REGION 2 RAC2 CONTRACT

GENERIC QUALITY ASSURANCE PROJECT PLAN

FOR SUPERFUND SITES

Select from list below the type of study being performed:

Remedial Investigation/Feasibility Study
Remedial Design
Remedial Action
Remedial Investigation/Feasibility Study Oversight
Remedial Design Oversight
Remedial Action Oversight

[Site Location, State]

[redacted]

January 28, 2009

Prepared for:
U.S. Environmental Protection Agency
290 Broadway, New York, NY 10007-1866

Prepared by:

[redacted]

TABLE OF CONTENTS

Literature Cited **TBD**

The following items are not included in this generic QAPP - To be included in Project-specific QAPPs

List of Appendices

Appendix A – Tables, Site Maps, and Figures and applicable excerpts from Work Plan

Figures *Site Location*
Figures *Site Plan*
Figures *Proposed Sampling Locations for each matrix -*
Figures *Schedule*

Appendix B *Project-Specific Low Flow Groundwater Purging and Sampling*
Appendix C [redacted]*Technical Standard Operating Procedures*

1-1 *Surface Water Sampling*
1-2 *Sample Custody**
1-3 *Surface Soil Sampling**
1-4 *Subsurface Soil Sampling**
1-6 *Water Level Measurement*
1-9 *Tap Water Sampling**
1-10 *Field Measurement of Organic Vapors*
1-11 *Sediment/Sludge Sampling**
2-1 *Packaging and Shipping of Environmental Samples**
2-2 *Guide to Handling of Investigation Derived Waste*
3-1 *Geoprobe® Sampling*
3-2 *Topographic Survey*
3-4 *Geophysical Logging, Calibration, and Quality Control*
3-5 *Lithologic Logging*
4-1 *Field Logbook Content and Control**
4-2 *Photographic Documentation of Field Activities*
4-3 *Well Development and Purging**
4-4 *Design and Installation of Monitoring Wells in Aquifers**
4-8 *Environmental Data Management*
4-10 *Borehole and Well Decommissioning*
5-1 *Control of Measurement and Test Equipment**

** RAC II Contract-Specific Clarification (to be included in project-specific QAPPs)*

Appendix C HACH Kit Test Procedures for Field Sampling
Appendix D [redacted]DV SOP 029A, Revision 0
Appendix F Field Forms (Examples):
Daily Quality Control Report
ANSETS Form
Cooler Return Form

Acronyms – Generic List

AA	atomic absorption
ABS	absolute difference
A-E	architect -engineer
AES	atomic emission spectrophotometry
Ag	silver
ANSETS	Analytical Services Tracking System
AOC	area of concern
ASC	analytical services coordinator
AVS	acid volatile sulfide
bgs	below ground surface
BOA	basic ordering agreement
BOD	biological oxygen demand
BS	Bachelor of Science
C	Celsius
CA	corrective action
CAS	Chemical Abstract Service
CCV	continuing calibration verification
CD	compact disk
[redacted]	[redacted]
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHMM	Certified Hazardous Materials Manager
CIH	certified industrial hygienist
CLP	contract laboratory program
COC	chain of custody
COD	chemical oxygen demand
CQM	certified quality manager
[redacted]	[redacted]
CRQL	contract required quantitation limits
CSP	certified safety professional
DEE	Diplomate Environmental Engineer
DESA	Division of Environmental Science and Assessment
DO	dissolved oxygen
DQI	data quality indicators
DV	data validation
DMC	deuterated monitoring compound
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
EQL	estimated quantitation limit
eV	electron volt
FAR	Federal Acquisition Regulations
FASTAC	Field and Analytical Services Teaming Advisory Committee
FID	flame ionization detector
FFS	focused feasibility study
FTL	field team leader

[redacted]

GC/ECD	gas chromatograph / electron capture detector
GC/MS	gas chromatograph / mass spectroscopy
GW	groundwater
GWS	groundwater sampling event
H&S	health and safety
HSM	health and safety site manager
HASP	Health and Safety Plan
HDPE	high density polyethylene
ICP	inductively coupled plasma
ID	identification
IR	infra-red
L	liter
LAN	local area network
LCS	laboratory control samples
LCSD	laboratory control sample duplicates
MCAWW	Method for Chemical Analysis of Water and Wastes
MDL	minimum detection limit
mg/L	milligrams per liter
mL	milliliter
MMH	monomethyl hydrazine
MPC	measurement performance criteria
MW	monitoring well
MS	mass spectrophotometer
MS/ MSD	matrix spikes /matrix spike duplicates
NA	not applicable
NEIC	National Enforcement Investigations Center
NJDEP	New Jersey Department of Environmental Protection
NYSDEC	New York State Department of Enviironmental Conservation
O&M	operation and maintenance
OU	operable unit
%	percent
%D	percent difference
%R	percent recovery
P	total phosphorus
PAL	project action limit
PC	personal computer
PCB	polychlorinated biphenyls
PCE	tetrachloroethene
PE	professional engineer
PID	photo-ionization detector
PM	project manager
ppbv	parts per billion by volume
ppm	parts per million
PQL	project quantitation limit
PQLG	project quantitation limit goal
PQO	project quality objective

PREQB	Puerto Rico Environmental Quality Broad
PRP	potentially responsible party
PTFE	polytetrafluoroethylene
PVC	polyvinyl chloride
QA	quality assurance
QAC	quality assurance coordinator
QAPP	quality assurance project plan
QC	quality control
QL	quantitation limit
%R	percent recovery
RA	remedial action
RAS	routine analytical services
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation/feasibility study
RL	reporting limit
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
SA	self assessment
S&A	sampling and analytical
Sb	antimony
SEM	simultaneously extracted metals
SIM	simultaneous ion monitoring
SOP	standard operating procedure
SOW	scope of work
SSHO	site health and safety officer
SVOC	semivolatile organic compound
TAL	target analyte list
TBD	to be determined
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characterization leaching procedure
TDS	total dissolved solids
TSS	total suspended solids
TICs	tentatively identified compounds
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TSOP	Technical Standard Operating Procedure
µg	microgram
µg/kg	microgram per kilogram
µg/L	microgram per liter
UDMH	unsymmetrical dimethyl hydrazine

VOC	volatile organic compound
VTSR	verified time of sample receipt
°C	degrees Celsius
%D	percent difference

INSTRUCTIONS FOR USE OF THIS RAC2 CONTRACT GENERIC QAPP:

The purpose of the QAPP is to document the scientific basis of the investigation including why the work is being done, what is planned, the objectives, the intended use of the data collected, and the tools for QA oversight and reconciliation of planned objectives and the investigation results. The QAPP should provide sufficient information and detail so the investigation can proceed without the planning team.

The Generic QAPP worksheets included herein provide general project procedures and requirements for field investigation, sampling, and quality assurance/quality control (QA/QC) for field investigations. It should be noted that project action limits for surface water and sediment samples have not been included in this version. Future updates will include this information. The official approved Generic QAPP will be maintained in the RAC II Document Files and an electronic copy will be kept on the New York office server.

Prior to commencing field investigation activities a project-specific QAPP shall be prepared using the Generic QAPP worksheets as a template. A complete document, including all worksheets, is to be submitted for each project. Text in italics is intended to draw the attention of the QAPP preparer and must be amended to create a project-specific document.

Project-specific QAPP worksheets shall provide information on project stakeholders, contacts, background and history, problem summary, objectives, sampling design and rationale, sampling methods and locations (including maps and figures), analytical methods and other site-specific information unique to each work assignment.

The user is instructed to read the QAPP in entirety to ensure that the information in the project-specific QAPP is applicable to the objectives of the work assignment.

For example, Worksheets #12, #15, and #28 will need to include only those pages or columns for which a particular method or method option and matrix is needed. Information irrelevant to the project should be removed. Users must pay attention to formulas in worksheet #15 and check that the standards and criteria being referenced is the most current.

Also, some analytical worksheets have a range of measurement performance criteria. The project chemist or QAPP preparer must select the criteria suitable for the purpose and objectives of the project task.

Information on project geology or site investigation history and associated standard operating procedures (SOPs), field forms, figures and tables shall be appended to project-specific QAPPs.

The project-specific QAPP preparer in consultation with the project team will be responsible for determing the information to be included in the QAPP and to ensure that the document is accurate and complete.

1.0 Introduction

Include here information on receipt of the work assignment and contract under which the work is being performed. Describe the task/and nature of the assignment, i.e., Remedial Investigation/Feasibility Study (RI/FS), Remedial Design or Remedial action and whether this is an oversight assignment. Describe the operable unit and a brief summary of the site from the scope of work.

This generic/project-specific QAPP has been 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). This project will be implemented in accordance with the quality procedures in [redacted] QA Manual [redacted] and this QAPP. This QAPP, *and any other applicable documents,* are the governing documents for execution of this work.

1.1 Site Overview

[*Describe physical features and why this investigation is being performed*]

1.2 Site Background and Path Forward

Describe relevant information, such as the nature of contamination at the site, if known, brief history, media in question, potential stakeholders, and actions that led to the investigation.

QAPP Worksheet #1
Title and Approval Page

RAC2 CONTRACT
GENERIC QUALITY ASSURANCE PROJECT PLAN (QAPP)
for
[*Site Name*]
[*Site Location*]

US Environmental Protection Agency (EPA) Region 2

Prepared by: [redacted]

Date: [ ]

[redacted] Project Manager: *[Project Manager]*

Signature_____

[redacted] QA Manager: [redacted]

Signature_____

EPA Project Manager: [*EPA RPM*]

Signature_____

[redacted] RAC 2 Program Manager: [redacted]

Signature_____

EPA Region 2 Hazardous Waste Support Section: [redacted]

Signature_____

QAPP Worksheet #2
QAPP Identifying Information

Site Name/Project: [*Site Name*]

Site Location: [*Site Location*]

Operable Unit: [*Insert project-specific information*]

Contractor Name: [redacted]

Contractor Number: [redacted]

Contract Title: Response Action Contract (RAC) 2, EPA Region 2

Work Assignment Number: N/A *[Update for Project-Specific QAPP]*

Regulatory Program: CERCLA

Approval Entity: EPA Region 2

Is QAPP Generic or Project Specific: Generic [*Update for Project-Specific QAPP]*

Dates of scoping sessions: [*Date*]

Dates and Titles of QAPP Documents Written for Previous Site Work, if Applicable:
[*Insert titles of existing project QAPPs and dates*]

Organizational Partners (stakeholders) and Connection with Lead Organization:
[New Jersey Department of Environmental Protection/ New York State Department of Environmental Conservation/ US Virgin Island Department of Planning and Natural Resources/ Puerto Rico Environmental Quality Board], EPA

Data Users:
CDM, EPA Region 2, *[New Jersey Department of Environmental Protection/ New York State Department of Environmental Conservation/ US Virgin Island Department of Planning and Natural Resources/ Puerto Rico Environmental Quality Board]*

Required QAPP elements and required information that are not applicable to the project, and an explanation for their exclusions:
N/A

QAPP Worksheet #2
QAPP Identifying Information
(continued)

CROSSWALK

The following table provides a "cross-walk" between the QAPP elements outlined in the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP Manual), the necessary information, and the location of the information within the text document and corresponding QAPP Worksheet. Any QAPP elements and required information that are applicable/not applicable to the project will be noted in the project-specific QAPPs.

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual	Required Information	Crosswalk to QAPP Worksheet No.
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	1
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	2
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	3 4
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications - Special Personnel Training Requirements	5 6 7 8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps (historical and present)	 9 10
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria	11 12

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual	Required Information	Crosswalk to QAPP Worksheet No.
Project Management and Objectives		
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations	13
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation - Project Schedule/Timeline	14 15 16 [*Figure X-X*]
Measurement/Data Acquisition		
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.5 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/SOP Requirements - Analytical Methods/SOP Requirements - Field Quality Control Sample Summary - Sampling SOPs - Project Sampling SOP References - Field Equipment Calibration, Maintenance, Testing, and Inspection	17 [*Figure*] 18 19 20 21 22
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References - Analytical Instrument Calibration - Analytical Instrument and Equipment Maintenance, Testing, and Inspection	23 24 25
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example Chain-of-Custody Form and Seal	27 26
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- QC Samples - Screening/Confirmatory Analysis Decision Tree	28

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual		Required Information	Crosswalk to QAPP Worksheet No.
Project Management and Objectives			
3.5	Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records - Analytical Services - Data Management SOPs	29 30
Assessment/Oversight			
4.1	Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Assessments and Response Actions - Planned Project Assessments - Audit Checklists - Assessment Findings and Corrective Action Responses	31 32 33
4.2	QA Management Reports	- QA Management Reports	33
4.3	Final Project Report	- Final Report(s)	
Data Review			
5.1	Overview		NA
5.2	Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- Verification (Step I) Process - Validation (Steps IIa and IIb) Process - Validation (Steps IIa and IIb) Summary - Usability Assessment	34 35 36 37
5.3	Streamlining Data Review 5.3.1 Data review steps to be streamlined 5.3.2 Criteria for streamlining data Review 5.3.3 Amounts and Types of Data appropriate for Streamlining		

QAPP Worksheet #3
Distribution List

[*List those to whom copies of the QAPP and amendments will be sent*]

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address
[redacted]	Project Officer	EPA	[redacted]	[redacted]	[redacted]
[*Name*]	Remedial Project Manager (RPM)	EPA			
[redacted]	Hazardous Waste Support Section Chief	EPA	[redacted]	[redacted]	[redacted]
[redacted]	QA Officer	EPA	[redacted]	[redacted]	[redacted]
[*Name*]	Stakeholder Agency Program Manager	Name of organization			
[*Name*]	Project Manager	[redacted]			
[*Name*]	Project Engineer	[redacted]			
[redacted] or other assigned QAC	Regional QA Coordinator (RQAC)/ Project QA Officer	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	RAC 2 Program Manager	[redacted]	[redacted]	[redacted]	[redacted]
[*Name*]	Task Manager	[redacted]			
[*Name*]	Field Team Leader	[redacted]			
[redacted]	Health and Safety Officer	[redacted]	[redacted]	-	[redacted]

[redacted]

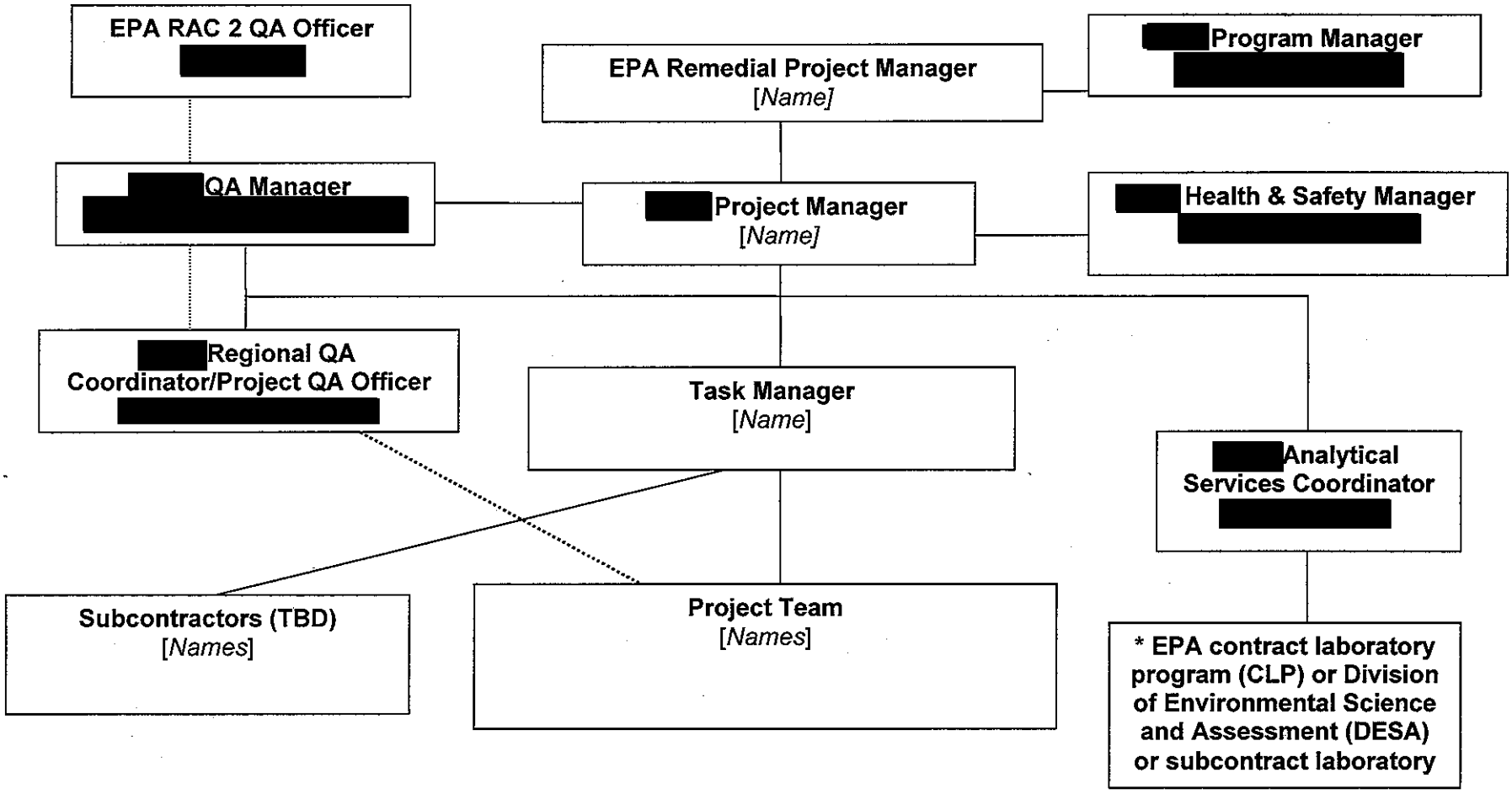
QAPP Worksheet #4
Project Personnel Sign-Off Sheet

[Have copies of this form signed by key project personnel from each organization to indicate that they have read the applicable sections of the QAPP and will perform the tasks as described; add additional sheets as required. Ask each organization to forward signed sheets to the central project file.]

Organization: CDM

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
[*Name*]	Project Manager			
[redacted]	Analytical Services Coordination (ASC)			
[redacted]	[redacted] QA Manger			
[redacted]	Regional QAC (RQAC)			
[*Name*]	Project Engineer			
[*Name*]	Staff Engineer			
[Name]	Field Team Leader			
[*Name*]	Task Manager			
[*Name*]	Field Support			
[*Name*]	Hydrogeologist			
[*Name*]	Risk Assessor			

QAPP Worksheet #5
Project Organizational Chart



QAPP Worksheet #6
Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Point of Contact with EPA RPM	[redacted] Project Manager (PM)	*[Name]*	*[Phone number]*	All information about the project will be sent to [*insert EPA remedial project manager name (RPM) here]* by the [redacted] PM. Field changes will be discussed with the EPA Project Manager (RPM) prior to implementation
Manage Field Tasks	*[RI/RD/RA]* Task Manager	[*Name*]	*[Phone number]*	Act as liaison to PM concerning investigation activities. Daily communication with project team and PM. Communicate implementation issues to Field Team Leader.
Facilitate Database Setup and Data Management Planning	Field Team Leader (FTL)	*[Name]*	*[Phone number]*	Provide sample location, sample ID, and analysis information prior to sample collection. Provide information on sample and analytical reporting groups, and types of report tables required for project.
QAPP Changes in the Field	FTL	*[Name]*	*[Phone number]*	Notify Task Manager immediately and complete a Field Change Request (FCR) form and/or corrected worksheets. Send FCR forms to QAC.
	Task Manager	*[Name]*	*[Phone number]*	Notify EPA RPM, [redacted] PM and Analytical Services Coordinator (ASC) of delays or changes to field work.
Completion of Daily Summary Reports	FTL	*[Name]*	*[Phone number]*	Complete on a daily basis and submit to PM and FTM. PM will forward to EPA RPM upon request.
Booking of Analytical Services	FTL	*[Name]*	*[Phone number]*	Submit request to ASC before the timeframe below.
	Analytical Services Coordinator (ASC)	[redacted]	[redacted]	Book Division of Environmental Science and Assessment (DESA) and Contract Laboratory Program (CLP) analytical services through Regional Sample Control Center (RSCC) 3 weeks prior to sampling.

[redacted]

QAPP Worksheet #6
Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Notification of Analytical Issues	ASC	[redacted]	[redacted]	Notify FTL of any sample collection/ shipment issues. Notify RSCC, DESA lab or subcontract labs to initiate corrective action.
Field Corrective Action	[redacted] RQAC, auditor, Task Manager, FTL, and Field Team	*[Name]*	*[Phone number]*	PM, Task Manager, FTL, per [redacted] QA manual requirement corrective actions may also be identified by the field team. FTL initiates corrective action on identified field issues immediately or within QAM recommended timeframe.
Analytical Services Support	ASC	[redacted]	[redacted]	Act as liaison with RSCC for CLP laboratories, with [redacted] for DESA, and with subcontract laboratory (ies).
Facilitate Data Management	FTL	*[Name]*	*[Phone number]*	Provide electronic survey data, sample ID, locations and analyses. Transmit completed sample tracking information to data manager by the completion of each sampling case.
Reporting of Issues Relating to Analytical Data Quality (including ability to meet reporting limits, and usability of data)	ASC	[redacted]	[redacted]	Communicate to PM as appropriate
	Data Assessor	*[Name]*	*[Phone number]*	Communicate to PM as appropriate. Document situation and effect in a data quality report prepared prior to evaluation of remedial design report.
Release of Analytical Data	ASC	[redacted]	[redacted]	Receive and review data packages before data is used. Initiate data validation of subcontract laboratory data.
Site Health and Safety Issues	Site Health and Safety Officer	*[Name]*	*[Phone number]*	Conduct Daily Health and Safety Meetings, make decisions regarding health and safety issues and upgrading PPE. Communicate to PM, Task Manager, Health and Safety Manager, and field staff as appropriate

QAPP Worksheet #7
Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
[Name]	PM	[redacted]	Oversee project and responds to EPA RPM. Manages subcontractors.	
[Name]	Task Manager	[redacted]	Oversees Remedial Investigation Tasks Provide guidance on the drilling program and analyze the geologic data, responsible for implementing the field activities	
[Name]	QA Coordinator/ Project Chemist	[redacted]	Oversee adherence to QA requirements	
[Name]	FS Task Manager	[redacted]	Oversees Feasibility Study Tasks	
[redacted]	Health and Safety Manager	[redacted]	Oversees adherence to Health and Safety requirements	
[redacted]	ASC, Database Manager	[redacted]	Communicate with EPA RSCC, DESA laboratory and subcontract laboratories; oversee data management, validation and data packages.	
[Name]	Project Hydrogeologist	[redacted]	Oversee and provide guidance on the drilling program and analyze the geologic data	
[Name]	FTL	[redacted]	Oversee all field investigation activities	
[Name]	Project Ecologist	[redacted]	Performs ecological risk assessment	
[Name]	Project Human Health Risk Assessor	[redacted]	Performs human health risk assessment	
[Name]	Field Geologist	[redacted]	Performs field investigations	
[Name]	Field Sampler	[redacted]	Performs field investigations	
[Name]	Staff Scientist/Engineer	[redacted]	Performs feasibility study	
[Name]	Staff Engineer	[redacted]	Performs feasibility study	

Note:
1. An individual can fill as many roles as he or she is qualified.

QAPP Worksheet #8
Special Personnel Training Requirements Table

Project Function	Specialized Training	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
All Field Activities	40-hour OSHA Training and Annual 8 hour refresher	40 hour - EPA or vendor;	various	All [redacted] and subcontractor personnel that will be onsite	[redacted] staff, subcontractors	[redacted] H&S database and on site
All Field Activities	Site Supervisor Training	H&S Manager	various	Site H&S officer	Site H&S officer	[redacted] H&S database and on site
Sample Collection	Trained in EPA CERCLA sampling methods, and field testing procedures	On-site training	various	All personnel that performs sample collection	All personnel that performs sample collection	[redacted] and Onsite
Sample Analysis	Trained in EPA analytical methods	Laboratory on-site and vendor training	various	Subcontract laboratory personnel - TBD	Laboratory personnel	Laboratory
Data Validation	Data validation RAS and non-RAS data	EPA	various	Data validators	DESA/EPA/[redacted] Data Validators	[redacted] DV staff files
Data Review/ Assessment	None, performed by experienced chemists	N/A	various	[redacted] chemists	All personnel used for project data review	[redacted]
QA Audits	EPA G-7 auditor training	[redacted]	various	[redacted] auditors	[Name], QAC and designated field auditors	[redacted]
Self Assessments (SA)	SA training	[redacted] Quality Assurance Coordinators (QACs)	various	project personnel	project personnel	[redacted]

Other tasks requiring specialized skills and training will be performed by appropriate subcontractors such as drilling, surveying, and well installing. Training, certification, and permit requirements will be outlined in separate scopes of work for each task and project.

QAPP Worksheet #9
Project Scoping Session Participants Sheet

Projected Date(s) of Sampling: [*date*] **Project Manager:** [*Name*]	**Site Name:** [*Site Name*] **Site Location:** [*Site Location*] **Operable Unit**: [*OU##*]
Date of Session: [*Date*] **Scoping Session Purpose:** [*Purpose*]	

Name	Affiliation	Phone #	E-mail Address	Project Role

Comments/Decisions:

Action Items:

Consensus Decisions:

**Site –specific information to be added*

QAPP Worksheet #10
Problem Definition

Problem Summary
[*Purpose or reason for this particular sampling event. Problem to be addressed. Environmental questions being asked*]

Site Description
[*Brief description of the site and sampling locations and how they were chosen*]

Site History
[*Brief description of the site history, including contaminants of concern, environmental indicators, historic results and any actions at the site*]

Project Description

Project Decision Conditions

1. [*If….., then…. statement for general purpose of sampling*]
2. [*If….., then…. statement for specific sampling type*]
3. [*If….., then…. statement for result and action level*]
4. [*If….., then…. statement for other necessary statements*]

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

Site specific information to include:

Overall project objectives include:
[*Objective of sampling event*]
[*Contaminants and matrix of event*]
[*Receptors*]
[*Remedies*]

Who Will Use the Data? Data will be used by:
EPA, *[New Jersey Department of Environmental Protection/ New York State Department of Environmental Conservation/ US Virgin Island Department of Planning and Natural Resources/ Puerto Rico Environmental Quality Board]*, and [redacted] *[Project-specific QAPP will describe the data use.]*

What Will the Data be Used For?
[Explain the ultimate use of the data at each phase of the project]

What Type of Data is Needed?
[*Site specific sample type and matrix*]
[*Field screening or parameters*]
[*Type of sampling*]
[*Access agreements, if applicable*]
[*Sampling Locations*]

How "good" do the data need to be in order to support the environmental decision?
The project-specific action limits and quantification limits for each sampled media are specified on Worksheet #15 for all contaminants of concern (COCs).The data will be used in order to meet [*project action limits/clean up criteria/risk criteria/permit discharge criteria/monitor remedial progress/site operations*]. EPA's Field and Analytical Services Teaming Advisory Committee (FASTAC) policy for obtaining laboratory resources will be utilized for sampling events [*include project-specific information here*]. Data must meet the data quality objectives (DQOs) that have been specified for the site [*refer to Worksheets #12, 18 and 28*]. [*The work plan, table XX describes the data quality for each type of data to be collected]*

Where, when, and how should the data be collected?
[*Site specific sample locations and time frame*]

Who will collect and generate the data?
[*Include Site specific information here*]

[redacted]

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

How will the data be reported?
[*Insert site specific information here*: *DESA/EPA Contractor/*[redacted] will be responsible for data validation of [*site-specific]* samples analyzed by [*site-specific]* laboratory. Samples analyzed by CLP will be validated by a contractor of the EPA or by EPA staff; EPA DESA staff will validate samples analyzed by the DESA laboratory; and [redacted] will validate sample analyzed by its subcontract laboratories. DESA, CLP and subcontract validated analytical data will be forwarded to [redacted] for evaluation and use in the [*project-specific]* reports. Analytical data will be received in electronic and hard copy. Following completion of all laboratory analysis and data validation the data will be reported in the *project-specific]* reports prepared by [redacted]. Analytical data will be uploaded to the Environmental Quality Information Systems (EQuIS) database, version *[5.3.2].* The database query and reporting tools will be used to create a project data management system as specified by the project team. The reports will be submitted to EPA for review. [redacted] will use Geographic Information Systems (GIS) and other graphics software to facilitate spatial analysis of data and to generate figures for reports and presentations.

How will the data be archived?
- Preliminary data (Form 1s) will be faxed or e-mailed to [redacted] within the specified turnaround time
- Data from subcontract laboratories will be received in electronic format specified in the contract and validated by subcontractor personnel
- Final CLP and subcontracted validated data will be submitted to [redacted] and the subcontractor in electronic format and hard copy consistent with CLP deliverables
- Electronic data will be input into the project's EQuIS database
- 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 [redacted] will be archived in the project files for 10 years after contract expiration

QAPP Worksheet #12
Measurement Performance Criteria Table
General Instructions and Notes:

(UFP-QAPP Manual Section 2.6.2)

Complete this worksheet for each matrix, analytical group, and concentration level. Identify the data quality indicators (DQI), measurement performance criteria (MPC) and QC sample and/or activity used to assess the measurement performance for both the sampling and analytical measurement systems. Use additional worksheets if necessary. If MPC for specific DQI vary within an analytical parameter, i.e., MPC are analyte-specific, then provide analyte-specific MPC on an additional worksheet.

The concentration levels for each matrix and analyte are project-specific.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Gas/air
Analytical Group	Volatile Organics
Concentration Level	Low (ppbv)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	TO-15	Precision	± 25 % D*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*, **	Field Blank	S & A
	[2]Also refer to QAPP Worksheet #23	Precision	± 25 % D*	Laboratory Replicate Sample	A
		Accuracy	70-130 %R*	Laboratory Audit Standard (LCS)	A
		Accuracy	No analyte > CRQL*	Laboratory Method Blank	A

*Reference Compendium Method TO-15 Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by GC/MS, 2nd Edition, January 1999; Table 3 "Summary of Internal Quality Control Procedures for VOCs by EPA method TO-15, Revision 01/21/2000.

**Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.
% recovery (%R)

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Gas/ air
Analytical Group	Volatile Organics
Concentration Level	Low (ppbv)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	CLP SAV01.X	Precision	≤ 25 % RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*, **	Field Blank	S & A
		Precision	± 25% RPD*	Laboratory Replicate /CCV	A
	[2]Also refer to QAPP Worksheet #23	Accuracy	No analyte > ½ CRQL*	Method Blank	A
		Accuracy	±30%R*	Laboratory Control Sample	A

*Reference EPA Contract Laboratory Program Statement of Work for Volatile Organic Analysis in Air, SAV01.X, Draft, February 2007

**Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	TCL Volatile Organics
Concentration Level	Trace (µg/L)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	SOM01.2	Precision	*Project-Specific %RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	*Project-Specific %RPD;* *List compound specific RPD*	Field Duplicate; MS/MSD**	S & A
	[2]Also refer to QAPP Worksheet #23	Accuracy	*List compound specific value;* range is 28-155%R	***DMCs; MS/MSD**	A

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

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	TCL Volatile Organics
Concentration Level	Low/Medium (µg/L)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	SOM01.2	Precision	*Project-Specific* %RPD	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	*Project-Specific %RPD; List compound specific RPD*	Field Duplicate; MS/MSD**	S & A
	[2]Also refer to QAPP Worksheet #23	Accuracy	*List compound specific %R*	***DMCs; MS/MSD**	A

*Reference EPA Region 2 SOP No. 33 for Low/Medium VOA - Blank Type Criteria Table
**Optional MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 6 for Criteria – Not typically required for Region 2
***Deuterated Monitoring Compounds (DMCs) – Reference CLP SOM01.2, Exhibit D, Table 5 for Criteria

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	TCL Semivolatiles
Concentration Level	Low/Medium (µg/L)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	SOM01.2	Precision	*Project-Specific* %RPD	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	*Project-Specific %RPD; List compound specific RPD*	Field Duplicate; MS/MSD**	S & A
	[2]Also refer to QAPP Worksheet #23	Accuracy	*List compound specific %R*	***DMCs; MS/MSD**	A

*Reference EPA Region 2 SOP No. 35/Low/Medium Semivolatile - Blank Type Criteria Table
**Optional MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 6 for Criteria – Not typically required for Region 2
***Deuterated Monitoring Compounds (DMCs) – Reference CLP SOM01.2, Exhibit D, Table 5 for Criteria

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

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

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	SOM01.2	Precision	*Project-Specific %RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	*Project-Specific %RPD; List compound specific RPD*	Field Duplicate; MS/MSD**	S & A
	[2]Also refer to QAPP Worksheet #23	Accuracy	*List compound specific %R*	***LCS; MS/MSD**	A

*Reference EPA Region 2 SOP No. 36/Low/Medium Pesticide - Blank Type Criteria Table
**MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 3 for Criteria – Not typically required for Region 2
***Laboratory Control Sample (LCS) – Reference CLP SOM01.2, Exhibit D, Table 2 for Criteria

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	TCL Aroclors (PCBs)
Concentration Level	Low/Medium (µg/L)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	SOM01.2	Precision	*Project-Specific %RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	*Project-Specific %RPD; List compound specific RPD*	Field Duplicate; MS/MSD**	S & A
	[2]Also refer to QAPP Worksheet #23	Accuracy	*List compound specific %R*	***LCS; MS/MSD**	A

*Reference EPA Region 2 SOP No. 37/Low/Medium Aroclor - Blank Type Criteria Table
**MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 1 for Criteria – Not typically required for Region 2
***Laboratory Control Sample (LCS) – Reference CLP SOM01.2, Exhibit D, Table 2 for Criteria

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ sediment
Analytical Group	TCL Volatiles
Concentration Level	Low/Medium (µg/kg)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	SOM01.2	Precision	*Project-Specific %RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	*Project-Specific %RPD; List compound specific RPD*	Field Duplicate; MS/MSD**	S & A
	[2]Also refer to QAPP Worksheet #23	Accuracy	*List compound specific %R*	***DMCs; MS/MSD**	A

*Reference EPA Region 2 SOP No. 33/ VOCs (SIM/ Low/ Medium) - Blank Type Criteria Table
**Optional MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 6 for Criteria – Not typically required for Region 2
***Deuterated Monitoring Compounds (DMCs) – Reference CLP SOM01.2, Exhibit D, Table 5 for Criteria

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ sediment
Analytical Group	TCL Semivolatiles
Concentration Level	Low/Medium (µg/kg)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	SOM01.2	Precision	*Project-Specific %RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	*Project-Specific %RPD; List compound specific RPD*	Field Duplicate; MS/MSD**	S & A
	[2]Also refer to QAPP Worksheet #23	Accuracy	*List compound specific %R*	***DMCs; MS/MSD**	A

*Reference EPA Region 2 SOP No. 35/SVOCs - Blank Type Criteria Table
**Optional MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 6 for Criteria – Not typically required for Region 2
***Deuterated Monitoring Compounds (DMCs) – Reference CLP SOM01.2, Exhibit D, Table 5 for Criteria

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ sediment
Analytical Group	TCL Pesticides
Concentration Level	Low/Medium (µg/kg)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	SOM01.2	Precision	*Project-Specific %RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	*Project-Specific %RPD; List compound specific RPD*	Field Duplicate; MS/MSD**	S & A
	[2]Also refer to QAPP Worksheet #23	Accuracy	*List compound specific %R*	***LCS; MS/MSD**	A

*Reference EPA Region 2 SOP No. 36/Low/Medium Pesticide - Blank Type Criteria Table
**MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 3 for Criteria – Not typically required for Region 2
***Laboratory Control Sample (LCS) – Reference CLP SOM01.2, Exhibit D, Table 2 for Criteria

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ sediment
Analytical Group	TCL Aroclors (PCBs)
Concentration Level	Low/Medium (µg/kg)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	SOM01.2	Precision	*Project-Specific %RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	*Project-Specific %RPD; List compound specific RPD*	Field Duplicate; MS/MSD**	S & A
	[2]Also refer to QAPP Worksheet #23	Accuracy	*List compound specific %R*	***LCS; MS/MSD**	A

*Reference EPA Region 2 SOP No. 36/Low/Medium Pesticide - Blank Type Criteria Table
**MS/MSD – Reference CLP SOM01.2, Exhibit D, Table 3 for Criteria – Not typically required for Region 2
***Laboratory Control Sample (LCS) – Reference CLP SOM01.2, Exhibit D, Table 2 for Criteria

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

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

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	**ILM05.4**	Precision	≤ 20% RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	≤ 20% RPD*	Duplicate Sample **	A
	[2]Also refer to QAPP Worksheet #23	Accuracy	75–125%; 80–120%	*** Matrix Spike; LCSW****	A A

*Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include absolute difference criteria)
**Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for Duplicate Sample Criteria - (include absolute difference criteria)
***Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for Spike Sample Criteria
****Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for aqueous Laboratory Control Sample (LCSW) Criteria w/exception of silver (Ag) and antimony (Sb)

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

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

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	ILM05.4	Precision	≤20% RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	≤20% RPD*	Duplicate Sample **	A
		Accuracy	75–125%;	*** Matrix Spike; LCSW****	A
	[2]Also refer to QAPP Worksheet #23		80–120%		A

*Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include absolute difference criteria)
**Reference EPA CLP ILM05.4, Exhibit D of ICP-MS for Duplicate Sample Criteria - - (include absolute difference criteria)
***Reference EPA CLP ILM05.4, Exhibit D of ICP-MS for Spike Sample Criteria
****Reference EPA CLP ILM05.4, Exhibit D of ICP-MS for LCSW Criteria

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	TAL –Total Mercury
Concentration Level	Cold Vapor Atomic Absorption (CVAA)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	ILM05.4	Precision	≤ 20% RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	≤ 20% RPD*	Duplicate Sample **	A
	[2]Also refer to QAPP Worksheet #23	Accuracy	75–125%	*** Matrix Spike;	A

*Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include absolute difference criteria)
**Reference EPA CLP ILM05.4, Exhibit D of ICP-MS for Duplicate Sample Criteria - - (include absolute difference criteria)
***Reference EPA CLP ILM05.4, Exhibit D of ICP-MS for Spike Sample Criteria

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	TAL –Total Cyanide
Concentration Level	Colorimeter or Spectrophotometer

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	ILM05.4	Precision	≤ 20% RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	≤ 20% RPD*	Duplicate Sample **	A
	[2]Also refer to QAPP Worksheet #23	Accuracy	75–125%	*** Matrix Spike	A

*Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP- (include absolute difference criteria)
**Reference EPA CLP ILM05.4, Exhibit D of ICP-MS for Duplicate Sample Criteria - (include absolute difference criteria)
***Reference EPA CLP ILM05.4, Exhibit D of ICP-MS for Spike Sample Criteria

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ sediment
Analytical Group	TAL Metals
Concentration Level	ICP-AES (mg/kg)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	ILM05.4	Precision	≤ 35% RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	≤ 35% RPD*	Duplicate Sample **	A
	[2]Also refer to QAPP Worksheet #23	Accuracy	75–125%	*** Matrix Spike; LCS****	A

*Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include absolute difference criteria)
**Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for Duplicate Sample Criteria
***Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for Spike Sample Criteria
****Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for solid Laboratory Control Sample (LCS) **Note: Control Limits established by EPA for LCS**

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ sediment
Analytical Group	TAL –Total Mercury
Concentration Level	Cold Vapor Atomic Absorption (CVAA)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	ILM05.4	Precision	≤ 35% RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	≤ 35% RPD*	Duplicate Sample **	A
	[2]Also refer to QAPP Worksheet #23	Accuracy	75–125%	*** Matrix Spike; LCS****	A

*Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP – (include absolute difference criteria)
**Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for Duplicate Sample Criteria
Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for Spike Sample Criteria*Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for solid Laboratory Control Sample (LCS) Note: Control Limits established by EPA for LCS

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ sediment
Analytical Group	TAL –Total Cyanide
Concentration Level	Colorimeter or Spectrophotometer

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	ILM05.4	Precision	≤ 35% RPD*	Field Duplicate	S & A
		Accuracy	No analyte > CRQL*	Field Blank	S & A
		Precision	≤ 35% RPD*	Duplicate Sample **	A
	[2]Also refer to QAPP Worksheet #23	Accuracy	75–125%	*** Matrix Spike; LCS****	A

*Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP – (include absolute difference criteria)
**Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for Duplicate Sample Criteria
Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for Spike Sample Criteria*Reference EPA CLP ILM05.4, Exhibit D of ICP-AES for solid Laboratory Control Sample (LCS)
Note: Control Limits established by EPA for LCS

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	Wet Chemistry
Concentration Level	Ion Chromatography

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	Bromide Chloride Fluoride Nitrate Nitrite Nitrate/nitrite Orthophosphate Sulfate by EPA 300 Perchlorate – EPA 314.0 [2]Also refer to QAPP Worksheet #23	Precision	≤ 25-50% RPD[3] ABS ≤ 5xQL	Field Duplicate	S & A
		Accuracy	No analyte > QL*	Field Blank	S & A
		Accuracy	≤ 10 degrees Celsius	Temperature Blank	S
		Precision	≤ 40% RPD	Duplicate Sample	A
		Sensitivity	No analyte > QL*	Method Blank	A
		Accuracy	80–120%; 75–125%; 90-110% recovery	Laboratory Fortified Blank; Matrix Spike; Calibration Standard Verification	A
		Completeness	≥ 90%	Data Assessment	S & A
		Comparability	Similar Units (mg/L) Detection limits meet project goals	Data Review	S & A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL).

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	Wet Chemistry
Concentration Level	Colorimetry; Spectrophotometry

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	Hardness 130.1 Alkalinity – 310.2 Ammonia – 350.1/.2 Chloride – 325.1/ 325.2 COD – 410.4 Fluoride - 340.1/ 340.3 Nitrate – 352.1 Nitrite – 354.1 Nitrate/Nitrite – 353.1/353.2/353.3 Phosphorus – 365.1/365.2/365.3/365.4 Sulfate – 375.1/375.2/375.4 Sulfide – 376.2 Total Kjeldahl Nitrogen (TKN) – 351.1/351.2/351.3 Hexavalent Chromium-7196A Also refer to QAPP Worksheet #23	Precision	≤ 25-50% RPD[3] ABS ≤ 5xQL	Field Duplicate	S & A
		Accuracy	No analyte > QL*	Field Blank	S & A
		Accuracy	≤ 10 degrees Celsius	Temperature Blank	S
		Precision	≤ 40% RPD*	Duplicate Sample	A
		Sensitivity	No analyte > QL*	Method Blank	A
		Accuracy	75–125%; 80-120% recovery	Matrix Spike; LCS	A
		Completeness	≥ 90%	Data Assessment	S & A
		Comparability	Similar Units (mg/L) Detection limits meet project goals	Data Review	S & A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL).

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous				
Analytical Group	Wet Chemistry				
Concentration Level	Titration or potentiometer				
Sampling Procedure[1]	**Analytical Method/SOP[2]**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
[1]Refer to QAPP Worksheet #21	Hardness 130.2	Precision	≤ 25-50% RPD[3] ABS ≤ 5xQL	Field Duplicate	S & A
	Alkalinity - 310.1	Accuracy	No analyte > QL*	Field Blank	S & A
	Ammonia - 350.2/350.3	Accuracy	≤ 10 degrees Celsius	Temperature Blank	S
		Precision	≤ 40% RPD*	Duplicate Sample	A
	Bromide - 320.1	Sensitivity	No analyte > QL*	Method Blank	A
	Chloride - 325.3	Accuracy	80-120 % recovery	LCS	A
		Completeness	≥ 90%	Data Assessment	S & A
	Fluoride - 340.2	Comparability	Similar Units (mg/L)	Data Review	S & A
	Sulfide – 376.1		Detection limits meet project goals		
	TKN – 351.4				
	COD - 410.1/410.2/410.3				
	Also refer to QAPP Worksheet #23				

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL).

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	Wet Chemistry
Concentration Level	Gravimetry

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	Sulfate 375.3 Total Dissolved Solids Total Suspended Solids – 160.1/160.2 Also refer to QAPP Worksheet #23	Precision	≤ 25-50% RPD[3] ABS ≤ 5xQL	Field Duplicate	S & A
		Accuracy	No analyte > QL*	Field Blank	S & A
		Accuracy	≤ 10 degrees Celsius	Temperature Blank	S
		Precision	≤ 40% RPD	Duplicate Sample	A
		Sensitivity	No analyte > QL*	Method Blank	A
		Accuracy	80-120% recovery	LCS	A
		Completeness	≥ 90%	Data Assessment	S & A
		Comparability	Similar Units (mg/L) Detection limits meet project goals	Data Review	S & A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL).

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	Wet Chemistry
Concentration Level	Dissolved Oxygen meter

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	Biological Oxygen Demand (BOD) – 405.1	Precision	≤ 25-50% RPD[3] ABS ≤ 5xQL	Field Duplicate	S & A
		Accuracy	≤ 10 degrees Celsius	Temperature Blank	S
		Precision	≤ 40% RPD	Duplicate Sample	A
		Accuracy	DO uptake 0.6-1 mg/L	Seeded Water Blank	A
	Also refer to QAPP Worksheet #23	Accuracy	BOD < 0.2 mg/l	Water Control Blank	A
		Accuracy	Within laboratory control limits (mean ± 3 standard deviations)	Glucose glutamic acid check	A
		Completeness	≥ 90%	Data Assessment	S & A
		Comparability	Similar Units (mg/L) Detection limits meet project goals	Data Review	S & A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL).

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	Wet Chemistry
Concentration Level	Carbon Converter + Infra-red or Flame Ionization Detector

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	Total Organic Carbon (TOC) – 415.1/415.2 or method 9060	Precision	≤ 25-50% RPD[3] ABS ≤ 5xQL	Field Duplicate	S & A
		Accuracy	≤ 10 degrees Celsius	Temperature Blank	S
		Precision	≤ 20% RPD for samples >5x QL; ± QL for samples <5xQL*	Duplicate Sample	A
		Accuracy	75–125%; 80-120 % recovery	Matrix Spike; LCS	A
		Sensitivity	≤ QL	Method Blank	A
		Completeness	≥ 90%	Data Assessment	S & A
	Also refer to QAPP Worksheet #23	Comparability	Similar Units (mg/L) Detection limits meet project goals	Data Review	S & A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL). Criteria are subject to change in project-specific QAPPs.

*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ sediment
Analytical Group	Total Organic Carbon
Concentration Level	Organic Carbon Analyzer

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria*	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	Lloyd Kahn or Walkley Black	Precision	≤ 35-100% RPD[3] ABS ≤ 5xQL *	Field Duplicate	S & A
		Accuracy	80–120% 75–125%	Mid Range calibration verification standard; Near detection Limit Standard	
	Also refer to QAPP Worksheet #23	Precision	≤ 35% RPD	Duplicate Sample	A
		Accuracy	< 3xStandard deviation	Quadruplicate analysis	A
		Accuracy	4± 6 degrees Celsius	Temperature Blank	S
		Completeness	≥ 90%	Data Assessment	S&A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL). Criteria are subject to change in project-specific QAPPs.

*Measurement Performance Criteria are project specific. The MPC is expected to be between these values.
*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ Sediment
Analytical Group	pH
Concentration Level	0-12

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria*	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	SW-846, 9045D	Precision	≤ 35-100% RPD[3] ABS ≤ 5xQL *	Field Duplicate	S & A
	Also refer to QAPP Worksheet #23	Precision	≤ 35% RPD	Duplicate Sample	A
		Accuracy	± 0.05 pH units	Standard buffer solution	A
		Completeness	≥ 90%	Data Assessment	S&A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL). Criteria are subject to change in project-specific QAPPs.

*Measurement Performance Criteria are project specific. The MPC is expected to be between these values.
*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ Sediment
Analytical Group	Grain size
Concentration Level	Hydrometer

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria*	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	ASTM D421-85 & D422-63	Precision	≤35-100% RPD[3] ABS ≤ 5xQL	Field Duplicate	S & A
	Also refer to QAPP Worksheet #23	Precision	≤ 35% RPD	Duplicate Sample	A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL). Criteria are subject to change in project-specific QAPPs.

*Measurement Performance Criteria are project specific. The MPC is expected to be between these values.
*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ Sediment				
Analytical Group	Hexavalent Chromium				
Concentration Level	Colorimeter or Spectrophotometer				
Sampling Procedure[1]	**Analytical Method/SOP**[2]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria***	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
[1]Refer to QAPP Worksheet #21	SW-846 3060A and 7196A	Precision	≤35-100% RPD[3] ABS ≤ 5xQL	Field Duplicate	S & A
		Accuracy	No analyte > QL*	Field Blank	S & A
		Precision	≤35-100% RPD	Duplicate Sample	A
		Accuracy	75–125%; 80-120% recovery	Matrix Spike; LCS	A
		Sensitivity	No analyte > QL*	Method Blank	A
		Accuracy	4± 6 degrees Celsius	Temperature Blank	S
	Also refer to QAPP Worksheet #23	Completeness	≥ 90%	Data Assessment	S & A
		Comparability	Similar Units (mg/L) Detection limits meet project goals	Data Review	S & A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL). Criteria are subject to change in project-specific QAPPs.

*Measurement Performance Criteria are project specific. The MPC is expected to be between these values.
*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ Sediment
Analytical Group	Sulfide
Concentration Level	Colorimeter/ titration

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria*	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	EPA 376	Precision	≤35-100% RPD[3] ABS ≤ 5xQL	Field Duplicate	S & A
		Precision	≤35-100% RPD	Duplicate Sample	A
		Accuracy	50–150%; 70-130% recovery	Matrix Spike; LCS	A
	Also refer to QAPP Worksheet #23	Sensitivity	No analyte > QL*	Method Blank	A
		Accuracy	4± 6 degrees Celsius	Temperature Blank	S
		Completeness	≥ 90%	Data Assessment	S & A
		Comparability	Similar Units (mg/L) Detection limits meet project goals	Data Review	S & A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL). Criteria are subject to change in project-specific QAPPs.

*Measurement Performance Criteria are project specific. The MPC is expected to be between these values.
*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ Sediment				
Analytical Group	Perchlorate				
Concentration Level	Ion chromatography				
Sampling Procedure[1]	**Analytical Method/SOP**[2]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria***	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
[1]Refer to QAPP Worksheet #21	EPA 314.0	Precision	≤35-100% RPD[3] ABS ≤ 5xQL	Field Duplicate	S & A
		Accuracy	No analyte > QL	Method Blank	S & A
		Precision	≤40% RPD	Duplicate Sample	A
		Accuracy	80–120%; 75–125%	Laboratory Fortified Blank; Matrix Spike	A
	Also refer to QAPP Worksheet #23	Accuracy/Representativeness	Holding times	Laboratory report/DV	A
		Completeness	≥ 90%	Data Assessment	S & A
		Comparability	Similar Units (mg/L) Detection limits meet project goals	Data Review	S & A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL). Criteria are subject to change in project-specific QAPPs.

*Measurement Performance Criteria are project specific. The MPC is expected to be between these values.
*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ Sediment				
Analytical Group	AVS-SEM				
Concentration Level	Colorimeter/ titration-ICP AES/MS				
Sampling Procedure[1]	**Analytical Method/SOP**[2]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
[1]Refer to QAPP Worksheet #21	Also refer to QAPP Worksheet #23	Refer to soil TAL metals worksheet for SEM criteria			
		Refer to soil sulfide worksheet for AVS criteria			

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ Sediment
Analytical Group	Specific Gravity/Bulk Density
Concentration Level	NA

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria*	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	Specific Gravity ASTM D854	Precision	≤ 35-100% RPD	Field Duplicate	S & A
		Precision	≤ 35% RPD	Duplicate Sample	A
		Completeness	≥ 90%	Data Assessment	S & A
	Bulk Density - ASTM D2937	Comparability	Similar Units (mg/L) Detection limits meet project goals	Data Review	S & A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL). Criteria are subject to change in project-specific QAPPs.

*Measurement Performance Criteria are project specific. The MPC is expected to be between these values.
*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ Sediment
Analytical Group	Cation Exchange Capacity
Concentration Level	AA - AES

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	SW-846 9080 or 9081 or SW-846 6010B modified	Precision	≤ 35-100% RPD[3] ABS ≤ 5xQL	Field Duplicate	S & A
		Accuracy	No analyte > QL*	Field Blank	S & A
		Precision	≤ 35% RPD*	Duplicate Sample	A
		Accuracy	75–125%;	Matrix Spike; LCS	A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL). Criteria are subject to change in project-specific QAPPs.

*Measurement Performance Criteria are project specific. The MPC is expected to be between these values.
*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Soil/ Sediment				
Analytical Group	Rigid Wall Permeability				
Concentration Level	NA				
Sampling Procedure[1]	**Analytical Method/SOP[2]**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
[1]Refer to QAPP Worksheet #21	ASTM D2434	Precision	≤35-100% RPD[3]	Field Duplicate	S & A
	Also refer to QAPP Worksheet #23	Precision	≤35% RPD*	Duplicate Sample	A

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. The absolute difference (ABS) will be calculated for all results failing the RPD; where only one result is detected; or one or both results are reported below the quantitation limit (QL). Criteria are subject to change in project-specific QAPPs.

*Measurement Performance Criteria are project specific. The MPC is expected to be between these values.
*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous				
Analytical Group	Wet Chemistry Field Test Kits				
Concentration Level	HACH Test Kits				
Sampling Procedure[1]	**Analytical Method/SOP**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria***	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
[1]Refer to QAPP Worksheet #21	Ferrous Iron HACH Method 8146	Precision	≤ 35-100% RPD[3]	Field Duplicate	S & A
		Precision	≤ 50% RPD for samples	Confirmatory versus Field Screening Sample	A
	Hexavalent Chromium HACH Method 8023	Accuracy	80-120% recovery	LCS	A
		Sensitivity	≤ QL (To be noted in project-specific QAPPs)	Method Blank	A
	Sulfate HACH Method 8051	Completeness	≥ 90%	Data Assessment	S & A
		Comparability	Similar Units (mg/L) Detection limits meet project goals	Data Review	S & A
	Also refer to QAPP Worksheet #23				

[2] If a subcontract laboratory is utilized, the laboratory will provide the SOP as part of the procurement.
[3] RPDs (relative percent difference) will be determined for all detected results. Criteria are subject to change in project-specific QAPPs.

*Measurement Performance Criteria are project specific. The MPC is expected to be between these values.
*Refer to Worksheet 15 for the required quantitation limits; project specific QAPPs will provide quantitation limit goals.

QAPP Worksheet #12
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	In-field Measurements
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
[1]Refer to QAPP Worksheet #21	Manufacturer's Instruction manuals	Representativeness	± 0.1	pH (standard units)	S & A
			± 3%	Conductivity (µSiemens)	S & A
			± 10 mV	Redox potential (Eh) (millivolts)	S & A
			± 10%	Turbidity	S & A
			± 10%	Dissolved Oxygen	S & A
			± 10% or ± 15% of the calibration gas concentration	Photoionization detector	S & A
			Flow rate	Field monitored – rate as determined in project-specific QAPP	S & A

*Measurement Performance Criteria are project specific. The MPC is expected to be between these values.

QAPP Worksheet # 13
Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
[Previous investigation sampling results]	*[Document with results, i.e. RI/FS, Pre-design investigation, ROD]*	*[Who collected data and when]*	*[Indicate purpose of sampling]*	*[Reason for additional sampling, i.e., data gaps, and discussions on comparability issues, incomplete data sets as well as quality data]*

QAPP Worksheet #14
Summary of Project Tasks

Project Tasks:
[Description of tasks that will be performed]

Sampling Tasks: [*include samles to be collected. e.g. 10 surface soil samples from area A from 0-6 inches, etc.]*
Analysis Tasks: [*analysis requested by media]*

Quality Control Tasks: [*Include information on QA/QC samples to be collected. For example, field duplicate, performance evaluation samples, matrix spikes, etc.]*

Secondary Data:
Secondary data listed in Worksheet #13 will be reviewed and used to plan sample locations, but will not be added to the project database.

Data Management Tasks:
Analytical data will be imported into the [redacted] database after validation. Field measurements will also be added to the database.

Analytical data will be loaded into [redacted] database.

- Form I preliminary data will be e-mailed or faxed to [redacted] within the specified turn-around-time.
- All final laboratory data will be submitted to [redacted] in electronic format consistent with CLP deliverables. The ASC will review all analytical data.
- Hard copies of analytical data received by [redacted] will be archived in project file.
- Electronic data will be uploaded into the [redacted] Database system.
- Electronic data will be consistent with EPA Region 2 requirements for electronic data deliverable (EDDs).
- Electronic analytical data will be archived on CDs and copies of CDs will be forwarded to the EPA.

[redacted]s [*field team leader/RI Task Manager/project engineer*] is responsible for tracking samples from the point of field collection to submittal for laboratory analysis and the subsequent data validation and data management efforts. The sample handling and custody requirements, including field logs and generation of sample paperwork, sample labels and custody seals (TSOP 1-2) discussed in Worksheets #26 and #27, will be followed. The laboratory QA requirements including laboratory audits and contract compliance screening will be followed according to procedures described below and in Worksheet #23. The ASC will receive non-RAS data from the [*insert selected laboratory(s) selected using FASTAC procedure*] and will track it through the data validation process. For non-routine analytical services (non-RAS) data, the ASC will submit the electronic "ANSETS Data Requirement" form (Appendix C) to the RSCC by the first day of each month for the previous month's sampling. RAS data will be validated by DESA or the EPA; EPA will be responsible for tracking and maintaining custody of the laboratory data packages through the data validation process. When non-RAS data packages are received from the laboratory, the ASC will initiate a non-RAS Data Package Chain-of-Custody Form. All transfers of the data package from one individual to the next must be recorded on the custody record. The data package itself must remain under lock and key when not undergoing processing. Data validation performed by the subcontractor will be in accordance with the procedures described in Worksheets #35

QAPP Worksheet #14
Summary of Project Tasks

and #36 of this QAPP. Once the data is validated, it will be input into [redacted] database.

FORMS II Lite, a project-specific electronic spreadsheet will be developed for sample tracking purposes prior to field activities. The tracking system will be initiated in the field during sample collection and will be updated during the sample analysis and data validation phases. The data will be entered by project staff and then checked by the ASC for accuracy. This tracking system will ensure that no data is lost during the data management process.

The following information is recorded in the tracking system:
Sample Number
I. Area of Concern
II. Sample Matrix
III. SDG Number
IV. CLP Case No.
V. CLP No.
VI. Analytical Parameter
VII. Collection Date
VIII. Shipment Date
IX. Date Received from Lab
X. Date Submitted for Data Validation
VI. Name of Data Validator
VII. Date of Data Validation Completion
VIII. Database Entry Date
IX. Database QC Date
X. Comments (i.e., MS/D designation, duplicate samples).

Analytical data collected during the field effort will be entered into an EQuIS database management system. This management system will include both location and environmental data. The database management system will provide data storage, retrieval, and analytical capabilities. The system will be able to meet a full range of site and media sampling requirements since it will be able to interface with a variety of spreadsheet, word processing, statistical, and graphics software packages.

To facilitate the use of the database, [redacted] will provide the laboratories with a detailed format specification for the delivery of analytical data in an EDD. Once it is uploaded into the database, validated analytical data will be organized, formatted, and input into the database for use in the data evaluation phase. A 100 percent quality control check will be performed to ensure accuracy on all hand-entered data (i.e., data qualifiers added by [redacted] validators on subcontract laboratory data, sample field notations).

[redacted]

QAPP Worksheet #14
Summary of Project Tasks

Data tables that compare the results of the various phases of sampling efforts will be prepared and evaluated. Data will be evaluated to [*insert project specific information]*. Analytical data results will interface with graphics packages to illustrate contaminants detected. As a quality control check, reports, tables, and graphical figures will be compared to the sample tracking system for errors and omissions. A data usability assessment will be prepared prior to use and reporting of the data in measurement reports. [redacted] will provide EPA with final analytical data on electronic media.

Data management will utilize personal computers (PC), local area networks (LAN), and electronic communications (ex: the World Wide Web) to support the database management system software. [redacted] will set up PC stations on which the database management system and commercial software will run in compliance with those software licensing requirements. [redacted] will take reasonable care to protect the data and will perform periodic backups to prevent wholesale loss of project data. Control of the computer hardware and software will be as per [redacted] quality procedure (QP) 4.1. A backup system has been installed for facility hard drives to prevent loss of PLC data due to hardware failure, which can occur due to frequent power outages/fluctuations that occur onsite.

After the CLP data has been validated, the package is returned to the EPA RPM. CLP data packages forwarded to the [redacted] ASC will then have copies made of the Region 2 chain-of-custody/data transfer log, validated Form Is, data validation assessment and data validation checklist for distribution to the project manager. The original CLP data package with all associated forms is retained by EPA for archival. Non-CLP data packages received from the Laboratory Subcontractor will be validated by [redacted] ASC. These packages are copied and distributed to the project manager and document control. Copies of the non-CLP data packages will be submitted to EPA during project close-out.

Documentation and Records:
Information regarding samples will be recorded in site field logs. Any changes that are made to the field logs shall be initialed and dated. Documents will be maintained in the project files and/or the RAC 2 document control system. Monitoring well purge water data forms will be completed for each sample collected. Chain-of-Custody (COC) and airbills will also be completed for each sampling event.

Field Change Requests:
In the event that anticipated conditions are different from those encountered once the field work is under way, it may be necessary to implement a deviation from the approved QAPP. When such changes are required, the proposed change will be documented on a FCR Form by the [redacted] project engineer and approved by [redacted] PM. An e-mail copy of the FCR form will be sent to the EPA RPM and will serve as documentation of communication with EPA. A copy of the FCR Form is included in Appendix C. A copy of the FCR will be kept on site along with the approved QAPP. A copy of the FCR form will be distributed to the authorizing parties, the field staff, and the [redacted] QAC in order to keep all staff informed of the change and to allow QAC oversight of any changes.

When significant field changes occur, the QAPP will be revised. Modifications will be carried out via revised pages to the QAPP. Minor changes will be made through formal memoranda from the [redacted] PM to the EPA RPM and will be included as addenda to the QAPP. The complete sign-off procedure will be followed if, in the judgment of the [redacted] PM, major revisions to the QAPP are required. All revisions to the QAPP will be subject to [redacted] nternal review process. All such changes will be approved by EPA prior to their implementation.

QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater VOCs

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit (PAL)						*Project Quantitation Limit Goal (PQLG)*	Analytical Method					Achievable Laboratory Limits***	
		Federal	New York		New Jersey		Puerto Rico			CRQL					
		EPA National Primary Drinking Water Standards (1)	NYSDEC Standards and Guidance Values for Class GA Groundwater (2)	NYSDOH Drinking Water Quality Standards (3,4)	NJDEP Groundwater Quality Standards Class IIA Water (5)	NJDEP Drinking Water Standards (6)	PREQB Groundwater Quality Standards (7)		MDLs	Analytical Method - SOM01.2 Trace Water by SIM	Analytical Method - SOM01.2 Trace Water	Analytical Method - SOM01.2 Low Water	*Project Selected Option*	MDLs	QLs
1,1,1-Trichloroethane	71-55-6	200	5	5	30	30	200		N/A	NL	0.5	5		N/A	N/A
1,1,2,2-Tetrachloroethane	79-34-5	NL	5	5	1	1	NL		N/A	NL	0.5	5		N/A	N/A
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NL	5	50	NL	NL	NL		N/A	NL	0.5	5		N/A	N/A
1,1,2-Trichloroethane	79-00-5	5	1	5	3	3	5		N/A	NL	0.5	5		N/A	N/A
1,1-Dichloroethane	75-34-3	NL	5	5	50	50	NL		N/A	NL	0.5	5		N/A	N/A
1,1-Dicholoroethene	75-35-4	7	5	5	1	2	7		N/A	NL	0.5	5		N/A	N/A
1,2,3-Trichlorobenzene	87-61-6	NL	5	5	NL	NL	NL		N/A	NL	0.5	5		N/A	N/A
1,2,4-Trichlorobenzene	120-82-1	70	5	5	9	9	9		N/A	NL	0.5	5		N/A	N/A
1,2-Dibromo-3-chloropropane	96-12-8	0.20	0.04	0.2	0.02	NL	0.2		N/A	0.05	0.5	5		N/A	N/A
1,2-Dibromoethane	106-93-4	0.05	0.0006	0.05	0.0004	NL	NL		N/A	0.05	0.5	5		N/A	N/A
1,2-Dichlorobenzene	95-50-1	600	3	5	600	600	600		N/A	NL	0.5	5		N/A	N/A
1,2-Dichloroethane	107-06-2	5	0.6	5	0.3	2	5		N/A	NL	0.5	5		N/A	N/A
1,2-Dichloropropane	78-87-5	5	1	5	0.5	5	5	*As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.*	N/A	NL	0.5	5		N/A	N/A
1,3-Dichlorobenzene	541-73-1	NL	3	5	600	600	NL		N/A	NL	0.5	5		N/A	N/A
1,4-Dichlorobenzene	106-46-7	75	3	5	75	75	75		N/A	NL	0.5	5		N/A	N/A
1,4-Dioxane	123-91-1	NL	NL	50	NL	NL	NL		N/A	NL	NL	100		N/A	N/A
2-Butanone	78-93-3	NL	50	50	300	NL	NL		N/A	NL	5	10		N/A	N/A
2-Hexanone	591-78-6	NL	50	50	100	NL	NL		N/A	NL	5	10		N/A	N/A
4-Methyl-2-pentanone	108-10-1	NL	NL	50	NL	NL	NL		N/A	NL	5	10		N/A	N/A
Acetone	67-64-1	NL	50	50	6000	NL	NL		N/A	NL	5	10		N/A	N/A
Benzene	71-43-2	5	1	5	0.2	1	5		N/A	NL	0.5	5		N/A	N/A
Bromochloromethane	74-97-5	NL	5	5	NL	NL	NL		N/A	NL	0.5	5		N/A	N/A
Bromodichloromethane	75-27-4	80	50	80	0.6	80	5		N/A	NL	0.5	5		N/A	N/A
Bromoform	75-25-2	80	50	80	4	80	NL		N/A	NL	0.5	5		N/A	N/A
Bromomethane	74-83-9	NL	5	5	10	NL	NL		N/A	NL	0.5	5		N/A	N/A
Carbon Disulfide	75-15-0	NL	60	50	700	NL	NL		N/A	NL	0.5	5		N/A	N/A
Carbon tetrachloride	56-23-5	5	5	5	0.4	2	5		N/A	NL	0.5	5		N/A	N/A
Chlorobenzene	108-90-7	100	5	5	50	50	100		N/A	NL	0.5	5		N/A	N/A
Chloroethane	75-00-3	NL	5	5	100	NL	NL		N/A	NL	0.5	5		N/A	N/A
Chloroform	67-66-3	80	7	80	70	80	80		N/A	NL	0.5	5		N/A	N/A
Chloromethane	74-87-3	NL	5	5	NL	NL	NL		N/A	NL	0.5	5		N/A	N/A
cis-1,2-Dichloroethene	156-59-2	70	5	5	70	70	70		N/A	NL	0.5	5		N/A	N/A
cis-1,3-Dichloropropene	10061-01-5	NL	0.4	5	0.4	NL	NL		N/A	NL	0.5	5		N/A	N/A
Cyclohexane	110-82-7	NL	NL	50	100	NL	NL		N/A	NL	0.5	5		N/A	N/A

QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater VOCs

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit (PAL)						*Project Quantitation Limit Goal (PQLG)*	Analytical Method				*Project Selected Option*	Achievable Laboratory Limits***	
		Federal	New York		New Jersey		Puerto Rico		MDLs	CRQL				MDLs	QLs
		EPA National Primary Drinking Water Standards (1)	NYSDEC Standards and Guidance Values for Class GA Groundwater (2)	NYSDOH Drinking Water Quality Standards (3,4)	NJDEP Groundwater Quality Standards Class IIA Water (5)	NJDEP Drinking Water Standards (6)	PREQB Groundwater Quality Standards (7)			Analytical Method - SOM01.2 Trace Water by SIM	Analytical Method - SOM01.2 Trace Water	Analytical Method - SOM01.2 Low Water			
Dibromochloromethane	124-48-1	80	50	80	0.4	80	NL	*As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.*	N/A	NL	0.5	5		N/A	N/A
Dichlorodifluoromethane	75-71-8	NL	5	5	1,000	NL	NL		N/A	NL	0.5	5		N/A	N/A
Ethylbenzene	100-41-4	700	5	5	700	700	700		N/A	NL	0.5	5		N/A	N/A
Isopropylbenzene	98-82-8	NL	5	5	700	NL	NL		N/A	NL	0.5	5		N/A	N/A
m, p-Xylene *	1330-20-7	10,000	5	5	1,000	1,000	NL		N/A	NL	0.5	5		N/A	N/A
Methyl acetate	79-20-9	NL	NL	50	7,000	NL	NL		N/A	NL	0.5	5		N/A	N/A
Methyl tert-butyl ether	1634-04-4	NL	10	10	70	70	NL		N/A	NL	0.5	5		N/A	N/A
Methylcyclohexane	108-87-2	NL	NL	50	NL	NL	NL		N/A	NL	0.5	5		N/A	N/A
Methylene chloride	75-09-2	5	5	5	3	3	5		N/A	NL	0.5	5		N/A	N/A
o-Xylene **	1330-20-7	10,000	5	5	1,000	1,000	NL		N/A	NL	0.5	5		N/A	N/A
Styrene	100-42-5	100	5	5	100	100	100		N/A	NL	0.5	5		N/A	N/A
Tetrachloroethene	127-18-4	5	5	5	0.4	1	5		N/A	NL	0.5	5		N/A	N/A
Toluene	108-88-3	1,000	5	5	600	1,000	1,000		N/A	NL	0.5	5		N/A	N/A
trans-1,2-Dichloroethene	156-60-5	100	5	5	100	100	100		N/A	NL	0.5	5		N/A	N/A
trans-1,3-Dichloropropene	10061-02-6	NL	0.4	5	0.4	NL	NL		N/A	NL	0.5	5		N/A	N/A
Trichloroethene	79-01-6	5	5	5	1	1	5		N/A	NL	0.5	5		N/A	N/A
Trichlorofluoromethane	75-69-4	NL	5	5	2,000	NL	NL		N/A	NL	0.5	5		N/A	N/A
Vinyl Chloride	75-01-4	2	2	2	0.08	2	2		N/A	NL	0.5	5		N/A	N/A

QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater SVOCs

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

Semi-Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit						*Project Quantitation Limit Goal (PQLG)*	Analytical Method				Achievable Laboratory Limits***	
		Federal	New York		New Jersey		Puerto Rico			CRQL				
		EPA National Primary Drinking Water Standards (1)	NYSDEC Standards and Guidance Values for Class GA Groundwater (2)	NYSDOH Drinking Water Quality Standards (3,4)	Groundwater Quality Standards Class IIA Water (5)	Drinking Water Standards (6)	Puerto Rico Groundater Quality Standards (7)		MDLs	Analytical Method - SOM01.2 Low Water by SIM	Analytical Method - SOM01.2 Low Water	*Project Selected Option*	MDLs	QLs
1,1'-Biphenyl	92-52-4	NL	5	50	400	NL	NL		N/A	NL	5		N/A	N/A
1,2,4,5-Tetrachlorobenzene	95-94-3	NL	5	50	NL	NL	NL		N/A	NL	5		N/A	N/A
2,2'-Oxybis (1-chloropropane)	108-60-1	NL	5	50	300	NL	NL		N/A	NL	5		N/A	N/A
2,3,4,6-Tetrachlorophenol	58-90-2	NL	NL	50	200	NL	NL		N/A	NL	5		N/A	N/A
2,4,5-Trichlorophenol	95-95-4	NL	NL	50	700	NL	NL		N/A	NL	5		N/A	N/A
2,4,6-Trichlorophenol	88-06-2	NL	NL	50	1	NL	NL		N/A	NL	5		N/A	N/A
2,4-Dichlorophenol	120-83-2	NL	5	50	20	NL	NL		N/A	NL	5		N/A	N/A
2,4-Dimethylphenol	105-67-9	NL	50	50	100	NL	NL		N/A	NL	5		N/A	N/A
2,4-Dinitrophenol	51-28-5	NL	10	50	10	NL	NL		N/A	NL	10		N/A	N/A
2,4-Dinitrotoluene	121-14-2	NL	5	50	0.05	NL	NL		N/A	NL	5		N/A	N/A
2,6-Dinitrotoluene	606-20-2	NL	5	50	NL	NL	NL		N/A	NL	5		N/A	N/A
2-Chloronapthalene	91-58-7	NL	NL	50	600	NL	NL		N/A	NL	5		N/A	N/A
2-Chlorophenol	95-57-8	NL	NL	50	40	NL	NL	*As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.*	N/A	NL	5		N/A	N/A
2-Methylnapthalene	91-57-6	NL	NL	50	NL	NL	NL		N/A	0.1	5		N/A	N/A
2-Methylphenol	95-48-7	NL	NL	50	NL	NL	NL		N/A	NL	5		N/A	N/A
2-Nitroaniline	88-74-4	NL	5	50	NL	NL	NL		N/A	NL	10		N/A	N/A
2-Nitrophenol	88-75-5	NL	NL	50	NL	NL	NL		N/A	NL	5		N/A	N/A
3,3'-Dichlorobenzidine	91-94-1	NL	5	50	0.08	NL	NL		N/A	NL	5		N/A	N/A
3-Nitroaniline	99-09-2	NL	5	50	NL	NL	NL		N/A	NL	10		N/A	N/A
4,6-Dinitro-2-methylphenol	534-52-1	NL	NL	50	NL	NL	NL		N/A	NL	10		N/A	N/A
4-Bromophenyl-phenylether	101-55-3	NL	NL	50	NL	NL	NL		N/A	NL	5		N/A	N/A
4-Chloro-3-methylphenol	59-50-7	NL	NL	50	NL	NL	NL		N/A	NL	5		N/A	N/A
4-Chloroaniline	106-47-8	NL	5	50	30	NL	NL		N/A	NL	5		N/A	N/A
4-Chlorophenyl-phenyl ether	7005-72-3	NL	NL	50	NL	NL	NL		N/A	NL	5		N/A	N/A
4-Methylphenol	106-44-5	NL	NL	50	NL	NL	NL		N/A	NL	5		N/A	N/A
4-Nitroaniline	100-01-6	NL	5	50	NL	NL	NL		N/A	NL	10		N/A	N/A
4-Nitrophenol	100-02-7	NL	NL	50	NL	NL	NL		N/A	NL	10		N/A	N/A
Acenaphthene	83-32-9	NL	NL	50	400	NL	NL		N/A	0.1	5		N/A	N/A
Acenaphthylene	208-96-8	NL	NL	50	NL	NL	NL		N/A	0.1	5		N/A	N/A
Acetophenone	98-86-2	NL	NL	50	700	NL	NL		N/A	NL	5		N/A	N/A
Anthracene	120-12-7	NL	50	50	2,000	NL	NL		N/A	0.1	5		N/A	N/A
Atrazine	1912-24-9	3	7.5	3	3	3	3		N/A	NL	5		N/A	N/A

QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater SVOCs

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

Semi-Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit						*Project Quantitation Limit Goal (PQLG)*	Analytical Method				Achievable Laboratory Limits***	
		Federal	New York		New Jersey		Puerto Rico			CRQL				
		EPA National Primary Drinking Water Standards (1)	NYSDEC Standards and Guidance Values for Class GA Groundwater (2)	NYSDOH Drinking Water Quality Standards (3,4)	Groundwater Quality Standards Class IIA Water (5)	Drinking Water Standards (6)	Puerto Rico Groundater Quality Standards (7)		MDLs	Analytical Method - SOM01.2 Low Water by SIM	Analytical Method - SOM01.2 Low Water	*Project Selected Option*	MDLs	QLs
Benzaldehyde	100-52-7	NL	NL	50	NL	NL	NL		N/A	NL	5		N/A	N/A
Benzo (a) anthracene	56-55-3	NL	0.002	50	0.05	NL	NL		N/A	0.1	5		N/A	N/A
Benzo (a) pyrene	50-32-8	0.2	ND	0.2	0.005	0.2	0.2		N/A	0.1	5		N/A	N/A
Benzo (b) fluoroanthene	205-99-2	NL	0.002	50	0.05	NL	NL		N/A	0.1	5		N/A	N/A
Benzo (g,h,i) perylene	191-24-2	NL	NL	50	NL	NL	NL		N/A	0.1	5		N/A	N/A
Benzo (k) fluoroanthene	207-08-9	NL	0.002	50	0.5	NL	NL		N/A	0.1	5		N/A	N/A
Bis (2-chloroethoxy) methane	111-91-1	NL	5	50	NL	NL	NL		N/A	NL	5		N/A	N/A
Bis (2-ethylhexyl) phthalate	117-81-7	6	5	6	2	6	6		N/A	NL	5		N/A	N/A
bis-(2-chloroethyl) ether	111-44-4	NL	1	50	0.03	NL	NL		N/A	NL	5		N/A	N/A
Butylbenzylphthalate	85-68-7	NL	50	50	100	NL	NL		N/A	NL	5		N/A	N/A
Caprolactam	105-60-2	NL	NL	50	NL	NL	NL		N/A	NL	5		N/A	N/A
Carbazole	86-74-8	NL	NL	50	NL	NL	NL		N/A	NL	5		N/A	N/A
Chrysene	218-01-9	NL	0.002	50	5	NL	NL		N/A	0.1	5		N/A	N/A
Dibenzo (a,h)-anthracene	53-70-3	NL	NL	50	0.005	NL	NL	*As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.*	N/A	0.1	5		N/A	N/A
Dibenzofuran	132-64-9	NL	NL	50	NL	NL	NL		N/A	NL	5		N/A	N/A
Diethylphthalate	84-66-2	NL	50	50	6,000	NL	NL		N/A	NL	5		N/A	N/A
Dimethylphthalate	131-11-3	NL	50	50	NL	NL	NL		N/A	NL	5		N/A	N/A
Di-n-butylphthalate	84-74-2	NL	50	50	700	NL	NL		N/A	NL	5		N/A	N/A
Di-n-octylphthalate	117-84-0	NL	50	50	100	NL	NL		N/A	NL	5		N/A	N/A
Fluoranthene	206-44-0	NL	50	50	300	NL	NL		N/A	0.1	5		N/A	N/A
Fluorene	86-73-7	NL	50	50	300	NL	NL		N/A	0.1	5		N/A	N/A
Hexachlorobenzene	118-74-1	1	0.04	1	0.02	1	1		N/A	NL	5		N/A	N/A
Hexachlorobutadiene	87-68-3	NL	0.5	5	0.4	NL	NL		N/A	NL	5		N/A	N/A
Hexachlorocyclo-pentadiene	77-47-4	50	5	50	40	50	50		N/A	NL	5		N/A	N/A
Hexachloroethane	67-72-1	NL	5	50	2	NL	NL		N/A	NL	5		N/A	N/A
Indeno (1,2,3-cd)-pyrene	193-39-5	NL	0.002	50	0.05	NL	NL		N/A	0.1	5		N/A	N/A
Isophorone	78-59-1	NL	50	50	40	NL	NL		N/A	NL	5		N/A	N/A
Napthalene	91-20-3	NL	NL	50	300	300	NL		N/A	0.1	5		N/A	N/A
Nitrobenzene	98-95-3	NL	0.4	50	4	NL	NL		N/A	NL	5		N/A	N/A
N-Nitroso-di-n propylamine	621-64-7	NL	NL	50	0.005	NL	NL		N/A	NL	5		N/A	N/A
N-Nitrosodiphenylamine	86-30-6	NL	50	50	7	NL	NL		N/A	NL	5		N/A	N/A
Pentachlorophenol	87-86-5	1	NL	1	0.3	1	1		N/A	0.2	10		N/A	N/A
Phenanthrene	85-01-8	NL	50	50	NL	NL	NL		N/A	0.1	5		N/A	N/A
Phenol	108-95-2	NL	NL	50	2,000	NL	NL		N/A	NL	5		N/A	N/A
Pyrene	129-00-0	NL	50	50	200	NL	NL		N/A	0.1	5		N/A	N/A

QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater Pesticides

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

Pesticides (All units: µg/L)	CAS Number	Project Action Limit						*Project Quantitation Limit Goal (PQLG)*	Analytical Method		Achievable Laboratory Limits***	
		Federal	New York		New Jersey		Puerto Rico		MDLs	CRQL		
		EPA National Primary Drinking Water Standards (1)	NYSDEC Standards and Guidance Values for Class GA Groundwater (2)	NYSDOH Drinking Water Quality Standards (3,4)	NJDEP Groundwater Quality Standards Class IIA Water (5)	NJDEP Drinking Water Standards (6)	PREQB Groundwater Quality Standards (7)			Analytical Method - SOM01.2 Water	MDLs	QLs
4,4'-DDD	72-54-8	NL	0.3	50	0.1	NL	NL	*As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.*	N/A	0.1	N/A	N/A
4,4'-DDE	72-55-9	NL	0.2	50	0.1	NL	NL		N/A	0.1	N/A	N/A
4,4'-DDT	50-29-3	NL	0.2	50	0.1	NL	NL		N/A	0.1	N/A	N/A
Aldrin	309-00-2	NL	ND	50	0.002	NL	NL		N/A	0.05	N/A	N/A
alpha-BHC	319-84-6	NL	0.01	50	0.006	NL	NL		N/A	0.05	N/A	N/A
alpha-Chlordane	5103-71-9	2	0.05	2	0.01	0.5	0.2		N/A	0.05	N/A	N/A
beta-BHC	319-85-7	NL	0.04	50	0.02	NL	NL		N/A	0.05	N/A	N/A
delta-BHC	319-86-8	NL	0.04	50	NL	NL	NL		N/A	0.05	N/A	N/A
Dieldrin	60-57-1	NL	0.004	50	0.002	NL	NL		N/A	0.1	N/A	N/A
Endosulfan I	959-98-8	NL	NL	50	40	NL	0.056		N/A	0.05	N/A	N/A
Endosulfan II	33213-65-9	NL	NL	50	40	NL	0.056		N/A	0.1	N/A	N/A
Endosulfan sulfate	1031-07-8	NL	NL	50	40	NL	NL		N/A	0.1	N/A	N/A
Endrin	72-20-8	2	ND	2	2	2	0.0023		N/A	0.1	N/A	N/A
Endrin aldehyde	7421-93-4	NL	5	50	NL	NL	NL		N/A	0.1	N/A	N/A
Endrin ketone	53494-70-5	NL	5	50	NL	NL	NL		N/A	0.1	N/A	N/A
gamma-BHC (Lindane)	58-89-9	0.2	0.05	0.2	0.03	0.2	0.2		N/A	0.05	N/A	N/A
gamma-Chlordane	5103-74-2	2	0.05	2	0.01	0.5	0.2		N/A	0.05	N/A	N/A
Heptachlor	76-44-8	0.4	0.04	0.4	0.008	0.4	0.4		N/A	0.05	N/A	N/A
Heptachlor epoxide	1024-57-3	0.2	0.03	0.2	0.004	0.2	0.2		N/A	0.05	N/A	N/A
Methoxychlor	72-43-5	40	35	40	40	40	3		N/A	0.5	N/A	N/A
Toxaphene	8001-35-2	3	0.06	3	0.03	3	3		N/A	5	N/A	N/A

QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater Aroclors

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

Aroclors (All units: µg/L)	CAS Number	Project Action Limit						*Project Quantitation Limit Goal (PQLG)*	Analytical Method		Achievable Laboratory Limits***	
		Federal	New York		New Jersey		Puerto Rico		MDLs	CRQL	MDLs	QLs
		EPA National Primary Drinking Water Standards (1)	NYSDEC Standards and Guidance Values for Class GA Groundwater (2)	NYSDOH Drinking Water Quality Standards (3,4)	NJDEP Groundwater Quality Standards Class IIA Water (5)	NJDEP Drinking Water Standards (6)	PREQB Groundwater Quality Standards (7)			Analytical Method - SOM01.2 Water		
Aroclor-1016	12674-11-2	0.5	0.09	0.5	0.02	0.5	0.5	*As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.*	N/A	1	N/A	N/A
Aroclor-1221	11104-28-2	0.5	0.09	0.5	0.02	0.5	0.5		N/A	1	N/A	N/A
Aroclor-1232	11141-16-5	0.5	0.09	0.5	0.02	0.5	0.5		N/A	1	N/A	N/A
Aroclor-1242	53469-21-9	0.5	0.09	0.5	0.02	0.5	0.5		N/A	1	N/A	N/A
Aroclor-1248	12672-29-6	0.5	0.09	0.5	0.02	0.5	0.5		N/A	1	N/A	N/A
Aroclor-1254	11097-69-1	0.5	0.09	0.5	0.02	0.5	0.5		N/A	1	N/A	N/A
Aroclor-1260	11096-82-5	0.5	0.09	0.5	0.02	0.5	0.5		N/A	1	N/A	N/A
Aroclor-1262	37324-23-5	0.5	0.09	0.5	0.02	0.5	0.5		N/A	1	N/A	N/A
Aroclor-1268	11100-14-4	0.5	0.09	0.5	0.02	0.5	0.5		N/A	1	N/A	N/A

QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater Inorganics (Metals and Cyanide)

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

Inorganics (All units: µg/L)	CAS Number	Project Action Limit						*Project Quantitation Limit Goal (PQLG)*	Analytical Method				Achievable Laboratory Limits***	
		Federal	New York		New Jersey		Puerto Rico			CRQL				
		EPA National Primary Drinking Water Standards (1)	NYSDEC Standards and Guidance Values for Class GA Groundwater (2)	NYSDOH Drinking Water Quality Standards (3,4)	NJDEP Groundwater Quality Standards Class IIA Water (5)	NJDEP Drinking Water Standards (6)	PREQB Groundwater Quality Standards (7)		MDLs	Analytical Method - ILM05.4 ICP-AES	Analytical Method - ILM05.4 ICP-MS	*Project Selected Option*	MDLs	QLs
Aluminum	7429-90-5	NL	NL	NL	200	200	NL	*As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.*	N/A	200	NL		N/A	N/A
Antimony	7440-36-0	6	3	6	6	6	5		N/A	60	2		N/A	N/A
Arsenic	7440-38-2	10	25	50	0.02	5	10		N/A	10	1		N/A	N/A
Barium	7440-39-3	2000	1,000	2,000	6,000	2,000	2,000		N/A	200	10		N/A	N/A
Beryllium	7440-41-7	4	3	4	1	4	4		N/A	5	1		N/A	N/A
Cadmium	7440-43-9	5	5	5	4	5	5		N/A	5	1		N/A	N/A
Calcium	7440-70-2	NL	NL	NL	NL	NL	NL		N/A	5000	NL		N/A	N/A
Chromium	7440-47-3	100	50	100	70	100	100		N/A	10	2		N/A	N/A
Cobalt	7440-48-4	NL	NL	NL	NL	NL	NL		N/A	50	1		N/A	N/A
Copper	7440-50-8	1300	200	1,300	1,300	1,300	1,300		N/A	25	2		N/A	N/A
Cyanide	57-12-5	200	200	200	100	200	200		N/A	10	NL		N/A	N/A
Iron	7439-89-6	NL	NL	300	300	300	NL		N/A	100	NL		N/A	N/A
Lead	7439-92-1	15	25	15	5	15	15		N/A	10	1		N/A	N/A
Magnesium	7439-95-4	NL	35,000	NL	NL	NL	NL		N/A	5000	NL		N/A	N/A
Manganese	7439-96-5	NL	NL	300	50	50	NL		N/A	15	1		N/A	N/A
Mercury	7439-97-6	2	1	2	2	2	2		N/A	0.2	NL		N/A	N/A
Nickel	7440-02-0	NL	100	NL	100	NL	NL		N/A	40	1		N/A	N/A
Potassium	7440-09-7	NL	NL	NL	NL	NL	NL		N/A	5000	NL		N/A	N/A
Selenium	7782-49-2	50	10	50	40	50	50		N/A	35	5		N/A	N/A
Silver	7440-22-4	NL	50	100	40	100	NL		N/A	10	1		N/A	N/A
Sodium	7440-23-5	NL	20,000	NL	50,000	50,000	NL		N/A	5000	NL		N/A	N/A
Thallium	7440-28-0	2	1	2	1	2	2		N/A	25	1		N/A	N/A
Vanadium	7440-62-2	NL	NL	NL	NL	NL	NL		N/A	50	5		N/A	N/A
Zinc	7440-66-6	NL	2,000	5	2,000	5,000	NL		N/A	60	2		N/A	N/A

Notes for QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater VOCs

1. EPA National Primary Drinking Water Standards (web page http://www.epa.gov/safewater/contaminants/index.html), EPA 816-F-03-016, June 2003. last updated November 28, 2006.
2. NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Includes April 2000 and June 2004 Addendum values. (http://www.dec.ny.gov/regulations/2652.html)
3. New York State Department of Health Drinking Water Standards, NYCRR Title 10, Part 5, Subpart 5-1 Public Water Systems, Effective November 23, 2005 (Statutory authority: Public Health Law 225, Effective May 26, 2004). (http://www.health.state.ny.us/environmental/water/drinking/part5/subpart5.htm)
4. The maximum contaminant level determination for the sum of principal organic contaminants (POC) and unspecified organic contaminants (UOC) is 100 ug/L.

New Jersey Department of Environmental Protection:

5. New Jersey Ground Water Quality Standards Class IIA (NJAC 7:9C), July 7, 2008, downloaded November 13, 2008
6. New Jersey Drinking Water Standards, February 2005 (http://www.state.nj.us/dep/watersupply/standard.htm), downloaded November 13, 2008

Puerto Rico Environmental Quality Board:

7. Puerto Rico Groundwater Quality Standards Regulation, As Amended. March 28, 2003. Received from Puerto Rico Environmental Quality Board (PREQB). (http://www.epa.gov/ost/standards/wqslibrary/pr/pr.html). The criteria used for Puerto Rico is the lower value of (1) and (7)

* m-xylene and p-xylene reported as one compound under S0M01.2. Xylene (total) was used for m,p-xylene criteria.

** Xylene (total) was used for o-xylene criteria.

*** *Project-specific QAPPs will provide the MDLs and CRQLs after a subcontract laboratory is selected (if required).*

*** *Steps will be taken to obtain analytical limits that meet project requirements.*

EPA = United States Environmental Protection Agency
CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
MDL = method detection limit
N/A = Not Applicable
NL = Not Listed or chemical name listed but no value available
PAL= Project Action Limit
µg/L = micrograms per liter

NYSDEC = New York State Department of Environmental Conservation
NJDEP = New Jersey Department of Environmental Protection
NYSDOH = New York State Department of Health
NYCRR = New York Codes, Rules and Regulations
PRGQS = Puerto Rico Groundwater Quality Standards
PREQB = Puerto Rico Environmental Quality Board
SIM = selective ion monitoring
TOGS = Technical and Operational Guidance Series

Notes for QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater SVOCs

1. EPA National Primary Drinking Water Standards (web page http://www.epa.gov/safewater/contaminants/index.html), EPA 816-F-03-016, June 2003. last updated November 28, 2006.
2. NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Includes April 2000 and June 2004 Addendum values. (http://www.dec.ny.gov/regulations/2652.html)
3. New York State Department of Health Drinking Water Standards, NYCRR Title 10, Part 5, Subpart 5-1 Public Water Systems, Effective November 23, 2005 (Statutory authority: Public Health Law 225, Effective May 26, 2004). (http://www.health.state.ny.us/environmental/water/drinking/part5/subpart5.htm)
4. The maximum contaminant level determination for the sum of principal organic contaminants (POC) and unspecified organic contaminants (UOC) is 100 ug/L.
5. New Jersey Ground Water Quality Standards Class IIA (NJAC 7:9C), July 7, 2008, downloaded November 13, 2008
6. New Jersey Drinking Water Standards, February 2005 (http://www.state.nj.us/dep/watersupply/standard.htm), downloaded November 13, 2008
7. Puerto Rico Groundwater Quality Standards Regulation, As Amended. March 28, 2003. Received from Puerto Rico Environmental Quality Board (PREQB). (http://www.epa.gov/ost/standards/wqslibrary/pr/pr.html). The criteria used for Puerto Rico is the lower value of (1) and (7)

**** Project-specific QAPPs will provide the MDLs and CRQLs after a subcontract laboratory is selected (if required).*

**** Steps will be taken to obtain analytical limits that meet project requirements.*

EPA = United States Environmental Protection Agency
CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
MDL = method detection limit
N/A = Not Applicable
NL = Not Listed or chemical name listed but no value available
PAL= Project Action Limit
µg/L = micrograms per liter
NYSDEC = New York State Department of Environmental Conservation
NJDEP = New Jersey Department of Environmental Protection
NYSDOH = New York State Department of Health
NYCRR = New York Codes, Rules and Regulations
PRGQS = Puerto Rico Groundwater Quality Standards
PREQB = Puerto Rico Environmental Quality Board
SIM = selective ion monitoring
TOGS = Technical and Operational Guidance Series

Notes for QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater Pesticides

1. EPA National Primary Drinking Water Standards (web page http://www.epa.gov/safewater/contaminants/index.html), EPA 816-F-03-016, June 2003. last updated November 28, 2006.
2. NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Includes April 2000 and June 2004 Addendum values. (http://www.dec.ny.gov/regulations/2652.html)
3. New York State Department of Health Drinking Water Standards, NYCRR Title 10, Part 5, Subpart 5-1 Public Water Systems, Effective November 23, 2005 (Statutory authority: Public Health Law 225, Effective May 26, 2004). (http://www.health.state.ny.us/environmental/water/drinking/part5/subpart5.htm)
4. The maximum contaminant level determination for the sum of principal organic contaminants (POC) and unspecified organic contaminants (UOC) is 100 ug/L.
5. New Jersey Ground Water Quality Standards Class IIA (NJAC 7:9C), July 7, 2008, downloaded November 13, 2008
6. New Jersey Drinking Water Standards, February 2005 (http://www.state.nj.us/dep/watersupply/standard.htm), downloaded November 13, 2008

(http://www.epa.gov/ost/standards/wqslibrary/pr/pr.html). The criteria used for Puerto Rico is the lower value of (1) and (7)

**** Project-specific QAPPs will provide the MDLs and CRQLs after a subcontract laboratory is selected (if required).*
**** Steps will be taken to obtain analytical limits that meet project requirements.*

EPA = United States Environmental Protection Agency
CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
MDL = method detection limit
N/A = Not Applicable
NL = Not Listed or chemical name listed but no value available
PAL= Project Action Limit
µg/L = micrograms per liter

NYSDEC = New York State Department of Environmental Conservation
NJDEP = New Jersey Department of Environmental Protection
NYSDOH = New York State Department of Health
NYCRR = New York Codes, Rules and Regulations
PRGQS = Puerto Rico Groundwater Quality Standards
PREQB = Puerto Rico Environmental Quality Board
TOGS = Technical and Operational Guidance Series

Notes for QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater Aroclors (PCBs)

1. EPA National Primary Drinking Water Standards (web page http://www.epa.gov/safewater/contaminants/index.html), EPA 816-F-03-016, June 2003. last updated November 28, 2006.
2. NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Includes April 2000 and June 2004 Addendum values. (http://www.dec.ny.gov/regulations/2652.html)
3. New York State Department of Health Drinking Water Standards, NYCRR Title 10, Part 5, Subpart 5-1 Public Water Systems, Effective November 23, 2005 (Statutory authority: Public Health Law 225, Effective May 26, 2004). (http://www.health.state.ny.us/environmental/water/drinking/part5/subpart5.htm)
4. The maximum contaminant level determination for the sum of principal organic contaminants (POC) and unspecified organic contaminants (UOC) is 100 ug/L.
5. New Jersey Ground Water Quality Standards Class IIA (NJAC 7:9C), July 7, 2008, downloaded November 13, 2008
6. New Jersey Drinking Water Standards, February 2005 (http://www.state.nj.us/dep/watersupply/standard.htm), downloaded November 13, 2008
7. Puerto Rico Groundwater Quality Standards Regulation, As Amended. March 28, 2003. Received from Puerto Rico Environmental Quality Board (PREQB). (http://www.epa.gov/ost/standards/wqslibrary/pr/pr.html). The criteria used for Puerto Rico is the lower value of (1) and (7)

**** Project-specific QAPPs will provide the MDLs and CRQLs after a subcontract laboratory is selected (if required).*

**** Steps will be taken to obtain analytical limits that meet project requirements.*

EPA = United States Environmental Protection Agency
CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
MDL = method detection limit
N/A = Not Applicable
NL = Not Listed or chemical name listed but no value available
µg/L = micrograms per liter

NYSDEC = New York State Department of Environmental Conservation
NJDEP = New Jersey Department of Environmental Protection
NYSDOH = New York State Department of Health
NYCRR = New York Codes, Rules and Regulations
PAL= Project Action Limit
PRGQS = Puerto Rico Groundwater Quality Standards
PREQB = Puerto Rico Environmental Quality Board
TOGS = Technical and Operational Guidance Series

Notes for QAPP Worksheet #15
Reference Limits and Evaluation Table - Groundwater Inorganics (Metals and Cyanide)

1. EPA National Primary Drinking Water Standards (web page http://www.epa.gov/safewater/contaminants/index.html), EPA 816-F-03-016, June 2003. last updated November 28, 2006.
2. NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Includes April 2000 and June 2004 Addendum values. (http://www.dec.ny.gov/regulations/2652.html)
3. New York State Department of Health Drinking Water Standards, NYCRR Title 10, Part 5, Subpart 5-1 Public Water Systems, Effective November 23, 2005 (Statutory authority: Public Health Law 225, Effective May 26, 2004). (http://www.health.state.ny.us/environmental/water/drinking/part5/subpart5.htm)
4. The maximum contaminant level determination for the sum of principal organic contaminants (POC) and unspecified organic contaminants (UOC) is 100 ug/L.
5. New Jersey Ground Water Quality Standards Class IIA (NJAC 7:9C), July 7, 2008, downloaded November 13, 2008
6. New Jersey Drinking Water Standards, February 2005 (http://www.state.nj.us/dep/watersupply/standard.htm), downloaded November 13, 2008
7. Puerto Rico Groundwater Quality Standards Regulation, As Amended. March 28, 2003. Received from Puerto Rico Environmental Quality Board (PREQB). (http://www.epa.gov/ost/standards/wqslibrary/pr/pr.html). The criteria used for Puerto Rico is the lower value of (1) and (7)

*** *Project-specific QAPPs will provide the MDLs and CRQLs after a subcontract laboratory is selected (if required).*

*** *Steps will be taken to obtain analytical limits that meet project requirements.*

AES = atomic emission spectroscopy
CRQL = Contract Required Quantitation Limit
EPA = United States Environmental Protection Agency
MDL = method detection limit
MS = mass spectroscopy
N/A = Not Applicable
NL = Not Listed or chemical name listed but no value available
PAL= Project Action Limit
NYSDEC = New York State Department of Environmental Conservation
NJDEP = New Jersey Department of Environmental Protection
NYSDOH = New York State Department of Health
NYCRR = New York Codes, Rules and Regulations
PRGQS = Puerto Rico Groundwater Quality Standards
PREQB = Puerto Rico Environmental Quality Board
TOGS = Technical and Operational Guidance Series
µg/L = micrograms per liter

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

QAPP Worksheet #15
Reference Limits and Evaluation Table - Soil VOCs

Volatile Organic Compounds (All units: µg/kg)	CAS Number	Project Action Limit							Project Quantitation Limit Goal (PQLG)	Analytical Method				Achievable Laboratory Limits***	
		Federal (Puerto Rico)		New York		New Jersey					CRQL				
		EPA Soil Screening Levels for Migration to Ground Water (1)	EPA Soil Screening Levels for Direct Contact (2)	NYSDEC Recommended Soil Cleanup Objectives (3)	NYSDEC Soil Cleanup Objectives to Protect Ground Water (4)	NJDEP Residential Direct Contact Soil Remediation Standard (5)	NJDEP Non-Residential Direct Contact Soil Remediation Standard (6)	NJDEP Default Impact to Groundwater Soil Remediation Standard (7)		MDLs	Analytical Method - SOM01.2 Low Soil	Analytical Method - SOM01.2 Medium Soil	Project-Specific Option	MDLs	QLs
1,1,1-Trichloroethane	71-55-6	100	NL	800	760	290,000	4,200,000	200		N/A	5	250		N/A	N/A
1,1,2,2-Tetrachloroethane	79-34-5	0.2	3,000	600	600	1,000	3,000	5		N/A	5	250		N/A	N/A
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NL	NL	6,000	6,000	NL	NL	NL		N/A	5	250		N/A	N/A
1,1,2-Trichloroethane	79-00-5	0.9	11,000	10,000	NL	2,000	6,000	10		N/A	5	250		N/A	N/A
1,1-Dichloroethane	75-34-3	1000	7,800,000	200	200	8,000	24,000	200		N/A	5	250		N/A	N/A
1,1-Dicholoroethene	75-35-4	3	3,900,000	400	400	11,000	150,000	5		N/A	5	250		N/A	N/A
1,2,3-Trichlorobenzene	87-61-6	NL	NL	10,000	NL	NL	NL	NL		N/A	5	250		N/A	N/A
1,2,4-Trichlorobenzene	120-82-1	300	610,000	3,400	3,400	73,000	820,000	400		N/A	5	250		N/A	N/A
1,2-Dibromo-3-chloropropane	96-12-8	NL	NL	10,000	NL	80	200	5		N/A	5	250		N/A	N/A
1,2-Dibromoethane	106-93-4	NL	NL	10,000	NL	8	40	5		N/A	5	250		N/A	N/A
1,2-Dichlorobenzene	95-50-1	900	5,500,000	7,900	7,900	5,300,000	59,000,000	11,000		N/A	5	250		N/A	N/A
1,2-Dichloroethane	107-06-2	1	7,000	100	100	900	3,000	5		N/A	5	250		N/A	N/A
1,2-Dichloropropane	78-87-5	1	9,000	10,000	NL	2,000	5,000	5		N/A	5	250		N/A	N/A
1,3-Dichlorobenzene	541-73-1	NL	NL	1,600	1,550	5,300,000	59,000,000	12,000		N/A	5	250		N/A	N/A
1,4-Dichlorobenzene	106-46-7	100	20,000	8,500	8,500	5,000	13,000	1,000		N/A	5	250		N/A	N/A
1,4-Dioxane	123-91-1	NL	NL	NL	NL	NL	NL	NL		N/A	100	5,000		N/A	N/A
2-Butanone	78-93-3	NL	NL	300	300	3,100,000	44,000,000	600		N/A	10	500		N/A	N/A
2-Hexanone	591-78-6	NL	NL	10,000	NL	NL	NL	NL		N/A	10	500		N/A	N/A
4-Methyl-2-pentanone	108-10-1	NL	NL	1,000	1,000	NL	NL	NL		N/A	10	500		N/A	N/A
Acetone	67-64-1	800	7,800,000	200	110	70,000,000	NL	12,000		N/A	10	500		N/A	N/A
Benzene	71-43-2	2	12,000	60	60	2,000	5,000	5		N/A	5	250		N/A	N/A
Bromochloromethane	74-97-5	NL	NL	10,000	NL	NL	NL	NL		N/A	5	250		N/A	N/A
Bromodichloromethane	75-27-4	30	10,000	10,000	NL	1,000	3,000	5		N/A	5	250		N/A	N/A
Bromoform	75-25-2	40	81,000	10,000	NL	81,000	280,000	20		N/A	5	250		N/A	N/A
Bromomethane	74-83-9	10	110,000	10,000	NL	25,000	59,000	30		N/A	5	250		N/A	N/A
Carbon Disulfide	75-15-0	2000	7,800,000	2,700	2,700	7,800,000	110,000,000	4,000		N/A	5	250		N/A	N/A
Carbon tetrachloride	56-23-5	3	5,000	600	600	600	2,000	5		N/A	5	250		N/A	N/A
Chlorobenzene	108-90-7	70	1,600,000	1,700	1,700	510,000	7,400,000	400		N/A	5	250		N/A	N/A
Chloroethane	75-00-3	NL	NL	1,900	1,900	220,000	1,100,000	NL		N/A	5	250		N/A	N/A
Chloroform	67-66-3	30	780,000	300	300	600	2,000	200		N/A	5	250		N/A	N/A
Chloromethane	74-87-3	NL	NL	10,000	NL	4,000	12,000	NL		N/A	5	250		N/A	N/A
cis-1,2-Dichloroethene	156-59-2	20	780,000	10,000	NL	230,000	560,000	200		N/A	5	250		N/A	N/A
cis-1,3-Dichloropropene	10061-01-5	NL	NL	10,000	NL	NL	NL	5		N/A	5	250		N/A	N/A
Cyclohexane	110-82-7	NL	NL	10,000	NL	NL	NL	NL		N/A	5	250		N/A	N/A
Dibromochloromethane	124-48-1	20	8,000	10,000	NL	3,000	8,000	5		N/A	5	250		N/A	N/A
Dichlorodifluoromethane	75-71-8	NL	NL	10,000	NL	490,000	230,000,000	25,000		N/A	5	250		N/A	N/A
Ethylbenzene	100-41-4	700	7,800,000	5,500	5,500	7,800,000	110,000,000	8,000		N/A	5	250		N/A	N/A
Isopropylbenzene	98-82-8	NL	NL	10,000	NL	NL	NL	NL		N/A	5	250		N/A	N/A
m, p-Xylene *	1330-20-7	10000	160,000,000	1,200	1,200	12,000,000	170,000,000	12,000		N/A	5	250		N/A	N/A
Methyl acetate	79-20-9	NL	NL	10,000	NL	78,000,000	NL	14,000		N/A	5	250		N/A	N/A
Methyl tert-butyl ether	1634-04-4	NL	NL	10,000	NL	110,000	320,000	200		N/A	5	250		N/A	N/A
Methylcyclohexane	108-87-2	NL	NL	10,000	NL	NL	NL	NL		N/A	5	250		N/A	N/A
Methylene chloride	75-09-2	1	85,000	100	100	34,000	97,000	7		N/A	5	250		N/A	N/A
o-Xylene **	1330-20-7	10000	160,000,000	1,200	1,200	12,000,000	170,000,000	12,000		N/A	5	250		N/A	N/A
Styrene	100-42-5	200	16,000,000	10,000	NL	90,000	260,000	2,000		N/A	5	250		N/A	N/A
Tetrachloroethene	127-18-4	3	1,000	1,400	1,400	2,000	5,000	5		N/A	5	250		N/A	N/A
Toluene	108-88-3	600	16,000,000	1,500	1,500	6,300,000	91,000,000	4,000		N/A	5	250		N/A	N/A
trans-1,2-Dichloroethene	156-60-5	30	1,600,000	300	300	300,000	720,000	400		N/A	5	250		N/A	N/A
trans-1,3-Dichloropropene	10061-02-6	NL	NL	10,000	NL	NL	NL	5		N/A	5	250		N/A	N/A
Trichloroethene	79-01-6	3	2,000	700	700	7,000	20,000	7		N/A	5	250		N/A	N/A
Trichlorofluoromethane	75-69-4	NL	NL	10,000	NL	23,000,000	340,000,000	22,000		N/A	5	250		N/A	N/A
Vinyl Chloride	75-01-4	0.7	400	200	120	700	2,000	5		N/A	5	250		N/A	N/A

As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.

Fill in selected EPA method option for each analyte.

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

QAPP Worksheet #15
Reference Limits and Evaluation Table - Soil SVOCs

Semi-Volatile Organic Compounds (All units: µg/kg)	CAS Number	Project Action Limit							*Project Quantitation Limit Goal (PQLG)*	Analytical Method				Achievable Laboratory Limits*	
		Federal (Puerto Rico)		New York		New Jersey					CRQL				
		EPA Soil Screening Levels for Migration to Ground Water (1)	EPA Soil Screening Levels for Direct Contact (2)	NYSDEC Recommended Soil Cleanup Objectives (3)	NYSDEC Soil Cleanup Objectives to Protect Ground Water (4)	NJDEP Residential Direct Contact Soil Remediation Standard (5)	NJDEP Non-Residential Direct Contact Soil Remediation Standard (6)	NJDEP Default Impact to Groundwater Soil Remediation Standard (7)		MDLs	Analytical Method - SOM01.2 Low Soil	Analytical Method - SOM01.2 Med. Soil	*Project-Specific Option*	MDLs	QLs
1,1'-Biphenyl	92-52-4	NL	NL	50,000	NL	3,100,000	34,000,000	90,000	*As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.*	N/A	170	5,000	*Fill in selected EPA method option for each analyte.*	N/A	N/A
1,2,4,5-Tetrachlorobenzene	95-94-3	NL	NL	50,000	NL	NL	NL	NL		N/A	170	5,000		N/A	N/A
2,2'-Oxybis (1-chloropropane)	108-60-1	NL	NL	50,000	NL	23,000	67,000	NL		N/A	170	5,000		N/A	N/A
2,3,4,6-Tetrachlorophenol	58-90-2	NL	NL	50,000	NL	#N/A	#N/A	#N/A		N/A	170	5,000		N/A	N/A
2,4,5-Trichlorophenol	95-95-4	14000	6,100,000	100	100	6,100,000	68,000,000	44,000		N/A	170	5,000		N/A	N/A
2,4,6-Trichlorophenol	88-06-2	8	44,000	50,000	NL	19,000	74,000	200		N/A	170	5,000		N/A	N/A
2,4-Dichlorophenol	120-83-2	50	180,000	400	400	180,000	2,100,000	200		N/A	170	5,000		N/A	N/A
2,4-Dimethylphenol	105-67-9	400	1,200,000	50,000	NL	1,200,000	14,000,000	700		N/A	170	5,000		N/A	N/A
2,4-Dinitrophenol	51-28-5	8	120,000	200	NL	120,000	1,400,000	300		N/A	330	10,000		N/A	N/A
2,4-Dinitrotoluene	121-14-2	0.04	700	50,000	NL	700	3,000	200		N/A	170	5,000		N/A	N/A
2,6-Dinitrotoluene	606-20-2	0.03	700	1,000	1,000	700	3,000	200		N/A	170	5,000		N/A	N/A
2-Chloronapthalene	91-58-7	NL	NL	50,000	NL	NL	NL	NL		N/A	170	5,000		N/A	N/A
2-Chlorophenol	95-57-8	200	310,000	800	800	310,000	2,200,000	500		N/A	170	5,000		N/A	N/A
2-Methylnapthalene	91-57-6	NL	NL	36,400	36,400	230,000	2,400,000	5,000		N/A	170	5,000		N/A	N/A
2-Methylphenol	95-48-7	800	3,100,000	100	100	310,000	3,400,000	NL		N/A	170	5,000		N/A	N/A
2-Nitroaniline	88-74-4	NL	NL	430	430	39,000	23,000,000	NL		N/A	330	10,000		N/A	N/A
2-Nitrophenol	88-75-5	NL	NL	330	330	NL	NL	NL		N/A	170	5,000		N/A	N/A
3,3'-Dichlorobenzidine	91-94-1	0.3	1,000	50,000	NL	1,000	4,000	200		N/A	170	5,000		N/A	N/A
3-Nitroaniline	99-09-2	NL	NL	500	500	NL	NL	NL		N/A	330	10,000		N/A	N/A
4,6-Dinitro-2-methylphenol	534-52-1	NL	NL	50,000	NL	6,000	68,000	300		N/A	330	10,000		N/A	N/A
4-Bromophenyl-phenylether	101-55-3	NL	NL	50,000	NL	NL	NL	NL		N/A	170	5,000		N/A	N/A
4-Chloro-3-methylphenol	59-50-7	NL	NL	240	240	NL	NL	NL		N/A	170	5,000		N/A	N/A
4-Chloroaniline	106-47-8	30	240,000	220	220	NL	NL	NL		N/A	170	5,000		N/A	N/A
4-Chlorophenyl-phenyl ether	7005-72-3	NL	NL	50,000	NL	NL	NL	NL		N/A	170	5,000		N/A	N/A
4-Methylphenol	106-44-5	NL	NL	900	900	31,000	340,000	NL		N/A	170	5,000		N/A	N/A
4-Nitroaniline	100-01-6	NL	NL	50,000	NL	NL	NL	NL		N/A	330	10,000		N/A	N/A
4-Nitrophenol	100-02-7	NL	NL	100	100	NL	NL	NL		N/A	330	10,000		N/A	N/A
Acenaphthene	83-32-9	29000	3,400,000	50,000	90,000	3,400,000	37,000,000	74,000		N/A	170	5,000		N/A	N/A
Acenaphthylene	208-96-8	NL	NL	41,000	41,000	NL	300,000,000	NL		N/A	170	5,000		N/A	N/A
Acetophenone	98-86-2	NL	NL	50,000	NL	2,000	5,000	2,000		N/A	170	5,000		N/A	N/A
Anthracene	120-12-7	590000	17,000,000	50,000	700,000	17,000,000	30,000,000	NL		N/A	170	5,000		N/A	N/A
Atrazine	1912-24-9	NL	NL	50,000	NL	210,000	2,400,000	200		N/A	170	5,000		N/A	N/A

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

QAPP Worksheet #15
Reference Limits and Evaluation Table - Soil SVOCs

Semi-Volatile Organic Compounds (All units: µg/kg)	CAS Number	Project Action Limit							*Project Quantitation Limit Goal (PQLG)*	Analytical Method				Achievable Laboratory Limits*	
		Federal (Puerto Rico)		New York		New Jersey					CRQL				
		EPA Soil Screening Levels for Migration to Ground Water (1)	EPA Soil Screening Levels for Direct Contact (2)	NYSDEC Recommended Soil Cleanup Objectives (3)	NYSDEC Soil Cleanup Objectives to Protect Ground Water (4)	NJDEP Residential Direct Contact Soil Remediation Standard (5)	NJDEP Non-Residential Direct Contact Soil Remediation Standard (6)	NJDEP Default Impact to Groundwater Soil Remediation Standard (7)		MDLs	Analytical Method - SOM01.2 Low Soil	Analytical Method - SOM01.2 Med. Soil	*Project-Specific Option*	MDLs	QLs
Benzaldehyde	100-52-7	NL	NL	50,000	NL	6,100,000	68,000,000	NL		N/A	170	5,000		N/A	N/A
Benzo (a) anthracene	56-55-3	80	600	224	3,000	600	2,000	NL		N/A	170	5,000		N/A	N/A
Benzo (a) pyrene	50-32-8	400	60	61	11,000	200	200	NL		N/A	170	5,000		N/A	N/A
Benzo (b) fluoroanthene	205-99-2	200	600	1,100	1,100	600	2,000	NL		N/A	170	5,000		N/A	N/A
Benzo (g,h,i) perylene	191-24-2	NL	NL	50,000	800,000	380,000,000	30,000,000	NL		N/A	170	5,000		N/A	N/A
Benzo (k) fluoroanthene	207-08-9	2000	6,000	1,100	1,100	6,000	23,000	NL		N/A	170	5,000		N/A	N/A
Bis (2-chloroethoxy) methane	111-91-1	NL	NL	50,000	NL	NL	NL	NL		N/A	170	5,000		N/A	N/A
Bis (2-ethylhexyl) phthalate	117-81-7	180000	35,000	50,000	435,000	35,000	140,000	NL		N/A	170	5,000		N/A	N/A
bis-(2-chloroethyl) ether	111-44-4	0.02	400	50,000	NL	400	2,000	200		N/A	170	5,000		N/A	N/A
Butylbenzylphthalate	85-68-7	810000	12,000,000	50,000	122,000	1,200,000	14,000,000	NL		N/A	170	5,000		N/A	N/A
Caprolactam	105-60-2	NL	NL	50,000	NL	31,000,000	340,000,000	8,000		N/A	170	5,000		N/A	N/A
Carbazole	86-74-8	30	24,000	50,000	NL	24,000	96,000	NL		N/A	170	5,000		N/A	N/A
Chrysene	218-01-9	8000	62,000	400	400	62,000	230,000	NL		N/A	170	5,000		N/A	N/A
Dibenzo (a,h)-anthracene	53-70-3	80	60	14	165,000,000	200	200	NL		N/A	170	5,000		N/A	N/A
Dibenzofuran	132-64-9	NL	NL	6,200	6,200	NL	NL	NL		N/A	170	5,000		N/A	N/A
Diethylphthalate	84-66-2	23000	49,000,000	7,100	7,100	49,000,000	550,000,000	57,000		N/A	170	5,000		N/A	N/A
Dimethylphthalate	131-11-3	NL	NL	2,000	2,000	NL	NL	NL		N/A	170	5,000		N/A	N/A
Di-n-butylphthalate	84-74-2	270000	6,100,000	8,100	8,100	6,100,000	68,000,000	NL		N/A	170	5,000		N/A	N/A
Di-n-octylphthalate	117-84-0	10000000	1,200,000	50,000	120,000	2,400,000	27,000,000	NL		N/A	170	5,000		N/A	N/A
Fluoranthene	206-44-0	210000	2,300,000	50,000	1,900,000	2,300,000	24,000,000	NL		N/A	170	5,000		N/A	N/A
Fluorene	86-73-7	28000	2,300,000	50,000	350,000	2,300,000	24,000,000	110,000		N/A	170	5,000		N/A	N/A
Hexachlorobenzene	118-74-1	100	300	410	1,400	300	1,000	NL		N/A	170	5,000		N/A	N/A
Hexachlorobutadiene	87-68-3	100	6,000	50,000	NL	6,000	25,000	NL		N/A	170	5,000		N/A	N/A
Hexachlorocyclo-pentadiene	77-47-4	20000	370,000	50,000	NL	45,000	110,000	NL		N/A	170	5,000		N/A	N/A
Hexachloroethane	67-72-1	20	35,000	50,000	NL	35,000	140,000	200		N/A	170	5,000		N/A	N/A
Indeno (1,2,3-cd)-pyrene	193-39-5	700	600	3,200	3,200	600	2,000	NL		N/A	170	5,000		N/A	N/A
Isophorone	78-59-1	30	510,000	4,400	4,400	510,000	2,000,000	200		N/A	170	5,000		N/A	N/A
Napthalene	91-20-3	4000	1,100,000	13,000	13,000	6,000	17,000	16,000		N/A	170	5,000		N/A	N/A
Nitrobenzene	98-95-3	7	31,000	200	200	31,000	340,000	200		N/A	170	5,000		N/A	N/A
N-Nitroso-di-n propylamine	621-64-7	0.002	70	50,000	NL	200	300	200		N/A	170	5,000		N/A	N/A
N-Nitrosodiphenylamine	86-30-6	60	99,000	50,000	NL	99,000	390,000	200		N/A	170	5,000		N/A	N/A
Pentachlorophenol	87-86-5	1	3,000	1,000	1,000	3,000	10,000	300		N/A	330	10,000		N/A	N/A
Phenanthrene	85-01-8	NL	NL	50,000	220,000	NL	300,000,000	NL		N/A	170	5,000		N/A	N/A
Phenol	108-95-2	5000	18,000,000	30	30	18,000,000	210,000,000	5,000		N/A	170	5,000		N/A	N/A
Pyrene	129-00-0	210000	1,700,000	50,000	665,000	1,700,000	18,000,000	NL		N/A	170	5,000		N/A	N/A

As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.

Fill in selected EPA method option for each analyte.

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

QAPP Worksheet #15
Reference Limits and Evaluation Table - Soil Pesticides

Pesticides (All units: µg/kg)	CAS Number	Project Action Limit							*Project Quantitation Limit Goal (PQLG)*	Analytical Method		Achievable Laboratory Limits*	
		Federal (Puerto Rico)		New York		New Jersey					CRQL		
		EPA Soil Screening Levels for Migration to Ground Water (1)	EPA Soil Screening Levels for Direct Contact (2)	NYSDEC Recommended Soil Cleanup Objectives (3)	NYSDEC Soil Cleanup Objectives to Protect Ground Water (4)	NJDEP Residential Direct Contact Soil Remediation Standard (5)	NJDEP Non-Residential Direct Contact Soil Remediation Standard (6)	NJDEP Default Impact to Groundwater Soil Remediation Standard (7)		MDLs	Analytical Method - SOM01.2 Soil	MDLs	QLs
4,4'-DDD	72-54-8	800	3,000	2,900	7,700	3,000	13,000	NL	*As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.*	N/A	3.3	N/A	N/A
4,4'-DDE	72-55-9	3000	2,000	2,100	4,400	2,000	9,000	NL		N/A	3.3	N/A	N/A
4,4'-DDT	50-29-3	2000	2,000	2,100	2,500	2,000	8,000	NL		N/A	3.3	N/A	N/A
Aldrin	309-00-2	20	40	41	500	40	200	NL		N/A	1.7	N/A	N/A
alpha-BHC	319-84-6	0.03	100	110	200	100	500	2		N/A	1.7	N/A	N/A
alpha-Chlordane	5103-71-9	NL	NL	540	2,000	200	1,000	NL		N/A	1.7	N/A	N/A
beta-BHC	319-85-7	0.1	400	200	200	400	2,000	2		N/A	1.7	N/A	N/A
delta-BHC	319-86-8	NL	NL	300	300	400	2,000	2		N/A	1.7	N/A	N/A
Dieldrin	60-57-1	0.2	40	44	100	40	200	NL		N/A	3.3	N/A	N/A
Endosulfan I	959-98-8	900	NL	900	900	470,000	6,800,000	2,000		N/A	1.7	N/A	N/A
Endosulfan II	33213-65-9	NL	NL	900	900	470,000	6,800,000	2,000		N/A	3.3	N/A	N/A
Endosulfan sulfate	1031-07-8	NL	NL	1,000	1,000	470,000	6,800,000	1,000		N/A	3.3	N/A	N/A
Endrin	72-20-8	50	23,000	100	100	23,000	340,000	600		N/A	3.3	N/A	N/A
Endrin aldehyde	7421-93-4	NL	NL	NL	NL	23,000	340,000	600		N/A	3.3	N/A	N/A
Endrin ketone	53494-70-5	NL	NL	NL	NL	23,000	340,000	600		N/A	3.3	N/A	N/A
gamma-BHC (Lindane)	58-89-9	0.5	400	60	60	400	2,000	2		N/A	1.7	N/A	N/A
gamma-Chlordane	5103-74-2	NL	NL	540	14,000	200	1,000	NL		N/A	1.7	N/A	N/A
Heptachlor	76-44-8	1000	100	100	100	100	700	NL		N/A	1.7	N/A	N/A
Heptachlor epoxide	1024-57-3	30	70	20	20	70	300	NL		N/A	1.7	N/A	N/A
Methoxychlor	72-43-5	8000	390,000	NL	900,000	390,000	5,700,000	NL		N/A	17	N/A	N/A
Toxaphene	8001-35-2	2000	600	NL	NL	600	3,000	NL		N/A	170	N/A	N/A

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

QAPP Worksheet #15
Reference Limits and Evaluation Table - Soil Aroclors (PCBs)

Aroclors (All units: µg/kg)	CAS Number	Project Action Limit							*Project Quantitation Limit Goal (PQLG)*	Analytical Method		Achievable Laboratory Limits*	
		Federal (Puerto Rico)		New York		New Jersey					CRQL		
		EPA Soil Screening Levels for Migration to Ground Water (1)	EPA Soil Screening Levels for Direct Contact (2)	NYSDEC Recommended Soil Cleanup Objectives (3)	NYSDEC Soil Cleanup Objectives to Protect Ground Water (4)	NJDEP Residential Direct Contact Soil Remediation Standard (5)	NJDEP Non-Residential Direct Contact Soil Remediation Standard (6)	NJDEP Default Impact to Groundwater Soil Remediation Standard (7)		MDLs	Analytical Method - SOM01.2 Soil	MDLs	QLs
Aroclor-1016	12674-11-2	NL	NL	1,000	10,000	200	1,000	NL	*As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.*	N/A	33	N/A	N/A
Aroclor-1221	11104-28-2	NL	NL	1,000	10,000	200	1,000	NL		N/A	33	N/A	N/A
Aroclor-1232	11141-16-5	NL	NL	1,000	10,000	200	1,000	NL		N/A	33	N/A	N/A
Aroclor-1242	53469-21-9	NL	NL	1,000	10,000	200	1,000	NL		N/A	33	N/A	N/A
Aroclor-1248	12672-29-6	NL	NL	1,000	10,000	200	1,000	NL		N/A	33	N/A	N/A
Aroclor-1254	11097-69-1	NL	NL	1,000	10,000	200	1,000	NL		N/A	33	N/A	N/A
Aroclor-1260	11096-82-5	NL	NL	1,000	10,000	200	1,000	NL		N/A	33	N/A	N/A
Aroclor-1262	37324-23-5	NL	NL	1,000	10,000	200	1,000	NL		N/A	33	N/A	N/A
Aroclor-1268	11100-14-4	NL	NL	1,000	10,000	200	1,000	NL		N/A	33	N/A	N/A

Project-specific QAPPs will use the appropriate criteria and approach to select the project action limits (PAL) and the analytical methods best suited to achieve the desired project-specific action and quantitation limits.

QAPP Worksheet #15
Reference Limits and Evaluation Table -Soil Inorganics (Metals)

Inorganics (All units: mg/kg)	CAS Number	Project Action Limit							*Project Quantitation Limit Goal (PQLG)*	Analytical Method		Achievable Laboratory Limits*	
		Federal (Puerto Rico)		New York		New Jersey					CRQL		
		EPA Soil Screening Levels for Migration to Ground Water (DAF = 1) (1)	EPA Soil Screening Levels for Direct Contact (2)	NYSDEC Recommended Soil Cleanup Objectives (3)	NYSDEC Soil Cleanup Objectives to Protect Ground Water (4)	NJDEP Residential Direct Contact Soil Remediation Standard (5)	NJDEP Non-Residential Direct Contact Soil Remediation Standard (6)	NJDEP Default Impact to Groundwater Soil Remediation Standard (7)		MDLs	Analytical Method - ILM05.4 ICP-AES for Soil	MDLs	QLs
Aluminum	7429-90-5	NL	NL	NL	NL	78,000	NL	NL	*As per project-specific QAPPs. Should be 1/3 to 1/5 of the PAL or equal to the CRQL where method limits cannot achieve the PQLG.*	N/A	20	N/A	N/A
Antimony	7440-36-0	0.3	31	NL	NL	31	450	NL		N/A	6	N/A	N/A
Arsenic	7440-38-2	1	0.4	7.5	NL	19	19	NL		N/A	1	N/A	N/A
Barium	7440-39-3	82	5,500	300	NL	16,000	59,000	NL		N/A	20	N/A	N/A
Beryllium	7440-41-7	3	160	0.16	NL	16	140	NL		N/A	0.5	N/A	N/A
Cadmium	7440-43-9	0.4	70	1	NL	78	78	NL		N/A	0.5	N/A	N/A
Calcium	7440-70-2	NL	NL	NL	NL	NL	NL	NL		N/A	500	N/A	N/A
Chromium	7440-47-3	2	230	10	NL	NL	NL	NL		N/A	1	N/A	N/A
Cobalt	7440-48-4	NL	NL	30	NL	1,600	590	NL		N/A	5	N/A	N/A
Copper	7440-50-8	NL	NL	25	NL	3,100	45,000	NL		N/A	2.5	N/A	N/A
Cyanide	57-12-5	2	1,600	NL	NL	1,600	23,000	NL		N/A	2.5	N/A	N/A
Iron	7439-89-6	NL	NL	2,000	NL	NL	NL	NL		N/A	10	N/A	N/A
Lead	7439-92-1	NL	NL	NL	NL	400	800	NL		N/A	1	N/A	N/A
Magnesium	7439-95-4	NL	NL	NL	NL	NL	NL	NL		N/A	500	N/A	N/A
Manganese	7439-96-5	NL	NL	NL	NL	11,000	5,900	NL		N/A	1.5	N/A	N/A
Mercury	7439-97-6	0.1	23	0.1	NL	23	65	NL		N/A	0.1	N/A	N/A
Nickel	7440-02-0	7	1,600	13	NL	1,600	23,000	NL		N/A	4	N/A	N/A
Potassium	7440-09-7	NL	NL	NL	NL	NL	NL	NL		N/A	500	N/A	N/A
Selenium	7782-49-2	0.3	390	2	NL	390	5,700	NL		N/A	3.5	N/A	N/A
Silver	7440-22-4	2	390	NL	NL	390	5,700	NL		N/A	1	N/A	N/A
Sodium	7440-23-5	NL	NL	NL	NL	NL	NL	NL		N/A	500	N/A	N/A
Thallium	7440-28-0	0.04	6	NL	NL	5	79	NL		N/A	2.5	N/A	N/A
Vanadium	7440-62-2	300	550	150	NL	78	1,100	NL		N/A	5	N/A	N/A
Zinc	7440-66-6	620	23,000	20	NL	23,000	110,000	NL		N/A	6	N/A	N/A

Notes for QAPP Worksheet #15
Reference Limits and Evaluation Table - Soil VOCs

1. EPA Soil Screening Guidance: Technical Background Document (EPA/540/R95/128, May 1996). Table A-1. Generic SSLs for Residential Scenarios Migration to Groundwater (DAF = 1)
2. EPA Soil Screening Guidance: Technical Background Document (EPA/540/R95/128, May 1996). Table A-1. Generic SSLs for Residential Scenarios Ingestion-Dermal
3. NYSDEC Recommended Soil Cleanup Objectives (TAGM #4046, January 1994)
4. NYSDEC Soil Cleanup Objectives to Protect Groundwater (TAGM #4046, January 1994)
5. NJDEP Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 6/2008); http://www.state.nj.us/dep/srp/regs/rs/, downloaded November 14, 2008
6. NJDEP Non-Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 6/2008); http://www.state.nj.us/dep/srp/guidance/rs/, downloaded November 14, 2008
7. NJDEP Guidance Document, Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation; http://www.state.nj.us/dep/srp/guidance/rs/igw_intro.htm, downloaded November 14, 2008

* m-xylene and p-xylene reported as one compound under S0M01.2.
** Xylene (total) was used for o-xylene criteria when the criteria is not listed.
** Project-specific QAPPs will provide the MDLs and CRQLs after a subcontract laboratory is selected (if required).*
** Steps will be taken to obtain analytical limits that meet project requirements.*

CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
EPA = United States Environmental Protection Agency
MDL = method detection limit
N/A = Not Applicable
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed or chemical name listed but no value available
NYSDEC = New York State Department of Environmental Conservation
PAL= Project Action Limit
µg/L = micrograms per liter

Notes for QAPP Worksheet #15
Reference Limits and Evaluation Table - Soil SVOCs

1. EPA Soil Screening Guidance: Technical Background Document (EPA/540/R95/128, May 1996). Table A-1. Generic SSLs for Residential Scenarios Migration to Groundwater (DAF = 1)
2. EPA Soil Screening Guidance: Technical Background Document (EPA/540/R95/128, May 1996). Table A-1. Generic SSLs for Residential Scenarios Ingestion-Dermal
3. NYSDEC Recommended Soil Cleanup Objectives (TAGM #4046, January 1994)
4. NYSDEC Soil Cleanup Objectives to Protect Groundwater (TAGM #4046, January 1994)
5. NJDEP Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 6/2008); http://www.state.nj.us/dep/srp/guidance/rs/, downloaded November 14, 2008
6. NJDEP Non-Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 6/2008); http://www.state.nj.us/dep/srp/guidance/rs/, downloaded November 14, 2008
7. NJDEP Guidance Document, Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation; http://www.state.nj.us/dep/srp/guidance/rs/igw_intro.htm, downloaded November 14, 2008

** Project-specific QAPPs will provide the MDLs and CRQLs after a subcontract laboratory is selected (if required).*

** Steps will be taken to obtain analytical limits that meet project requirements.*

CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
EPA = United States Environmental Protection Agency
MDL = method detection limit
N/A = Not Applicable
NA = Chemical name listed but no value available
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed
NYSDEC = New York State Department of Environmental Conservation
PAL= Project Action Limit
µg/L = micrograms per liter

Notes for QAPP Worksheet #15
Reference Limits and Evaluation Table - Soil Pesticides

1. EPA Soil Screening Guidance: Technical Background Document (EPA/540/R95/128, May 1996). Table A-1. Generic SSLs for Residential Scenarios Migration to Groundwater (DAF = 1)
2. EPA Soil Screening Guidance: Technical Background Document (EPA/540/R95/128, May 1996). Table A-1. Generic SSLs for Residential Scenarios Ingestion-Dermal
3. NYSDEC Recommended Soil Cleanup Objectives (TAGM #4046, January 1994)
4. NYSDEC Soil Cleanup Objectives to Protect Groundwater (TAGM #4046, January 1994)
5. NJDEP Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 6/2008); http://www.state.nj.us/dep/srp/guidance/rs/
6. NJDEP Non-Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 6/2008); http://www.state.nj.us/dep/srp/guidance/rs/,
7. NJDEP Guidance Document, Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation; http://www.state.nj.us/dep/srp/guidance/rs/igw_intro.htm, downloaded November 14, 2008
   All NJDEP standards downloaded November 14, 2008

** Project-specific QAPPs will provide the MDLs and CRQLs after a subcontract laboratory is selected (if required).*

** Steps will be taken to obtain analytical limits that meet project requirements.*

CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
EPA = United States Environmental Protection Agency
MDL = method detection limit
N/A = Not Applicable
NA = Chemical name listed but no value available
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed
NYSDEC = New York State Department of Environmental Conservation
PAL= Project Action Limit
µg/L = micrograms per liter

Notes for QAPP Worksheet #15
Reference Limits and Evaluation Table - Soil Aroclors (PCBs)

1. EPA Soil Screening Guidance: Technical Background Document (EPA/540/R95/128, May 1996). Table A-1. Generic SSLs for Residential Scenarios Migration to Groundwater (DAF = 1)
2. EPA Soil Screening Guidance: Technical Background Document (EPA/540/R95/128, May 1996). Table A-1. Generic SSLs for Residential Scenarios Ingestion-Dermal
3. NYSDEC Recommended Soil Cleanup Objectives (TAGM #4046, January 1994)
4. NYSDEC Soil Cleanup Objectives to Protect Groundwater (TAGM #4046, January 1994)
5. NJDEP Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 6/2008); http://www.state.nj.us/dep/srp/guidance/rs/
6. NJDEP Non-Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 6/2008); http://www.state.nj.us/dep/srp/guidance/rs/
7. NJDEP Guidance Document, Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation; http://www.state.nj.us/dep/srp/guidance/rs/igw_intro.htm, downloaded November 14, 2008
   All NJDEP standards downloaded November 14, 2008

** Project-specific QAPPs will provide the MDLs and CRQLs after a subcontract laboratory is selected (if required).*

** Steps will be taken to obtain analytical limits that meet project requirements.*

CAS = Chemical abstract service
EPA = United States Environmental Protection Agency
CRQL = Contract Required Quantitation Limit
MDL = method detection limit
NA = Chemical name listed but no value available
PAL= Project Action Limit
µg/L = micrograms per liter
NYSDEC = New York State Department of Environmental Conservation
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed

Notes for QAPP Worksheet #15
Reference Limits and Evaluation Table - Soil Inorganics (Metals)

1. EPA Soil Screening Guidance: Technical Background Document (EPA/540/R95/128, May 1996). Table A-1. Generic SSLs for Residential Scenarios Migration to Groundwater (DAF = 1)
2. EPA Soil Screening Guidance: Technical Background Document (EPA/540/R95/128, May 1996). Table A-1. Generic SSLs for Residential Scenarios Ingestion-Dermal
3. NYSDEC Recommended Soil Cleanup Objectives (TAGM #4046, January 1994)
4. NYSDEC Soil Cleanup Objectives to Protect Groundwater (TAGM #4046, January 1994)
5. NJDEP Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 6/2008); http://www.state.nj.us/dep/srp/guidance/rs/
6. NJDEP Non-Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 6/2008); http://www.state.nj.us/dep/srp/guidance/rs/
7. NJDEP Guidance Document, Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation; http://www.state.nj.us/dep/srp/guidance/rs/igw_intro.htm, downloaded November 14, 2008

All NJDEP standards downloaded November 14, 2008

** Project-specific QAPPs will provide the MDLs and CRQLs after a subcontract laboratory is selected (if required).*

** Steps will be taken to obtain analytical limits that meet project requirements.*

AES = atomic emission spectroscopy
CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
DAF = dilution attenuation factor
EPA = United States Environmental Protection Agency
MDL = method detection limit
MS = mass spectroscopy
NA = Chemical name listed but no value available
NJDEP = New Jersey Department of Environmental Protection
NYSDEC = New York State Department of Environmental Conservation
PAL= Project Action Limit
SSL = soil screening levels
µg/L = micrograms per liter

QAPP Worksheet #16
Project Schedule Timeline Table

[Insert Project-Specific Schedule or Figure here or as an attachment]

QAPP Worksheet # 17
Sampling Design and Rationale

[Summary of sampling program]

The field program will include:

- Mobilization **(Worksheet 17a)**
  - Site Reconnaissance **(Worksheet 17b)**
- Monitoring Well Abandonment and Well Repair **(Worksheet 17c)**
- Hydrogeological Assessments
  - Continuous Water Level Measurements **(Worksheet 17d)**
  - Synoptic Water Level Measurements **(Worksheet 17e)**
- Soil Screening Sampling with Direct-Push Technology (DPT) **(Worksheet 17f)**
- Soil Screening Sampling with Hollow Stem Augers **(Worksheet 17g)**
- Groundwater Screening with DPT **(Worksheet 17h)**
- Groundwater Sampling **(Worksheet 17i)**
- Air Sampling **(Worksheet 17j)**
- Monitoring Well Installation **(Worksheet 17k)**
- Decontamination Procedures **(Worksheet 17l)**

QAPP Worksheet # 17a
Sampling Design and Rationale
Mobilization

Site Preparation
All site workers will become familiar with the groundwater treatment facility operations, the locations of the extraction wells, monitoring wells, and supply wells at the Site.

Access Support
Access to public areas and private property will be needed to execute the field investigation. EPA will be responsible for obtaining site access. [redacted] will assist EPA with site access. Access support is anticipated for the [*tasks where access support is needed*]. [redacted] will provide a list of property owners (public and private) to be accessed during the field activities. The list will include the mailing address and telephone number of the property owners. Once EPA has established that access has been granted, field work can begin. [redacted] will contact and coordinate with property owners and local officials (for work in public areas) to schedule sampling activities. Per EPA direction, [redacted] will give one week (seven days) advance verbal notice to the facility/property owners before field activities on their properties are initiated.

Field Planning Meetings
Prior to field activities, each field team member will review all project plans and participate in a field planning meeting, conducted by the [redacted] PM, to become familiar with the history of the Site, health and safety requirements, field procedures, and related QC requirements. Field personnel 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 personnel will receive comparable briefing if they were not at the initial field planning meeting and/or the tailgate kick-off meeting. Local authorities such as the police and fire departments will be notified prior to the start of field activities.

Field Equipment and Supplies
Equipment and field supply mobilization, governed by [redacted] 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 equipment and supplies needed for each part of the RI field investigation. This will also include staging and transferring all equipment and supplies to and from the site. Measurement and Test Equipment forms will be completed for rental or purchase of equipment (instruments) that will be utilized to collect field measurements. The field equipment will be inspected for acceptability, and instruments calibrated as required prior to use. This task also involves the construction of a decontamination area for sampling equipment and personnel. A separate decontamination pad will be constructed by the drilling subcontractor for drilling equipment.

Investigation Derived Waste (IDW)
[*Description of how IDW will be handled and disposed*]

Field Procedures for these Activities are detailed in:
- TSOP 2-2 Guide to Handling Investigation Derived Waste
- TSOP 5-1 Control of Measurement and Test Equipment

QAPP Worksheet # 17b
Sampling Design and Rationale
Site Reconnaissance

Site Reconnaissance
[*Activities of the site reconnaissance*]

The following reconnaissance activities are also required to support the field activities:
- Aerial photography and analysis
- Reconnaissance of the main trunk sanitary and storm sewer lines
- Ecological resource reconnaissance
- Topographical survey
- Cultural resources survey
- Photographic documentation

Review of Aerial Photography
[*If applicable*]

Ecological Resource Reconnaissance
[*If applicable*]

Topographical Mapping, Monitoring Well Survey, and Sampling Point Location
[*If applicable*]

Cultural Resources Survey
[*If applicable*]

Photographic Documentation
[*If applicable*]

Monthly Field Activity Report
CDM will submit a monthly field activity report to the EPA RPM electronically using email and in hard copy.

Field Procedures for these Activities are detailed in:
- TSOP 3-2 Topographic Survey
- TSOP 4-1 Field Logbook Content and Control, with a RAC 2 clarification
- 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 # 17c
Sampling Design and Rationale
Monitoring Well Abandonment and Well Repair

Monitoring Wells
Well Abandonment
[*If applicable*]

Well Repair
[*If applicable*]

Field Procedures for Well Abandonment are detailed in:

■ TSOP 2-2	Guide to Handling of Investigation-Derived Waste
■ TSOP 4-10	Borehole and Well Decommissioning, except Sections 5.3 (Well Overdrilling) and 5.4 (Borehole or Well Plugging)
■ Worksheet 17I	Decontamination Procedures

QAPP Worksheet # 17d
Sampling Design and Rationale
Continuous Water Level Measurements

Continuous water level measurements will be collected. Water level and barometric pressure readings will be measured using In-situ TROLL® data loggers, and will be operated according to manufacturer's instructions.
[description of where water levels will be collected]

Field Procedures for these Activities are detailed in:

- TSOP 1-6 Water Level Measurement, Section 5.3.4 Continuous Recording Method
- TSOP 1-10 Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement, if required by Health and Safety Plan
- TSOP 4-1 Field Logbook Content and Control, with a RAC 2 clarification
- TSOP 5-1 Control of Measurement and Test Equipment
- Worksheet 17l Decontamination Procedures

QAPP Worksheet # 17e
Sampling Design and Rationale
Synoptic Water Level Measurements

Groundwater levels will be used to monitor site-wide groundwater elevations. Synoptic water level elevation measurements will be collected from [*names of monitoring wells*].

Water level measurements will be collected from conventional monitoring wells using an electronic water level indicator, at the surveyors mark on the inner casing. [*Other ancillary site specific information for project*]

Field Procedures for these Activities are detailed in:

- TSOP 1-6 Water Level Measurement, Section 5.2 Water Level Measurement Using Electronic Water Level Indicators (and manufacturer's instructions)
- TSOP 1-10 Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement, if required by Health and Safety Plan
- TSOP 4-1 Field Logbook Content and Control, with a RAC 2 clarification
- Worksheet 17l Decontamination Procedures

QAPP Worksheet # 17f
Sampling Design and Rationale
Soil Screening Sampling with Direct-Push Technology (DPT)

[*Description of soil screening sampling with DPT with location, number of samples, analysis, procedures*]

Field Procedures for these Activities are detailed in:

■ TSOP 1-2	Sample Custody
■ TSOP 1-4	Subsurface Soil Sampling, Section 5.2. Direct Push Rig Sampling
■ TSOP 1-6	Water Level Measurement, Section 5.2 Water Level Measurement Using Electronic Water Level Indicators (In-Situ Level TROLL or equivalent)
■ TSOP 1-10	Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement
■ TSOP 2-1	Packaging and Shipping Environmental Samples
■ TSOP 2-2	Guide to Handling Investigation Derived Waste
■ TSOP 4-1	Field Logbook Content and Control, with a RAC 2 clarification
■ Worksheet 17l	Decontamination Procedures
■ Worksheet 18	Sampling Locations and Methods/ SOP Requirements

QAPP Worksheet # 17g
Sampling Design and Rationale
Soil Screening Sampling with Hollow Stem Augers

[*Description of soil screening sampling with hollow stem augers with location, number of samples, analysis, procedures*]

Field procedures for these activities are detailed in:

■ Appendix A	Site-Specific Low Flow Groundwater Purging and Sampling Procedure
■ TSOP 1-2	Sample Custody
■ TSOP 1-4	Subsurface Soil Sampling, Section 5.2.3 Split-Barrel (or Split-Spoon) Sampling
■ TSOP 1-6	Water Level Measurement, 5.2 Water Level Measurement Using Electronic Water Level Indicators
■ TSOP 1-10	Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement
■ TSOP 2-1	Packaging and Shipping Environmental Samples
■ TSOP 2-2	Guide to Handling Investigation Derived Waste
■ TSOP 3-5	Lithologic Logging
■ TSOP 4-1	Field Logbook Content and Control, with a RAC 2 clarification
■ Worksheet 17l	Decontamination Procedures
■ Worksheet 18	Sampling Locations and Methods/ SOP Requirements
■ ASTM D 1586-99	Penetration Test and Split-Barrel Sampling of Soils

QAPP Worksheet # 17h
Sampling Design and Rationale
Groundwater Screening with DPT

Groundwater Screening Sampling
[*Description of groundwater screening sampling with DPT with location, number of samples, analysis, procedures*]

Field Procedures for these Activities are detailed in:

■ Appendix A	Site-Specific Low Flow Groundwater Purging and Sampling Procedure
■ TSOP 1-2	Sample Custody
■ TSOP 1-6	Water Level Measurement, Section 5.2.3 Water Level Measurement Using Electronic Water Level Indicators (and manufacturer's instructions)
■ TSOP 1-10	Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement
■ TSOP 2-1	Packaging and Shipping Environmental Samples
■ TSOP 2-2	Guide to Handling Investigation Derived Waste
■ TSOP 3-1	Geoprobe® Sampling
■ TSOP 4-1	Field Logbook Content and Control, with a RAC 2 clarification
■ Worksheet 17l	Decontamination Procedures
■ Worksheet 18	Sampling Locations and Methods/ SOP Requirements

QAPP Worksheet # 17i
Sampling Design and Rationale
Groundwater Sampling

[*Description of groundwater sampling including locations, analyses, frequency and procedures*]

Field Procedures for these Activities are detailed in:

- Appendix A — Site-Specific Low Flow Groundwater Purging and Sampling Procedure
- TSOP 1-2 — Sample Custody
- TSOP 1-6 — Water Level Measurement, Section 5.2.3 Water Level Measurement Using Electronic Water Level Indicators (and manufacturer's instructions)
- TSOP 1-9 — Tap Water Sampling, with a RAC 2 clarification
- TSOP 1-10 — Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement
- TSOP 2-1 — Packaging and Shipping Environmental Samples
- TSOP 2-2 — Guide to Handling Investigation Derived Waste
- TSOP 4-1 — Field Logbook Content and Control, with a RAC 2 clarification
- Worksheet 17I — Decontamination Procedures
- Worksheet 18 — Sampling Locations and Methods/ SOP Requirements

QAPP Worksheet # 17j
Sampling Design and Rationale
Air Sampling

[*Description of air sampling, procedures, locations, and quantity*]

Field Procedures for these Activities are detailed in:

■ TSOP 1-2	Sample Custody
■ TSOP 1-10	Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement, if required by Health and Safety Plan
■ TSOP 1-8	Volatile Organic Compound Air Sampling Using EPA Method TO-15 with SUMMA® Canister
■ TSOP 2-1	Packaging and Shipping Environmental Samples
■ TSOP 2-2	Guide to Handling Investigation Derived Waste
■ Worksheet 17l	Decontamination Procedures
■ Worksheet 18	Sampling Locations and Methods/ SOP Requirements

QAPP Worksheet # 17k
Sampling Design and Rationale
Monitoring Well Installation

Monitoring Well Installation
[redacted] will prepare a technical memorandum summarizing the results of the soil and groundwater investigation. If determined monitoring wells are required, [redacted] will provide rationale in the technical memorandum for the total number of monitoring wells, locations, and depths. The following procedures will be refined with a Field Change Request form after the technical memorandum is submitted.

[Description of the monitoring well installation]

Development
[How monitoring wells will be developed]

Geophysical Logging
[How geophysical logging will be performed, if applicable]

Field Procedures for these Activities are detailed in:

■ Appendix A	Site-Specific Low Flow Groundwater Purging and Sampling Procedure
■ TSOP 1-2	Sample Custody
■ TSOP 1-6	Water Level Measurement, Section 5.2 Water Level Measurement Using Electronic Water Level Indicators
■ TSOP 1-10	Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement
■ TSOP 2-1	Packaging and Shipping Environmental Samples
■ TSOP 2-2	Guide to Handling Investigation Derived Waste
■ TSOP 3-4	Geophysical Logging, Calibration, and Quality Control
■ TSOP 4-1	Field Logbook Content and Control, with a RAC 2 clarification
■ TSOP 4-2	Photographic Documentation of Field Activities, Sections 5.2.2 General Guidelines for Still Photography and 5.2.4 Photographic Documentation
■ TSOP 4-3	Well Development and Purging, with a RAC 2 clarification, Section 5.3 Indicator Parameter Method of Well Purging
■ TSOP 4-4	Design and Installation of Monitoring Wells in Aquifers (Mud Rotary Drilling)
■ Worksheet 17l	Decontamination Procedures
■ Worksheet 18	Sampling Locations and Methods/ SOP Requirements
■ ASTM D 1586-99	Penetration Test and Split-Barrel Sampling of Soils [*If applicable*]

QAPP Worksheet # 17I
Sampling Design and Rationale
Decontamination Procedures

Field decontamination will be performed on all personnel and equipment that enters the exclusion zone. Personnel decontamination procedures will be implemented to prevent worker exposure to site contaminants. Equipment decontamination procedures will be implemented to prevent cross-contamination of environmental samples and prevent off-site migration of contaminants as a result of site investigation activities.

Personal Protective Equipment

- Non-residual detergent (Alconox) and tap water rinse
- Respirator sanitizer (for respirator or self contained breathing apparatus [SCBA] face piece)
- Thorough rinse with potable water
- Air dry

Field Monitoring and Geophysical Logging Equipment

Instruments should be cleaned per manufacturer's instructions. The electronic water level indicators, geophysical logging equipment, and water quality parameter probes cannot be rinsed with solvents or acids. The electronic water level indicators will be decontaminated with a non-phosphate detergent, tap water rinse, and a final distilled/deionized water rinse prior to use at each well. The water quality parameter probes will be rinsed prior to and after each use with deionized/distilled water only.

Well Components

Well components must be steam cleaned prior to installation to ensure that all oils, greases, and waxes have been removed. The components should be stored using clean polyethylene sheeting to keep the possibility of contamination to a minimum.

Drilling Equipment and Other Large Pieces of Equipment

All drilling equipment that comes in contact with the soil must be steam cleaned before use, and after drilling each borehole. This includes drill rods, bits and augers, dredges, or any other large piece of equipment. Sampling devices such as split-spoons must be decontaminated, after each use, by the procedure listed below.

Sampling Apparatus, General Considerations

All sampling apparatus must be properly decontaminated prior to its use in the field to prevent cross-contamination. Equipment should be decontaminated after usage (once a day or on an as needed basis). Decontamination will be performed in an area outside the contamination zone. Enough equipment will be available to be dedicated to the sampling points planned each day.

QAPP Worksheet # 17I
Sampling Design and Rationale
Decontamination Procedures

Decontamination Procedure:
The required decontamination procedure for all sampling equipment is:

*	a.	wash and scrub with low phosphate detergent
	b.	tap water rinse
**	c.	10 percent nitric acid rinse (for metals analysis only), laboratory grade (one percent solution will be used when carbon steel equipments, such as split-spoons, are used)
	d.	demonstrated analyte-free water rinse
***	e.	isopropanol rinse (all solvents must be pesticide-grade or better)
****	f.	demonstrated analyte-free water rinse (amount of water must be at least five times that of the solvents used)
	g.	air dry
	h.	wrap in aluminum foil, shiny side out, for transport

* Tap water must be from a municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute.
** Nitric acid rinse will only be used when samples are collected for inorganics
*** Solvent rinse required only when sampling for organics.
**** A sample of the demonstrated analyte-free water will be collected and submitted for chemical analysis. Analytical results will be kept on-site. Determination of analyte-free water will be according to the EPA Region II CERCLA QA Manual (EPA 1989) (see page 59).

While performing decontamination activities, phthalate-free gloves should be used to prevent phthalate contamination of the sampling equipment that could result from the interaction of the gloves with the organic solvents.

Decontamination Equipment

- Steam cleaner
- Distilled/deionized water
- Potable water
- Deep basins
- Brush
- Acetone or isopropanol (pesticide-grade)
- Personnel protective equipment
- 10 percent nitric acid (one percent when needed), ultra pure grade
- Power source (e.g., generator), if required
- Demonstrated analyte-free water
- Polyethylene sheeting
- Utility knife
- Non-phosphate detergent (i.e. Alconox)
- Aluminum foil
- Air monitoring equipment and calibration gas

Field Procedures for these Activities are detailed in:
■ TSOP 4-5 Field Equipment Decontamination at Nonradioactive Sites.

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)[4]	Sampling SOP Reference	Rationale for Sampling Location
Gas							
Soil							
Sediment							
Groundwater							
Potable Water							
Surface Water							

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/ SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
Air	Soil Gas	Low	TO-15 scan	6 L	SUMMA canister	NA	30 days
	Indoor Air	Low	TO-15 SIM	6 L	SUMMA canister	NA	30 days
Soil or Sediment for DESA or CLP	VOC	Low	5035A/SOM01.2	15 grams total	(3) 40 mL glass vials with magnetic stir bars and PTFE lined septa/open top screw caps	Cool to 4°C	10 days VTSR; Technical-14 days (Technical is from time of sample collection)
					(3) EnCore Samplers (with pre-notification of RSCC coordinator and approval of EPA)		Technical-48 hours
	Percent Moisture (include with VOC vials)	NA	SOM01.2	50 grams	(1) 4 oz. jar w/Teflon lined cap	No preservation No headspace in sample jar	Technical-48 hours
	TCL SVOC	SIM	SOM01.2	Fill to capacity	(1) 8 oz. glass jar w/Teflon lined cap	Cool to 4°C	10 days extract-VTSR; 40 days analyze
	TCL SVOCs	Low	SOM01.2	100 grams	(1) 8 oz. glass jar w/Teflon lined cap	Cool to 4°C	10 days extract-VTSR; 40 days analyze
	TCL Pesticide	Low	SOM01.2	100 grams	(1) 8 oz. glass jar w/Teflon lined cap	Cool to 4°C	10 days extract-VTSR;
	TCL PCB	Low	SOM01.2	100 grams	Included with Pesticides	Cool to 4°C	40 days analyze Technical 14/40
	TAL Metals	Low	ILM05.4	250 grams	(1) 8 oz. glass jar w/Teflon lined cap	Cool to 4°C	Technical-180 days (Hg-28 days and cyanide 14 days) VTSR - Subtract 2 days – this allowance for sample receipt by laboratory

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/ SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
Soil or sediment for DESA or [redacted] Subcontract laboratory	TOC	Low	Lloyd Kahn	10 g	(1) 8-oz glass jar	Cool to 4°C	14 days
	Grain size	Low	ASTM D421-85 ASTM D422-63	500 g	(1) 8-oz glass jar	Cool to 4°C	None
	pH	Low	SW-846, 9045D	10 g	(1) 8-oz glass jar	Cool to 4°C	48 hours
	Hexavalent Chromium	Low	SW-846 3060A/7196A	Fill to capacity	(1) 8 oz glass jar	Cool to 4°C	30 days: extraction; 7 days: analysis
	Cation exchange Capacity	Low	EPA 9080, 9081, ILM05.4 Modified	10 g	(1) 4 oz glass jar	None	None
	Rigid Wall permeability		ASTM D2434	TBD	(1) 4 oz glass jar	None	None
	In-situ Porosity (Determined from specific gravity & dry bulk density)	Low	ASTM D854 ASTM D2937	TBD	Shelby tube	None	None
	Sulfide	Low	EPA 376 – after extraction	TBD	(1) 4 oz glass jar	Cool to 4°C	7 days
	Perchlorate	Low	EPA 314.0 – after extraction	TBD	(1) 4 oz glass jar w/Teflon lined cap	Cool to 4°C	28 days
	Acid Volatile Sulfide-Simultaneously Extracted Metals (AVS-SEM)	Low	SW-9030/9034/ 3010/6010B or ILM05.4	TBD	(1) 4 oz glass jar w/Teflon lined cap	Cool to 4°C	14 days

Technical holding time is referenced unless otherwise noted.
MS/MSD is not required for TCL VOC and SVOC.
The field team is encouraged to consolidate the sample volumes in consultation with DESA, RSCC and the subcontract laboratories as appropriate.
Additional sample volumes may be required when more than one option of a method is requested, for example Low plus SIM SVOC analysis. Consult the CLP Guidance for Field Samplers and include this information in the project-specific QAPPs.

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/ SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
Aqueous	TCL VOCs	Trace plus SIM	SOM01.2	200 mL	(5) 40 ml VOA vials w/Teflon lined septum	1:1 HCl to pH<2; no headspace; no bubbles.	Technical 14 days 10 days VTSR Preserved; Unpreserved 7 days
	TCL VOCs	Trace or Low	SOM01.2	120 mL	(3) 40 ml VOA vials w/Teflon lined septum	Do not preserve if effervescence occurs. Cool to 4°C	
	Methane, ethane and ethene	Low	RSK 175	40 mL	(3) 40 ml VOA vials w/Teflon lined septum		14 days
	TCL SVOCs	Low or Low plus SIM	SOM01.2	1000 mL	(2) 1L amber glass bottles w/Teflon lined cap. No additional volume required for SIM	Cool to 4°C	5 days extract, 40 days analyze for VTSR; 7/40 Technical
	TCL Pesticide Compounds	Low	SOM01.2	1000 mL	(2) 1L amber glass bottle w/Teflon lined cap	Cool to 4°C	5 days extract, 40 days analyze; 7/40 Technical
	TCL PCBs	Low	SOM01.2	1000 mL	(2) 1L amber glass bottle w/Teflon lined cap	Cool to 4°C	5 days extract, 40 days analyze; 7/40 Technical
	TAL Metals, Mercury	Low (AES)	ILM05.4	250 mL each	(2) 1 L high density polyethylene bottle (HDPE)	HNO_3 to pH<2; Cool to 4°C	6 months (Hg-26 days VTSR or 28 days Technical)
	TAL Metals	Trace (MS)		250 mL	(1) 1 L HDPE [extra bottle is for MS analysis]		
	Cyanide	Low		250 mL	(1) 1 L HDPE	NaOH to pH >12; cool to 4°C	12 days VTSR; 14 days Technical
	Alkalinity	Low	EPA 310.1/310.2	100 mL	(1) 250 mL HDPE	Cool to 4°C	14 days
	Ammonia	Low	EPA 350.1/350.2, 350.2/.350.3	400 mL	(1) 1 L HDPE	H_2SO_4 to pH <2; Cool to 4°C	28 days

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/ SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
Aqueous	Bromide	Low	EPA 300, 320.1	100 mL	(1) 250 mL HDPE	Cool to 4°C	28 days
	Chloride	Low	EPA 300, 325.1/325.2, 325.3	50 mL	(1) 125 mL HDPE	Cool to 4°C	28 days
	Ferrous Iron (field test)	Low	HACH 8146	25 mL	1 HDPE	Cool to 4°C	Analyze on day collected
	Fluoride	Low	EPA 300, 340.1/340.3, 340.2	50 mL 300 mL for 340.1	(1) 500 mL HDPE	Cool to 4°C	28 days
	Hardness	Low	EPA 130.1, 130.2 or ILM05.4 + calculation	100 mL	(1) 250 mL HDPE	HNO_3 to pH<2; Cool to 4°C	6 months
	Hexavalent Chromium	Low	SW-846 7196A	500 mL	0.5 liter HDPEs	Cool to 4°C	24 hours
	Hexavalent Chromium (field test)	Low	HACH 8023	25 mL	HDPEs	Cool to 4°C	Analyze on day collected
	Nitrate	Low	EPA 300, 352.1	100 mL	(1) 250 mL HDPE	Cool to 4°C	48 hours
	Nitrite	Low	EPA 300, 354.1	100 mL	(1) 250 mL HDPE	Cool to 4°C	48 hours
	Nitrate/Nitrite	Low	EPA 353 or 300	100 mL	250 mL polyethylene bottle	H_2SO_4 to pH <2; Cool to 4°C	28 days
	Chemical Oxygen Demand	Low	EPA 410.4, 410.1/410.2/410.3	50 mL	(1) 125 mL HDPE	H_2SO_4 to pH <2; Cool to 4°C	28 days
	Biological Oxygen Demand	Low	EPA 405.1	1 L	(1) 2 L HDPE	Cool to 4°C	48 hours
	Dissolved Organic Carbon	Low	EPA 415.1 or 9060	50 mL	(1) 250 mL amber glass bottle or protect from light	Filter, H_2SO_4 to pH <2; Cool to 4°C	28 days
	Total Organic Carbon	Low	EPA 415.1/415.2 or 9060	50 mL	(1) 250 mL amber glass bottle or protect from light	H_2SO_4 to pH <2; Cool to 4°C	28 days
	Orthophosphorus	Low	EPA 300, 365.1/365.2/365.3	50 mL	(1) 125 mL HDPE	Cool to 4°C	48 hours

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/ SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
Aqueous	Phosphorus (all forms)	Low	EPA 365.1/365.2/ 365.3/365.4	50 mL; 25 mL for 365.4	(1) 125 mL HDPE	H_2SO_4 to pH <2; Cool to 4°C	28 days
	Perchlorate	Low	EPA 314.0	250 mL	(1) 125 mL HDPE	None; can Cool to 4°C	28 days
	TKN	Low	EPA 351.4, 351.1/351.2/351.3	500 mL	(1) 1 L HDPE	H_2SO_4 to pH <2; Cool to 4°C	28 days
	TDS (Filterable residue)	Low	EPA 160.1	100 mL	(1) 250 mL HDPE	Cool to 4°C	7 days
	TSS (Non-filterable residue)	Low	EPA 160.2	100 mL	(1) 250 mL HDPE	Cool to 4°C	7 days
	Sulfate	Low	EPA 300, 375.3, 375.1/375.2/375.4	50-100 mL	(1) 250 mL HDPE	Cool to 4°C	28 days
	Sulfate	Low	HACH 8051	10 mL	Test kit bottle	Cool to 4°C	Analyze on day collected
	Sulfide	Low	EPA 376.1, 376.2	200 mL	(1) 1 L HDPE	Sodium acetate and NaOH to pH>9; Cool to 4°C	7 days; Unpreserved 48 hours
	Sulfide	Low	HACH 8131	25 mL	Test kit bottle	Cool to 4°C	Analyze on day collected

Technical holding time is referenced unless otherwise noted.
MS/MSD is not required for TCL VOC and SVOC.
The field team is encouraged to consolidate the sample volumes in consultation with DESA, RSCC and the subcontract laboratories as appropriate. Additional sample volumes may be required when more than one option of a method is requested, for example Low plus SIM SVOC analysis. Consult the CLP Guidance for Field Samplers and include this information in the project-specific QAPPs.

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group [Lab Assignment]	Concentration Level	Analytical and Preparation Method/SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
Aqueous (Equipment Blanks)	Trace VOCs	Trace	SOM01.2	120 ml	(3) 40 ml VOA vials w/Teflon lined septum	1:1 HCl to pH<2; cool to 4°C	10 days
	TCL SVOCs	Low	SOM01.2	1000 ml	(2) 1L amber glass bottles w/Teflon lined cap	Cool to 4°C	5 days extract, 40 days analyze
	TCL Pesticides	Low	SOM01.2	1000 ml	(2) 1L amber glass bottle w/Teflon lined cap	Cool to 4°C	5 days extract, 40 days analyze
	TCL Aroclors/PCBs	Low	SOM01.2	1000 ml	Included with Pesticides	Cool to 4°C	5 days extract, 40 days analyze
	TAL Metals	Low	ILM05.4	250 ml	(1) 1 L polyethylene	HNO_3 to pH<2; cool to 4°C	6 months (Hg-26 days)
Aqueous (Trip Blanks)	Trace VOCs	Trace	SOM01.2	120 ml	(4) 40 ml VOA vials w/Teflon lined septum	1:1 HCl to pH<2; cool to 4°C	10 days

Verified time of sample receipt (VTSR) holding time is referenced above.
MS/MSD is not required for QC samples.
The field team is encouraged to consolidate the sample volumes in consultation with DESA, RSCC and the subcontract laboratories as appropriate.

QAPP Worksheet #20
Field Quality Control Sample Summary Table[1]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations[2]	No. of Field Duplicate Pairs	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples	No. of Equipment Blanks	No. of Trip. Blanks	No of PE Samples[2]
Air	Soil Gas	Low	TO-15 scan		1/20	NA	NA	NA	TBD
	Indoor Air	Low	TO-15 SIM		1/20	NA	NA	NA	TBD
Soil/ Sediment	TCL VOC	Low	SOM01.2		1/20	NA	1 per decontamination event	NA	TBD
	Percent Moisture	NA	SOM01.2		1/20	NA	NA	NA	TBD
	TCL SVOC	Low	SOM01.2		1/20	NA	1 per decontamination event not to exceed 1 per day *(see project-specific QAPP)*	NA	TBD
	TCL Pesticides	Low	SOM01.2		1/20	See the CLP Guidance for Field Samplers		NA	TBD
	TCL Aroclors (PCB) Compounds	Low	SOM01.2		1/20			NA	TBD
	TAL Metals	Low	ILM05.4		1/20	1 per SDG		NA	TBD
	Wet Chemistry	Low	Varies		1/20	As required by laboratory	NA	NA	TBD
	Geotechnical parameters	NA	Varies		1/20	NA	NA	NA	NA
Aqueous	Trace Concentration Volatile Organics	Low	SOM01.2		1/20	NA	1 per decontamination event not to exceed 1 per day *(see project-specific QAPP)*	1 per cooler	TBD
	Methane, ethane, ethene	Low	RSK 175		1/20	NA		1 per cooler	TBD
	Semi-Volatile Organics	Low	SOM01.2		1/20	NA		NA	TBD
	Pesticide Compounds	Low	SOM01.2		1/20	See the CLP Guidance for Field Samplers		NA	TBD
	PCB Compounds	Low	SOM01.2		1/20			NA	TBD
	TAL Metals	Low	ILM05.4		1/20	1 per SDG		NA	TBD
	Wet Chemistry	Low	As selected by project team		1/20	As required by laboratory	NA	NA	TBD

1. The frequency of QC samples are outlined above, the exact number of QC samples will be detailed in the project-specific QAPPs.
2. Project-specific information. PE samples may be requested by EPA Region 2.

[redacted]

QAPP Worksheet #20
Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations	No. of Field Duplicate Pairs	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples	No. of Equipment Blanks	No. of Trip. Blanks	No of PE Samples
Aqueous	pH; conductivity; dissolved oxygen; turbidity; temperature	NA	See equipment manual		NA	NA	NA	NA	NA

QAPP Worksheet #21
Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type*	Modified for Project Work? (Y/N)*	Comments
1-2	Sample Custody, Rev. 5, 3/31/07	[redacted]	*NA*	Y	Contract clarification applies
1-4	Subsurface Sampling, Rev. 6, 3/31/07	[redacted]	*TSOP*	Y	Contract clarification applies
1-6	Water Level Measurement, Rev. 6, 3/31/07	[redacted]	*TSOP*	N	
1-10	Field Measurement of Organic Vapors, Rev. 4, 3/31/07	[redacted]	*TSOP/ Mini-RAE/Multi-RAE*	N	
2-1	Packaging and Shipping Environmental Samples, Rev. 3, 3/31/07	[redacted]	*TSOP*	Y	Contract clarification applies
2-2	Guide to Handling of Investigation-Derived Waste, Rev. 5, 3/31/07	[redacted]	*NA*	N	
3-2	Topographic Survey, Rev. 6, 3/31/07	[redacted]	*NA*	N	
3-4	Geophysical Logging, Calibration, and Quality Control	[redacted]	*TSOP*	N	
3-5	Lithologic Logging	[redacted]			
4-1	Field Logbook Content and Control, Rev. 6, 3/31/07	[redacted]	*NA*	Y	Contract clarification applies
4-2	Photographic Documentation of Field Activities, Rev. 7, 3/31/07	[redacted]	*Camera*	N	
4-3	Well Development and Purging, Rev. 5, 3/31/07	[redacted]	*TSOP YSI*	Y	Contract clarification applies
4-4	Design and Installation of Monitoring Wells in Aquifers, Rev. 6, 3/31/07	[redacted]		Y	Contract clarification applies
4-5	Field Equipment Decontamination at Nonradioactive Sites, Rev. 7, 3/31/07	[redacted]	*TSOP*	Y	Contract clarification applies
4-9	Aquifer Performance Tests, Rev. 0, 5/06/05	[redacted]	*TSOP*	N	
5-1	Control of Measurement and Test Equipment, Rev. 8, 3/31/07	[redacted]	*NA*	Y	Contract clarification applies
N/A	Site-Specific Low Flow Groundwater Purging and Sampling Procedure	[redacted]	*SOP*	N	
D1586	Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils	ASTM	*SOP*	N	

[redacted]

Modify for each project –specific QAPP.
To be updated- project specific QAPP will specify the appropriate sections of TSOP that apply

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

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Mini RAE plus Classic (PGM-76) Toxic Gas Monitor - 11.7 electron volt (eV) lamp	Calibration checked at the beginning and end of day	As needed in field; semi-annually by supplier	Measure Isobutylene 100 parts per million (ppm) (calibration gas)	Upon receipt, Successful operation	Calibrate am, check pm	± 10% of the calibrated value	Manually zero meter or service as necessary and recalibrate	FTL	Manufacturers specifications
Multi-RAE plus photoionization detector (PID) Toxic Gas Monitor - 11.7 eV lamp	Calibration checked at the beginning and end of day	As needed in field; semi-annually by supplier	Measure known concentration of Isobutylene 100 ppm (calibration gas); plus O_2, CO, H_2S, LEL	Upon receipt, Successful operation	Calibrate am, check pm	± 10% of the calibrated value	Manually zero meter or service as necessary and recalibrate	FTL	Manufacturers specifications
YSI-*600XL* Flow through cell	Calibrate: beginning of day and check calibration at the end of the day	Performed before shipment and as needed	Measure with known National Institute for Standards and Technology (NIST) traceable buffers and conductivity calibration solutions	Upon receipt, Successful operation	Daily, before each use	pH: ± 0.05 Specific Conductivity:±5 micro Siemens (µS) DO ± 0.02 ppm Temp.: ±0.3°C	Recalibrate or service as necessary	FTL	Manufacturers specifications
In-Situ Mini TROLL® 30 psig level transducer with HP *IPAQ 2215 PDA* and Pocket-Situ	Manufacture Calibration only	Performed by manufacture or prior to shipping	Manufacture Calibration only	Check instrument is in working order	Performed by manufacture or prior to shipping	Pass/Fail	Return to rental company for replacement.	FTL	Manufacturers specifications
3001 LT Level Logger Gold *M10/F30* part #108081 with Level Loader Gold	Manufacture Calibration only	Performed by manufacture or prior to shipping	Manufacture Calibration only	Check instrument is in working order	Performed by manufacture or prior to shipping	Pass/Fail	Return to rental company for replacement	Sub-contractor	Manufacturers specifications
Water Level Meter	N/A	None	Check daily, before each use	Check instruments are working	Check daily before each use	Pass/Fail	Return to rental company for replacement	Sub-contractor	Manufacturers specifications
LaMotte Turbidity Meter *[insert model #]*	Accuracy/calibration check at the beginning and end of the day	Return for replacement	Measure with standard solution	Upon receipt, Successful operation	Calibrate before use and whenever anomaly suspected	Pass /fail	Replace battery or bulb or return for replacement	FTL	Manufacturers specifications

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)*
TO-15	Determination Of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/Mass Spectrometry (GC/MS)	Definitive	VOC Gases	GC/MS	EPA Headquarters National Contract Laboratory	
SAV01.X	Volatile Organics Analysis in Air (Draft) June 2008	Definitive	VOC Gases	GC/MS	DESA or CLP Laboratory	
SOM01.2	EPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Multi-Media, Multi-Concentration Organic Analysis; April 2007 amendment	Definitive	TCL VOCs	GC/MS	DESA or CLP Laboratory	
SOM01.2	CLP SOW for Multi-Media, Multi-Concentration Organic Analysis; April 2007 amendment	Definitive	Trace SVOCs	GC/MS	DESA or CLP Laboratory	
SOM01.2	CLP SOW for Multi-Media, Multi-Concentration Organic Analysis; April 2007 amendment	Definitive	TCL SVOCs	GC/MS	DESA or CLP Laboratory	
SOM01.2	CLP SOW for Multi-Media, Multi-Concentration Organic Analysis; April 2007 amendment	Definitive	TCL Pesticides	GC/ECD	DESA or CLP Laboratory	
SOM01.2	CLP SOW for Multi-Media, Multi-Concentration Organic Analysis; April 2007 amendment	Definitive	TCL Aroclors (PCBs)	GC/ECD	DESA or CLP Laboratory	

[* *If yes, explain the modification*]

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)*
RSK 175/ AM20Gax or other SOP using QC procedures in RSK 175	Analysis of Dissolved Methane, Ethane, and Ethene in Groundwater -Robert S. Kerr Environmental Research Laboratory Standard Operating Procedures. May 1998.	Definitive	Methane, Ethane, Ethene	GC / FID	DESA or subcontract laboratory	
ILM05.4	CLP SOW for Multi-Media, Multi-Concentration Inorganic Analysis; December 2006	Definitive	TAL Metals	ICP-AES / ICP-MS	DESA or CLP Laboratory	
		Definitive	Mercury	Cold Vapor Atomic Absorption	DESA or CLP Laboratory	
		Definitive	Cyanide	Distiller - Colorimeter	DESA or CLP Laboratory	
EPA 9080, 9081 or ILM05.4 Modified	Cation exchange capacity of soils. September 1986	Definitive	Cation Exchange Capacity	AES or Atomic Absorption	DESA or subcontract Laboratory	
SW-846 7196A	Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, SW-846, 3rd Edition (SW-846).	Definitive	Hexavalent Chromium	Colorimeter/ photometer	DESA or subcontract laboratory	
SW-846 9060	Determination of "Total Organic Carbon"	Definitive	TOC	Carbon analyzer/ FID	DESA or subcontract laboratory	
130.1, 130.2	Methods for Chemical Analysis of Water and Wastes (MCAWW): EPA-600/4-79-029, revised March 1983.	Definitive	Hardness	Colorimeter, automated or titrator	DESA or subcontract laboratory	
160.1, 160.2	MCAWW. Revised 1983	Definitive	TDS and TSS	Balance, oven	DESA or subcontract laboratory	
300.0	Determination of Inorganic Anions by Ion Chromatography	Definitive	Bromide, Chloride, Fluoride, Nitrate, Nitrite, Nitrate/Nitrite, Orthophosphate	Ion chromatograph	DESA or subcontract laboratory	
310.1	MCAWW. Revised 1983	Definitive	Alkalinity	pH meter or electronic titrator	DESA or subcontract laboratory	
320.1	MCAWW. Revised 1983	Definitive	Bromide	Titrimetric	DESA or subcontract laboratory	

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)*
1-325.1, 325.2 , 2-325.3	MCAWW. Revised 1983	Definitive	Chloride	1-Colorimetric, 2-Titrimetric	DESA or subcontract laboratory	
1-340.1, 340.3, 2-340.2,	MCAWW. Revised 1983	Definitive	Fluoride	1-Colorimeter, 2-Titrimetric		
1-350.1, 350.2, 2-350.2, 350.3	MCAWW. Revised 1983	Definitive	Ammonia	Colorimeter-automated, Titrimetric, Potentiometric		
1-351.1, 351.2, 351.3 2-351.4	MCAWW. Revised 1983	Definitive	TKN	1- Colorimeter 2- Potentiometric		
352.1	MCAWW. Revised 1983	Definitive	Nitrate	Colorimeter		
353.1, 353.2, 353.3	MCAWW. Revised 1983	Definitive	Nitrate/Nitrite	Colorimeter		
354.1	MCAWW. Revised 1983	Definitive	Nitrite	Colorimeter		
365.2	MCAWW. Revised 1983	Definitive	Ortho-phosphate	Colorimeter		
365.1, 365.2, 365.3, 365.4	MCAWW. Revised 1983	Definitive	Phosphate	Colorimeter-automated block digester AA		
375.1, 375.2, 375.4	MCAWW. Revised 1983	Definitive	Sulfate	Colorimeter		
375.3, 375.4	MCAWW. Revised 1983	Definitive	Sulfate	Gravimetric (balance/oven) Spectrophotometer		
1-376.1 2-376.2	MCAWW. Revised 1983	Definitive	Sulfide	1-Titrimetry 2-Colorimeter		
405.1	MCAWW. Revised 1983	Definitive	BOD	DO meter		
1-410.1, 410.2, 410.3 2-410.4	MCAWW. Revised 1983	Definitive	COD	1-Titrimetry 2-Colorimeter		
415.1, 9060	MCAWW. Rev. 1983	Definitive	DOC	Carbon analyzer/IR/FID		
415.1, 415.2, 9060	MCAWW. Rev. 1983	Definitive	TOC	Carbon analyzer/IR/FID		
Lloyd Kahn	Determination of TOC in Sediment, July 1998 and Attachment B, Supplemental Technical Direction and Additional QC Procedures.	Definitive	TOC - soil	Carbon analyzer	DESA or subcontract laboratory	

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)*
SW-846 3060A/7196A	Alkaline digestion for Hexavalent Chromium; Determination of Dissolved Hexavalent Chromium, July 1992, Revision 1	Definitive	Hexavalent Chromium – soil	Extraction by alkaline digestion; colorimeter	DESA or subcontract laboratory	
ASTM D421-85	Standard Practice for Dry Preparation of Soil Samples. 2002	Definitive	Grain Size	Sieves, hydrometer	DESA or [redacted] subcontract laboratory	
ASTM D422-63	Standard Test Method for Particle-Size Analysis of Soils. 2002	Definitive	Grain Size	Sieves, hydrometer	DESA or [redacted] subcontract laboratory	
ASTM D2937	Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method	Definitive	Dry bulk Density	thin-walled cylinder	[redacted] subcontract laboratory	
ASTM D854	Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer	Definitive	Specific Gravity	Water Pycnometer	[redacted] subcontract laboratory	
HACH 8146	HACH Test Kit - Phenanthroline Method (adapted from PM for Water and Wastewater)	Screening	Ferrous Iron	Colorimeter or Spectrophotometer model DR/890, 850 or 820 or as per project requirement	[redacted] field personnel	
HACH 8023	HACH Test Kit – 1,5-Diphenylcarbohydrazide Method	Screening	Hexavalent Chromium	Spectrophotometer model DR/890, 850 or 820 or as per project requirement	[redacted] field personnel	
NA	Manufacturer's Manual	Screening	Water Quality Parameters	YSI Water quality Checker, Model 600XL or current version as defined by project-specific QAPP	[redacted] field personnel	
NA	Manufacturer's Manual	Screening	Turbidity	La Motte Turbidity Meter, Model 2020	[redacted] field personnel	

[** If yes, explain the modification*]

1. CLP laboratories SOPs are reviewed through EPA. DESA laboratory specific SOPs will apply and not these generic SOPs whenever the DESA laboratory is able to perform the analyses. [redacted] subcontract laboratory specific SOPs are not available at this stage since the Region II Field and Analytical Services Teaming Advisory Committee (FASTAC) Policy will be implemented for procuring laboratory services. If the DESA laboratory does not have capacity for these analyses, then a [redacted] basic ordering agreement (BOA) subcontractor laboratory will be selected.
2. For non-RAS data, the ASC will submit the electronic "Analytical Services Tracking System (ANSETS) Data Requirement" form to the Regional Sample Control Coordinator (RSCC) by the first day of each month for the previous month's sampling.

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Instruments used for TO-15 follow the calibration frequencies outlined in the selected laboratory's method SOP.						
GC/MS	See TO-15 Initial calibration:	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.	Initial calibration/ Continuing calibration: relative response factor (RRF) ≥ minimum acceptable response factor listed in Table 5 of procedure; %RSD must be ≤ value listed in Table 5 of procedure.	Inspect system for problems (e.g., clean ion source, change the column, service the purge and trap device), correct problem, re-calibrate.	EPA National Air Contract Laboratory GC/MS Technician; or Subcontractor Laboratory GC/MS Technician	TO-15
	Continuing calibration:	Following initial calibration verification, once every 12 hours, end of run.		Inspect system, recalibrate the instrument, and reanalyze samples.		
	GC/MS Tuning:	Tune with 4-Bromoflurobenzene (BFB): Beginning of each 12 hour period during which standards and samples are analyzed.	See ion abundance table in TO-15.	Inspect the system, identify problem. MS tune criteria must be met before calibration		
	Retention Time Evaluation:	Each analysis.	+/- 0.50 minute of the internal standard retention time in the associated calibration check verification	Re-calibrate and verify, re-analyze samples back to the last good calibration check verification		

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS See SOM01.2	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 > 0.995. %RSD ≤ value listed in Table 5 of procedure.	Inspect system for problems (e.g., clean ion source, change the column, service the purge and trap device), correct problem, re-calibrate.	EPA CLP Laboratory GC/MS Technician	SOM01.2
GC/MS	Continuing calibration (CCV)	Once every 12 hours	%D ≤15% or <30% as required	Inspect system; correct problem; recalibrate the instrument, reanalyze samples and standards.		
GC/MS	Calibration Standards Verification	Each lot of standards	As per lab established control limits	Inspect system; correct problem; re-run standard and affected samples		
GC/MS	Tuning	Daily: every 12 hours	Response factors and RRF as method specified	Inspect system; correct problem; re-run standard and affected samples		
GC/ECD See SOM01.2	Initial calibration	Upon award of the contract, whenever major instrument maintenance or modification is performed or if the calibration verification technical acceptance criteria have not been met.	Initial calibration/ Calibration verification: resolution between two adjacent peaks ≥60.0%, single components ≥90.0% resolved, RTs within the RT window.	Inspect the system (e.g., change the column, bake out the detector, clean the injection port); correct problem, re-calibrate.	EPA CLP Laboratory GC/ECD Technician	SOM01.2
	Calibration verification	Once every 12 hours	%D must be greater than or equal to -25 percent and less than or equal to 25 percent, %RSD must be less than or equal to 20.0 percent.	Inspect system, recalibrate the instrument, and reanalyze samples.		

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
ICP-AES / ICP-MS	See ILM05.4; as per instrument manufacturer's recommended procedures	Initial calibration: daily or once every 24 hours and each time the instrument is set up.	ICP-AES: As per instrument manufacturer's recommended procedures, with at least 2 standards.	Inspect the system, correct problem, re-calibrate, and re-analyze samples.	TBD EPA CLP Laboratory ICP-AES / ICP-MS Technician or DESA Laboratory analyst / QA officer -	ILM05.4
	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% recovery; 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% recovery or concentration ≤ 30% difference (from true value)	Re-analyze failed standard		
	CCV	Every 10 samples and at end of analytical sequence	90-110% recovery; source of standard separate from calibration standards	Re-check; re-calibrate and rerun all samples analyzed after last valid CCV		
ICP-MS	Continuing calibration	Beginning and end of run; 10% frequency or every 2 hours during an analysis run	As per instrument manufacturer's recommended procedures, with at least 2 standards. A minimum of three replicate integrations are required for data acquisition.			ILM05.4
CV-GAS	Calibration; 3 point standards	After instrument set up	$R^3 \geq 0.995$	Inspect system; correct problem	Laboratory analyst / QA officer - TBD	TBD
	Initial Calibration Verification (ICV)	Before sample analysis	80-120% recovery; source of standard separate from calibration standards	Do not analyze samples until problem is corrected	Laboratory analyst / QA officer - TBD	TBD
	Continuing Calibration Verification	10% or every 2 hours, whichever is more frequent	80-120% recovery	Inspect system, re-calibrate and rerun associated samples	Laboratory analyst / QA officer - TBD	TBD

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Total Organic Carbon Analyzer (soil)	Calibration and corrective action as per Manufacturer's instruction. No samples shall be analyzed if instrument calibration exceeds the acceptance criteria.				Lab analyst / QA officer - TBD	TBD
Colorimeter[4]	Initial Calibration; 4 - 9 point standards	Every 3 months; every 6 months for method 300. or as per lab SOP	90-110 % recovery	Re-check; re-calibrate	Lab analyst / QA officer - TBD	TBD
	Calibration check (Cal Check)	Every 10 samples and at end of analytical run	80-120 % recovery	Re-check; re-calibrate and rerun all samples analyzed after last valid Cal Check	Lab analyst / QA officer - TBD	TBD
Infra red or UltraViolet Spectrophotometer	Initial Calibration; 5 point standards	Every 3 months or when other unresolved QC failure occurs	90-110 % recovery	Re-check; re-calibrate	Lab analyst / QA officer - TBD	TBD
	Calibration check	Every 10 samples and at end of analytical run	80-120 % recovery	Re-check; re-calibrate and rerun all samples analyzed after last valid cal check		
Ion Chromatography	Initial Calibration; 5 point standards	Every 12 hours of operation	90-110 % recovery	Find the problem and re-calibrate	Lab analyst / QA officer - TBD	TBD
Ion Chromatography	Calibration check	Every 10 samples and at end of analytical run	90-110 % recovery	Re-check; re-calibrate and rerun all samples analyzed after last valid cal check	Lab analyst / QA officer - TBD	TBD
Spectrophotometer model – per project specific QAPP	1 point standard	Daily	All target compounds, initial relative standard deviation (RSD) ≤ 20%	Inspect system; correct problem; re-run standard and affected samples	Lab analyst / QA officer - TBD	TBD
Thermometer	Calibration	Quarterly; serviced annually	See instrument manual	Replace defective thermometer	Lab analyst / QA officer - TBD	TBD
Balance	Calibration verification	Daily - before use	See instrument manual	Troubleshoot as per equipment manual/call for repair	Lab analyst / QA officer - TBD	TBD
	Mass check	Daily - before use	See instrument manual	Troubleshoot as per equipment manual/call for repair	Lab analyst / QA officer - TBD	
	Temperature check	Annually	± 2°C			
Oven	Serviced annually as per Manufacturer's instruction				Lab analyst / QA officer - TBD	TBD

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
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 buffer solutions and recheck. If still fails perform instrument check or place out of service	[redacted]– FTL Lab analyst / QA officer - TBD	TBD
YSI	Calibrate with standard solutions; as per instrument manufacturer's recommended procedures	Prior to day's activities; end of day's activities; anytime anomaly suspected	+/- 0.1 units	Clean probe, replace battery, replace membrane, replace probe	[redacted]FTL	Manufacturer's Instructions
LaMotte Turbidity Meter	Calibrate with standard solutions; as per instrument manufacturer's recommended procedures	Prior to day's activities; end of day's activities; anytime anomaly suspected	See worksheet #12	Replace battery, replace standards, replace bottle, replace lightbulb	[redacted]FTL	Manufacturer's Instructions

1. The FASTAC decision process will be used for procuring laboratory services. CLP, DESA and [redacted] 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, [redacted] will submit their SOP as a field change request.
3. R represents the correlation coefficient
4. For field screening use the HACH test kit SOPs 8023 for hexavalent chromium and 8146 for ferrous iron located in Appendix C. Field instrument are calibrated by the supplier.

QAPP Worksheet #25
Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
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 [redacted] laboratories' QA Manuals. [redacted] laboratory to be utilized (if DESA is not available) not determined at this time. Maintenance, testing and inspection frequencies are documented in the [redacted] laboratories SOPs.							
GC/MS	See TO-15; as per instrument manufacturer's recommendations	See TO-15; as per instrument manufacturer's recommendations	See TO-15; as per instrument manufacturer's recommendations	Acceptable re-calibration; see TO-15	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	EPA National Air Contract Laboratory GC/MS Technician	TO-15
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
ICP-AES / ICP-MS	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable re-calibration; see ILM05.4	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	EPA CLP Laboratory ICP-AES / ICP-MS Technician	ILM05.4
YSI Multi-parameter meter	Check/replace battery	Visual inspection	Prior to day's activities; anytime anomaly suspected	No visual defects; +/- 0.1 units	Replace battery; replace probe	[redacted]FTL	Manufacturer's Instructions
LaMotte Turbidity Meter	Check/replace battery	Visual inspection	Prior to day's activities; anytime anomaly suspected	See worksheet #12	Replace battery; replace light bulb	[redacted]FTL	Manufacturer's Instructions

QAPP Worksheet #26
Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT

Sample Collection: The [*staff and subcontractors*] will collect all samples. Sample numbers will be assigned as described below. A coding system will be used to identify each sample collected during the duration of the project. This coding system will provide a tracking record to allow retrieval of information about a particular sample and ensure that each sample is uniquely identified. Each sample is identified by a unique code which indicates the sample type, sample number, and, in some cases, sample depth. A sample numbering system is described below which provides a unique identifier for all samples that will be collected during the site field investigation. The total number and types of samples collected are detailed in Worksheet #18.

[Include here a description of how samples will be identified and named] [Soil/Groundwater Well/Surface Water/Surface Water]

Sample Packaging: (Personnel/Organization): Qualified personnel will perform the sample packaging. Sample packaging will follow TSOP 1-2 and TSOP 2-1; their RAC 2 clarifications; and the CLP Guidance for Field Samplers, January 2007, with the exception that: sample tags and vermiculite will not be used. Forms II Lite is mandatory and will be assigned to experienced field personnel. [Please note that due to elevated temperatures [*in the summer/region*], extra ice should be placed in the cooler to ensure that the temperature requirements are met].

Coordination of Shipment (Personnel/Organization): FTL, ASC CLP coordinator

Type of Shipment/Carrier: Priority Overnight Shipping/TBD. Samples for Saturday delivery will have the airbills checked for Saturday delivery.

SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Laboratory Sample Custodian - TBD as per FASTAC. The CLP Laboratory assignment sheet will indicate the laboratory sample custodian, and if a subcontract laboratory is required. The laboratory project officer will notify the field team of the laboratory sample custodian.
Sample Custody and Storage (Personnel/Organization): TBD as per FASTAC [*project–specific information here*]
Sample Preparation (Personnel/Organization): TBD as per FASTAC [*project–specific information here*]
Sample Determinative Analysis (Personnel/Organization): TBD as per FASTAC [*project–specific information here*]

SAMPLE ARCHIVING

Field Sample Storage (No. of days from sample collection): All samples will be shipped to a CLP laboratory, DESA or a subcontract laboratory on the day of collection via priority overnight (FedEx). Samples may be hand delivered/courier depending on laboratory location.

Sample Extract/ Digestate Storage (No. of days from extraction/digestion): Refer to Worksheet #19 for holding time requirements

Biological Sample Storage (No. of days from sample collection): As applicable

SAMPLE DISPOSAL

Personnel/Organization: Laboratory responsible for analysis will dispose of samples in accordance with the applicable regulations.

Number of Days from Analysis: 90 days

QAPP Worksheet #27
Sample Custody Requirements

Sample Identification Procedures: *Each sample will be labeled with the site identification code [ ] and sample type letter code and number that depicts a specific location. Each sample will also be labeled with a CLP or Non- CLP assigned number. Depending on the type of sample, additional information such as depth, sampling round, date, etc. will be added. Examples are provided in the QAPP.*

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):
Packaging for all shipments will be performed according to the EPA Contract Laboratory Program (CLP) Guidance for Field Samplers, Final (EPA 2007) and TSOP 2-1. To maintain a record of sample collection transfer between field personnel, shipment, and receipt by the laboratory, the applicable sample chain-of-custody paperwork (TSOP 1-2) is completed for each shipment (i.e., cooler) of packed sample bottles or summa cannisters. The team member actually performing the sampling is personally responsible for the care and custody of the samples collected until they are transferred properly. The field technician will review all field sampling activities to confirm that proper custody procedures were followed during the field work. Subcontractor personel relinquishing the sample to the courier will sign the chain of custody record.

All courier receipts and/or paperwork associated with the shipment of samples will serve as a custody record for the samples while they are in transit from the field to the laboratory. Custody seals should remain intact during this transfer.

Coolers are secured with nylon fiber tape and at least two custody seals are placed across cooler openings. Since custody forms are sealed inside the sample cooler and custody seals remain intact, commercial carriers are not required to sign the chain-of-custody form. [*For summa cannister shipments, the summa cannister will be shipped in a box secured with nylon fiber tape and at least two custody seals placed across the box openings. No custody seals are required on the summa cannister itself*]. Examples of custody seals are included in TSOP 1-2.

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal): : A sample custodian at the laboratory will accept custody of shipped samples, and check them for discrepancies, proper preservation, integrity, etc. If noted, issues will be forwarded to the laboratory manager for corrective action. The sample custodian will relinquish custody to the appropriate department for analysis. [*Project specific QAPPs will indicate whether samples will be archived at the laboratory*]. Disposal of the samples will occur only after analyses and QA/QC checks are completed. This will complete sample transfer.

It will be each laboratory's responsibility to maintain internal logbooks and records that provide a custody record throughout sample preparation and analysis. To track field samples through data handling, the subcontractors responsible for sampling will maintain photocopies of all chain-of-custody forms.

QAPP Worksheet #28
QC Samples Table

(UFP-QAPP Manual Section 3.4)

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Duplicates
Field duplicate samples are collected and analyzed to assess the overall precision of the field sampling technique. Duplicate samples, of a similar matrix, will be collected at a rate of five percent or at least one per every 20 samples. These duplicates will be submitted "blind" to the laboratories by using sample numbers that differ from their associated environmental samples. For groundwater samples collected during the annual site-wide groundwater event, duplicate samples will be collected on a per event basis. For process samples, duplicate samples will be collected based on an ongoing sample count basis.

Duplicate samples will be collected by alternately filling bottles for the same analysis. Duplicate air samples will be co-located.

Trip Blanks
A trip blank will be prepared by the LTRA subcontract team at the start of each day on which aqueous samples will be collected for analysis of VOCs and ethane/ethene. Trip blanks are used to determine whether on site atmospheric contaminants are seeping into the sample vials, or if any cross-contamination of samples is occurring during shipment or storage of sample containers. A trip blank consists of demonstrated analyte-free water sealed in 40-ml Teflon septum vials with no headspace (including bubbles) in the vials. Trip blank water will be considered analyte-free when analysis results for VOC analysis are below Contract Required Quantitation Limits (CRQL). Certification of blank water quality will be kept on site and will be filed in the RAC 2 project files once field work is completed. A sample of the blank water lot used in the field will be submitted for confirmatory analysis.

Trip blanks are to be kept in close proximity to the samples being collected and will be maintained at 4degrees Celsius (°C) and handled in the same manner as the other VOC or ethane/ethene aqueous samples. Preservation of trip blanks is presented on Worksheet # 19. One trip blank will be included with each daily shipment that contains aqueous samples collected for VOC analysis and one trip blank will be included with each daily shipment that contains aqueous samples collected for ethane/ethene analysis. Trip blanks will be analyzed by the same VOC method as the associated set of VOC samples.
Trip blanks will be analyzed by the same ethane/ethene method as the associated set of ethane/ethane samples.

Field Blanks
One field blank will be collected for each equipment type per decontamination event and will be analyzed for the same constituents as the environmental samples. Field blanks, also known as "rinsate blanks" or "equipment blanks," are used to assess the effectiveness of equipment decontamination. Field blanks will be collected before the use of the decontaminated equipment for sampling. The frequency for field blanks is one per decontamination event, not to exceed one per day, for each equipment type and for each sample matrix. Field blanks are generated by pouring demonstrated analyte-free water over or through the decontaminated sampling tool. The definition of demonstrated analyte-free water is discussed in the previous section. Field blanks will be collected in a way that will minimize potential contamination from the ambient air. The use of the same aliquot of water on all equipment associated with a particular matrix for the required analyses is permissible. However, a separate field rinse blank must be collected for each piece of equipment associated with a particular sample matrix that will be analyzed for VOCs. Preservation of field blanks is specified on Worksheet # 19. Field blanks will accompany the set of samples collected by the decontaminated sampling equipment and will be kept at 4°C.

QAPP Worksheet #28
QC Samples Table

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.

Triple volume may be required for aqueous VOC matrix MS/MSD if a subcontract laboratory is being used and are not required for CLP method SOM01.2. The water quality parameters do not require extra volume unless identified on Worksheet #19 and confirmed with a non-CLP laboratory.

QAPP Worksheet #28
QC Samples Table

Matrix	Gas/ Air
Analytical Group	VOCs
Concentration Level	Low (ppbv)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	TO-15
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 20 samples	None	Notify PM and flag field duplicate results	[redacted]ASC and FTL	Precision	25 -50% RPD as determined by project-specific QAPP
Laboratory Method Blank	1 per 20 samples	No analyte >CRQL	Suspend analysis unit source recertified	National Air Contract Laboratory Technician	Accuracy	No analyte > CRQL
Laboratory Replicate Sample	1 per 20 samples	± 25%D	± 25%D	National Air Contract Laboratory Technician	Precision	± 25%RPD
Laboratory Control Sample	1 per 20 samples	±30% R	Flag outliers	National Air Contract Laboratory Technician	Accuracy	±30% R

QAPP Worksheet #28
QC Samples Table

Matrix	Gas/ Air
Analytical Group	VOCs
Concentration Level	Low (ppbv)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	CLP SAV01.X
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 20 samples	None	Notify PM and flag field duplicate results	[redacted] ASC and FTL	Precision	25 -50% RPD as determined by project-specific QAPP
Laboratory Method Blank	1 per 20 samples	No analyte > ½ CRQL	Suspend analysis unit source recertified	National Air Contract Laboratory Technician	Accuracy	No analyte > ½ CRQL
Laboratory Replicate Sample	1 per 20 samples	± 25%RPD	± 25%RPD	National Air Contract Laboratory Technician	Precision	± 25%RPD
Laboratory Control Sample	1 per 20 samples	± 30%R	Flag outliers	National Air Contract Laboratory Technician	Accuracy	± 30%R

QAPP Worksheet #28 Continued

QC Samples Table

for

Routine Analytical Services

Aqueous TCL and TAL Analyses

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	TCL Trace Concentration VOCs
Concentration Level	Trace (µg/L)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Field Duplicate	1 per 20 samples	None		Notify PM and flag duplicate results	[redacted]ASC and FTL	Precision	25 -50% RPD as determined by project-specific QAPP	
Temperature Blank	1 per cooler	≤ 6 degrees Celsius		Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius	
Trip Blank	1 per cooler	≤ CRQL		Verify results; re-analyze. Flag outliers	Laboratory analyst	Accuracy / Contamination	≤ CRQL	
Field Blank	1 per decontamination event not to exceed 1 per day	≤ CRQL		Verify results; re-analyze. Flag outliers. Check decon procedures.	Laboratory analyst /[redacted]PM	Accuracy / Contamination	≤ CRQL	
Method Blank	1 every 12 hours	No analyte > CRQL*		Suspend analysis unit source recertified	DESA or EPA CLP Laboratory GC/MS Technician	Accuracy	No analyte > CRQL*	
Matrix Spike (Not Required)	1 per 20 samples; if requested	1,1-Dichloroethene	61-145 %R	Flag outliers		Accuracy	1,1-Dichloroethene	61-145 %R
		Benzene	76-127 %R				Benzene	76-127 %R
		Trichloroethene	71-120 %R				Trichloroethene	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; if requested	1,1-Dichloroethene	0-14 %RPD	Flag outliers		Precision	1,1-Dichloroethene	0-14 %RPD
		Benzene	0-11 %RPD				Benzene	0-11 %RPD
		Trichloroethene	0-14 %RPD				Trichloroethene	0-14 %RPD
		Toluene	0-13 %RPD				Toluene	0-13 %RPD
		Chlorobenzene	0-13 %RPD				Chlorobenzene	0-13 %RPD
Deuterated Monitoring Compounds	all samples	Vinyl chloride-d3	65-131 %R	Check calculations and instruments, reanalyze affected samples		Accuracy	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, or in some situations may require these compounds be up to 4 times the CRQL.

QAPP Worksheet #28
QC Samples Table

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
TCL Trace Concentration 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	Accuracy	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		Accuracy	± 40 % of response area, ± 20 sec retention time shift	

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	TCL VOCs
Concentration Level	Low (µg/L)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Field Duplicate	1 per 20 samples	None		Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	25 -50% RPD as determined by project-specific QAPP	
Temperature Blank	1 per cooler	≤ 6 degrees Celsius		Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius	
Trip Blank	1 per cooler	≤ CRQL		Verify results; re-analyze. Flag outliers	Laboratory analyst	Accuracy / Contamination	≤ CRQL	
Field Blank	1 per decontamination event not to exceed 1 per day	≤ CRQL		Verify results; re-analyze. Flag outliers. Check decon procedures.	Laboratory analyst / [redacted]PM	Accuracy / Contamination	≤ CRQL	
Method Blank	1 every 12 hours	No analyte > CRQL*		Suspend analysis unit source recertified	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	No analyte > CRQL*	
MS (Not Required)	1 per 20 samples; if requested	1,1-Dichloroethene	61-145 %R	Flag outliers	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	1,1-Dichloroethene	61-145 %R
		Benzene	76-127 %R				Benzene	76-127 %R
		Trichloroethene	71-120 %R				Trichloroethene	71-120 %R
		Toluene	76-125 %R				Toluene	76-125 %R
		Chlorobenzene	75-130 %R				Chlorobenzene	75-130 %R
MSD (Not Required)	1 per 20 samples; if requested	1,1-Dichloroethene	0-14 %RPD	Flag outliers	EPA CLP RAS Laboratory GC/MS Technician	Precision	1,1-Dichloroethene	0-14 %RPD
		Benzene	0-11 %RPD				Benzene	0-11 %RPD
		Trichloroethene	0-14 %RPD				Trichloroethene	0-14 %RPD
		Toluene	0-13 %RPD				Toluene	0-13 %RPD
		Chlorobenzene	0-13 %RPD				Chlorobenzene	0-13 %RPD
Deuterated Monitoring Compounds	all samples	Vinyl chloride-d3	65-131 %R	Check calculations and instruments, reanalyze affected samples; see asterisk below	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	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 #28
QC Samples Table

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
TCL VOCs (Low) 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	Accuracy	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	DESA or EPA CLP Laboratory GC/MS Technician	Accuracy	± 40 % of response area, ± 20 sec retention time shift	

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	TCL SVOCs
Concentration Level	Low/Medium (µg/L)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Field Duplicate	1 per 20 samples	None		Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	25 -50% RPD as determined by project-specific QAPP	
Temperature Blank	1 per cooler	≤ 6 degrees Celsius		Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius	
Field Blank	1 per decontamination event not to exceed 1 per day	≤ CRQL		Verify results. Flag outliers. Check decontamination procedures.	Laboratory analyst / [redacted]PM	Accuracy / Contamination	≤ CRQL	
Method Blank	1 per 20 samples or batch	No analyte > CRQL*		Stop analysis unit source recertified	DESA or CLP Laboratory GC/MS Technician	Accuracy	≤ CRQL	
Matrix Spike (Not Required)	1 per 20 samples; if requested	Phenol	12-110 %R	Flag outliers	DESA or CLP Laboratory GC/MS Technician	Accuracy	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
		4-Nitrophenol	29-94 %R				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
Matrix Spike Duplicate (Not Required)	1 per 20 samples; if requested	Phenol	0-42 %RPD	Flag outliers	DESA or CLP Laboratory GC/MS Technician	Precision	Phenol	0-42 %RPD
		2-Chlorophenol	0-40 %RPD				2-Chlorophenol	0-40 %RPD
		N-Nitroso-di-n-propylamine	0-38 %RPD				N-Nitroso-di-n-propylamine	0-38 %RPD
		4-Chloro-3-methylphenol	0-42 %RPD				4-Chloro-3-methylphenol	0-42 %RPD
		Acenaphthene	0-31 %RPD				Acenaphthene	0-31 %RPD
		4-Nitrophenol	0-50 %RPD				4-Nitrophenol	0-50 %RPD
		2,4-Dinitrotoluene	0-38 %RPD				2,4-Dinitrotoluene	0-38 %RPD
		Pentachlorophenol	0-50 %RPD				Pentachlorophenol	0-50 %RPD
		Pyrene	0-31 %RPD				Pyrene	0-31 %RPD

*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 #28
QC Samples Table

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	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	Accuracy	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			Accuracy	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-methylphenol-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			Accuracy	Benzo(a)pyrene-d12	32-121 %R
Internal Standards	all samples	50-100% of area, ± 20 second retention time shift		Check calculations/instruments reanalyze affected samples	DESA or CLP Laboratory GC/MS Technician	Accuracy	50-100% of area, ± 20 second retention time shift	

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	TCL Pesticides
Concentration Level	Low/Medium (µg/L)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Field Duplicate	1 per 20 samples	None		Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	25 -50% RPD as determined by project-specific QAPP	
Temperature Blank	1 per cooler	≤ 6 degrees Celsius		Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius	
Field Blank	1 per decon event not to exceed 1 per day	≤ CRQL		Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / CDM PM	Accuracy / Contamination	≤ CRQL	
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	Accuracy	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	Accuracy	gamma-BHC (Lindane)	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	DESA or CLP Laboratory GC/ECD Technician	Precision	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
Laboratory Control Sample	1 per 20 samples	gamma-BHC	50-120 %R	Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	Accuracy	gamma-BHC	50-120 %R

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	TCL Pesticides [cont'd]
Concentration Level	Low/Medium (µg/L)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Laboratory Control Sample [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	Accuracy	Helpachlor 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	Accuracy	30-150 %R	

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	TCL PCBs
Concentration Level	Low/Medium (µg/L)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Field Duplicate	1 per 20 samples	None		Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	25 -50% RPD as determined by project-specific QAPP	
Temperature Blank	1 per cooler	≤ 6 degrees Celsius		Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius	
Field Blank	1 per decon event not to exceed 1 per day	≤ CRQL		Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / CDM PM	Accuracy / Contamination	≤ CRQL	
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	Accuracy	No analyte > CRQL	
Matrix Spike	1 per 20 samples; if requested	Aroclor-1016	29-135 %R	Flag outliers	DESA or CLP Laboratory GC/ECD Technician	Accuracy	Aroclor-1016	29-135 %R
		Aroclor-1260	29-135 %R				Aroclor-1260	29-135 %R
Matrix Spike Duplicate	1 per 20 samples; if requested	Aroclor-1016	0-15 %RPD	Flag outliers	DESA or CLP Laboratory GC/ECD Technician	Precision	Aroclor-1016	0-15 %RPD
		Aroclor-1260	0-20 %RPD				Aroclor-1260	0-20 %RPD
Laboratory Control Sample	1 per 20 samples	Aroclor-1016	50-150 %R	Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	Accuracy	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	Accuracy	30-150 %R	

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	TAL inorganic Metals
Concentration Level	Low/Medium (µg/L)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	ILM05.4
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 20 samples	None	Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	25 -50% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius
Field Blank	1 per decontamination event not to exceed 1 per day	≤ CRQL	Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / [redacted]PM	Accuracy / Contamination	≤ CRQL
Preparation Blank	1 per 20 samples	No constituent > CRQL	Suspend analysis rectify source; redigest and reanalyze affected samples	DESA or CLP Laboratory ICP Technician	Accuracy	No constituent > CRQL
Spike	1 per 20 samples	75-125%R*	Flag outliers	DESA or CLP Laboratory ICP Technician	Accuracy	75-125%R*
Laboratory Duplicate	1 per 20 samples	± 20% RPD**	Flag outliers	DESA or CLP Laboratory ICP Technician	Precision	± 20% RPD**
Post-Digestion Spike	after any analyte (except Ag and Hg) fails spike %R	75-125%R	Flag outliers	DESA or CLP Laboratory ICP Technician	Accuracy	75-125%R
Interference Check Sample [ICP Analysis Only]	beginning, end and periodically (not less than 1 per 20 samples)	± 2 x CRQL of true value or ± 20% of true value, whichever is greater	Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory ICP Technician	Sensitivity	± 2 times CRQL of true value or ± 20% of true value, whichever is greater
Laboratory Control Sample	1 per 20 samples	80-120%R (except Ag and Sb)	Suspend analysis until source rectified; redigest and reanalyze affected samples	DESA or CLP Laboratory ICP Technician	Accuracy	80-120%R (except Ag and Sb)

*except when the sample concentration is greater than 4 times the spike concentration, then disregrard the recoveries; no data validation action taken
**Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include absolute difference criteria)
**except when the sample and/or duplicate concentration is less than 5 times the CRQL, then ± CRQL.

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	TAL – Total Mercury
Concentration Level	Low/Medium (µg/L)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	ILM05.4 – Cold Vapor Atomic Absorption (CVAA)
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 20 samples	None	Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	25 -50% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius
Field Blank	1 per decon event not to exceed 1 per day	≤ CRQL	Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / [redacted]PM	Accuracy / Contamination	≤ CRQL
Preparation Blank (PB)	1 per 20 samples	No analyte > CRQL	Suspend analysis; redigest and reanalyze	DESA or CLP Laboratory Technician	Accuracy	No analyte > CRQL
Laboratory Duplicate	1 per 20 samples	± 20% RPD*	Flag outliers	DESA or CLP Laboratory Technician	Precision	± 20% RPD
Spike Sample	1 per 20 samples	75 – 125 %R	Flag outliers	DESA or CLP Laboratory Technician	Accuracy	75 – 125 %R

*Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include absolute difference criteria)

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	TAL - Total Cyanide
Concentration Level	Low/Medium (µg/L)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	ILM05.4 – Colorimeter or Spectrophotometer
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 20 samples	None	Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	25 -50% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius
Field Blank	1 per decon event not to exceed 1 per day	≤ CRQL	Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / [redacted] PM	Accuracy / Contamination	≤ CRQL
Preparation Blank (PB)	1 per ≤ 20 samples	No analyte > CRQL	Suspend analysis; redistill and reanalyze	DESA or CLP Laboratory Technician	Accuracy	No analyte > CRQL
Laboratory Duplicate	1 per ≤ 20 samples	± 20% RPD*	Flag outliers	DESA or CLP Laboratory Technician	Precision	± 20% RPD
Spike Sample	1 per ≤ 20 samples	75 – 125 %R	Flag outliers	DESA or CLP Laboratory Technician	Accuracy	75 – 125 %R

*Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include absolute difference criteria)

QAPP Worksheet #28

QC Samples Table

For

Routine Analytical Services

Soil - Organic TCL and TAL Analyses

QAPP Worksheet #28
QC Samples Table

Matrix	Soil
Analytical Group	AVS - SEM VOCs
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	ILMO5.4/EPA 376
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Refer to soil TAL metals worksheet for SEM criteria						
Refer to soil sulfide worksheet for AVS						

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	TCL VOCs
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Field Duplicate	1 per 20 samples	None		Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	35 -100% RPD as determined by project-specific QAPP	
Temperature Blank	1 per cooler	≤ 6 degrees Celsius		Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius	
Field Blank	1 per decontamination event not to exceed 1 per day	≤ CRQL		Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / [redacted]PM	Accuracy / Contamination	≤ CRQL	
Method Blank	1 every 12 hours	No analyte > CRQL*		Suspend analysis unit source recertified	DESA/ CLP Laboratory GC/MS Technician	Accuracy	No analyte > CRQL*	
Matrix Spike (Not Required)	1 per ≤ 20 samples; if requested	1,1-Dichloroethene	59-172 %R	Flag outliers	DESA/ CLP Laboratory GC/MS Technician	Accuracy	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; if requested	1,1-Dichloroethene	0-22 %RPD	Flag outliers	DESA/ CLP Laboratory GC/MS Technician	Precision	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

*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 #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	TCL VOCs [cont'd]
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	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	Accuracy	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	Accuracy	50-100% of area, ± 30 second retention time shift	

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	TCL SVOCs
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Field Duplicate	1 per 20 samples	None		Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	35-100% RPD as determined by project-specific QAPP	
Temperature Blank	1 per cooler	≤ 6 degrees Celsius		Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius	
Field Blank	1 per decontamination event not to exceed 1 per day	≤ CRQL		Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / [redacted] PM	Accuracy / Contamination	≤ CRQL	
Method Blank	1 per 20 samples or batch	No analyte > CRQL*		Suspend analysis unit source recertified	DESA or CLP Laboratory GC/MS Technician	Accuracy	No analyte > CRQL*	
Matrix Spike (Not Required)	1 per 20 samples; if requested	Phenol	26-90 %R	Flag outliers	DESA or CLP Laboratory GC/MS Technician	Accuracy	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
		4-Nitrophenol	11-114 %R				4-Nitrophenol	11-114 %R
		2,4-Dinitrotoluene	28-89 %R				2,4-Dinitrotoluene	28-89 %R
		Pentachlorophenol	17-109 %R				Pentachlorophenol	17-109 %R
		Pyrene	35-142 %R				Pyrene	35-142 %R

*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 #28
QC Samples Table

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
TCL SVOCs – Soil Continued								
Matrix Spike Duplicate (Not Required)	1 per 20 samples; if requested	Phenol	0-35 %RPD	Flag outliers	DESA or CLP Laboratory GC/MS Technician	Precision	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
		4-Nitrophenol	0-50 %RPD				4-Nitrophenol	0-50 %RPD
		2,4-Dinitrotoluene	0-47 %RPD				2,4-Dinitrotoluene	0-47 %RPD
		Pentachloro-phenol	0-47 %RPD				Pentachloro-phenol	0-47 %RPD
		Pyrene	0-36 %RPD				Pyrene	0-36 %RPD
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 #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	TCL Pesticides
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Field Duplicate	1 per 20 samples	None		Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	35 -100% RPD as determined by project-specific QAPP	
Temperature Blank	1 per cooler	≤ 6 degrees Celsius		Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius	
Field Blank	1 per decon event not to exceed 1 per day	≤ CRQL		Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / [redacted]PM	Accuracy / Contamination	≤ CRQL	
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	Accuracy	No analyte > CRQL	
Matrix Spike	1 per 20 samples	gamma-BHC (Lindane)	46-127 %R	Flag outliers	DESA or CLP Laboratory GC/ECD Technician	Accuracy	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	Precision	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 #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	TCL Pesticides [cont'd]
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Laboratory Control Sample	all samples	gamma-BHC	50-120 %R	Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	Accuracy	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	Accuracy	30-150 %R	

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	TCL PCBs
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	SOM01.2
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Field Duplicate	1 per 20 samples	None		Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	35 -100% RPD as determined by project-specific QAPP	
Temperature Blank	1 per cooler	≤ 6 degrees Celsius		Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius	
Field Blank	1 per decontamination event not to exceed 1 per day	≤ CRQL		Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / [redacted]PM	Accuracy / Contamination	≤ CRQL	
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	Accuracy	No analyte > CRQL	
Matrix Spike	1 per 20 samples	Aroclor-1016	29-135 %R	Flag outliers	DESA or CLP Laboratory GC/ECD Technician	Accuracy	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	Precision	Aroclor-1016	0-15 %RPD
		Aroclor-1260	0-20 %RPD				Aroclor-1260	0-20 %RPD
Laboratory Control Sample	all samples	Aroclor-1016	50-150 %R	Check calculations and instruments, reanalyze affected samples	DESA or CLP Laboratory GC/ECD Technician	Accuracy	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	Accuracy	30-150%R	

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	TAL – Metals
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	ILM05.4
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 20 samples	None	Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	35 -100% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius
Field Blank	1 per decontamination event not to exceed 1 per day	≤ CRQL	Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / [redacted] PM	Accuracy / Contamination	≤ CRQL
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	Accuracy	No constituent > CRQL
Spike	1 per 20 samples	75-125%R*	Flag outliers		Accuracy	75-125%R*
Laboratory Duplicate	1 per 20 samples	± 20% RPD**	Flag outliers		Precision	± 20% RPD**
Post-Digestion Spike	after any analyte (except Ag and Hg) fails spike %R	75-125%R	Flag outliers		Accuracy	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		Sensitivity	Within ± 2 times CRQL of true value or ± 20% of true value, whichever is greater
Laboratory Control Sample	1 per 20 samples	Control limits established by EPA*	Suspend analysis rectify source; re-digest and reanalyze affected samples		Accuracy	Control limits established by EPA*

*except when the sample concentration is greater than 4 times the spike concentration, then disregrard the recoveries; no data validation action taken
**Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include absolute difference 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 documnetd and provided.

[redacted]

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ sediment
Analytical Group	TAL –Total Mercury
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	ILM05.4 – Cold Vapor Atomic Absorption (CVAA)
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 20 samples	None	Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	35 -100% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius
Field Blank	1 per decontamination event not to exceed 1 per day	≤ CRQL	Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / [redacted]PM	Accuracy / Contamination	≤ CRQL
Preparation Blank (PB)	1 per 20 samples	No analyte > CRQL	Suspend analysis; redigest and reanalyze	DESA or CLP Laboratory Technician	Accuracy	No analyte > CRQL
Laboratory Duplicate	1 per 20 samples	± 20% RPD	Flag outliers	DESA or CLP Laboratory Technician	Precision	± 20% RPD
Spike Sample	1 per 20 samples	75 – 125 %R	Flag outliers	DESA or CLP Laboratory Technician	Accuracy	75 – 125 %R
Laboratory Control Sample	1 20 samples	Control limits established by EPA*	Flag outliers	DESA or CLP Laboratory Technician	Accuracy	Control limits established by EPA*

* 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 documnetd and provided.

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	TAL – Total Cyanide
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	ILM05.4 – Colorimeter or Spectrophotometer
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 20 samples	None	Notify PM and flag duplicate results	[redacted]ASC and PM	Precision	35 -100% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius
Field Blank	1 per decontamination event not to exceed 1 per day	≤ CRQL	Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / [redacted]PM	Accuracy / Contamination	≤ CRQL
Preparation Blank (PB)	1 per 20 samples	No analyte > CRQL	Suspend analysis; redigest and reanalyze	DESA or CLP Laboratory Technician	Accuracy	No analyte > CRQL
Laboratory Duplicate	1 per 20 samples	± 20% RPD	Flag outliers	DESA or CLP Laboratory Technician	Precision	± 20% RPD
Spike Sample	1 per 20 samples	75 – 125 %R	Flag outliers	DESA or CLP Laboratory Technician	Accuracy	75 – 125 %R
Laboratory Control Sample	1 per 20 samples	Control limits established by EPA*	Flag outliers	DESA or CLP Laboratory Technician	Accuracy	Control limits established by EPA*

* 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 #28 Continued

QC Samples Table

for

Non-Routine Analytical Services

Aqueous and Soil Wet Chemistry and Geotechnical Analyses

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	Wet Chemistry Anions by Ion Chromatography
Concentration Level	Low/Medium (mg/L)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	EPA 300 and EPA 314 for perchlorate
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank (PB)	1 per 20 samples	Result ≤ 1/2QL No analyte > QL	Suspend analysis; redigest and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius
Laboratory Duplicate	1 per 20 samples	± 20% RPD	Flag outliers	DESA or subcontract Laboratory Analyst	Precision	± 20-40% RPD as per project-specific QAPP
Field Duplicate	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; flag duplicate results	[redacted]ASC	Precision	± 25-50% RPD as per project-specific QAPP
Spike Samples	1 per 20 samples	80-120%R-Method A of 300 75 – 125 %R-Method B of 300. [Perchlorate results can exceed 80-120% if other QC acceptable.]	Flag outliers	DESA or subcontract Laboratory Analyst	Accuracy	75 – 125 %R
Quality Control Sample	Quarterly	90-110%R	Identify source of problem, correct and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy	90-110%R
Laboratory Fortified Blank	1 per 10 samples-method 300 1 per 20 samples	85 – 115 %R-perchlorate 90-110%R-method 300	Flag outliers	DESA or subcontract Laboratory Analyst	Accuracy	80-120%R

Control limits for the LCS must be documented and provided.

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	Wet Chemistry Anions by Colorimetry -see worksheet #12 for list
Concentration Level	Low/Medium (mg/L)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	MCAWW Methods
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank (PB)	1 per 20 samples	None	Suspend analysis; check; redigest and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Increase coolant	[redacted]FTL	Accuracy	≤ 10 degrees Celsius
Field Duplicate	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; flag duplicate results	[redacted]ASC	Precision	± 25-50% RPD as per project-specific QAPP
Laboratory Duplicate	1 per 20 samples	None	Flag outliers	DESA or Subcontract Laboratory Analyst	Precision	± 20-40% RPD as per project-specific QAPP
Spike Samples	1 per 20 samples	None	Flag outliers	DESA or subcontract Laboratory Analyst	Accuracy	75 – 125 %R
Laboratory Control Sample	After calibration, every 20 samples and at end of day	None	Identify source of problem, correct and reanalyze	DESA or Subcontract Laboratory Analyst	Accuracy	80-120%R
Carbonate-bicarbonate standard-Alkalinity	1 per batch	± 10% of true value	Re-prep and re-analyze; recalibrate if still outlying	DESA or Subcontract Laboratory Analyst	Contamination – Accuracy/bias	± 20% of true value

Control limits for the LCS must be documented and provided.

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	Hexavalent Chromium
Concentration Level	Low/Medium (mg/L)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	SW-846, 7196A
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank (PB)/	1 per 20 samples	None	Suspend analysis; check; redigest and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Field Duplicate	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; flag duplicate results	[redacted]ASC	Precision	± 25-50% RPD as per project-specific QAPP
Laboratory Duplicate	1 per 20 samples	None	Flag outliers	DESA or subcontract Laboratory Analyst	Precision	± 25-50% RPD as per project-specific QAPP
Spike Samples	1 per 20 samples	None	Flag outliers	DESA or subcontract Laboratory Analyst	Accuracy	75 – 125 %R
Laboratory Control Sample	After calibration, every 20 samples and at end of day	None	Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy	80-120%R
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Inform field crew of failure and need for additional coolant; check packing procedure	DESA or subcontract Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation

Control limits for the LCS must be documented and provided.

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	Wet Chemistry by Titrimetric or Potentiometric procedures
Concentration Level	Low/Medium (mg/L)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	MCAWW Methods - see worksheet #12 for list
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank (PB)/	1 per 20 samples	None	Suspend analysis; check; redigest and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Field Duplicate	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; flag duplicate results	[redacted]ASC	Precision	± 25-50% RPD as per project-specific QAPP
Laboratory Duplicate	1 per 20 samples	None	Flag outliers	DESA or subcontract Laboratory Analyst	Precision	± 20-40% RPD as per project-specific QAPP
Laboratory Control Sample	After calibration, every 20 samples and at end of day	None	Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy	80-120%R
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Inform field crew of failure and need for additional coolant; check packing procedure	DESA or subcontract Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation

Control limits for the LCS must be documented and provided.

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	Wet Chemistry by Gravimetric procedures
Concentration Level	Low/Medium (mg/L)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	MCAWW Methods - see worksheet #12 for list
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank (PB)/	1 per 20 samples	None	Suspend analysis; check; redigest and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Field Duplicate	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; flag duplicate results	[redacted]ASC	Precision	± 25-50% RPD as per project-specific QAPP
Laboratory Duplicate	1 per 20 samples	None	Flag outliers	DESA or subcontract Laboratory Analyst	Precision	± 20-40% RPD as per project-specific QAPP
Laboratory Control Sample	After calibration, every 20 samples and at end of day	None	Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy	80-120%R
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Inform field crew of failure and need for additional coolant; check packing procedure	DESA or subcontract Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation

Control limits for the LCS must be documented and provided.

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	Biological Oxygen Demand
Concentration Level	Low/Medium (mg/L)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	MCAWW Method 405.1
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Water Control Blank	1 per 20 samples	BOD <0.2 mg/L	Suspend analysis; check; redigest and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Seeded Water Blank	1 per batch	DO uptake 0.6-1 mg/L	Verify results and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Laboratory Duplicate	1 per 20 samples	None	Flag outliers	DESA or subcontract Laboratory Analyst	Precision	± 20-40% RPD as per project-specific QAPP
Glucose glutamic acid check	After calibration, every 20 samples	Within laboratory control limits (mean ± 3 standard deviations)	Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy	80-120%R
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Inform field crew of failure and need for additional coolant; check packing procedure	DESA or subcontract Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation

Control limits for the Laboratory must be documented and provided.

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	Wet Chemistry – TOC-Carbon analyzer + IR or FID detector
Concentration Level	Low/Medium (mg/L)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	MCAWW Method 415.1/415.2 or SW-846 9060
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	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	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Laboratory Duplicate	All samples duplicated	≤ 20% RPD; ±QL for samples <5x QL	Flag outliers	DESA or subcontract Laboratory Analyst	Precision	± 20-40% RPD as per project-specific QAPP
Matrix Spike	1 per batch of 20 samples	75-125%R	Flag outliers	DESA or subcontract Laboratory Analyst	Accuracy	75-125%R
Laboratory Control Sample	1 per batch of 20 samples	80-120%R	Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy	80-120%R
Field Duplicate	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; flag duplicate results	[redacted]ASC	Precision	± 25-50% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Inform field crew of failure and need for additional coolant; check packing procedure	DESA or subcontract Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation

Control limits for the LCS must be documented and provided.

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	Wet Chemistry – Total Organic Carbon using Carbon analyzer + IR or FID detector
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	Lloyd Kahn with Additional QC requirements
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria (Project-specific)
Preparation Blank	1 per 20 samples	≤ 100 mg/kg	Verify results; reanalyze; recalibrate if still outlying	DESA or subcontract Laboratory Analyst	Accuracy/bias	≤ QL
Laboratory Duplicate	Every sample	≤20% RPD	Re-run sample; flag outliers	DESA or subcontract Laboratory Analyst	Precision	≤ 35-100% RPD
Quadruplicate analysis	Per batch	<3xStandard deviation	Identify error and re-analyze	Laboratory analyst	Precision	<3S
Detection Limit Verification Standard	1 per sample run	± 25% of true value	Identify error and re-analyze	Laboratory analyst	Accuracy/bias	± 25% of true value
Field Duplicate	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; flag duplicate results	[redacted]ASC	Precision	± 35-100% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Inform field crew of failure and need for additional coolant; check packing procedure	DESA or subcontract Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	pH, Bulk density; specific gravity
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	SW-846, 9045D; ASTM2937; SW-846 9080/9081
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria (Project-specific)
Buffer standard solution check – pH only	Daily	± 0.05 pH units (of true value)	Verify results; check probe for coating and clean if needed; check buffer solutions; reanalyze	DESA or subcontract Laboratory Analyst	Accuracy	± 0.05 pH units (of true value)
Laboratory Duplicate - pH	Every sample	≤ 20% RPD	Re-run sample; flag outliers	DESA or subcontract Laboratory Analyst	Precision	± 0.05 pH units
Duplicate Sample -density and specific gravity	Every sample	TBD	Re-run sample; flag outliers	DESA or subcontract Laboratory Analyst	Precision	≤ 35-100% RPD as determined by project-specific requirements

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	Grain Size
Concentration Level	Low/Medium (percent particle sizes)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	ASTM D421-85 and ASTM D422-63
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria (Project-specific)
Laboratory Duplicate / Field Duplicate	1 per sample	None	Flag outliers. Data assessor will inform project manager of variability. Data validator will recommend which results set is to be used.	DESA or subcontract Laboratory Analyst	Homogeneity/ Precision	≤ 100% RPD or other values as determined by project team

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	Hexavalent chromium
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	SW-846, 7196A; extraction by 3060A
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria (Project-specific)
Field Duplicate	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; flag duplicate results	[redacted] ASC	Precision	± 35-100% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Inform field crew of failure and need for additional coolant; check packing procedure	DESA or subcontract Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation
Method Blank	1 per 20 samples	None	Suspend analysis; check; redigest and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Laboratory Duplicate	1 per 20 samples	≤ 20% RPD	Flag outliers	DESA or subcontract Laboratory Analyst	Precision	± 35-100% RPD as per project-specific QAPP
Matrix Spike	1 per 20 samples	75 – 125 %R	Per method - typically Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy	75 – 125 %R
Laboratory Control Sample	After calibration, every 20 samples and at end of day	80-120%R		DESA or subcontract Laboratory Analyst	Accuracy	80-120%R

Control limits for the LCS must be documented and provided.

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	Sulfide
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	EPA 376, extraction by 9031
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria (Project-specific)
Field Duplicate	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; flag duplicate results	[redacted]ASC	Precision	± 35-100% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Inform field crew of failure and need for additional coolant; check packing procedure	DESA or subcontract Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation
Method Blank	1 per 20 samples	None	Suspend analysis; check; redigest and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Laboratory Duplicate	1 per 20 samples	Not provided - Laboratory established limits	Flag outliers	DESA or subcontract Laboratory Analyst	Precision	± 35-100% RPD as per project-specific QAPP
Matrix Spike	1 per 20 samples	Not provided - Laboratory established limits	Per method - typically Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy	50 – 150 %R
Laboratory Control Sample	After calibration, every 20 samples and at end of day	Not provided - Laboratory established limits		DESA or subcontract Laboratory Analyst	Accuracy	70-130%R

Control limits for the LCS must be documented and provided.

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	Perchlorate by Ion Chromatography
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	EPA 314 with modification for soil extraction
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank	1 per 20 samples	Result ≤ 1/2QL No analyte > QL	Suspend analysis; redigest and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Laboratory Duplicate	1 per 20 samples	None noted for soil – use laboratory established limits	Flag outliers	DESA or subcontract Laboratory Analyst	Precision	± 20-40% RPD as per project-specific QAPP
Spike Samples	1 per 20 samples	None noted for soil – use laboratory established limits	Flag outliers	DESA or subcontract Laboratory Analyst	Accuracy	80 – 120 %R
Quality Control Sample	Quarterly	None noted for soil – use laboratory established limits	Identify source of problem, correct and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy	90-110%R
Laboratory Fortified Blank	1 per 10 samples-method 300 1 per 20 samples	None noted for soil – use laboratory established limits	Flag outliers	DESA or subcontract Laboratory Analyst	Accuracy	80-120%R
Field Duplicate	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; flag duplicate results	[redacted]ASC	Precision	± 35-100% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Inform field crew of failure and need for additional coolant; check packing procedure	DESA or subcontract Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation

Control limits for the LCS must be documented and provided.
Perchlorate limits should be reevaluated for project-specific QAPP

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	Cation exchange capacity
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	SW-846 9080/9081or 6010B modified
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria (Project-specific)
Preparation Blank	1 per batch of 20 samples	None noted for soil – use laboratory established limits	Suspend analysis; redigest and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Laboratory Control Sample/Matrix Spike	1 per batch of 20 samples	None noted for soil – use laboratory established limits	Identify source of problem, correct and reanalyze	DESA or subcontract Laboratory Analyst	Accuracy	75-125%R
Laboratory Duplicate - Cation exchange capacity	1 per 20 samples	None noted for soil – use laboratory established limits	Re-run sample; flag outliers	DESA or subcontract Laboratory Analyst	Precision	≤ 35-100% RPD as determined by project-specific requirements
Field Duplicate	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; flag duplicate results	[redacted] ASC	Precision	± 35-100% RPD as per project-specific QAPP
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Inform field crew of failure and need for additional coolant; check packing procedure	DESA or subcontract Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation

Method modification to be included in project-specific QAPP.

QAPP Worksheet #28
QC Samples Table

Matrix	Soil/ Sediment
Analytical Group	Rigid Wall Permeability
Concentration Level	NA
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	ASTM D2434
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See worksheet #20

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria (Project-specific)
Laboratory Duplicate / Field Duplicate	1 per sample	None	Flag outliers. Data assessor will inform project manager of variability. Data validator will recommend which results set is to be used.	DESA or subcontract Laboratory Analyst	Homogeneity/ Precision	≤ 35-100% RPD or other values as determined by project team

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	Field Test Kits (Ferrous iron, hexavalent chromium, sulfate)
Concentration Level	Low/Medium (mg/L)
Sampling SOP(s)	See worksheet #21
Analytical Method/SOP Reference	HACH 8146, 8023, and 8051
Sampler's Name	TBD
Field Sampling Organization	[redacted]
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Blank Check	Daily or 1 per 20 samples	No analyte > QL	Suspend analysis; re-prep and reanalyze	Field analyst	Accuracy/Sensitivity	No analyte > QL
Laboratory Duplicate	1 per 20 samples	None	Reanalyze. Re-perform calibration check if still outlying.	Field analyst	Precision	± 50% RPD as per project-specific QAPP
Quality Control Sample check	1 per 20 samples	None	Identify source of problem, correct and reanalyze	Field analyst	Accuracy	75-125%R

Control limits for the LCS must be documented and provided.
Limits should be re-evaluated for project-specific QAPPs.

QAPP Worksheet #29
Project Documents and Records Table

Sample Collection Documents and Records	On-Site Analysis Documents and Records	Off-Site Analysis Documents and Records	Data Assessment Documents and Records	Other
FORMS II Lite Traffic Reports/ COC Records	Equipment Calibration and Maintenance Log	Sample Receipt, Custody and Tracking Logs	Field Sampling Audit Plans, Reports and Checklists	M&TE (measurement and testing equipment) Forms
Airbills	Field Data Collection Logs	Standards Tracking Logs	Office Audit Plans, Reports and Checklist	Technical/QA Review Forms
Sample Tracking Log/Sheets	PID Logs, if applicable	Sample Disposal and Waste Manifests	Corrective Action Reports	Purchase Requisition Forms
Field logs/logbooks	Water Quality Data Logs	Sample Preparation Logs	Analytical sample results	Telephone Logs
Chain of Custody Forms	Photographs	Corrective Action Reports	Subcontract Laboratory certifications	Electronic Data Deliverables
Field Change Request Forms	Water Level Measurement logs	Corrective Action Forms	Subcontract Laboratory QA Plan (on file with EPA and [redacted]	Non-Conformance Reports
Custody Seals	Groundwater treatment facility data collection logs	Data Packages (Case Narratives, Sample Results, QC Summaries and Raw Data (detailed in CLP SOPs).	QC Audit Reports Data Validation SOPs Data Validation Reports	Subcontract Documents (Contract, Scopes of Work, Bid Sheet), Subcontract Documents and Review Forms
ANSETS Forms	Inspection and maintenance records	Trip Reports	Data Package Completeness Checklist Validated Data Reports	Electronic Transducer data
Boring Logs	Spill incident reports	Sample analysis run logs	Self Assessment Checklist	Subcontract Laboratory SOPs
NA	Well Constructions Diagram	Telephone logs	Data Quality Assessments	NA

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Gas/Air (Soil)	TO-15 Scan VOCs		TO-15	As per project-specific QAPP	EPA Non-RAS Air Program	RAC Basic Ordering Agreement Subcontract Laboratory (TBD)
Gas/ (Indoor Air)	TO-15 SIM VOCs		TO-15	As per project-specific QAPP	EPA Non-RAS Air Program	RAC Basic Ordering Agreement Subcontract Laboratory (TBD)
Aqueous	Trace VOCs		SOM01.2	As per project-specific QAPP	EPA Primary contact: RSCC [redacted] DESA contact: [redacted]	RAC Basic Ordering Agreement Subcontract Laboratory (TBD)
	TCL VOCs		SOM01.2			
	SVOCs		SOM01.2			
	PCBs		SOM01.2			
	Pesticides		SOM01.2			
	TAL Metals/Cyanide		ILM05.4 -ICP-AES/MS			
Soil/ Sediment - RAS	TCL VOCs		SOM01.2	As per project-specific QAPP	EPA Primary contact: RSCC [redacted] DESA contact: [redacted]	RAC Basic Ordering Agreement Subcontract Laboratory (TBD)
	TCL SVOCs		SOM01.2			
	TCL PCBs		SOM01.2			
	TCL Pesticides		SOM01.2			
	TAL Total Metals		ILM05.4 -ICP-AES/MS			
Soil/ Sediment – non-RAS	TOC		See Worksheet # 19	As per project-specific QAPP	EPA Primary contact: RSCC [redacted] DESA contact: [redacted]	RAC Basic Ordering Agreement Subcontract Laboratory (TBD)
	Grain size					
	pH					
	Hexavalent Chromium					
	Cation Exchange Capacity					
	Rigid Wall Permeability					
	In-situ porosity					
	Sulfide					
	AVS-SEM					
	Perchlorate					

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Aqueous	Alkalinity		EPA MCAWW Methods	As per project-specific QAPP	FASTAC Tier 1: DESA All Laboratory Services: EPA Primary contact: RSCC [redacted] DESA contact: [redacted]	FASTAC Tier 3: RAC Basic Ordering Agreement Subcontract Laboratory (TBD)
	Ammonia					
	Bromide					
	Chloride					
	Fluoride					
	Hardness					
	Hexavalent chromium		SW-846 7196A			
	Nitrate		EPA MCAWW Methods See Worksheet # 19			
	Nitrite					
	Nitrate/Nitrite					
	COD					
	BOD					
	DOC					
	TOC					
	Orthophosphorus/ Phosphorus (all forms)					
	Perchlorate					
	TKN					
	TDS					
	TSS					
	Sulfate					
	Sulfide					
Aqueous	Methane, Ethane, Ethene		RSK 175	As per project-specific QAPP	DESA	RAC Basic Ordering Agreement Subcontract Laboratory (TBD)

For non-RAS analyses, the EPA DESA laboratory will provide analytical services; where the DESA laboratory is not available or does not provide a particular analytical service, the [redacted] subcontrac[redacted] will be used to procure these services.

Ferrous Iron (field test) Hexavalent chromium (field test)

QAPP Worksheet #31
Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions (Title and Organizational Affiliation)
Laboratory Technical Systems/ Performance Audits	TBD	External	[redacted] EPA	TBD	EPA CLP RAS Laboratory	EPA CLP RAS Laboratory	EPA or other Regulatory Agency
Performance Evaluation Samples	TBD	External	[redacted] EPA	TBD	EPA CLP RAS Laboratory	EPA CLP RAS Laboratory	EPA or other Regulatory Agency
Sample Collection and Documentation	Once	External	EPA	TBD	PM, [redacted]	PM, [redacted]	[redacted] (RQAC) or field auditor, [redacted]
Health and Safety	Once if warranted	Internal/ External	EPA	TBD	PM, [redacted]	PM, [redacted]	[redacted] Health & Safety Manager or designee, SSHO, [redacted]
Field Audit	Once	Internal	[redacted]	Approved field auditor	PM, [redacted]	[redacted] Project Geologist and field staff	Field Auditor, [redacted]
Office Audit	Once	Internal	[redacted]	Approved [redacted] QA Staff	PM, [redacted]	PM, [redacted]	[redacted] (RQAC) or designee, PM, [redacted]
QAPP	Annually	Internal	[redacted]	Approved [redacted] QA Staff or QA Coordinator	PM, [redacted]	PM, [redacted]	[redacted] (RQAC), [redacted]
Data Review	Once	Internal	[redacted]	[redacted] (ASC) or designee, [redacted]	PM, [redacted]	PM, [redacted] & Laboratory manager(s) (TBD)	[redacted] (ASC), PM, [redacted]

QAPP Worksheet #32
Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Laboratory Technical Systems/ Performance Audits	Written Report	Laboratory Manager, [redacted] (EPA) and [redacted]	30 days	Letter	EPA CLP Laboratory	14 days
Performance Evaluation Samples	Electronic Report	Laboratory Manager, [redacted] (EPA) and [redacted]	30 days	Letter or Written Report	EPA CLP Laboratory	14 days
Project Readiness Review	Checklist or logbook entry	Field Team Leader	Immediately to within 24 hours of review	Checklist or logbook entry	Field Team Leader	Immediately to within 24 hours of review
Field Observations/ Deviations from Work Plan	Logbook	Field Team Leader and EPA RPM	Immediately to within 24 hours of deviation	Logbook	Field Team Leader and EPA RPM	Immediately to within 24 hours of deviation
On-Site Field Inspection	Written Report	Field Team Leader	7 calendar days after completion of the audit	Letter/Internal Memorandum	Field Team Leader and/or EPA RPM	To be identified in the cover letter of the report
Health and Safety	Audit checklist	PM, [redacted]	Notify by phone immediately Report 1 week after audit	Memorandum and checklist	[redacted] Health and Safety Manager	Immediate CA required where possible; otherwise as specified on the CA Notice, typically 15 to 30 days from date of CA Notice
Field Audit	Field Audit Report	RI Task Leader, [redacted] PM, [redacted]	Provide summary of findings to field team on day of audit; Draft Report due within 10-15 days	Corrective Action Plan	[redacted] RQAC; [redacted] QA Manager	
Office Audit	Office Audit Report	PM, [redacted]	Provide summary of findings to PM on day of audit; Draft Report due within 10-15 days	Memorandum	[redacted] RQAC, [redacted] QA Manager	
QAPP	Memorandum	PM, [redacted]	Draft Report due 30 days	Memorandum and/or FCRs	[redacted] RQAC	TBD
Data Review	Memorandum	[redacted] (ASC), [redacted]	Notify by phone -24 hours	Memorandum	PM, [redacted]	

QAPP Worksheet #33
QA Management Reports Table

Type of Report	Frequency (daily, weekly, monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
EPA CLP RAS Laboratory Data (unvalidated)	As performed	Project-specific	EPA CLP RAS Laboratory	[redacted] RSCC, EPA Region 2 and [redacted] ASC, Project Manager
EPA CLP RAS Laboratory Data (validated)	As performed	Up to 60 days after receipt of unvalidated data	EPA Region 2	[redacted] Field Team Leader
Laboratory Technical Systems/ Performance Audits	As requested by EPA or as required	TBD; within 30 days of informal report	[redacted] EPA or other Regulatory Agency	EPA RSCC, Laboratory, [redacted] management
Performance Evaluation Samples	As requested by EPA or as required	Unknown	EPA or other Regulatory Agency	EPA RSCC, Laboratory, [redacted] management
Field Change Request	As required per field change	Three days after identification of need for field change	Field Team Leader	EPA RPM
Final Project Report	Once	As determined by project work plan (see project schedule)	Field Team Leader	EPA RPM, [redacted] QAC
QAPP Addendums	As needed by project changes	Project-specific information	Project Task Leader, [redacted]	EPA RPM, EPA Project Officer, EPA QA Officer, [redacted] Program Manager, [redacted] Site manager
Field Audit Report	Once		FTL, Field Auditor, [redacted]	
Office Audit Report	Once	30 calendar days after completion of the inspection	FTL, [redacted] (QAC) or designee, [redacted]	
Corrective Action Reports	As required on CA request	As required on CA request	QA Auditor, [redacted]	
Data Usability Assessments	With each Measurement Report	With final report	[redacted] (ASC), [redacted]	
RI/ or RD Report (Draft and Final)	Once	Project-specific information	PM, [redacted]	

QAPP Worksheet #34
Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Field logbooks	Field notes will be prepared daily by the Field Team Leader (FTL) and will be complete, appropriate to the project tasks, and legible. The FTL will review logbooks for accuracy and completeness. Upon completion of field work, logbooks will be placed in the project files. Field reports will be verified with field log books to ensure correct reporting of information. Review will be conducted prior to completion of each report.	Internal	Field team leader
Chains of custody	COC forms will be reviewed against the samples packed in the each cooler prior to shipment. COCs will be sent with the samples to the laboratory, while copies are retained for the Sampling Trip Report and the project files. They will be internally reviewed upon completion of activities and verified against field logs, and laboratory report. Review will be conducted with completion of each data usability assessment/measurement report.	Internal	Field team leader, ASC, data assessor
Sampling Trip Reports	They will be prepared 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.	Internal	Field team leader or designee; Laboratory coordinator
QAPP	All planning documents will be available to reviewers to allow reconciliation with planned activities and objectives.	Internal	All data users
Laboratory analytical data package	Data packages will be reviewed/verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All laboratory data will be verified by the laboratory performing the analysis for completeness and technical accuracy prior to submittal to EPA. Data packages will be reviewed as to content and sample information upon receipt by EPA. EPA or its contractor will evaluate the data packages for completeness and compliance. Table 9 of the IDQTF UFP-QAPP shows items for compliance review.	Internal	Laboratory analyst and QA officer; EPA DV contractor-data validator; [redacted] data validator, data assessor
Final Sample Report	The project data results will be compiled in a sample report for the project. Entries will be reviewed/verified against hardcopy information. Data validation reports, QAPP, FCRs and outputs of the EQuiS database will be used to prepare the project data quality and usability assessment report. The data will be evaluated against project DQOs and measurement performance criteria, such as completeness.	Internal	[redacted] Project task leader, data validator or field team leader
	Evaluate whether field sampling procedures were followed with respect to equipment and proper sampling support using audit and sampling reports, field change request forms and field logbooks.	Internal	[redacted] data assessor
Electronic Data Deliverables (EDDs)	Determine whether required fields and format were provided compatible with EQuIS.	Internal	[redacted] Data Manager

QAPP Worksheet #35
Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	SOPs	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.	[redacted] Task Leader or ASC
IIa	Chains of custody	Examine COC forms against QAPP and laboratory contract requirements (e.g., analytical methods, sample identification, etc.). 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.	ESAT Data Validation Personnel, EPA Region 2 or [redacted] ASC
IIa	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 [redacted] ASC
IIb	Laboratory data package	Used to perform data validation on 100% of all CLP data. Any subcontractor analyzed data will be validated by [redacted] A report shall be prepared within 30 days of data receipt. Ensure that all analytical procedures were followed. Corrective actions will be taken and documented when applicable per specific methods. Deviations will be documented. Data will be qualified in accordance with specific methods.	ESAT Data Validation Personnel, or [redacted] ASC
IIb	Field duplicates	Compare results of field duplicate (or replicate) analyses with RPD criteria	[redacted] ASC, data validator
IIa	Methods	Records support implementation of the SOP - sampling and analysis	
IIb	Data Narrative	Determine deviations from methods and contract and the impact.	
IIb	Audit Report	Reports used to validate compliance of field sampling, handling and analysis activities with the QAPP.	
IIb	Project Quantitation Limit	PQLG achieved as established in the QAPP and that the laboratory successfully analyzed a standard at the QL.	
IIb	Field and Lab 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 the meeting the established criteria shall be prepared within 30 days of receipt.	

QAPP Worksheet #36
Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
Organics: *Data Validation SOP for Organic Analysis of _[Level]_ Concentration _[Analytical Fraction]__ under SOW SOM01.2*, Region II - Data Validation Guidelines					
IIa / IIb	Soil/Sediment/ Aqueous	TCL VOCs	Trace	SOP HW-34, rev 0	ESAT DV Personnel, or EPA Region 2 - DESA
IIa / IIb	Soil/Sediment/ Aqueous	TCL VOCs	Low and Medium	SOP HW-33, rev 0	ESAT DV Personnel, or EPA Region 2 - DESA
IIa / IIb	Soil/Sediment/ Aqueous	TCL SVOCs	Low and Medium	SOP HW-35, rev 0	ESAT DV Personnel, or EPA Region 2 - DESA
IIb	Soil/Sediment/ Aqueous	TCL Pesticides	Low and Medium	SOP HW-36, rev 0	ESAT DV Personnel, or EPA Region 2 - DESA
IIa / IIb	Soil/Sediment/ Aqueous	TCL Aroclors (PCBs)	Low and Medium	SOP HW-36, rev 0	ESAT DV Personnel, or EPA Region 2 - DESA
Air and Inorganics: Data Validation SOP for Region II - Data Validation Guidelines					
IIa / IIb	Air	TCL VOCs	Low	Validating Volatile Organic Analysis of Ambient Air in canister by Method TO-15 October 2006, SOP HW-31, rev 4	ESAT DV Personnel, or EPA Region 2 - DESA or [redacted] data validator
IIa / IIb	Soil/Sediment/ Aqueous	TAL Metals, and cyanide	Low and Medium	Evaluation of Metals Data for the CLP Program based on SOW ILM05.4, September 2006, SOP HW-2, rev 13	ESAT DV Personnel, or EPA Region 2 - DESA

Project-specific QAPP will indicate if any streamlining of the data validation procedures is required. For example, how screening and geotechnical analysis data will be evaluated.
DV – data validation

QAPP Worksheet #36
Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa / IIb	Soil/Sediment/ Aqueous	Methane, ethane, ethene	Trace or Low	DESA SOP or National Functional Guidelines	ESAT Data Validation Personnel, EPA Region 2 DV Personnel, or [redacted]ASC/ designee
IIa / IIb	Soil/Sediment/ Aqueous	Inorganics (Hexavalent chromium)	ow and Medium	DESA SOP or [redacted]029A SOP	ESAT DV Personnel, EPA Region 2 DV Personnel, or [redacted]ASC/ designee
IIb	Soil/Sediment	CEC TOC, pH, Sulfide, AVS-SEM	Low and Medium	DESA SOP or [redacted]029A SOP	ESAT DV Personnel, EPA Region 2 DV Personnel, or [redacted]ASC/ designee
IIa / IIb	Aqueous	Wet Chemistry	Low and Medium	DESA SOP or [redacted]029A SOP	ESAT DV Personnel, EPA Region 2 DV Personnel, or [redacted]ASC/ designee
IIa / IIb	Soil/Sediment/ Aqueous	Perchlorate	Low and Medium	DESA SOP or [redacted]029A SOP and National Functional Guidelines	ESAT DV Personnel, EPA Region 2 DV Personnel, or [redacted]ASC/ designee

In-situ porosity (Determined from specific gravity & dry bulk density), grain size, and rigid wall permeability will not be validated.
Wet Chemistry = Alkalinity, ammonia, bromide, chloride, fluoride, hardness, nitrate-nitrite, sulfate, chloride, fluoride, ortho-phosphate, total phosphorus, TKN, COD, DOC, and TOC
Method requirements will also be used to evaluate the data during data validation.

(UFP-QAPP Manual Section 5.2.3)
Describe procedures/methods/activities used to determine whether data are of the right type, quality, and quantity to support environmental decision-making for the project. Describe how data quality issues will be addressed and how limitations on data use will be handled.

QAPP Worksheet #37
Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:
The Data Usability Assessment will be performed by a team of personnel at [redacted] The PM will be responsible for information in the Usability Assessment and will also be responsible for assigning task work to the individual task members who will be supporting the Data Usability Assessment. Note that the Data Usability Assessment will be conducted on validated data. After the Data Usability Assessment has been performed, data deemed appropriate for use will then be used in the [*RI/RD/RA, human health risk assessment, screening level ecological risk assessment, and FS*]. The results of the Data Usability Assessment will be presented in the project-specific report. The following items will be assessed and conclusions drawn based on their results.

Precision – Results of laboratory duplicates will be assessed during data validation and data will be qualified according to the data validation procedures cited on Worksheet #36. Field duplicates will be assessed by matrix using the RPD for each pair of results reported above CRQL for organic and inorganic analyses respectively. RPD acceptance criteria, presented in Worksheet #12, will be used to access field sampling precision. Absolute difference will be used for low results as described in worksheets 12 and 28. A discussion summarizing the results of laboratory and field precision and any limitations on the use of the data will be described.

Field duplicates - The PM will review the extent of exceedance of the field duplicate criteria. For groundwater, the sample results will be flagged according to the data validation protocol. For soils/sediment, the exceedances will be compared with the field lithological logs and grain size results, if available. Based on this review, the site manager will determine whether the exceedance is due to inherent soil heterogeneity or the result of sample handling in the field or laboratory. This information will be included in the data assessment report. As an added measure, the field team leader will be asked to inspect the soil coning and quartering procedures and re-train staff if needed. The data assessor will review the data validation report. If the field duplicate comparison is not included, it will be performed by the assessor.

Accuracy/Bias Contamination –Laboratory blank results will be assessed as part of data validation. During the data validation process the validator will qualify the data following the procedures listed on Worksheet #36. A discussion summarizing the results of laboratory accuracy and bias based on contamination will be presented and limitations on the use of the data will be described.

Overall Accuracy/Bias – The results of instrument calibration and matrix spike recoveries will be reviewed and data will be qualified according to the data validation procedures cited on Worksheet #36. A discussion summarizing the results of laboratory accuracy and any limitations on the use of the data will be described.

Sensitivity – Data results will be compared to criteria provided on Worksheet #15. A discussion summarizing any conclusions about sensitivity of the analyses will be presented and any limitations on the use of the data will be described.

Representativeness – A review of adherence to the sampling plan, field procedures and of project QA audits will be performed in order to assess the representativeness of the sampling program. Data validation narratives will also be reviewed and any conclusions about the representativeness of the data set will be discussed.

Comparability – Study results will be used in conjunction with existing data to make qualitative and quantitative assessments of the data to be used to produce the Site reports.

QAPP Worksheet #37
Usability Assessment

Reconciliation – The DQIs presented in Worksheet #12 will be examined to determine if the MPC were met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of major impacts observed from data validation, data quality indicators and measurement performance criteria assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined if the DQIs were met and whether project goals were achieved. As part of the reconciliation of each objective, conclusions will be drawn and any limitations on the usability of any of the data will be described.

Completeness - The Environmental Quality Information Systems (EQuIS) database will be queried to summarize the number of samples in each analytical fraction that are estimated and rejected. This data will be used along with the planned samples indicated in the QAPP to calculate the completeness of the obtained data set.

Data validation reports will be reviewed to determine the quality of the data and potential impacts on data usability. Field duplicates will be evaluated against the MPCs outlined in worksheet #12. Non-compliant data will be discussed in the usability report. The following equations will be used :

1. To calculate field duplicate precision: RPD = 100 x 2 |X1 - X2 | / (X1 + X2) where X1 and X2 are the reported concentrations for each duplicate or replicate

2. To calculate completeness: % Completeness = V/n x 100

where V= number of measurements judged valid; n = total number of measurements made and % Completeness = C/x x 100

where C= number of samples collected; x = total number of measurements planned

2. Describe the evaluative procedures used to assess overall measurement error associated with the project:

[redacted] will determine if quality control data is within specifications (MPC) through the data assessment and data validation process IIb.

3. Identify the personnel responsible for performing the usability assessment: [redacted] ASC or designee

4. Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

A usability report will describe the rationale for the data used and present any data limitations. The report will include a discussion of the accuracy, precision, representativeness, completeness and comparability of the data set and deviations from planned procedures and analysis and the impact on the project objectives. Tables will be prepared, including: a summary of planned samples, collected samples and parameters analyzed; detections in field and trip blanks; comparison of field duplicates; and a comparison of planned and actual detection limits.

QAPP Worksheet #37
Usability Assessment

5. Discuss the impacts of any qualified data, any deviations from original plan or sampling procedures, whether the project objectives were met, etc.

The following procedures will be followed for using data in preparing the RI/RD/RA Report.

- Defining the nature and extent of contamination – [redacted] *will evaluate individual sample results for the RI/RD/RA Report. The sample results will be compared to the site specific screening criteria defined as project action limits on worksheet #15. In addition, as part of the RI/RD/RA Report, figures will be generated in order to further refine the understanding of the nature and extent of contamination and to help identify data gaps*]. Figures will include geological profiles and cross-sections, water table maps, contaminant iso-concentration maps, and longitudinal and cross-sectional profiles of groundwater contamination.
- Identifying data gaps - Data gaps will be identified while writing the [*RI/RD/RA*] Report. As soon as data gaps are identified, [redacted] will discuss them with EPA. To identify data gaps, [redacted] will evaluate the analytical results by media and determine if results indicate levels or locations of contamination that need to be further delineated.
- Using qualified data - [redacted] utilizes all data not rejected during validation to determine the nature and extent of contamination.
- Deciding if high results are legitimate or outliers - [redacted] will assume that all data not rejected during validation will be considered in defining the nature and extent of contamination at the site. [redacted] will work with EPA if there is a concern about the statistical validity of the sample results. In particular, high "outlier" results that have no surrounding comparable results as confirmation will be discussed with EPA.