0036 U
Benzo(a)pyrene	6.2 D	0.0061 UB
Benzo(b)fluoranthene	6.9 D	0.0036 U
Dibenz(a,h)anthracene	0.71	0.0036 U

SS-47		
Depth(Feet)	(0 – 1)	(8 – 9)
Date	8/31/2009	8/31/2009
SVOCs		
Benzo(a)pyrene	0.2 J	0.21 J
PCBs (Aroclors)		
Aroclor–1254	3 D	0.61
Aroclor–1260	1.5 D	0.13
Total PCBs (Aroclors)	5.35	1.47 J
Metals		
Arsenic	23.1	5.5 J
Lead	7,140	835

SS-03	
Depth(Feet)	(0 – 1)
Date	9/19/2007
SVOCs	
Benzo(a)pyrene	0.92

SS-09	
Depth(Feet)	(0 – 1)
Date	9/20/2007
SVOCs	
Benzo(a)pyrene	1

SS-10	
Depth(Feet)	(0 – 1)
Date	9/20/2007
SVOCs	
Benzo(a)pyrene	0.74 D

SS-49	
Depth(Feet)	(0 – 1)
Date	8/31/2009
SVOCs	
Benzo(a)pyrene	1.7
Benzo(b)fluoranthene	2.4
Dibenz(a,h)anthracene	0.25 EJ
PCBs (Aroclors)	
Aroclor–1248	1.6 D
Aroclor–1254	2.7 D
Aroclor–1260	1.3 D
Total PCBs (Aroclors)	5.6
Metals	
Arsenic	21.1
Lead	1,010

SS-12	
Depth(Feet)	(0 – 1)
Date	9/20/2007
SVOCs	
Benzo(a)pyrene	0.77 D

SS-42	
Depth(Feet)	(0 – 1)
Date	8/28/2009
PCBs (Aroclors)	
Aroclor–1254	1.3 D
Total PCBs (Aroclors)	1.84

SS-48	
Depth(Feet)	(0 – 1)
Date	8/28/2009
SVOCs	
Benzo(a)pyrene	0.27 EJ
PCBs (Aroclors)	
Aroclor–1248	1.4 D
Aroclor–1254	2.4 D
Total PCBs (Aroclors)	4.4
Metals	
Lead	1,300

SS-50	
Depth(Feet)	(0 – 1)
Date	8/28/2009
PCBs (Aroclors)	
Aroclor–1254	2.3 D
Aroclor–1260	1.1
Total PCBs (Aroclors)	3.4
Metals	
Arsenic	19.1 J

SS-39	
Depth(Feet)	(0 – 1)
Date	9/16/2009
SVOCs	
Benzo(a)pyrene	0.41
PCBs (Aroclors)	
Aroclor–1242	6.1
Aroclor–1254	6.2
Total PCBs (Aroclors)	12.3
PCBs (Congeners)	
Total PCBs (Congeners)	100 J
Metals	
Lead	1,050

SS-51	
Depth(Feet)	(0 – 1)
Date	8/28/2009
SVOCs	
Benzo(a)pyrene	0.44
PCBs (Aroclors)	
Aroclor–1248	1.6 D
Aroclor–1254	3 D
Total PCBs (Aroclors)	5.45
Metals	
Lead	2,200

SS-44	
Depth(Feet)	(0 – 1)
Date	9/1/2009
PCBs (Aroclors)	
Aroclor–1254	1.1 D
Total PCBs (Aroclors)	1.83
Metals	
Lead	1,580

SS-53	
Depth(Feet)	(0 – 1)
Date	9/17/2009
SVOCs	
Benzo(a)pyrene	0.57
PCBs (Aroclors)	
Aroclor–1242	4.1
Aroclor–1254	5.6
Aroclor–1260	1.2
Total PCBs (Aroclors)	10.9
Metals	
Lead	1,110 J

SS-59	
Depth(Feet)	(0 – 1)
Date	8/27/2009
PCBs (Aroclors)	
Aroclor–1242	6.5 D
Aroclor–1254	2.7 D
Total PCBs (Aroclors)	10
Metals	
Lead	1,250 J

SS-60	
Depth(Feet)	(0 – 1)
Date	9/18/2009
PCBs (Aroclors)	
Aroclor–1248	1.2 J
Aroclor–1254	3.6 J
Aroclor–1260	1.2 J
Total PCBs (Aroclors)	6 J
Pesticides	
Dieldrin	0.29 DJ
Metals	
Lead	974

SS-52	
Depth(Feet)	(0 – 1)
Date	8/31/2009
SVOCs	
Benzo(a)anthracene	2.7
Benzo(a)pyrene	3.2 J
Benzo(b)fluoranthene	4.2 J
Dibenz(a,h)anthracene	0.58 EJ
PCBs (Aroclors)	
Aroclor–1242	9.4 D
Aroclor–1254	5.3 D
Total PCBs (Aroclors)	15.4
PCBs (Congeners)	
Total PCBs (Congeners)	12.4 J
Metals	
Lead	2,850

SS-58	
Depth(Feet)	(0 – 1)
Date	8/28/2009
PCBs (Aroclors)	
Aroclor–1248	67 D
Aroclor–1254	57 D
Aroclor–1260	1.7
Total PCBs (Aroclors)	126
PCBs (Congeners)	
Total PCBs (Congeners)	157 J
Pesticides	
Aldrin	0.27 DJN
Metals	
Lead	927

SS-57		
Depth(Feet)	(0 – 1)	(4 – 5)
Date	8/27/2009	8/27/2009
SVOCs		
Benzo(a)pyrene	2.3	0.38 J
Benzo(b)fluoranthene	3.6	0.58 J
Dibenz(a,h)anthracene	0.17 J	0.69 EJ
PCBs (Aroclors)		
Aroclor–1248	2.8 D	4.2 D
Aroclor–1254	2.7 DJN	4.6 D
Aroclor–1260	7 D	3.3 D
Total PCBs (Aroclors)	12.5 J	12.1
Pesticides		
Heptachlor epoxide	RX	0.33 DJN
Metals		
Lead	795 J	1,060 J

SS-68	
Depth(Feet)	(0 – 1)
Date	9/2/2009
SVOCs	
Benzo(a)pyrene	0.32 [0.18 EJ]
PCBs (Aroclors)	
Aroclor–1248	1.2 DJ [1.3 DJ]
Aroclor–1254	3.2 D [2.6 D]
Total PCBs (Aroclors)	4.99 J [4.41 J]
PCBs (Congeners)	
Total PCBs (Congeners)	4.91 J [9.46 J]
Metals	
Lead	1,320 [1,150]

SS-67	
Depth(Feet)	(0 – 1)
Date	9/3/2009
SVOCs	
Benzo(a)pyrene	0.49
PCBs (Aroclors)	
Total PCBs (Aroclors)	1.32 J
Metals	
Lead	1,580

SS-66	
Depth(Feet)	(0 – 1)
Date	8/28/2009
SVOCs	
Benzo(a)pyrene	0.28
PCBs (Aroclors)	
Aroclor–1248	15
Aroclor–1254	55 D
Aroclor–1260	8.1
Total PCBs (Aroclors)	78.1
PCBs (Congeners)	
Total PCBs (Congeners)	9.66 J
Metals	
Arsenic	21.9
Lead	2,100

SS-77	
Depth(Feet)	(0 – 1)
Date	9/17/2009
PCBs (Aroclors)	
Aroclor–1248	1.7
Total PCBs (Aroclors)	2.16 J

SS-75	
Depth(Feet)	(0 – 1)
Date	9/15/2009
PCBs (Aroclors)	
Aroclor–1248	1.3
Aroclor–1254	2.3
Total PCBs (Aroclors)	4.17
Metals	
Arsenic	32.3
Lead	1,360

SS-65		
Depth(Feet)	(0 – 1)	(5 – 6)
Date	8/27/2009	8/27/2009
SVOCs		
Acetophenone	18 D	0.05 J
Benzo(a)anthracene	66 D	0.86
Benzo(a)pyrene	51 D	0.88
Benzo(b)fluoranthene	49 D	1.2
Benzo(k)fluoranthene	51 D	1.3
Dibenz(a,h)anthracene	4.8 J	0.44 EJ
Indeno(1,2,3–cd)pyrene	12 J	0.15 J
PCBs (Aroclors)		
Aroclor–1242	0.065 U	4.2 DJ
Aroclor–1248	1.8 D	0.15 U
Aroclor–1254	1.5 DJ	3 D
Total PCBs (Aroclors)	3.68 J	7.73 J
Metals		
Lead	1,560 J	3,380 J

SS-72		
Depth(Feet)	(0 – 1)	(9 – 10)
Date	8/25/2009	8/25/2009
PCBs (Aroclors)		
Aroclor–1242	0.11 U	1.8
Aroclor–1248	2.5 D	0.11 U
Aroclor–1254	3.3 D	3.9 D
Total PCBs (Aroclors)	7.07 J	6.09
PCBs (Congeners)		
Total PCBs (Congeners)	8.65 J	NA
Metals		
Arsenic	26 J	12.6 J
Lead	1,750 J	950 J

SS-71	
Depth(Feet)	(0 – 1)
Date	8/26/2009
PCBs (Aroclors)	
Total PCBs (Aroclors)	1.1 J
Metals	
Lead	1,070 J
Vanadium	6,140

SS-63		
Depth(Feet)	(0 – 1)	(3.5 – 4.5)
Date	8/26/2009	8/26/2009
SVOCs		
Benzo(a)pyrene	0.26	0.19 EJ
PCBs (Aroclors)		
Aroclor–1242	0.24 U	2.8 D
Aroclor–1248	7.7 DJ	0.074 U
Aroclor–1254	5.3 DJ	4 D
Total PCBs (Aroclors)	13.9 J	7.44
PCBs (Congeners)		
Total PCBs (Congeners)	44.1 J	NA
Metals		
Arsenic	19.3 J	24.3 J
Lead	2,020 J	2,520 J

Nonresidential Soil Remediation Standards	
Constituent	Value
VOCs	
Carbon Tetrachloride	2
Chloroform	2
SVOCs	
Acetophenone	5
Benzo(a)anthracene	2
Benzo(a)pyrene	0.2
Benzo(b)fluoranthene	2
Benzo(k)fluoranthene	23
Dibenz(a,h)anthracene	0.2
Indeno(1,2,3–cd)pyrene	2
PCBs	
Aroclor–1242	1
Aroclor–1248	1
Aroclor–1254	1
Aroclor–1260	1
Aroclor–1262	1
Aroclor–1268	1
Total PCBs (Aroclors)	1
PCBs (Congeners)	
Total PCBs (Congeners)	1
Pesticides	
Aldrin	0.2
alpha–Chlordane	1
Dieldrin	0.2
gamma–Chlordane	1
Heptachlor	0.7
Heptachlor epoxide	0.3
Metals	
Antimony	450
Arsenic	19
Cadmium	78
Copper	45,000
Lead	800
Manganese	5,900
Mercury	65
Vanadium	1,100

SS-64		
Depth(Feet)	(0 – 1)	(5 – 6)
Date	8/27/2009	8/27/2009
SVOCs		
Dibenz(a,h)anthracene	0.21 EJ	0.49 EJ [0.36 EJ]
PCBs (Aroclors)		
Aroclor–1242	0.061 U	0.061 U [2.6 D]
Aroclor–1248	2.1 D	3.2 DJ [0.11 U]
Aroclor–1254	1.5 D	2.3 DJ [4.9 D]
Total PCBs (Aroclors)	3.99	6.32 J [8.24]
Metals		
Lead	1,930 J	1,020 J [1,130 J]

SS-73		
Depth(Feet)	(0 – 1)	(6 – 7)
Date	8/25/2009	8/25/2009
SVOCs		
Benzo(a)pyrene	0.12 EJ	0.24 J
PCBs (Aroclors)		
Aroclor–1242	0.11 U	1.7
Aroclor–1248	1.3	0.19 U
Aroclor–1254	2.5 D	1.3 J
Total PCBs (Aroclors)	4.49	3.16 J
Metals		
Lead	1,880 J	3,020 J

SS-74		
Depth(Feet)	(0 – 1)	(6 – 7)
Date	8/24/2009	8/24/2009
SVOCs		
Benzo(a)anthracene	1	2.2
Benzo(a)pyrene	1.1	2.7
Benzo(b)fluoranthene	1.2	3.8 D
Dibenz(a,h)anthracene	0.3 EJ	0.76 EJ
PCBs (Aroclors)		
Aroclor–1254	0.039 U	1.3 D
Total PCBs (Aroclors)	0.211 J	2.17

LEGEND:

- OPEN WATER
- EDGE OF LANDFILLED WASTES OBSERVED DURING TEST PIT ACTIVITIES (DASHED WHERE APPROXIMATE)
- GREAT SWAMP NATIONAL WILDLIFE REFUGE PROPERTY BOUNDARY (DASHED WHERE APPROXIMATE)
- WASTE AND DEBRIS OBSERVED ON GROUND SURFACE BUT NOT OBSERVED OR ANTICIPATED TO BE BELOW GROUND SURFACE
- AREAS WHERE SURFACE WATER FLOW DOES NOT EXHIBIT TYPICAL BED AND BANK MORPHOLOGY
- SOIL SAMPLING LOCATION
- SOIL SAMPLING LOCATION WITH DETECTED CONCENTRATIONS GREATER THAN NJDEP NONRESIDENTIAL SOIL REMEDIATION STANDARDS
- PROPOSED MONITORING WELL
- EXISTING MONITORING WELL
- PROPOSED TEMPORARY WELL POINT
- PROPOSED SOIL SAMPLE
- PROPOSED SURFACE WATER AND SEDIMENT SAMPLE
- PROPOSED POREWATER SAMPLE
- EXISTING STREAM GAUGE
- PROPOSED STREAM GAUGE

DATA NOTES:

UNITS = MILLIGRAMS PER KILOGRAM

[] = DUPLICATE SAMPLE

PCBS = POLYCHLORINATED BIPHENYLS

SVOCS = SEMIVOLATILE ORGANIC COMPOUNDS

VOCS = VOLATILE ORGANIC COMPOUNDS

NA = NOT ANALYZED

D = CONCENTRATIONS IDENTIFIED FROM ANALYSIS OF THE SAMPLE AT A SECONDARY DILUTION.

E = THE COMPOUND WAS QUANTITATED ABOVE THE CALIBRATION RANGE.

J = THE COMPOUND WAS POSITIVELY IDENTIFIED; HOWEVER, THE ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED CONCENTRATION ONLY.

JN = THE ANALYSIS INDICATES THE PRESENCE OF A COMPOUND FOR WHICH THERE IS PRESUMPTIVE EVIDENCE TO MAKE A TENTATIVE IDENTIFICATION. THE ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED CONCENTRATION ONLY.

U = THE COMPOUND WAS ANALYZED FOR BUT NOT DETECTED. THE ASSOCIATED VALUE IS THE COMPOUND QUANTITATION LIMIT.

RX = THE SAMPLE RESULTS ARE REJECTD DUE TO MATRIX INTERFERENCE.

NOTES:

1. ANALYTICAL RESULTS GIVEN IN MILLIGRAMS PER KILOGRAM FOR SOIL SAMPLES WITH DETECTED CONCENTRATIONS GREATER NEW JERSEY NONRESIDENTIAL SOIL REMEDIATION STANDARDS (DATED OCTOBER 2011).
2. THE EDGE OF LANDFILLED WASTES OBSERVED DURING TEST PIT ACTIVITIES IS DRAWN BASED ON OBSERVATIONS OF MATERIALS EXCAVATED DURING TEST PIT ACTIVITIES CONDUCTED FROM JULY 26, 2007 TO SEPTEMBER 6, 2007 AND MARCH 26, 2008.
3. THE PORTION OF THE GREAT SWAMP NATIONAL WILDLIFE REFUGE (GSNWR) PROPERTY BOUNDARY ON THIS FIGURE WITHIN CHATHAM TOWNSHIP, NJ WAS OBTAINED FROM CHATHAM TOWNSHIP TAX PARCEL DATA PROVIDED BY CIVIL SOLUTIONS. THE PORTION OF THE GSNWR PROPERTY BOUNDARY ON THIS FIGURE OUTSIDE OF CHATHAM TOWNSHIP IS APPROXIMATE AND WAS OBTAINED FROM THE UNITED STATES FISH AND WILDLIFE SERVICE (GEOGRAPHIC INFORMATION SYSTEMS AND SPATIAL DATA).
4. BLOCK 48.20, LOTS 184 AND 189 ARE OWNED BY ROBERT J. MIELE AS TRUSTEE FOR THE TRUST CREATED BY THE LAST WILL AND TESTAMENT OF ANGELO J. MIELE. BLOCK 48.20, LOT 189.01 IS OWNED BY THE GREEN VILLAGE FIRE DEPARTMENT.
5. THE EXTENT OF AREAS WHERE SURFACE WATER FLOW DOES NOT EXHIBIT TYPICAL BED AND BANK MORPHOLOGY IS BASED ON FIELD OBSERVATIONS MADE THROUGHOUT THE PERIOD OF INVESTIGATION ACTIVITIES. THE EXTENT OF THE AREA SHOWN IS APPROXIMATE.
6. ONLY SOIL ANALYTICAL RESULTS GREATER THAN NEW JERSEY NON–RESIDENTIAL SOIL REMEDIATION STANDARDS ARE POSTED.

SOURCES:

1. BASEMAP FROM JAMES M. STEWART INC., LAND SURVEYORS, PHILADELPHIA, PA., (ELECTRONIC FILE: 292406.DWG DATED: 6/30/06)
2. TAX PARCEL DATA FOR CHATHAM TOWNSHIP WAS PROVIDED BY CIVIL SOLUTIONS.

0 200' 400'
GRAPHIC SCALE

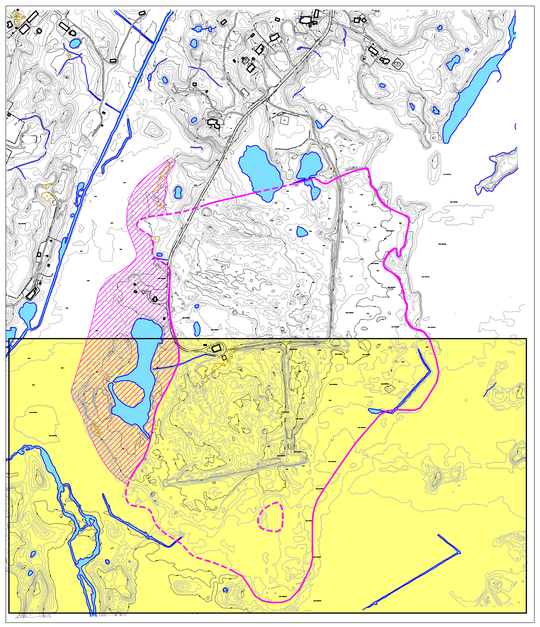
ROLLING KNOLLS LANDFILL SUPERFUND SITE
CHATHAM, NEW JERSEY
DATA GAPS SAMPLING AND ANALYSIS PLAN

PROPOSED SAMPLE LOCATIONS - NORTH

ARCADIS

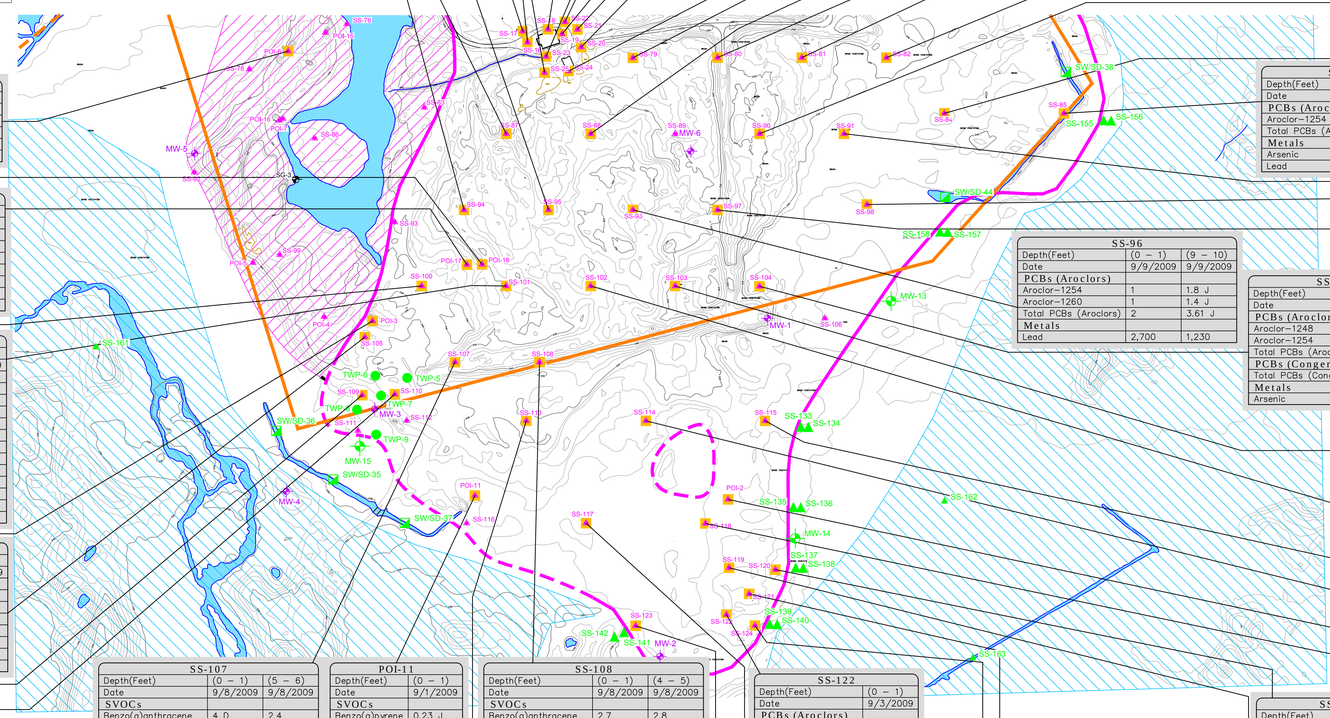
FIGURE
3a

CITY: CRANBURY-NJ DIVGROUP: ENVCAD DB: T.FATTO LD: T.FATTO PIC:(OK) PM: K.ROMAINE TM: L.HYATT LYR: ON=*;OFF=*REF*
G:\ENVCAD\CRANBURY\ACTIB\03320\03020\0011\B03320P03.DWG LAYOUT: 3A SAVED: 9/5/2014 9:52 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/16/2014 11:43 AM BY: MEYER, JULIE
XREFS: 33203X01 33203X03 IMAGES: PROJECTNAME: ----



SITE MAP

0 500' 1000'
GRAPHIC SCALE



SS-17	
Depth(Feet)	(0 – 1)
Date	11/2/2007
SVOCs	
Benzo(a)pyrene	1.2
Metals	
Lead	901 DJ

SS-16	
Depth(Feet)	(0 – 1)
Date	11/1/2007
SVOCs	
Benzo(a)pyrene	1.1 EJ

SS-25	
Depth(Feet)	(0 – 0.85)
Date	11/5/2007
SVOCs	
Benzo(a)pyrene	0.21

SS-18	
Depth(Feet)	(0 – 1)
Date	11/1/2007
SVOCs	
Benzo(a)pyrene	0.77 J

SS-23	
Depth(Feet)	(0 – 1)
Date	11/2/2007
SVOCs	
Benzo(a)pyrene	0.75

SS-22	
Depth(Feet)	(0 – 1)
Date	6/21/2007
SVOCs	
Benzo(a)anthracene	2.3 [3.3]
Benzo(a)pyrene	2.3 J [3.1]
Benzo(b)fluoranthene	3.3 J [4.5]

SS-19	
Depth(Feet)	(0 – 0.8)
Date	11/2/2007
SVOCs	
Benzo(a)anthracene	2.9
Benzo(a)pyrene	2.9
Benzo(b)fluoranthene	4.4
PCBs (Aroclors)	
Aroclor–1254	2.8 D
Total PCBs (Aroclors)	2.8
PCBs (Congeners)	
Total PCBs (Congeners)	6.41 J
Metals	
Lead	1,090 DJ

SS-21	
Depth(Feet)	(0 – 1)
Date	6/21/2007
SVOCs	
Benzo(a)anthracene	4.3
Benzo(a)pyrene	4.3 J
Benzo(b)fluoranthene	6.2 J
Indeno(1,2,3–cd)pyrene	2.6 J

SS-20	
Depth(Feet)	(0 – 1)
Date	11/2/2007
SVOCs	
Benzo(a)anthracene	2.7
Benzo(a)pyrene	2.4
Benzo(b)fluoranthene	3.4

SS-24	
Depth(Feet)	(0 – 1)
Date	11/5/2007
SVOCs	
Benzo(a)pyrene	0.65 J
PCBs (Aroclors)	
Aroclor–1248	2.6 D
Aroclor–1260	2.1 D
Total PCBs (Aroclors)	4.7
PCBs (Congeners)	
Total PCBs (Congeners)	6.89 J
Metals	
Lead	1,080 DJ

SS-79	
Depth(Feet)	(0 – 1)
Date	9/3/2009
PCBs (Aroclors)	
Aroclor–1254	2.7 J
Total PCBs (Aroclors)	4 J
Metals	
Lead	1,900

SS-88		
Depth(Feet)	(0 – 1)	(7 – 8)
Date	9/9/2009	9/9/2009
SVOCs		
Benzo(a)pyrene	0.51 J [0.72 J]	0.88 J
Dibenz(a,h)anthracene	0.21 EJ [0.54 EJ]	0.23 EJ
PCBs (Aroclors)		
Aroclor–1248	1.1 J [0.42 JN]	0.26 U
Aroclor–1254	4.8 J [2.4]	1.6
Total PCBs (Aroclors)	7.29 J [3.39 J]	2.01
Metals		
Arsenic	17.7 [19.8]	17.1
Lead	1,630 [2,370]	1,440

SS-95		
Depth(Feet)	(0 – 1)	(6 – 7)
Date	9/10/2009	9/10/2009
PCBs (Aroclors)		
Aroclor–1254	1.7 J	2.1
Total PCBs (Aroclors)	2.46 J	3.73 J
Metals		
Lead	1,550	1,110

SS-87		
Depth(Feet)	(0 – 1)	(6 – 7)
Date	9/10/2009	9/10/2009
SVOCs		
Benzo(a)pyrene	0.28	0.36
PCBs (Aroclors)		
Aroclor–1254	7.3 J	0.52 J
Aroclor–1260	1.4 J	0.23 J
Aroclor–1268	0.92 U	2.3 J
Total PCBs (Aroclors)	8.7 J	3.26 J
Metals		
Arsenic	22.6	28.2
Lead	1,640	886

SS-94		
Depth(Feet)	(0 – 1)	(9 – 10)
Date	9/9/2009	9/9/2009
SVOCs		
Benzo(a)pyrene	0.077 EJ	0.22 EJ
PCBs (Aroclors)		
Aroclor–1248	1.3 J	0.16 J
Aroclor–1254	2.9 J	0.38
Total PCBs (Aroclors)	5.03 J	0.67 J
Metals		
Arsenic	16.9	22.7
Lead	1,400	1,040

SS-80		
Depth(Feet)	(0 – 1)	(9 – 10)
Date	9/2/2009	9/2/2009
SVOCs		
Benzo(a)anthracene	11 D	5.1 D
Benzo(a)pyrene	11 D	5.8 D
Benzo(b)fluoranthene	13 DJ	6 D
Dibenz(a,h)anthracene	1.1 J	0.48 J
Indeno(1,2,3–cd)pyrene	2.5 J	1.5 J
PCBs (Aroclors)		
Aroclor–1254	0.32	1.5
Total PCBs (Aroclors)	0.407	3.18
Metals		
Lead	2,490	1,010

SS-81	
Depth(Feet)	(0 – 1)
Date	9/3/2009
PCBs (Aroclors)	
Aroclor–1242	0.6 U [3.1]
Aroclor–1248	1.7 J [0.6 U]
Aroclor–1254	5 [3.8]
Aroclor–1260	1.1 [0.87]
Total PCBs (Aroclors)	7.8 J [7.77]
Metals	
Lead	2,290 [3,190]

SS-90		
Depth(Feet)	(0 – 1)	(6 – 7)
Date	9/8/2009	9/8/2009
SVOCs		
Benzo(a)pyrene	0.082 J	0.49
PCBs (Aroclors)		
Aroclor–1242	2.4 U	1.3
Aroclor–1248	17 J	0.6 U
Aroclor–1254	12 J	2.3
Aroclor–1262	2.4 U	3.9
Total PCBs (Aroclors)	29 J	7.5
Metals		
Lead	1,540	1,620 J

SS-82	
Depth(Feet)	(0 – 1)
Date	9/3/2009
PCBs (Aroclors)	
Aroclor–1254	2.3
Total PCBs (Aroclors)	3.1 J
Metals	
Arsenic	22.4 J
Lead	4,010

SS-84	
Depth(Feet)	(0 – 1)
Date	9/2/2009
SVOCs	
Benzo(a)pyrene	0.47 J
PCBs (Aroclors)	
Aroclor–1254	9.4 D
Aroclor–1260	1.2
Total PCBs (Aroclors)	10.6
PCBs (Congeners)	
Total PCBs (Congeners)	125 J
Metals	
Lead	4,510

POI-6	
Depth(Feet)	(0 – 1)
Date	8/25/2009
SVOCs	
Benzo(a)pyrene	0.28 J
Metals	
Lead	2,570 J

POI-18	
Depth(Feet)	(5 – 6)
Date	1/14/2010
PCBs (Aroclors)	
Aroclor–1248	1.1 DJ
Aroclor–1254	2.5 D
Total PCBs (Aroclors)	4.07 J
Metals	
Arsenic	21.2 J
Lead	1,540

POI-17	
Depth(Feet)	(5 – 6)
Date	1/13/2010
PCBs (Aroclors)	
Aroclor–1254	2.1 D [3.1 D]
Aroclor–1260	3.2 D [0.86 J]
Total PCBs (Aroclors)	5.67 [5.15 J]
Metals	
Arsenic	41.9 J [57.7 J]
Lead	1,900 [1,940]

SS-85	
Depth(Feet)	(0 – 1)
Date	9/2/2009
PCBs (Aroclors)	
Aroclor–1254	2.2
Total PCBs (Aroclors)	3.74
Metals	
Arsenic	22.8 J
Lead	2,360

SS-91	
Depth(Feet)	(0 – 1)
Date	9/17/2009
SVOCs	
Benzo(a)pyrene	0.59
PCBs (Aroclors)	
Aroclor–1254	3.1
Total PCBs (Aroclors)	4.58 J

SS-100	
Depth(Feet)	(0 – 1)
Date	9/10/2009
PCBs (Aroclors)	
Aroclor–1254	2.6
Total PCBs (Aroclors)	4.06 J
Metals	
Lead	2,650

SS-101		
Depth(Feet)	(0 – 1)	(4 – 5)
Date	9/9/2009	9/9/2009
SVOCs		
Benzo(a)pyrene	0.21 EJ	0.16 J
PCBs (Aroclors)		
Aroclor–1242	1.4	0.63 U
Aroclor–1248	0.61 U	1.9 J
Aroclor–1254	4.4	3.4 J
Aroclor–1260	1.5	2.7 J
Total PCBs (Aroclors)	7.3	8 J
PCBs (Congeners)		
Total PCBs (Congeners)	10.6 J	NA
Metals		
Arsenic	19.5	13
Lead	1,380	3,010

SS-96		
Depth(Feet)	(0 – 1)	(9 – 10)
Date	9/9/2009	9/9/2009
PCBs (Aroclors)		
Aroclor–1254	1	1.8 J
Aroclor–1260	1	1.4 J
Total PCBs (Aroclors)	2	3.61 J
Metals		
Lead	2,700	1,230

SS-104	
Depth(Feet)	(0 – 1)
Date	9/2/2009
PCBs (Aroclors)	
Aroclor–1248	3.3 D
Aroclor–1254	1.9 D
Total PCBs (Aroclors)	5.57 J
PCBs (Congeners)	
Total PCBs (Congeners)	5.83 J
Metals	
Arsenic	22 J

SS-97		
Depth(Feet)	(0 – 1)	(6 – 7)
Date	9/4/2009	9/4/2009
SVOCs		
Benzo(a)pyrene	0.31 D	0.042 D
PCBs (Aroclors)		
Aroclor–1242	5.7	20 J
Aroclor–1254	10	4.8
Total PCBs (Aroclors)	15.7	24.8 J
PCBs (Congeners)		
Total PCBs (Congeners)	50.2 J	NA
Metals		
Arsenic	8.4 J	28.4 J
Lead	1,430	648

SS-98	
Depth(Feet)	(0 – 1)
Date	9/18/2009
PCBs (Aroclors)	
Aroclor–1248	2.4 J
Aroclor–1254	4.6
Total PCBs (Aroclors)	7.51 J
Metals	
Arsenic	25.7
Lead	2,710

POI-3		
Depth(Feet)	(0 – 1)	(0.5 – 1)
Date	8/25/2009	8/25/2009
VOCs		
Carbon Tetrachloride	NA	4.4
Chloroform	NA	4.5 D
SVOCs		
Benzo(a)pyrene	0.22 J	NA
Metals		
Arsenic	29.3 J	NA
Lead	1,720 J	NA
Manganese	13,600 J	NA
Mercury	85.1	NA

SS-105	
Depth(Feet)	(0 – 1)
Date	8/26/2009
PCBs (Aroclors)	
Aroclor–1248	4.6 D
Aroclor–1254	4.4 D
Total PCBs (Aroclors)	9.31
PCBs (Congeners)	
Total PCBs (Congeners)	22.7 J
Metals	
Lead	1,070 J

SS-103		
Depth(Feet)	(0 – 1)	(4 – 5)
Date	9/2/2009	9/2/2009
PCBs (Aroclors)		
Aroclor–1248	1.9 DJ	2.3 D
Aroclor–1254	3.1 D	4.1 D
Total PCBs (Aroclors)	5.55 J	7.01
Metals		
Arsenic	20.4 J	15 J
Cadmium	38.1 J	22,500 J
Lead	13,800	951

SS-102		
Depth(Feet)	(0 – 1)	(9 – 10)
Date	9/10/2009	9/10/2009
PCBs (Aroclors)		
Aroclor–1254	2.5	2.1
Total PCBs (Aroclors)	4.22 J	3.75
Metals		
Lead	1,870	4,700

SS-115	
Depth(Feet)	(0 – 1)
Date	9/14/2009
SVOCs	
Benzo(a)pyrene	1.5
Dibenz(a,h)anthracene	0.29 EJ
Metals	
Arsenic	33
Lead	6,170

SS-114	
Depth(Feet)	(0 – 1)
Date	9/14/2009
PCBs (Aroclors)	
Total PCBs (Aroclors)	1.17
Metals	
Lead	2,540

SS-110	
Depth(Feet)	(0 – 1)
Date	9/1/2009
SVOCs	
Benzo(a)pyrene	0.83
PCBs (Aroclors)	
Total PCBs (Aroclors)	1.28 J

SS-109	
Depth(Feet)	(0.5 – 1)
Date	8/31/2009
VOCs	
Chloroform	1,900 DJ

SS-107		
Depth(Feet)	(0 – 1)	(5 – 6)
Date	9/8/2009	9/8/2009
SVOCs		
Benzo(a)anthracene	4 D	2.4
Benzo(a)pyrene	3.6 D	2.7
Benzo(b)fluoranthene	4.2 D	3.1 D
Dibenz(a,h)anthracene	0.69 EJ	0.16 J
Metals		
Lead	792	1,070

POI-11	
Depth(Feet)	(0 – 1)
Date	9/1/2009
SVOCs	
Benzo(a)pyrene	0.23 J

SS-108		
Depth(Feet)	(0 – 1)	(4 – 5)
Date	9/8/2009	9/8/2009
SVOCs		
Benzo(a)anthracene	2.7	2.8
Benzo(a)pyrene	3.1	2.9
Benzo(b)fluoranthene	4.5 DJ	3.4 DJ
Dibenz(a,h)anthracene	0.27 J	0.24 J
PCBs (Aroclors)		
Aroclor–1254	0.29	2.5 DJ
Aroclor–1260	0.12	4.8 D
Total PCBs (Aroclors)	0.481	7.81 J
Metals		
Arsenic	9.8 J	28.3 J
Lead	6,270	3,340

SS-122	
Depth(Feet)	(0 – 1)
Date	9/3/2009
PCBs (Aroclors)	
Total PCBs (Aroclors)	1.28
Metals	
Lead	1,270

SS-120	
Depth(Feet)	(0 – 1)
Date	9/3/2009
PCBs (Aroclors)	
Aroclor–1254	1.8
Aroclor–1260	1.6
Total PCBs (Aroclors)	3.4
Metals	
Arsenic	25.3 J
Lead	1,310

POI-2	
Depth(Feet)	(0 – 1)
Date	9/3/2009
PCBs (Aroclors)	
Total PCBs (Aroclors)	2.18
Metals	
Lead	1,490

SS-113	
Depth(Feet)	(0 – 1)
Date	9/16/2009
PCBs (Aroclors)	
Aroclor–1254	1.4
Total PCBs (Aroclors)	2.29 J
PCBs (Congeners)	
Total PCBs (Congeners)	3.55
Metals	
Antimony	881 J
Arsenic	33.9
Lead	2,280

SS-117	
Depth(Feet)	(0 – 1)
Date	9/17/2009
PCBs (Aroclors)	
Aroclor–1254	1.8 J
Total PCBs (Aroclors)	2.66 J
Metals	
Arsenic	28.5
Lead	1,420 J

SS-121	
Depth(Feet)	(0 – 1)
Date	9/3/2009
PCBs (Aroclors)	
Aroclor–1254	1.7 J
Aroclor–1260	6.9 J
Total PCBs (Aroclors)	8.6 J
PCBs (Congeners)	
Total PCBs (Congeners)	12.3 J
Metals	
Arsenic	30.2 J
Lead	1,340

SS-123	
Depth(Feet)	(0 – 1)
Date	9/15/2009
PCBs (Aroclors)	
Aroclor–1254	1.3
Aroclor–1260	1.2
Total PCBs (Aroclors)	3.15
Metals	
Lead	1,370

SS-124	
Depth(Feet)	(0 – 1)
Date	9/15/2009
PCBs (Aroclors)	
Total PCBs (Aroclors)	1.48 J

SS-119	
Depth(Feet)	(0 – 1)
Date	9/3/2009
SVOCs	
Benzo(a)pyrene	1.5
Benzo(b)fluoranthene	3.2
Dibenz(a,h)anthracene	0.33 EJ
PCBs (Aroclors)	
Aroclor–1254	1.3
Total PCBs (Aroclors)	2.3
Pesticides	
Heptachlor	1.1 D
Metals	
Lead	1,070

SS-118	
Depth(Feet)	(0 – 1)
Date	9/15/2009
SVOCs	
Benzo(a)pyrene	0.4 D
PCBs (Aroclors)	
Aroclor–1242	11 J
Aroclor–1254	7.7 J
Aroclor–1260	4.3 J
Total PCBs (Aroclors)	23 J
Metals	
Lead	2,560

Nonresidential Soil Remediation Standards	
Constituent	Value
VOCs	
Carbon Tetrachloride	2
Chloroform	2
SVOCs	
Acetophenone	5
Benzo(a)anthracene	2
Benzo(a)pyrene	0.2
Benzo(b)fluoranthene	2
Benzo(k)fluoranthene	23
Dibenz(a,h)anthracene	0.2
Indeno(1,2,3–cd)pyrene	2
PCBs	
Aroclor–1242	1
Aroclor–1248	1
Aroclor–1254	1
Aroclor–1260	1
Aroclor–1262	1
Aroclor–1268	1
Total PCBs (Aroclors)	1
PCBs (Congeners)	
Total PCBs (Congeners)	1
Pesticides	
Aldrin	0.2
alpha–Chlordane	1
Dieldrin	0.2
gamma–Chlordane	1
Heptachlor	0.7
Heptachlor epoxide	0.3
Metals	
Antimony	450
Arsenic	19
Cadmium	78
Copper	45,000
Lead	800
Manganese	5,900
Mercury	65
Vanadium	1,100

LEGEND:

- OPEN WATER
- EDGE OF LANDFILLED WASTES OBSERVED DURING TEST PIT ACTIVITIES (DASHED WHERE APPROXIMATE)
- GREAT SWAMP NATIONAL WILDLIFE REFUGE PROPERTY BOUNDARY (DASHED WHERE APPROXIMATE)
- WASTE AND DEBRIS OBSERVED ON GROUND SURFACE BUT NOT OBSERVED OR ANTICIPATED TO BE BELOW GROUND SURFACE
- AREAS WHERE SURFACE WATER FLOW DOES NOT EXHIBIT TYPICAL BED AND BANK MORPHOLOGY
- SOIL SAMPLING LOCATION
- SOIL SAMPLING LOCATION WITH DETECTED CONCENTRATIONS GREATER THAN NJDEP NONRESIDENTIAL SOIL REMEDIATION STANDARDS
- PROPOSED MONITORING WELL
- EXISTING MONITORING WELL
- PROPOSED TEMPORARY WELL POINT
- PROPOSED SOIL SAMPLE
- PROPOSED SURFACE WATER AND SEDIMENT SAMPLE
- EXISTING STREAM GAUGE

DATA NOTES:

UNITS = MILLIGRAMS PER KILOGRAM

[] = DUPLICATE SAMPLE

PCBS = POLYCHLORINATED BIPHENYLS

SVOCS = SEMIVOLATILE ORGANIC COMPOUNDS

VOCS = VOLATILE ORGANIC COMPOUNDS

NA = NOT ANALYZED

D = CONCENTRATIONS IDENTIFIED FROM ANALYSIS OF THE SAMPLE AT A SECONDARY DILUTION.

E = THE COMPOUND WAS QUANTITATED ABOVE THE CALIBRATION RANGE.

J = THE COMPOUND WAS POSITIVELY IDENTIFIED; HOWEVER, THE ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED CONCENTRATION ONLY.

JN = THE ANALYSIS INDICATES THE PRESENCE OF A COMPOUND FOR WHICH THERE IS PRESUMPTIVE EVIDENCE TO MAKE A TENTATIVE IDENTIFICATION. THE ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED CONCENTRATION ONLY.

U = THE COMPOUND WAS ANALYZED FOR BUT NOT DETECTED. THE ASSOCIATED VALUE IS THE COMPOUND QUANTITATION LIMIT.

RX = THE SAMPLE RESULTS ARE REJECTD DUE TO MATRIX INTERFERENCE.

NOTES:

1. ANALYTICAL RESULTS GIVEN IN MILLIGRAMS PER KILOGRAM FOR SOIL SAMPLES WITH DETECTED CONCENTRATIONS GREATER NEW JERSEY NONRESIDENTIAL SOIL REMEDIATION STANDARDS (DATED OCTOBER 2011).
2. THE EDGE OF LANDFILLED WASTES OBSERVED DURING TEST PIT ACTIVITIES IS DRAWN BASED ON OBSERVATIONS OF MATERIALS EXCAVATED DURING TEST PIT ACTIVITIES CONDUCTED FROM JULY 26, 2007 TO SEPTEMBER 6, 2007 AND MARCH 26, 2008.
3. THE PORTION OF THE GREAT SWAMP NATIONAL WILDLIFE REFUGE (GSNWR) PROPERTY BOUNDARY ON THIS FIGURE WITHIN CHATHAM TOWNSHIP, NJ WAS OBTAINED FROM CHATHAM TOWNSHIP TAX PARCEL DATA PROVIDED BY CIVIL SOLUTIONS. THE PORTION OF THE GSNWR PROPERTY BOUNDARY ON THIS FIGURE OUTSIDE OF CHATHAM TOWNSHIP IS APPROXIMATE AND WAS OBTAINED FROM THE UNITED STATES FISH AND WILDLIFE SERVICE (GEOGRAPHIC INFORMATION SYSTEMS AND SPATIAL DATA).
4. BLOCK 48.20, LOTS 184 AND 189 ARE OWNED BY ROBERT J. MIELE AS TRUSTEE FOR THE TRUST CREATED BY THE LAST WILL AND TESTAMENT OF ANGELO J. MIELE. BLOCK 48.20, LOT 189.01 IS OWNED BY THE GREEN VILLAGE FIRE DEPARTMENT.
5. THE EXTENT OF AREAS WHERE SURFACE WATER FLOW DOES NOT EXHIBIT TYPICAL BED AND BANK MORPHOLOGY IS BASED ON FIELD OBSERVATIONS MADE THROUGHOUT THE PERIOD OF INVESTIGATION ACTIVITIES. THE EXTENT OF THE AREA SHOWN IS APPROXIMATE.
6. ONLY SOIL ANALYTICAL RESULTS GREATER THAN NEW JERSEY NON–RESIDENTIAL SOIL REMEDIATION STANDARDS ARE POSTED.

SOURCES:

1. BASEMAP FROM JAMES M. STEWART INC., LAND SURVEYORS, PHILADELPHIA, PA., (ELECTRONIC FILE: 292406.DWG DATED: 6/30/06)
2. TAX PARCEL DATA FOR CHATHAM TOWNSHIP WAS PROVIDED BY CIVIL SOLUTIONS.

0 200' 400'
GRAPHIC SCALE

ROLLING KNOLLS LANDFILL SUPERFUND SITE
CHATHAM, NEW JERSEY
DATA GAPS SAMPLING AND ANALYSIS PLAN

PROPOSED SAMPLE LOCATIONS - SOUTH

ARCADIS

FIGURE
3b

CITY: CRANBURY,NJ DIV/GROUP: ENVCAD DB: T.FATTO LD: T.FATTO PIC: (0pt) PM: K.ROMAINE TM: L.HYATT LYR: ON=*;OFF=*REF*
G:\ENVCAD\CRANBURY\ACT\B0033203\0003\00110\B0033203P04.DWG LAYOUT: 3B SAVED: 9/5/2014 9:33 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/16/2014 11:44 AM BY: MEYER, JULIE
XREFS: 33203X01 33203X03 IMAGES: PROJECTNAME: ----

ARCADIS U.S., Inc.
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Tel 609 860 0590
Fax 609 860 0491

MEMO

To:
Tanya Mitchell
United States Environmental Protection Agency

Copies:
John Persico

From:
Suzy Walls

Date:
October 15, 2014

ARCADIS Project No.:
B0033203.0004

Subject:
USEPA Comments dated October 9, 2014 on the Data Gaps Sampling and Analysis Plan and Quality Assurance Project Plan
Rolling Knolls Landfill Superfund Site, Chatham, New Jersey

This memorandum is a summary of the conference call on October 15, 2014 to discuss USEPA's comments (dated October 9, 2014) on the Data Gaps Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) for the Rolling Knolls Landfill Superfund Site in Chatham, New Jersey. The call was attended by:

- Tanya Mitchell, United States Environmental Protection Agency (USEPA);
- Michael Sivak, USEPA;
- Michael Clemetson, USEPA;
- Juan Fajardo, USEPA
- Paul Hagerman (CDM Smith);
- Joe Button (CDM Smith);
- Richard Ricci, Lowenstein Sandler LLP;
- Mickey Faigen, Issues, LLC;
- Andrew Gutherz, ARCADIS;
- John Persico, ARCADIS; and
- Suzy Walls, ARCADIS.

During the call, John Persico (ARCADIS) lead the discussion of general and specific comments from the USEPA's comment letter as discussed below. USEPA also reiterated the need to have USEPA counsel present if the Settling Parties' counsel would be present.

General Comment 4: ARCADIS asked for clarification on which data USEPA would like to have in the Electronic Data Deliverable (EDD) format. USEPA clarified that beginning now, with the data gaps sampling, and moving forward, all data collected for the site must be submitted to the USEPA in the EDD format. Data previously collected for the Site Characterization Summary Report would not be submitted as part of this request. ARCADIS agreed to submit these deliverables moving forward.

Specific Comment 2: ARCADIS asked for clarification on the inclusion of the reference to New Jersey Department of Environmental Protection (NJDEP) Technical Requirements for Site Remediation, given that these have not been required by USEPA and have not been used during the site evaluations thus far. USEPA stated that this comment was only in regards to the current phase of sampling and would not open the door to applying these guidelines to previous phases of investigation at the site. ARCADIS asked if the comment could be reworded to include a specific request, such as needing vertical delineation in site boundary samples. USEPA stated that in general NJDEP regulations would need to be met, but that ARCADIS could submit a proposed response to the comment that USEPA would review and that they would also confer with NJDEP.

Specific Comment 5: ARCADIS requested that “approximately 200-acre” be removed from the revised site description due to the inconsistency in the paragraph when the landfill was later referred to as “approximately 170 acres.” USEPA instead suggested that the paragraph be revised to remove the latter size reference of 170 acres. ARCADIS agreed to revise accordingly.

Specific Comment 9: ARCADIS reviewed their understanding of the permit equivalency process, which included revisiting areas of the site where work is currently proposed and filling out the proper permit equivalency forms. These forms were sent to the property owners for their review and signature and will be sent to NJDEP; however, NJDEP would not need to issue permits prior to the start of work. USEPA agreed that this process was also their understanding of the permit equivalency process but that this comment was sent from the NJDEP. USEPA agreed to contact NJDEP for clarification of this request and instructed ARCADIS to respond with the proposed approach stated above.

Specific Comment 10: ARCADIS asked for clarification on the request for vertical delineation of the proposed surface soil samples, given that the current samples were proposed for use in the risk assessments which only require surface evaluations for the identified receptors. Contrary to that objective, NJDEP guidance requires delineation to any depth necessary. USEPA requested a written explanation to the response for why vertical delineation was not necessary for this sampling.

ARCADIS also asked for clarification on the request for full Target Compound List (TCL)/Target Analyte List (TAL) parameters for all surface soil samples proposed. ARCADIS explained that the analyses chosen for each sample were based on historical sample results in each of those areas and that step-out samples would not require the full TCL/TAL list. USEPA acknowledged the reasoning but felt that full TCL/TAL parameters were required given the inconsistent occurrence of constituents in surface soil at the

site. USEPA did not agree that reducing the list of analytes based on previous sample results was appropriate at this time.

Specific Comment 15: ARCADIS asked for clarification on the request for full TCL/TAL parameters for all temporary wells, given that these temporary wells were in very close proximity to one another and were being installed specifically to evaluate volatile organic compound (VOC) and metal concerns in MW-3 and MW-10. Further, ARCADIS stated that these wells were intended to be used for screening, were not meant for delineation and that permanent wells would be placed in these areas for future monitoring if USEPA felt TCL/TAL parameters were necessary in these areas. USEPA acknowledged the reasoning but felt that full TCL/TAL parameters were required given the extended time since the last round of groundwater data and the potential for constituents other than VOCs and metals to have migrated into groundwater. USEPA did not agree that targeting the list of analytes was appropriate at this time.

Specific Comment 16: ARCADIS asked for clarification on the request for full TCL/TAL parameters for the proposed porewater samples, given that the samples were only being collected to evaluate VOC and metal concerns in MW-3 and MW-10, and that these samples were not meant for delineation purposes. ARCADIS also raised the concern of finding suitable membranes for all of the TCL/TAL parameters, specifically polychlorinated biphenyls (PCBs), pesticides, and semi-volatile organic compounds (SVOCs), and for collecting enough volume to accommodate all of the analyses. USEPA did not agree that targeting the list of analytes was appropriate at this time; however, they acknowledged the concerns of finding a suitable membrane for the passive sampling and asked that ARCADIS look into the possible membranes. In the event an appropriate membrane could be found, USEPA requested collection of porewater in the following sequence: VOCs, PCBs, pesticides, SVOCs, and metals. If a suitable membrane cannot be identified, USEPA acknowledged that the analyses may be limited.

Specific Comment 20: ARCADIS asked for clarification on USEPA's proposed schedule change from 30 days between rounds of groundwater sampling to potentially 90 days or more to capture wet season and dry season conditions. While ARCADIS was not opposed to this change, we believe the extra time would not significantly change the outcome of the sampling but would add an additional delay in the schedule. USEPA did not believe that extending the time between sampling would drastically alter the overall schedule given that groundwater sampling was unlikely to delay biota sampling, which would also be occurring at the site.

ARCADIS also asked for clarification on the request for a second round of complete sampling from the existing monitoring wells on-site. USEPA explained that without sufficient groundwater data, monitored natural attenuation (MNA) could not be considered as a possible remedy during the feasibility study. ARCADIS asked if this second round of sampling would also require the full TCL/TAL parameters and USEPA confirmed that the full suite of constituents would be required. USEPA suggested that the Settling Parties review the requirements needed for each potential alternative that they would consider during the feasibility study. ARCADIS asked where those requirements were listed and USEPA said they could be

found online, along with the New Jersey requirements for MNA remedies. ARCADIS stated that previous New Jersey projects required 8 rounds of groundwater monitoring prior to MNA remedies; however, USEPA said that in some cases fewer round of monitoring may be required if adequate trends or patterns could be demonstrated. USEPA stated that MNA closures were receiving higher scrutiny at USEPA at this time and reiterated that adequate rounds groundwater data would be needed to consider MNA as a potential remedy. ARCADIS asked if other data would also be required, including specific geochemistry data. USEPA stated that geochemistry data, along with a number of other types of data and trends, would be required.

Appendices