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FINAL SAMPLING AND ANALYSIS PLAN SOLID WASTE MANAGEMENT UNIT 11 (SWMU 11) OLD STORAGE BULDING 225 NSA CRANE IN

3/1/2011

TETRA TECH

Comprehensive Long-term Environmental Action Navy

CONTRACT NUMBER N62470-08-D-1001

SAMPLING AND ANALYSIS PLAN

FINAL

for

SWMU 11 – Old Storage Building 225

Naval Support Activity Crane
Crane, Indiana

Contract Task Order F27E

March 2011

NAVFAC
Naval Facilities Engineering Command
Midwest
201 Decatur Avenue
Building 1A, Code EV
Great Lakes, Illinois 60088

TETRA TECH NUS, Inc.

SAP Worksheet No. 1 -- Title and Approval Page

(UFP-QAPP Manual Section 2.1)

FINAL
Revision 0
SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)
March 2011

RESOURCE CONSERVATION AND RECOVERY ACT
FACILITY INVESTIGATION

SWMU 11 – OLD STORAGE BUILDING 225
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

Prepared for:
Naval Facilities Engineering Command Midwest
201 Decatur Ave., Building 1A
Great Lakes, Illinois 60088

Prepared by:
Tetra Tech NUS, Inc.
234 Mall Boulevard, Suite 260
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Prepared under:
Contract No. N62470-08-D-1001
Contract Task Order F27E

Review Signatures:

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Anthony P. Klimek 3/24/11
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Approval Signatures:

Howard Hickey/ RPM/ Date
NAVFAC Midwest

Doug Griffin/ RPM/ Date
Indiana Department of Environmental Management

Navy Chemist/ Date

SAP Worksheet No. 1 -- Title and Approval Page

(UFP-QAPP Manual Section 2.1)

DRAFT FINAL
SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)
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Contract Task Order F27E

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NSA Crane Environmental Restoration Site Manager

Doug Griffin/ RPM/ Date
Indiana Department of Environmental Management

Jonathan Tucker Digitally signed by TUCKER.JONATHAN.P.1239524180 Date: 2011.03.17 12:51:49 -04'00'
Navy Chemist/ Date

EXECUTIVE SUMMARY

Tetra Tech NUS, Inc. (Tetra Tech) has prepared this Sampling and Analysis Plan (SAP) for the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at Solid Waste Management Unit (SWMU) 11 – Old Storage Building 225 at Naval Support Activity (NSA) Crane, Indiana under Contract Task Order (CTO) F27E, Contract N62470-08-D-1001, Comprehensive Long-term Environmental Action Navy (CLEAN).

SWMU 11 – Old Storage Building 225 (site) is located near the western boundary of NSA Crane, approximately midway between the northern and southern boundaries of the facility. The site is a rectangular shape and covers approximately 1 acre. Building 225 was used for storage of inert materials including pentachlorophenol (PCP), paints, sodium flourescein dye, solvents (acetone, toluene, and methyl ethyl ketone), and various other items including inks, staples, and wax paraffin. The building was destroyed by a fire on July 13, 1976.

Water used in fighting the fire in July 1976 may have become contaminated with the chemicals stored in the building. According to the "Green Water" Report (Department of the Navy, 1976), runoff from fire fighting activities was brilliant fluorescent green from the flourescein dye. The green colored water entered the drainage channel and the ditch east of the site and began flowing off-site. PCP, paints, sodium fluorescein, solvents, and other items stored in the building may have also entered the surface drainage and soils in the area of the site during firefighting efforts, and may continue to be present in these areas. Potentially contaminated water was contained by temporary dams that were constructed in the stream (Broom Branch) downstream of the site, but the water was eventually discharged from NSA Crane. The "Green Water" Report stated that several thousand gallons of water was pumped from the site and placed in a concrete reservoir to be properly disposed at a later date. The disposition of that water is unknown. Smoke from the fire may have also introduced contaminants that settled downwind from the site.

The primary purpose of the RFI described in this SAP is to conduct an initial site investigation of the potential contaminants at the site, and if present, to determine the nature and extent of those contaminants. This information will be used in the remedial decision process. The RFI will include the collection and analysis of surface and subsurface soil, sediment, and groundwater samples. These samples will be collected to provide representative coverage of the site for use in human health and ecological risk screening and potentially for risk assessment, if necessary.

Surface and subsurface soil, sediment, and groundwater samples will be analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), including low level polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, dioxins/furans, metals, and cyanide.

Sediment samples will also be analyzed for total organic carbon (TOC) to support site-specific risk calculations.

The SAP contained herein was generated for, and complies with, applicable Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP), and United States Environmental Protection Agency (USEPA) Region 5 requirements, regulations, guidance, and technical standards, as appropriate.

This SAP outlines the organization, project management, objectives, planned activities, measurement, data acquisition, assessment, oversight, and data review procedures associated with the planned investigation at SWMU 11. Protocols for sample collection, handling and storage, chain-of-custody, laboratory and field analyses, data validation, and reporting are also addressed in this SAP. The investigation procedures utilized will comply with Tetra Tech Standard Operating Procedures (SOPs), which are included in Appendix A. The analytical procedures will follow the Laboratory SOPs which are included in Appendix B. The field work is scheduled to begin in April 2011. A complete schedule is presented in SAP Worksheet No. 16.

Field activities conducted under this SAP will be in accordance with the requirements a Site-Specific Health and Safety Plan than will be prepared by Tetra Tech for this investigation.

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A - Tetra Tech Standard Operating Procedures and Field Forms
B - Laboratory Standard Operating Procedures
C - DQO Meeting Minutes
D - Background Reports
E - Project Screening Level Backup Documentation

ACRONYMS AND ABBREVIATIONS

AR	Administrative Record
BFB	Bromofluorobenzene
bgs	below ground surface
°C	degrees Celsius
CA	Corrective Action
CAS	Chemical Abstracts Service
CCB	Continuing Calibration Blank
CCC	Calibration Check Compound
CCV	Continuing Calibration Verification
CFA	Cape Fear Analytical, LLC
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action Navy
CLP	Contract Laboratory Program
CMS	Corrective Measures Study
COC	Contaminant of Concern
COPC	Constituent of Potential Concern
CPCS	Column Performance Check Solution
CSM	Conceptual Site Model
CTO	Contract Task Order
CWAP	Comprehensive Work Approval Process
%D	percent difference or percent drift
DAF	Dilution Attenuation Factor
DCL	Default Closure Level
DDT	dichlorodiphenyltrichloroethane
DFTPP	decafluorotriphenylphosphine
DO	dissolved oxygen
DON	Department of the Navy
DL	Detection Limit
DoD	Department of Defense
DPT	direct-push technology
DQI	Data Quality Indicator
DQO	Data Quality Objective
DVM	Data Validation Manager
Eco-SSL	Ecological Soil Screening Level
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
Empirical	Empirical Laboratories, LLC

ACRONYMS AND ABBREVIATIONS (CONTINUED)

EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ERSM	Environmental Restoration Site Manager
ESL	Ecological Screening Level
EU	Exposure Unit
FD	Field Duplicate
FOL	Field Operations Leader
FTMR	Field Task Modification Request
g	gram
GC/ECD	Gas Chromatography/ Electron Capture Detector
GC/MS	Gas Chromatograph/Mass Spectrometer
GPS	global positioning system
HASP	Health and Safety Plan
HCl	hydrochloric acid
HHRA	Human Health Risk Assessment
HSM	Health and Safety Manager
IA	Investigative Area
ICAL	Initial Calibration
ICB	Initial Calibration Blank
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
ICS	Interference Check Standard
ICV	Initial Calibration Verification
IDEM	Indiana Department of Environmental Management
IDW	investigation-derived waste
IS	Internal Standard
IUPPS	Indiana Underground Plant Protection Services
L	liter
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection
LOQ	Limit Of Quantitation
LUC	land use control
MCL	Maximum Contaminant Level
mg/L	milligram per liter
mg/kg	milligram per kilogram
mL	milliliter
MPC	Measurement Performance Criterion

ACRONYMS AND ABBREVIATIONS (CONTINUED)

msl	mean sea level
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
NaOH	Sodium Hydroxide
NAVFAC	Naval Facilities Engineering Command
NC	no criteria
ND	non detect
NFA	No Further Action
NIRIS	Naval Installation Restoration information Solution
NOAA	National Oceanic and Atmospheric Administration
NSA	Naval Support Activity
NTU	Nephelometric Turbidity Unit
ORP	Oxidation-Reduction Potential
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCP	pentachlorophenol
PDF	Portable Document Format
PID	Photoionization Detector
PM	Project Manager
POC	Point of Contact
ppb	part per billion
PPE	personal protective equipment
ppm	part per million
PQLG	Project Quantitation Limit Goal
PQO	project quality objective
PSL	Project Screening Level
PWD	Public Works Department
QA	quality assurance
QAM	Quality Assurance Manager
QAO	Quality Assurance Officer
QC	quality control
QSM	Quality Systems Manual
%R	percent recovery
r	Linear Regression Correlation Coefficient
r^2	Coefficient of Determination

ACRONYMS AND ABBREVIATIONS (CONTINUED)

R5 ESL-S	USEPA Region 5 Ecological Screening Level, Soil
R5 SED	USEPA Region 5 Ecological Screening Level, Sediment
RBSSL	Risk-Based Migration-to-Groundwater Soil Screening Level
RCRA	Resource Conservation and Recovery Act
R-DCLs	Risk-Default Closure Level
RF	Response Factor
RFI	Resource Conservation and Recovery Act Facility Investigation
RISC	Risk Integrated System of Closure
RPD	Relative Percent Difference
RPM	Remedial Project Manager
% RSD	Relative Standard Deviation
RSL	Regional Screening Level
R-RSL	Residential Regional Screening Level
RRT	Relative Retention Time
RT	Retention Time
SAP	Sampling and Analysis Plan
SDG	sample delivery group
SOP	Standard Operating Procedure
SPCC	System Performance Check Compound
SQL	Structured Query Language
SSO	Site Safety Officer
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TBD	To Be Determined
TCL	Target Compound List
TOC	total organic carbon
T-RSL	Tapwater Regional Screening Level
Tetra Tech	Tetra Tech NUS, Inc.
UCL	Upper Confidence Limit
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plan
µg/L	microgram per liter
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
VSP	Visual Sample Plan

SAP Worksheet No. 2 -- SAP Identifying Information

(UFP-QAPP Manual Section 2.2.4)

Site Name/Number:	Naval Support Activity (NSA) Crane, Solid Waste Management Unit (SWMU) 11 – Old Storage Building 225
Operable Units:	Not Applicable (NA)
Contractor Name:	Tetra Tech NUS, Inc. (Tetra Tech)
Contract Number:	N62470-08-D-1001
Contract Title:	Comprehensive Long-term Environmental Action Navy (CLEAN)
Work Assignment Number:	Contract Task Order (CTO) F27E

1. This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of the United States Environmental Protection Agency (USEPA) *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP)* (USEPA, 2005a) and *EPA Guidance for Quality Assurance Project Plans*, EPA QA/G-5, QAMS (USEPA, 2002a).

2. Identify regulatory program: The Indiana Department of Environmental Management (IDEM) Hazardous Waste Closure and Corrective Action Programs, which implement and enforce the Resource Conservation and Recovery Act (RCRA), and related state laws and rules.

3. This SAP is a project-specific SAP.

4. List dates of scoping sessions that were held:

Scoping Session	Date
Data Quality Objective (DQO) Meeting	November 4, 2010

5. List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation.

Title	Date
"Green Water" Report (Department of the Navy [DON], 1976a)	September 20, 1976
Report on the Fire Investigation, Building 225, Crane Naval Weapons Support Center; Crane Indiana; 14-16 July 1976, NAVMAT Report 11320.2 (DON, 1976b)	1976

6. List organizational partners (stakeholders) and connection with lead organization:

IDEM (lead regulatory agency), USEPA Region 5 (regulatory oversight), Naval Facilities Engineering Command (NAVFAC) Midwest, NSA Crane, (property owner), Tetra Tech (Navy contractor)

7. Lead organization: NAVFAC Midwest

8. If any required SAP elements or required information are not applicable to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusion below:

NA, as there are no exclusions.

SAP Worksheet No. 3 -- Distribution List

(UFP-QAPP Manual Section 2.3.1)

Name of SAP Recipients	Title/Role	Organization	Telephone Number	E-mail Address or Mailing Address
Howard Hickey	NAVFAC Remedial Project Manager (RPM)/ Manages Project Activities for the Navy	NAVFAC Midwest	847-688-2600 X243	howard.hickey@navy.mil
Tom Brent	Environmental Restoration Site Manager (ERSM)/ Crane Point of Contact (POC)	NAVFAC Midwest Public Works Department (PWD) Crane	812-854-6160	thomas.brent@navy.mil
To Be Determined (TBD) (electronic upload)	NAVFAC Quality Assurance Officer (QAO)/ Government Chemist	NAVFAC Atlantic	TBD	TBD
Bonnie Capito (final cover letter only)	Librarian and Records Manager/ Navy Administrative Record (AR)	NAVFAC Atlantic	757-322-4785	bonnie.capito@navy.mil
Peter Ramanauskas	USEPA RPM/ Regulator Input	USEPA Region 5	312-866-7890	ramanauskas.peter@epamail.epa.gov
Doug Griffin	IDEM RPM/ Regulator Input	IDEM	317-233-2710	dgriffin@idem.in.gov
John Trepanowski (distribution letter only)	Program Manager/ Manages Navy Initiatives	Tetra Tech	610-382-1532	john.trepanowski@tetratech.com
Garth Glenn (distribution letter only)	Deputy Program Manager/ Manages Program Activities	Tetra Tech	757-461-3926	garth.glenn@tetratech.com
Anthony P. Klimek, P.E.	Project Manager (PM)/ Manages Project Activities	Tetra Tech	513-557-5057	tony.klimek@tetratech.com
Ralph Basinski	Crane Activity Coordinator/ Coordinates Tetra Tech Activities at NSA Crane	Tetra Tech	412-921-8308	ralph.basinski@tetratech.com
Tom Johnston, PhD (electronic copy only)	Quality Assurance Manager (QAM)/ Manages Corporate Quality Assurance (QA) Program and Implementation	Tetra Tech	412-921-8615	tom.johnston@tetratech.com

Name of SAP Recipients	Title/Role	Organization	Telephone Number	E-mail Address or Mailing Address
Matt Soltis [Health and Safety Plan (HASP) only]	Health and Safety Manager (HSM)/ Manages Corporate Health and Safety Program	Tetra Tech	412-921-8912	matt.soltis@tetratech.com
Joe Samchuck (electronic copy only)	Data Validation Manager (DVM)/ Manages Data Validation	Tetra Tech	412-921-8510	joseph.samchuck@tetratech.com
George Ten Eyck	Field Operations Leader (FOL) and Site Safety Officer (SSO)/ Manages Field Operation and Site Safety Issues	Tetra Tech	513-557-5043	george.teneyck@tetratech.com
Mark Traxler (electronic copy only)	Project Chemist/ Provides Coordination with Laboratory	Tetra Tech	610-382-1171	mark.traxler@tetratech.com
Driller (TBD) (electronic copy only)	Drilling Subcontractor PM/ Provides Direct-Push Technology (DPT) Services	TBD	TBD	TBD
Kim Kostzer (electronic copy only)	Laboratory PM - Representative for Laboratory and Analytical Issues	Empirical Laboratories, LLC (Empirical)	615-345-1115	kkostzer@empirlabs.com
Chris Cornwell (electronic copy only)	Laboratory PM – Representative for Laboratory and Analytical Issues	Cape Fear Analytical, LLC (CFA)	910-795-0422	chris.cornwell@cfanalytical.com

SAP Worksheet No. 4 -- Project Personnel Sign-Off Sheet

(UFP-QAPP Manual Section 2.3.2)

Certification that project personnel have read the text will be obtained by one of the following methods as applicable:

1. In the case of regulatory agency personnel with oversight authority, approval letters or e-mails will constitute verification that applicable sections of the SAP have been reviewed. Copies of regulatory agency approval letters / e-mails will be retained in the project files and are listed in Worksheet No. 29 as project records.

2. E-mails will be sent to the Navy, Tetra Tech, and subcontractor project personnel who will be requested to verify by e-mail that they have read the applicable SAP / sections and the date on which they were reviewed. Copies of the verification e-mail will be included in the project files and is identified in Worksheet No. 29.

   A copy of the signed Worksheet No. 4 will be retained in the project files and is identified as a project document in Worksheet No. 29.

Name [1]	Organization/Title/Role	Telephone Number	Signature/E-Mail Receipt	SAP Section Reviewed	Date SAP Read
Navy and Regulator Project Team Personnel					
Howard Hickey	NAVFAC/ Navy RPM/ Manages Project Activities for the Navy	847-688-2600 X243		All	
Tom Brent	NAVFAC/ ERSM/ Site POC	812-854-6160	See Worksheet No.1 for signature	All	
Doug Griffin	IDEM/ RPM/ Provides Regulator Input	317-233-2710	See Worksheet No.1 for signature	All	
Tetra Tech Project Team Personnel					
Tony Klimek, P.E.	Tetra Tech/ PM/ Manages Project Activities	513-557-5057	See Worksheet No.1 for signature	All	
Tom Johnston	Tetra Tech/ QAM/ Manages NAVFAC Contract QA Program and Implementation	412-21-8615	See Worksheet No.1 for signature	All	
George Ten Eyck	Tetra Tech/ FOL/SSO/ Manages Field Operation and Site Safety Issues	513-557-5043		All	
Matt Soltis	Tetra Tech/ HSM/ Manages Corporate Health and Safety Program	412-921-8912		HASP only	

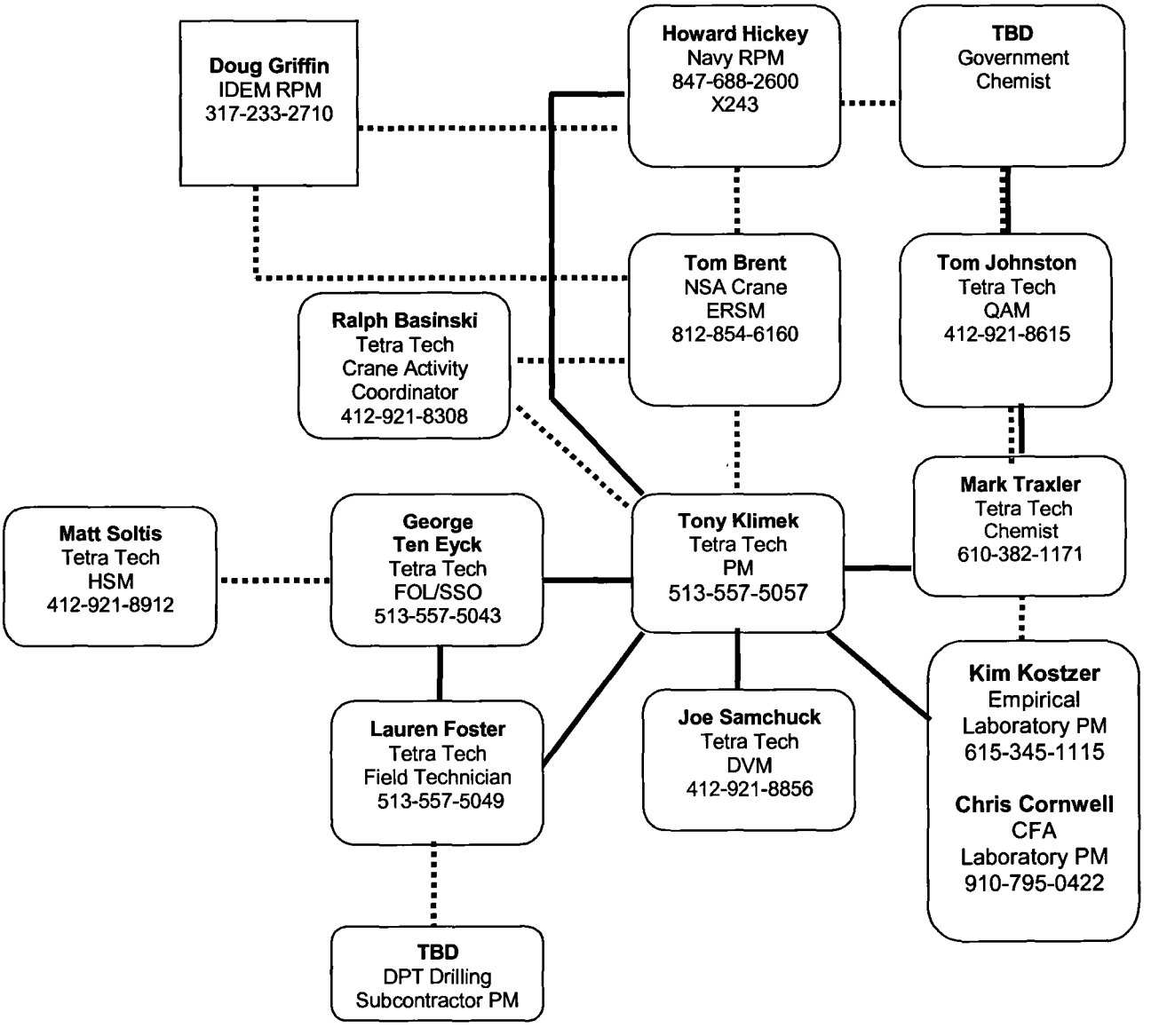
Name [1]	Organization/Title/Role	Telephone Number	Signature/E-Mail Receipt	SAP Section Reviewed	Date SAP Read
Joe Samchuck	Tetra Tech/ DVM/ Manages Data Validation	412-921-8510		Worksheet Nos. 12, 14, 15, 19, 20, 23-28, 30, and 34-37	
Mark Traxler	Tetra Tech/ Project Chemist/ Provides Coordination with Laboratory	610-382-1171		All	
Subcontractor Personnel					
Kim Kostzer	Empirical/ Laboratory PM/ Representative for Laboratory and Analytical Issues	615-345-1115		Worksheet Nos. 6, 12, 14, 15, 19, 20, 23-28, 30, and 34-36	
Chris Cornwell	CFA/ Laboratory PM/ Representative for Laboratory and Analytical Issues	910-795-0422		Worksheet Nos. 6, 12, 14, 15, 19, 20, 23-28, 30, and 34-36	
TBD	TBD/ Subcontractor PM/ Driller for DPT Services	TBD		Worksheet Nos. 6, 14, 17, and Figures	

[1] Persons listed on this worksheet will be responsible for distributing the SAP to the appropriate people within their organization.

SAP Worksheet No. 5 -- Project Organizational Chart

(UFP-QAPP Manual Section 2.4.1)

Lines of Authority ——— ..... Lines of Communication



SAP Worksheet No. 6 -- Communication Pathways

(UFP-QAPP Manual Section 2.4.2)

Communication Driver	Responsible Affiliation	Name	Phone Number and/or E-Mail	Procedure
SAP Amendments	Tetra Tech FOL/SSO Tetra Tech PM Navy RPM	George Ten Eyck Tony Klimek Howard Hickey	513-557-5043 513-557-5057 847-688-2600 x243	Tetra Tech FOL will verbally inform Tetra Tech PM within 24 hours of realizing a need for an amendment. Tetra Tech PM will document the proposed changes via a Field Task Modification Request (FTMR) form within 5 days and send the Navy RPM a concurrence letter within 7 days of identifying the need for change. SAP amendments will be submitted by Tetra Tech PM to NAVFAC Midwest Program Management Office for review and approval. Tetra Tech PM will send scope changes to Project Team via e-mail within 1 business day.
Changes in field work schedule	Tetra Tech PM NSA Crane ERSM	Tony Klimek Tom Brent	513-557-5057 812-854-6160	Tetra Tech PM will verbally inform the NSA Crane ERSM on the day that a schedule change is known and will document via schedule impact letter within 1 business day of when the impact is realized.
Issues in the field that result in changes in scope of field work	Tetra Tech FOL/SSO Tetra Tech PM NSA Crane ERSM	George Ten Eyck Tony Klimek Tom Brent	513-557-5043 513-557-5057 812-854-6160	Tetra Tech FOL will inform Tetra Tech PM within 1 business day of when an issue is discovered; Tetra Tech PM will inform NSA Crane ERSM by close of the next working day; NSA Crane ERSM will issue scope change if warranted. The scope change is to be implemented before further work is executed. Tetra Tech PM will document the changes within 2 days of identifying the need for change on a FTMR form and obtain required approvals within 5 days of initiating the form.
Recommendations to stop work and initiate work upon corrective action	Tetra Tech FOL/SSO Tetra Tech PM Tetra Tech QAM Tetra Tech Project Chemist Tetra Tech HSM NSA Crane ERSM	George Ten Eyck Tony Klimek Tom Johnston Mark Traxler Matt Soltis Tom Brent	513-557-5043 513-557-5057 412-921-8615 610-382-1171 412-921-8912 812-854-6160	If Tetra Tech is the responsible party for a stop work command, the Tetra Tech FOL will inform onsite personnel, subcontractor(s), NSA Crane ERSM, and the identified Project Team members within 1 hour (verbally or by e-mail). If a subcontractor is the responsible party, the subcontractor PM must inform the Tetra Tech FOL within 15 minutes, and the Tetra Tech FOL will then follow the procedure listed above.

Communication Driver	Responsible Affiliation	Name	Phone Number and/or E-Mail	Procedure
Field data quality issues	Tetra Tech FOL/SSO Tetra Tech PM	George Ten Eyck Tony Klimek	513-557-5043 513-557-5057	Tetra Tech FOL will inform Tetra Tech PM verbally or by e-mail on the same day that a field data quality issue is discovered.
Analytical data quality issues	Empirical Laboratory PM CFA Laboratory PM Tetra Tech Project Chemist Tetra Tech DVM Tetra Tech PM NSA Crane ERSM	Kim Kostzer Chris Cornwell Mark Traxler Joe Samchuck Tony Klimek Tom Brent	615-345-1115 910-795-0422 610-382-1171 412-921-8510 513-557-5057 812-854-6160	The Laboratory PM will notify (verbally or via e-mail) the Tetra Tech Project Chemist within one business day of when an issue related to laboratory data is discovered. The Tetra Tech Project Chemist will notify (verbally or via e-mail) the Tetra Tech DVM/data validation staff and the Tetra Tech PM within one business day. The Tetra Tech DVM or Project Chemist notifies the Tetra Tech PM verbally or via e-mail within 48 hrs of validation completion that a non-routine and significant laboratory quality deficiency has been detected that could affect this project and/or other projects. The Tetra Tech PM verbally advises the NAVFAC RPM within 24 hours of notification from the Tetra Tech Project Chemist or DVM. The NAVFAC RPM takes corrective action that is appropriate for the identified deficiency. Examples of significant laboratory deficiencies include data reported that has a corresponding failed tune or initial calibration verification. Corrective actions may include a consult with the NAVFAC Navy Chemist.

SAP Worksheet No. 7 -- Personnel Responsibilities and Qualifications Table

(UFP-QAPP Manual Section 2.4.3)

Name	Title/Role[1]	Organizational Affiliation	Responsibilities
Doug Griffin	RPM/ Provides regulator Input	IDEM	Participates in scoping, conducts data review and evaluation, and approves the SAP.
Tom Brent	ERSM/ Manages daily site activities related to this project	NSA Crane	Oversees site activities, participates in scoping, conducts data review and evaluation, and approves the SAP.
Howard Hickey	RPM/ Manages project	NAVFAC Midwest	Oversees project implementation including scoping and data review and evaluation.
Ralph Basinski	Crane Activity Coordinator/ Coordinates Tetra Tech activities at NSA Crane	Tetra Tech	Oversees project implementation including scoping and data review and evaluation.
Tony Klimek	PM/ Manages project on a daily basis	Tetra Tech	Oversees project, including financial, schedule, and technical day-to-day management of the project.
George Ten Eyck	FOL/SSO/ Manages field operations and oversees site activities to ensure safety requirements are met	Tetra Tech	As FOL, supervises, coordinates, and performs field sampling activities. As SSO, responsible for on-site project specific health and safety training and monitoring site conditions. Details of these responsibilities are presented in the HASP.
Tom Johnston	QAM/ Oversees program and project QA activities	Tetra Tech	Ensures quality aspects of the CLEAN program are implemented, documented, and maintained.
Mark Traxler	Project Chemist/ Provides coordination with laboratory	Tetra Tech	Participates in project scoping, prepares laboratory scopes of work, and coordinates laboratory-related functions with laboratory. Oversees data quality reviews and QA of data validation deliverables.

Name	Title/Role[1]	Organizational Affiliation	Responsibilities
Joseph Samchuck	DVM/ Oversees data validation activities	Tetra Tech	Manages data validation activities within Tetra Tech, including ensuring QA of data validation deliverables, providing technical advice on data usability, and coordinating and maintaining the data validation review schedule.
Matt Soltis	HSM/ Oversees health and safety activities	Tetra Tech	Oversees the CLEAN Program Health and Safety Program.
TBD	Driller	TBD	Performs DPT soil borings according to scope of work. Provide equipment to collect groundwater samples.
Kim Kostzer Chris Cornwell	Laboratory PM Laboratory PM	Empirical CFA	Coordinates analyses with lab chemists, ensures that scope of work is followed, provides QA of data packages, and communicates with Tetra Tech staff.

[1] In some cases, one person may be designated responsibilities for more than one position. For example, the FOL may also be responsible for SSO duties. This action will be performed only as credentials, experience, and availability permits.

SAP Worksheet No. 8 -- Special Personnel Training Requirements Table

(UFP-QAPP Manual Section 2.4.4)

Each site worker will be required to have completed a 40-hour course (and 8-hour refresher, if applicable) in Health and Safety Training as described under Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120(e). Safety requirements are addressed in greater detail in the site-specific HASP.

SAP Worksheet No. 9 -- Project Scoping Session Participants Sheet

(UFP-QAPP Manual Section 2.5.1)

Project Name: NSA Crane SWMU 11 RCRA Facility Investigation (RFI) Projected Date(s) of Sampling: April 2011 Project Manager: Tony Klimek	Site Name: SWMU 11 – Old Storage Building 225 Site Location: Crane, Indiana

Date of Session: November 4, 2010
Scoping Session Purpose: Develop project quality objectives (PQOs) for RFI activities

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Tony Klimek	PM	Tetra Tech	513-557-5057	tony.klimek@tetratech.com	Management
Tom Brent	ERSM	NSA Crane	812-854-6160	thomas.brent@navy.mil	Management
Doug Griffin	RPM	IDEM	317-233-2710	dgriffin@idem.in.gov	State RPM
Howard Hickey	Navy RPM	NAVFAC Midwest	847-688-2600 X243	howard.hickey@navy.mil	NAVFAC RPM
Ralph Basinski	Crane Activity Coordinator	Tetra Tech	412-921-8308	ralph.basinski@tetratech.com	Management/ Oversight
Peggy Churchill	DQO Facilitator	Tetra Tech	321-636-6470	peggy.churchill@tetratech.com	DQO Facilitator

Comments/Decisions: Discussed SWMU 11 historical use and available data. Discussed the steps for the RFI in accordance with the SAP format.

Action Items: Tetra Tech assigned the task of preparing the Draft SAP.

Consensus Decisions: See meeting minutes in Appendix C. The meeting participants developed PQOs using USEPA's seven-step DQO process. Consensus decisions included the following:

1. Background documents such as the "Green Water" Report will be attached to the SAP.

2. Surface soil samples will be collected from the discharge area of the tank used to store green water after the fire.

3. Groundwater samples will be collected using a direct DPT (direct push technology) rig. Two downgradient and one upgradient samples will be collected. Permanent and/or temporary groundwater monitoring wells will not be installed during the initial screening sampling event.

4. Dioxins/furans samples from the surface soil can be composited by area. They should also be collected from the sediment and from areas downwind of the site. If dioxins/furans are determined to be a concern based on the initial screening sampling event, additional background samples will be collected in a subsequent sampling event.

5. Primarily, surface soil and sediment samples will be collected. Subsurface soil samples will be collected from the Underground Storage Tank (UST) area only. If present and available, two layers of sediment will be collected; 0 to 6 inches below ground surface (bgs) and 6 to 12 inches bgs from each sediment sampling location.

SAP Worksheet No. 10 -- Conceptual Site Model

(UFP-QAPP Manual Section 2.5.2)

This worksheet presents general background information about SWMU 11 – Old Storage Building 225 and a conceptual site model (CSM) that describes potential contamination routes and possible exposure pathways. The CSM served as the basis for developing the sampling and analysis program.

10.1 PHYSICAL SITE DESCRIPTION

SWMU 11 – Old Storage Building 225 is located near the western boundary of NSA Crane, approximately midway between the northern and southern boundaries of the facility (see Figure 10-1). It is located on the northwest side of Highway 101 approximately 0.4 miles north of the intersection between H-101 and H-45. The site is a rectangular shape and covers approximately 1 acre, as shown on Figure 10-2.

The site is approximately 100 feet wide (southeast-northwest) and 350 feet long (southwest-northeast). Building 225 was destroyed in a fire on July 13, 1976. The site currently consists of the concrete pad from former Building 225, the adjacent concrete loading dock, a railroad siding spur that is adjacent to the loading dock, and grassed and paved areas surrounding the pad. The concrete pad is elevated approximately 2 feet above the adjacent grassed area on the southeastern side. SWMU 11 is bounded on the northwest by a set of railroad tracks and on the southeast by paved road H-101. There is a ditch on the northwestern side of the site that flows northeast; the ditch is between the railroad siding spur and railroad tracks. Building 224 and a gravel parking lot are southwest of the site. Building 2720, Railroad Repair Shop, is located approximately 100 feet west of the site. There are no physical barriers securing the site.

Historical drawings show an UST approximately 40 feet southwest of Building 225. The UST was designed to store fuel for a boiler room that was designed for Building 225 in 1950. According to an historical drawing, the UST was 24 feet long and 5.5 feet in diameter. It was installed by partially excavating the existing ground and then placing soil over the top of the UST to create a mound approximately 3 feet to 5 feet high above the adjoining ground. There was no visible evidence of the UST or the mound during a recent site visit. Presumably, it was removed shortly after the fire. No records were located regarding removal of this UST.

As shown on Figure 10-3, runoff from SWMU 11 drains to the ditch on the northwestern side of the site. The ditch drains to a culvert that conveys flow under multiple railroad tracks to a drainage channel in a wooded area west of the site. The drainage channel discharges to Broom Branch approximately 1,000 feet northwest of the site. Broom Branch then discharges into First Creek approximately 14,000 feet northwest of the site. First Creek then flows northwest and off of the NSA Crane facility approximately 1,000 feet northwest of where they join together.

NSA Crane is in the unglaciated Crawford upland physiographic province of southern Indiana, which is a rugged dissected plateau bordered on the west by the Wabash lowland and on the east by the Mitchell plain. Bedrock geology is mapped as Pennsylvanian and Mississippian sandstones, limestones, and shales overlain by Quaternary-age deposits. Groundwater flow in the area generally mimics topography and is assumed to flow northwest to the drainage channel toward Broom Branch. Depth to groundwater at SWMU 11 is unknown; based on other site investigations in the area, it is expected to be less than 20 feet bgs. The site is located at an elevation of 690 feet above mean sea level (msl). As shown on Figure 10-3, it is located at a topographic high point relative to the surrounding area.

The NSA Crane facility was a rural, forested, and farmed area when it was commissioned as a Navy facility in 1941; the site has been part of the Navy facility since that time. Most of NSA Crane is forested, including the area to the west of the site. There are no known historical or cultural concerns, such as Native American burial grounds or historic landmarks on or in the vicinity of the site. There is no land use controls (LUCs) associated with the site. The nearest residence is located greater than 1 mile to the west of the site, beyond the western boundary of the Facility in the town of Burns City.

10.2 SMWU 11 HISTORY

The exact construction date for Building 225 is unknown; however, it was existing in 1947. Based on historical drawings, a boiler room addition was designed to be added to the southwest side of the building in 1950. The design included the installation of a UST that was 24 feet long and 5.5 feet in diameter approximately 40 feet south of the building. The disposition of the UST is unknown.

Building 225 and its contents were destroyed by a fire on July 13, 1976. At the time Building 225 was destroyed by fire, it was used for inert storage of over 70,000 pounds of pentachlorophenol (PCP), approximately 50,000 gallons of paints, approximately 500 pounds of sodium flourescein dye, approximately 5,000 gallons of solvents (acetone, toluene, and methyl ethyl ketone), and various other items including inks, staples, and wax paraffin. The cause of the fire has been attributed to deterioration of containers which allowed contents to seep out onto cardboard containers and wooden pallets, causing spontaneous ignition. Stored inventory of cellulose nitrate binder and brown wrapping paper is believed to be the source of the fire.

The NSA Crane Fire Department pumped more than 600,000 gallons of water onto the blaze which burned out of control for several hours. The fire was contained to the Building 225 area, and no other buildings with exposure to the fire were threatened. However, the fire extended to grass in the area due to 55-gallon drums and aerosol cans which exploded from the building and landed in the surrounding grassy area. According to the "Fire Investigation" report, a slight northeast wind was reported during the fire (DON, 1976b). Building 225 and its contents were destroyed by the fire. Following the fire, the remaining debris and residue from the Building 225 site were removed and disposed off-site.

The concrete building slab, loading dock, and railroad siding spur have remained in place since Building 225 was destroyed by fire.

10.3 PREVIOUS ENVIRONMENTAL INVESTIGATIONS AND ACTIONS

Environmental concern was generated by the observation that runoff water used in fighting the fire was colored a brilliant fluorescent green (due to the sodium fluorescein which was stored in the building) and was entering the drainage channel northwest of the site. The drainage channel discharged into Broom Branch, and then into First Creek and off the NSA Crane property. First Creek, which also receives discharge from Lake Greenwood, flows off of NSA Crane and into White River near Newberry, Indiana.

At the time of the fire, Broom Branch had little flow other than runoff from the water used in fighting the fire. PCP, paints, sodium fluorescein, solvents, and other items stored in the building may have entered the surface drainage, and soils in the area of the site, during firefighting efforts, and may continue to be present in these areas. According to the "Green Water" Report (DON, 1976a), a series of dams were constructed on Broom Branch to contain the impacted water shortly after the July 13, 1976 fire. A copy of the Green Water Report is presented in Appendix D. A schematic sketch in the Green Water report shows one dam (Dam #1) on the upstream side of the railroad tracks, and three additional dams (Dams #4, #2, and #3 - upstream to downstream) on Broom Branch downstream of the site and upstream of the discharge point into First Creek. The actual location of the dams is unknown. Dead fish were observed in the green water on July 14, 1976.

On July 14, 1976, water samples were collected from the areas of the dams along Broom Branch and analyzed for the presence of toxic materials. According to the Green Water Report, exhaustive analysis did not reveal any pollutants other than zinc, copper, lead, sodium fluorescein, and PCP. The report concluded that the metals were confined to the area of the site, and the dye was "reasonably non-toxic," leaving PCP as the primary contaminant of concern (COC). On July 14, 1976, PCP concentrations at the site were reported at greater than 30 milligrams per liter (mg/L), they were 30 mg/L in Broom Branch just below the railroad tracks, and were not reported in more downstream locations.

On July 14, 1976, water near the building was pumped out and transported to a concrete holding pond located near the Burns City Gate approximately 1 mile southwest of the site, as shown on Figure 10-1. The "Green Water Report" stated that several thousand gallons of water was pumped from the site and placed in a concrete reservoir to be properly disposed at a later date. The "Green Water" Report does not specifically identify the concrete reservoir in which the water was placed. The Building 2981 concrete tank was determined to be the most likely location of the concrete reservoir described in the "Green Water" Report. The Building 2981 concrete pond was the only concrete reservoir known to exist at the time of the fire and had a large capacity; therefore, it is assumed that this is the concrete reservoir referenced in the "Green Water" Report. The Building 2981 concrete tank was built as a sonobuoy test pond and has since been replaced with a smaller concrete test structure in the same location. The

approximate location of the former concrete tank is shown on Figure 10-4. On July 15, 1976, water from Broom Branch was pumped into fuel storage bladders for containment.

During the afternoon of July 15, 1976, heavy precipitation added an estimated 10 to 20 million gallons of water to the watershed. As a result, the water in Broom Branch flowed around Dam #2, and Dam # 3 was washed away. Visibly green water left the NSA Crane property. The visible limit of the dye is 0.2 mg/L; the highest value recorded off NSA Crane property was 0.4 mg/L. Flow in the channel receded and flow around Dam #2 stopped on July 17, 1976.

Contaminant concentrations decreased as the water moved downstream. As previously mentioned, the PCP levels near the site were reported at greater than 30 mg/L (or 30,000 parts per billion [ppb]), and at 30,000 ppb just downstream of the railroad tracks on July 14, 1976. Further downstream the PCP levels in the reservoir above Dam # 2 were typically 60 to 100 ppb. PCP levels in the water collected in the fuel bladders were 10 to 80 ppb.

Water quality at the three bridges across First Creek downstream of NSA Crane property and upstream of the White River was continuously monitored. The highest PCP level in First Creek at an offsite bridge (#2) downstream of NSA Crane was less than 10 ppb.

Beginning on July 19, 1976, the water contained in the reservoir behind Dam # 2 was released in a controlled manner into Broom Branch downstream of Dam #2. At the same time, the outflow from Lake Greenwood was manipulated to control the flow in First Creek so that no green water would be visible leaving the NSA Crane property. During this process, green colored water was visible leaving NSA Crane at only one time. The PCP level in the water leaving NSA Crane did not exceed 20 ppb. Water contained in the fuel bladders was also discharged in the same manner. The final disposition of the water collected and stored in the concrete reservoir is not known.

10.4 CONCEPTUAL SITE MODEL

Releases as a result of the fire in Building 225 are the likely source of potential contamination at SWMU 11. The historical information and analytical results from the "Green Water" Report (DON, 1976a) indicate that releases likely occurred directly onto the surface soil and potentially the subsurface soil, as well as migrating in the ditch and drainage channel sediment and floodplain soil following the hydrology for runoff. The site had been used as a storage facility of various metals, solvents, paints, and combustibles. Previous analytical results provide evidence that there was a release of zinc, copper, lead, sodium fluorescein, and PCP in the runoff, with all pollutants being confined, with the exception of PCP. An additional environmental concern is the possibility of residual contaminants from particulates resulting from the fire smoke that may have settled downwind of the site. The Report of Fire Investigation (DON, 1976b) reports that a northeast wind was blowing at 7 miles per hour during the fire, which may have dispersed airborne particulates in a southwesterly direction . The surface soil, subsurface soil, sediment,

and groundwater had not been tested. A CSM schematic is presented on Figure 10.5; the schematic is a generalized cross-section of the site facing southwest.

Based on site topography and the historical information of the fire, areas of interest, identified as Investigation Areas (IAs), include the following (see Figures 10-3 and 10-4):

- IA-1 - Building 225 Sub-slab
- IA-2 - Ditch (on northwest side of site)
- IA-3 - Adjacent Areas
- IA-4 – Downwind Areas
- IA-5 - UST Area
- IA-6 – Downgradient Area of Concrete Tank
- IA-7 - Drainage Channel

10.4.1 Potential Sources and Contaminants of Concern

Based on historical information, the fire, including firefighting measures, led to environmental exposure from the chemicals stored in Building 225. Because the list of chemicals may not be complete, the proposed sampling strategy for this site includes a wide range of potential contaminants. The target analytes for this investigation were selected from the list of priority pollutant chemicals and is based on the contaminants suspected to be present at the site during the fire and those known to be present at other NSA Crane sites. The analytical groups that will be investigated include: volatile organic compounds (VOCs); semivolatile organic compounds (SVOCs), including low level polycyclic aromatic hydrocarbons (PAHs); pesticides; polychlorinated biphenyls (PCBs); dioxins/furans; metals, and cyanide for surface soil, subsurface soil, sediment, and groundwater. Worksheet No. 15 identifies the target analytes that are included in each analytical group for each type of environmental media.

10.4.2 Potential Migration and Exposure Pathways

After release to the soil, contamination may (1) result in a complete exposure pathway to human and ecological receptors, and/or (2) serve as a source of contamination to groundwater and surface water and result in a complete exposure pathway through those routes. The impacts of contamination reaching First Creek may result in direct exposure to receptors in and along the stream. Floating and dissolved contaminants may also have soaked into ditch and channel areas to act as a contaminant reservoir for migration to groundwater and result in direct exposure to contaminated soil and sediment. Due to the firefighting measures and weather conditions in days following the fire, contamination affecting sediment in ditch and channel areas may have also soaked into the surrounding floodplain soil. The only evidence of previous contamination, however, was to surface water which was later washed out by a storm event. Residual contaminants in the form of particulates resulting from the fire smoke may have settled downwind of the site. Potential exposure pathways are illustrated on Figure 10-6 and Figure 10-7 for human and ecological receptors, respectively.

10.4.3 Potential Receptors

Human receptors at SWMU 11 include people who currently, or could in the future, interact with contaminated media. Current site users include workers in Buildings 2720 and 224 located within 100 feet of the site, and trespassers. The area is rural, and the nearest residence is more than 1 mile from the site. However, because future land use is unknown, it is common practice to evaluate the future use of a property as residential. Therefore, potential future receptors include residents and persons recreating at the site. Human receptors may be exposed to different media based on their specific activities. These media include surface and subsurface soil, sediment, and groundwater.

Ecological receptors include animal and plant species that could be affected by the contaminants that are present at the site. Typically, ecological receptors can be exposed only to surface media – surface soil, surface water, and upper layers of wetland or stream sediment. Exposure of ecological receptors to groundwater and subsurface soil is not anticipated; however, contamination in subsurface soil or groundwater may serve as sources of contamination to sediment or surface water through subsurface transport or diffuse flow to streams. The exposure media for ecological receptors are surface soil and sediment. Terrestrial plants, invertebrates, and vertebrates are exposed to surface soil by direct contact and ingestion of soil and other food items. Aquatic and semi-aquatic vegetation, benthic invertebrates, and aquatic organisms are exposed to sediment by direct contact and/or ingestion of sediment and other food items. Benthic invertebrates or other aquatic organisms that may have contacted or ingested contaminated media may be consumed by wildlife. Although terrestrial vertebrates may be exposed to chemicals found in the air via inhalation, this is not considered a significant pathway.

SAP Worksheet No. 11 -- Project Quality Objectives/Systematic Planning Process Statements

(UFP-QAPP Manual Section 2.6.1)

This section describes the development of PQOs using USEPA's seven-step DQO/Systematic Planning Process.

11.1 PROBLEM STATEMENT

Based on site history and the CSM, it is unknown whether site-related contaminants are present in environmental media at SWMU 11 at concentrations that exceed applicable risk-based human health or ecological screening values. The data from the initial screening sampling event will be used with supplemental investigation data as deemed necessary by Project Team to locate contaminated areas, and to conduct a Human Health Risk Assessment (HHRA) and/or an Ecological Risk Assessment (ERA), If there is unacceptable risk to ecological or human receptors form exposure to site contaminants the project team will evaluate remedial alternatives in a Corrective Measures Study.

11.2 IDENTIFY THE INPUTS TO THE DECISIONS

The following chemical and physical data are needed to attain project objectives:

1. Chemical data: Surface and subsurface soil, sediment, and groundwater chemical data will be collected and analyzed to determine if target analytes are present in site media. The list of target analytes and associated Project Screening Levels (PSLs) for each matrix are presented in Worksheet No. 15. The sampling methods are presented in Worksheet No. 18, and the analytical methods are presented in Worksheet No. 19.

2. Subsurface soil screening: A photoionization detector (PID) will be used to measure VOCs and certain SVOCs (including PAH) levels in subsurface soil samples. Analyses will be conducted on the most contaminated subsurface soil interval at each boring location, based on the maximum PID reading. Visual observations will also be used to assist in the identification of subsurface soil with the greatest potential for contamination. The PID will be used in accordance with the manufacturer's guidance.

3. Physical: Well stabilization parameters will be measured during groundwater sampling to ensure that representative groundwater data is collected and to support risk calculations, if they become necessary.

4. Project Screening Levels (PSLs): The SWMU 11 RFI requires chemical data that can be compared to current USEPA and IDEM residential surface and subsurface soil, sediment, and groundwater risk-based screening criteria. The risk and regulatory criteria applicable to the SWMU 11 RFI include the IDEM Risk Integrated System of Closure (RISC) Default Closure Tables, Residential and Industrial

Closure Levels (R-DCLs and I-DCLs) (IDEM, 2009); USEPA Regions 3, 6 and 9 Residential Regional Screening Levels (R-RSLs) and risk-based migration-to-groundwater Soil Screening Levels (RBSSLs) for human health risk screening (USEPA, 2010a). ERA PSLs were selected by choosing the lowest value among USEPA Ecological Soil Screening Levels (Eco-SSLs) for plant, invertebrate, mammalian and avian values and this was selected as the ecological screening value (USEPA, 2005-2008). Eco-SSLs were used preferentially as soil screening values; however, Eco-SSLs are currently available for only a few analytes. USEPA Region 5 Ecological Screening Levels (ESLs) for soil (R5 ESL-S) and sediment (R5 SED) (USEPA, 2003) were used for screening values for analytes that do not have an Eco-SSL. The criterion for each analyte represents the PSL for each environmental matrix listed in Worksheet No. 15. A comprehensive list of the relevant environmental and medium-specific PSLs for the target analytes is provided in Appendix E.

To conduct comparisons of site data to screening values for surface soil, subsurface soil, sediment, and groundwater, the selected laboratory(s) should be able to achieve Limits of Quantitation (LOQs) that are low enough to measure constituent concentrations that are less than the PSLs.

Analytical data reported by the laboratory use the following reporting conventions: All results below the Detection Limit (DL) will be considered nondetects; positive results reported at concentrations between the DL and LOQ will be reported with a "J" qualifier; and analytes not found (not detected) in a sample will be reported at the Limit of Detection (LOD) with a "U" qualifier.

Several target analytes have PSLs that fall between the LOD and the LOQ. "J" flagged data will be accepted to achieve project goals; however, greater scrutiny will be applied in these cases. Additionally, the inability to quantify select analytes to PSL levels with confidence will be addressed in the risk screening uncertainty analysis. In cases where the laboratory LODs are greater than the PSLs, consistent with the USEPA Risk Assessment Guidance for Superfund, Part A (USEPA, 1989), if the analyte is not detected, the LOD will be reported and "U" qualified. An evaluation of these analytes will be also presented in the uncertainty section of the risk screening in the RFI Report.

5. Background: The background data set for various media at NSA Crane will also be used to determine whether metals present on-site are naturally occurring or are site-related. Background data for the various soil types identified at NSA Crane are described in the *Final Base-Wide Background Soil Investigation Report for NSWC Crane* (Tetra Tech, 2001). For risk assessment purposes, in the event that an analyte concentration exceeds a PSL, but is less than or equal to an established background concentration, the analyte will not be considered a COPC. For determining the extent of contamination, if a background concentration for a particular analyte is greater than the PSL for that analyte, the background concentration will replace the PSL prior to decision-making.

11.3 DEFINE THE STUDY BOUNDARIES

Based on the CSM, the study will be performed in a step-wise manner and will address the area of SWMU 11 as shown on Figure 10-3, and the area adjacent to the Building 2981 concrete tank as shown on Figure 10-4. Specific Investigative Areas

The following items address the horizontal, vertical, and temporal boundaries for the initial screening sampling event of the study:

1. Horizontal: The horizontal boundary of the study is defined as the outer perimeter of the area where the Building 225 fire took place and the outlet area of the Building 2981 Concrete Tank, based on information from aerial photographs and previous investigations. Horizontally, the area within SWMU 11 boundaries and drainage channel to Broom Branch will be investigated. Surface water is not of interest because the drainage channel is dry during part of the year. Lateral expansion of the horizontal study boundary may be necessary if concentrations in site media exceed PSLs (and background concentrations for metals) in the initial sampling round.

2. Vertical: The vertical boundary of the study is defined as soil from the surface to the top of the water table, which is estimated at less than 20 feet bgs at the site. Vertically, both surface and subsurface soil will be assessed. The interval of interest for surface soil is 0 to 2 feet bgs; the interval of interest for subsurface soil is a 2-foot interval selected based on field screening with a PID and/or visual observations. Surface soil data will be used for direct contact soil risk evaluations. Subsurface soil data will be collected at greater than 2 feet bgs to investigate for potential migration-to-groundwater.

3. Downwind Dioxin/Furan Investigation Area: A select area downwind of the fire smoke will be sampled for dioxins/furans. PSL exceedances at these locations would represent residual contaminants from particulates resulting from the fire smoke that may have settled downwind of the site. As such, EU boundaries and EPCs to represent the IA-4 Downwind Area will be addressed separately, if deemed necessary by the Project Team.

4. Groundwater: Groundwater downgradient of the known release may have been contaminated by infiltration of the runoff from firefighting measures. Upgradient groundwater samples will also be collected to provide a reference population. Groundwater will be assessed at the site by collecting groundwater samples during initial sampling. Because there are no known monitoring wells in the immediate vicinity, depth to groundwater is not known, but it is presumed to be less than 20 feet bgs based on other site investigations in the area.

5. Temporal: All target analyte concentrations are anticipated to be relatively unchanged (stable) over the course of time needed to conduct the environmental investigations and into the foreseeable future; therefore, no temporal constraints exist. SWMU 11 RFI initial sampling event field activities

are scheduled for early 2011. Subsequent field sampling activities, if deemed necessary based on the initial sampling event results, will be conducted in a timely manner.

The study area boundary may expand if COPCs are identified in relative site media.

11.4 DEVELOP THE ANALYTIC APPROACH

The decision statements for each step of the study are as follows:

Initial Screening

Based on the results from the initial screening sampling event, determine whether chemical concentrations in site media (surface and subsurface soil, sediment, and groundwater) exceed the PSLs within and around areas that are the most likely areas to have been impacted by the fire at SWMU 11. If chemical concentrations in site media are less than the lowest risk-based screening values, then the Project Team will recommend No Further Action (NFA) for the site, and the Navy will submit a Closure Report to IDEM.

If any analyte is detected in site media at a maximum concentration that exceeds a risk-based screening value and is greater than the site-specific background concentration (for metals), the Project Team will meet to discuss a path forward. The Project Team will review the analytes that exceed the risk-based screening values based on specific factors that include the following:

- The environmental media that is identified with an exceedance,
- The particular compound(s) that is identified with an exceedance, and
- The magnitude of any exceedance, in frequency, distribution of samples, and concentrations as compared to the screening value.

The decision rules for the initial screening sampling event of this investigation are as follows:

1. If target analyte concentrations in all surface and subsurface soil and sediment samples in the initial round of sampling are less than PSLs, then recommend NFA.
2. For each target analyte, if the maximum measured concentration in any medium exceeds its human health or ecological screening value (and applicable background concentration for metals), then classify the chemical as a human health or ecological Chemical of Potential Concern (COPC) for that medium and risk type and collect another round of data in order to conduct a human health and ecological risk assessment; otherwise, exclude the chemical from further consideration in the risk screening.

3. For target analytes that are detected in groundwater, if the maximum detected concentration of any analyte exceeds the PSL, then installation of permanent groundwater monitoring wells will be considered by the Project Team to assess and monitor groundwater conditions at the site; otherwise, no additional groundwater samples will be required.

Delineation of Exceedances of PSLs (and Background Concentrations for Metals)

If any COPCs are identified in soil, sediment or groundwater following the initial sampling event, then the Project Team will return to the site to collect one round of "step-out" samples (vertical or horizontal) to define the vertical and/or horizontal extent of COPC contamination. The second round of data will be used with the first round of data to evaluate risk to site users and to identify Contaminants of Concern (COCs) for presentation in the RFI Report. Delineation of COCs will be completed in the future if active remediation is required, which will be determined through an evaluation of corrective measures in the Corrective Measures Study (CMS).

Risk Assessment

Once COPCs have been identified and the second round of data is collected risk to site users will be evaluated. If risks are not unacceptable, as determined through the human health and ecological risk assessments, the Project Team will meet to discuss a path forward. Such a path would involve one or more of the following:

- Comparing chemical concentrations in site media to Industrial or Non-Default Closure (less conservative) criteria as potential options.
- Addressing exceedances as uncertainties in the risk assessment and a Corrective Measures Study (CMS) and implementing risk management options such as institutional or engineering controls.

To evaluate potential risk associated with exposure to soil and sediment, soil and sediment data collected across the defined EUs will be used to define EPCs, depending on the receptor for which the risk is being evaluated. For industrial and residential receptors, the soil data collected from subdivided EUs will provide the basis for determining the soil EPCs. These smaller subunits are more representative of the potential exposure associated with industrial and residential receptors. Trespasser, construction worker, and recreational user EUs will be defined as the entire area between Highway 101 and the railroad tracks, with a linear distance of approximately 430 feet (as shown on Figure 10-2). Therefore, data collected across the entire site will provide the basis for determining the EPCs for those receptors.

Data that are considered to be representative of current site conditions, which will include all initial screening samples and one round of supplemental "step-out" samples and random background samples that are needed to adequately define the levels of risk present on-site from COCs will be used in the risk assessment(s). Human health risks will be developed in accordance with USEPA Risk Assessment Guidance (USEPA, 1989), and ecological risks will be developed in accordance with USEPA Ecological Risk Assessment Guidance (USEPA, 1997).

For soil, average concentrations, as represented by the 95-percent upper confidence limit (UCL) of the arithmetic mean, will be determined for each EU, specific to the human receptor which it represents. The UCL will be determined using USEPA's ProUCL software (Version 4.00.05, or most current) and will be used to represent the EPC for soil. Surface soil, combined surface and subsurface soil, and sediment concentrations will be computed for the HHRA. For groundwater, maximum detected concentrations will be used to represent EPCs.

If COPC concentrations in the receptor exposure units defined for any medium represent an unacceptable human health risk, then proceed to a CMS; otherwise, recommend NFA from a human health perspective. Unacceptable human health risk is defined for this project as incremental lifetime cancer risk (ILCR) estimates exceeding the risk range of $1x10^{-6}$ to $1x10^{-4}$, or a non-cancer risk (i.e., hazard indices) exceeding 1 (on a target-organ specific basis). Risk management decisions will be made for risk from carcinogens that is within the acceptable range of $1x10^{-4}$ and $1x10^{-6}$.

For ecological risk screening, the maximum detected concentrations of each COPC in all surface soil, sediment, and groundwater samples will be compared to PSLs to determine if an analyte is a Chemical of Potential Ecological Concern (COPEC). Average concentrations (arithmetic means) of surface soil data

or sediment data will be used in food-chain modeling. If risks for defined receptor exposure units are determined to be "unacceptable" based on an evaluation of several lines of evidence (e.g., number of exceedances of screening criteria, magnitude of the exceedances of screening criteria, spatial distribution of data, home range, background concentrations, etc.), then the Project Team will determine the need to conduct a Baseline Ecological Risk Assessment (ERA) or consider the potential risks with respect to remedial actions.

For COCs detected in groundwater, if the maximum measured concentration of any COC exceeds the PSL, then permanent groundwater monitoring wells will be considered by the Project Team for installation to assess and monitor groundwater conditions at the Site.

11.5 SPECIFY PERFORMANCE OR ACCEPTANCE CRITERIA

Because the initial screening sampling event sample locations depend on biased sampling, probability limits for false positive and false negative decision errors were not established for soil, sediment, or groundwater samples. Simple comparisons of measured concentrations to PSLs will be used. Sample locations were selected to determine the nature of surface and subsurface soil, sediment, and groundwater contamination from areas most likely to be contaminated based on the CSM.

This biased selection of sample locations does not support the use of quantitative statistics to estimate decision performance, as specified in the USEPA QA/G-4, QA/G-5, and QA/G-5S DQO guidance documents (USEPA, 2006, 2002a, and 2002b, respectively). However, the quantity of samples to be collected in the initial sampling round is deemed sufficient by the Project Team to determine whether unacceptable environmental conditions are present.

The Project Team will use the data from the initial screening sampling event, and additional data collected to conduct risk assessment, as well as additional random background data to determine whether the amount and type of data collected are sufficient to support the attainment of project objectives, which include the identification of COPCs to support the planned risk assessment calculations for human health and ecological receptors. This process may involve an evaluation of contaminant concentrations and uncertainty for contaminants that have PSLs which are below the LODs to ensure that contaminants are likely to have been detected, if present. If all data have been collected as planned and no data points are missing or rejected for quality reasons, the investigation will be considered satisfactory. If any data gaps are identified, including missing or rejected data, the Project Team will assess whether the project objectives have been obtained. This assessment will depend on the number and type of identified data gaps; therefore, a more detailed strategy cannot be presented at this time. All stakeholders, including the IDEM RPM, the Navy RPM and ERSM, and the Tetra Tech PM, will be involved in rendering the final conclusion by consensus regarding adequacy of the data. All analytical data collected per the sampling design should meet the QA criteria established in Worksheet Nos. 19 through 37 and the prescribed detection limit requirements for each COPC.

11.6 DEVELOP THE PLAN FOR OBTAINING DATA

Based on the information presented above, a detailed plan was developed to obtain the necessary data to answer the problem for the RFI. The sampling design and rationale for all initial screening sampling event samples, "step-out" samples, and random background HHRA/ERA support samples that will be collected are provided in Worksheet No. 17.

SAP Worksheet No. 12 -- Measurement Performance Criteria Table – Field Quality Control Samples

(UFP-QAPP Manual Section 2.6.2)

Quality Control (QC) Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria (MPCs)	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Trip Blank	VOCs	One per cooler of VOC samples shipped to laboratory.	Bias/ Contamination	No analytes ≥ ½ LOQ, except common laboratory contaminants, which must be < LOQ.	S & A
Equipment Rinsate Blank	All analytical groups	One per 20 samples per matrix per sampling equipment[1].	Bias/ Contamination	No analytes ≥ ½ LOQ, except common laboratory contaminants, which must be < LOQ.	S & A
Filtered Rinsate Blank	Dissolved Metals (if necessary due to high turbidity)	One per filter brand[2].	Bias/ Contamination	No analytes ≥ ½ LOQ, except common laboratory contaminants, which must be < LOQ.	S & A
Field Duplicate (FD)	All analytical groups	One per 10 field samples.	Precision	Values > 5X LOQ: Relative Percent Difference (RPD) must be ≤30 (aqueous)[3,4] ; ≤50 (solids)[3,4].	S & A
Cooler Temperature Indicator	All analytical groups	One per cooler.	Representativeness	Temperature must be less than 6 degrees Celsius (<6 °C).	S

1 – Equipment rinsate blanks will be collected if non-dedicated submersible pumps or other equipment are used.
2 – A filtered rinsate blank will be collected if filtered samples (e.g., Dissolved Metals) are collected.
3 – If duplicate values for non-metals are < 5x LOQ, absolute difference should be < 2x LOQ.
4 – If duplicate values for metals are < 5x LOQ, absolute difference should be < 4x LOQ.

SAP Worksheet No. 13 -- Secondary Data Criteria and Limitations Table

(UFP-QAPP Manual Section 2.7)

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation / collection dates)	How Data Will Be Used	Limitations on Data Use
Aerial Photographs	Aerial Photographic Site Analysis, NSA Crane, Crane, Indiana	USEPA, Characterization Research Division, 2005	Data will be used to generate approximate storage building location on topographic or geographical information system maps and to select proposed boring locations at SMWU 11.	None.
"Green Water" Report	Green Water Report for SWMU 11, Naval Weapons Support Center, Crane, Indiana	Department of the Navy, September 20, 1976	Data was used to identify IAs.	Due to the age of data, data will not be used in risk calculations. The data would not represent current site conditions.
Initial Assessment Study	Initial Assessment Study of Naval Weapons Support Center, Crane, Indiana	Naval Energy and Environmental Support Activity, May 1983	Data was used to identify IAs.	Due to the age of data, data will not be used in risk calculations. The data would not represent current site conditions.
Background Metals Study	Basewide background Soil investigation report, naval Surface warfare Center crane, Crane, Indiana	Naval facilities Engineering Command, January 2001	Data may be used to recalculate environmental risks.	None, the data were fully validated.

SAP Worksheet No. 14 -- Summary of Project Tasks

(UFP-QAPP Manual Section 2.8.1)

14.1 FIELD INVESTIGATION TASK PLAN

The field tasks are summarized below. A short description of these tasks is also provided.

- Mobilization/Demobilization
- Site-Specific Health and Safety Training
- Utility Clearance
- Monitoring Equipment Calibration
- Sample Collection Tasks
- Surface and Subsurface Soil Boring Sampling
- Sediment Sampling
- Groundwater Well Installation and Development
- Groundwater Sampling
- Investigation-Derived Waste (IDW) Management
- Global Positioning System (GPS) Locating
- Field Decontamination Procedures
- Field Documentation Procedures
- Sample Custody and Shipment Tasks
- Quality Control Tasks

Mobilization/Demobilization

Mobilization will consist of the delivery of all equipment, materials, and supplies to the site, complete assembly in satisfactory working order of all such equipment at the site, and satisfactory storage at the site of all such materials and supplies. Tetra Tech will coordinate with the Navy to identify appropriate locations for the storage of equipment and supplies. Site-specific health and safety training for all Tetra Tech subcontractors will be provided as part of site mobilization.

Demobilization will consist of the prompt and timely removal of all equipment, materials, and supplies from the site following completion of the work. Demobilization includes the cleanup and removal of IDW generated during the conduct of the investigation.

Site-Specific Health and Safety Training

There are no specialized/non-routine project specific training requirements or certifications needed by personnel to successfully complete the project or tasks. All field personnel will have appropriate training to conduct the field activities to which they are assigned. Each site worker will be required to have

completed the OSHA 40-hour course (and 8-hour refresher, if applicable) in Health and Safety Training. Safety requirements are addressed in greater detail in the site-specific HASP.

Utility Clearance

Prior to commencing any work at NSA Crane, the Comprehensive Work Approval Process (CWAP) will be followed. The CWAP will identify constraints in the work area, such as the locations of eagle's nests, archaeological sites, wetlands, etc., that may affect work at the site and other requirements that must be met prior to commencing work. One week prior to the commencement of any subsurface intrusive activities, the Tetra Tech FOL or designee will contact Indiana Underground Plant Protection Services (IUPPS) to complete a utility clearance ticket for the areas under investigation. Work permits, if required by the facility, will be obtained prior to conducting field activities. The Tetra Tech FOL will be responsible for coordinating these activities.

Monitoring Equipment Calibration

These procedures are described in Worksheet No. 22.

Sample Collection Tasks

Site-specific Standard Operating Procedures (SOPs) have been developed for field activities at this NSA Crane site, including sample collection tasks. These SOPs are presented in Appendix A. Sample labeling will be in accordance with SOP-02 (Sample Labeling, Appendix A), and the sample numbering scheme will be in accordance with SOP-03 (Sample Identification and Nomenclature, Appendix A). Methods for recording data will be in accordance with SOP-04 (Sample Custody and Documentation of Field Activities, Appendix A), and the selection of sample containers, sample preservation, packaging, and shipping will be in accordance with SOP-05 (Sample Preservation, Packaging, and Shipping, Appendix A).

The sampling and analysis program is outlined in Worksheet No. 18, and the sampling requirements for each type of analyses (i.e., bottleware, preservation, holding time) are listed in Worksheet No. 19. Field and laboratory QC samples will also be collected as outlined in Worksheet No. 20.

Surface and Subsurface Soil Sampling

Surface soils at NSA Crane are identified as the top 2 feet of soil (from 0 to 2 feet bgs). Surface soil does not include surface pavement or gravel. The ground surface will begin at the bottom of a pavement or gravel layer. The demarcation line between gravel and surface soil will be where more than fifty percent of the material is soil based on a visual assessment by the sampler. At locations where samples are

collected through a pavement layer, the pavement will be replaced in kind prior to demobilization of field activities.

Soil samples will be collected in accordance with SOP-07 (Soil Coring and Sampling Using Hand Auger Techniques, Appendix A) and SOP-11 (Subsurface Soil and groundwater Sampling Using DPT, Appendix A). Surface soil samples (from 0 to 2 feet bgs) will be collected with a hand auger, backhoe, or DPT, depending on site conditions. Sample jars will be filled using either a decontaminated stainless steel trowel or dedicated disposable plastic trowel. Subsurface soil samples will be collected using a DPT rig, DPT rig with auger, or backhoe, and stainless steel or disposable trowel. The subsurface soil borings will be described by the Site Geologist in accordance with SOP-08 (Soil Sample Logging, Appendix A) and will be screened for evidence of contamination with a PID. Use of the PID will be in accordance with the manufacturer's instructions. Any qualitative visual signs of potential contamination (such as soil staining) will be noted on the soil boring log.

Sediment Sampling

Sediment samples will be collected from two depths – 0 to 6 inches bgs, and 6 inches bgs to 12 inches bgs. The sediment sampling procedures discussed in SOP-09 (Sediment Sampling, Appendix A) will be followed.

Groundwater Sampling

Initial screening groundwater samples will be collected using a DPT drill rig as described in SOP-11 (Subsurface Soil and Groundwater Sampling Using Direct-Push Technology, Appendix A).

Groundwater Well Installation and Development

If determined to be necessary by the Project Team based on the initial screening sampling event results, additional groundwater wells will be installed in accordance with SOP-12 (Monitoring Well Installation, Appendix A). Development and sampling of the wells will then be performed in accordance with SOP-13 (Monitoring Well Development, Appendix A), SOP-14 (Measurement of Water Levels, Appendix A), SOP-15 (Low Flow Well Purging and Stabilization, Appendix A), SOP-16 (Monitoring Well Sampling, Appendix A), and SOP-17 (Calibration and Care of Water Quality Meters, Appendix A).

Investigation-Derived Waste Management

It is not anticipated that significant volumes of solid or semi-solid IDW in the form of soil or sediment will be generated during field activities, including collection of surface and subsurface soil samples using DPT or backhoe excavations. Soil will be replaced into the excavation from which it was excavated. If gross contamination is encountered (e.g., any non-soil contaminated material such as free product or soil with PID readings greater than 100 parts per million [ppm]), then excavation will cease. Any grossly

contaminated material that is brought to the surface will not be returned to the excavation but will be segregated from other excavated soil and placed on a plastic liner. The grossly contaminated material will be securely staged until arrangements are made for proper off-site disposal.

IDW that is generated, including personal protective equipment (PPE) and decontamination fluids, will be handled in accordance with SOP-10 (Management of Investigation-Derived Waste, Appendix A).

Global Positioning System Locating

A GPS unit will be used to locate all sampling points in accordance with SOP-01 (Global Positioning System, Appendix A). The GPS equipment will be checked on control monuments before and after day's use, and these checks will be documented in the field notebook. To ensure sub-meter accuracy, the GPS SOP requires a minimum of six satellites to capture a position.

Field Decontamination Procedures

Sample containers will be provided certified clean (I-Chem 300 or equivalent) from Empirical and CFA. Decontamination of sampling equipment will not be necessary for this project if only dedicated and disposable hand trowels will be used. However, if decontamination is necessary, the requirements outlined in this section will apply. Decontamination of reusable sampling equipment (e.g., non-disposable hand trowels, hand augers, or DPT or backhoe equipment) will be conducted prior to sampling and between samples at each location. Decontamination of equipment will be conducted according to the sequence established in SOP-06 (Decontamination of Field Sampling Equipment, Appendix A).

Field Documentation Procedures

Field documentation will be performed in accordance with SOP-04 (Sample Custody and Documentation of Field Activity, Appendix A).

A summary of all field activities will be properly recorded in a bound logbook with consecutively number pages that cannot be removed. Logbooks will be assigned to field personnel and will be stored in a secured area when not in use. Field documentation will be performed in accordance with SOP-04 (Sample Custody and Documentation of Field Activity, Appendix A).

Sample Custody and Shipment Tasks

Sample custody and shipment tasks are defined in SOP-05 (Sample Preservation, Packaging, and Shipping, Appendix A) and are discussed in Worksheet No. 27.

Quality Control Tasks

QA/QC samples will be collected at frequencies listed in Worksheet No. 12.

14.2 ADDITIONAL PROJECT-RELATED TASKS

Additional project-related tasks include:

- Analytical tasks
- Data generation procedures
- Data handling and management
- Data tracking and control
- Assessment and oversight
- Data review
- Project reports

Analytical Tasks

Chemical analyses for VOCs, SVOCs (including low level PAHs), PCBs, pesticides, metals, cyanide, and total organic carbon (TOC) will be performed by Empirical, which is a current Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) accredited laboratory. Chemical analyses for dioxins/furans will be performed by CFA, which is also a current DoD ELAP accredited laboratory. Copies of the DoD ELAP accreditation for Empirical and CFA are included in Appendix B. Analyses will be performed in accordance with the analytical methods identified in Worksheet No. 30. Empirical and CFA will meet the PSLs specified in Worksheet No. 15 and will perform the chemical analyses following laboratory-specific SOPs (see Worksheet Nos. 19 and 23) that were developed based on the methods listed in Worksheet Nos. 19 and 30. Copies of laboratory SOPs are included in Appendix B.

All soil results will be reported by the laboratory on a dry-weight basis. Results of percent moisture will be reported in each analytical data package and associated electronic data deliverables (EDDs). This information will also be captured in the project database, which will eventually be uploaded to Naval Installation Restoration information Solution (NIRIS). Percent moisture information will also be captured in the RFI Report.

The analytical data packages provided by Empirical and CFA will be in a contract laboratory program-like format and will be fully validatable and contain raw data, summary forms for all sample and laboratory method blank data, and summary forms containing all method specific quality control (results, recoveries, relative percent differences, relative standard deviations, and/or percent differences, etc.).

Data Generation Procedures

- Project documentation and records include the following:
  - Field sample collection and field measurement records as described in Worksheet Nos. 27 and 29.
  - Laboratory data package deliverables as described in the analytical specifications.
  - Data assessment documents and records as listed in Worksheet No. 29.
- Data recording formats are described in Worksheet No. 27.

Data Handling and Management

After the RFI is completed, the field sampling log sheets will be organized by date and medium and filed in the project files. The field logbooks for this project will be used only for this site and will also be categorized and maintained in the project files after the completion of the field program. Project personnel completing concurrent field sampling activities may maintain multiple field logbooks. When possible, logbooks will be segregated by sampling activity. The field logbooks will be titled based on date and activity. The data handling procedures to be followed by Empirical and CFA will meet the requirements of the technical specifications. The electronic data results will be automatically downloaded into the Tetra Tech database in accordance with the proprietary Tetra Tech processes.

Data Tracking and Control

The Tetra Tech PM (or designee) is responsible for the overall tracking and control of data generated for the project.

- **Data Tracking**. Data are tracked from generation to archiving in the Tetra Tech project-specific files. The Tetra Tech Project Chemist (or designee) is responsible for tracking the samples collected and shipped to Empirical and CFA. Upon receipt of the data packages from Empirical and CFA, the Tetra Tech Project Chemist will oversee the data validation effort, which includes verifying that the data packages are complete and results for all samples have been delivered by Empirical and CFA.

- **Data Storage, Archiving, and Retrieval**. The data packages received from Empirical and CFA are tracked in the data validation logbook. After the data are validated, the data packages are entered into the Tetra Tech Navy CLEAN file system and archived in secure files. The field records including field log books, sample logs, chain-of-custody records, and field calibration logs will be submitted by the Tetra Tech FOL to be entered into the Navy CLEAN file system prior to archiving in secure project files. The project files are audited for accuracy and completeness. At the completion of the Navy contract, the records will be stored by Tetra Tech.

- **Data Security**. Access to Tetra Tech project files is restricted to designated personnel only. Records can only be borrowed temporarily from the project file using a sign-out system. The Tetra Tech Data Manager maintains the electronic data files, and access to the data files is restricted to qualified personnel only. File and data backup procedures are routinely performed.

Assessment and Oversight

Refer to Worksheet No. 32 for assessment findings and corrective actions and to Worksheet No. 33 for QA Management Reports.

Data Review

Data verification is described in Worksheet No. 34, data validation is described in Worksheet Nos. 35 and 36, and usability assessment is described in Worksheet No. 37.

Project Reports – Draft and final versions of project reports will be prepared and submitted to the Navy and IDEM for review. The reports will include the following sections:

- Executive Summary – will include a brief description of the work conducted and the findings.

- Introduction and Background – will include a description of the history of operations and activities at the site and a summary of any previous investigations and removal actions.

- Description of Field Investigations – will include a summary of the work performed in accordance with the approved SAP and any field modifications as documented by the Tetra Tech FOL. This section will include maps showing the sampling locations and tables summarizing the data collected.

- Data Quality – will include a summary of quantitative analytical performance indicators such as completeness, precision, accuracy, bias, and sensitivity and qualitative indicators such as representativeness and comparability. This section includes a reconciliation of project data with the DQOs and an identification of deviations from this SAP.

  A data usability assessment will be used to identify significant deviations in analytical performance that could affect the ability to meet project objectives. The elements of this review are presented in Worksheet No. 37.

- Nature and Extent of Contamination – will include a discussion of the contamination detected in each medium sampled in relation to the CSM of the site. This section will note the removals previously conducted (if applicable), contamination addressed, and any additional contaminants found during

this field effort. Detected contaminant concentrations will be tabulated for each medium and depicted on maps.

- Contaminant Fate and Transport – will include a description of the contaminants detected and their behavior in soil, bedrock, groundwater, surface water, and sediment, particularly with emphasis on the future migration of these contaminants to any possible exposure areas.

- Summary and Conclusions – includes a summary of the findings, conclusions as to whether delineation of contamination is adequate, and recommendations for further investigations, if needed.

Tetra Tech will submit the draft report and respond to comments received on the draft report before any additional sampling begins. The final version of the report will submitted in hardcopy and electronic format to the project stakeholders.

SAP Worksheet No. 15 -- Reference Limits and Evaluation Table

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil
Analytical Group: VOCs

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
1,1,1-Trichloroethane	71-55-6	1.9	29.8	R-DCL	R5 ESL-S	0.63	0.005	0.0025	0.00125
1,1,2,2-Tetrachloroethane	**79-34-5**	**0.00052**	0.127	**RBSSL**	R5 ESL-S	**1.7E-04**	**0.005**	**0.0025**	**0.00125**
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	3,000	NC	RBSSL	None	1,000	0.005	0.0025	0.00125
1,1,2-Trichloroethane	**79-00-5**	**0.0016**	28.6	**RBSSL**	R5 ESL-S	**5.3E-04**	**0.005**	**0.0025**	**0.00125**
1,1-Dichloroethane	75-34-3	0.014	20.1	RBSSL	R5 ESL-S	0.0047	0.005	0.0025	0.00125
1,1-Dichloroethene	75-35-4	0.058	8.28	R-DCL	R5 ESL-S	0.019	0.005	0.0025	0.00125
1,2,3-Trichlorobenzene	87-61-6	1.7	NC	RBSSL	None	0.57	0.005	0.0025	0.00125
1,2,4-Trichlorobenzene	120-82-1	0.14	11.1	RBSSL	R5 ESL-S	0.047	0.005	0.0025	0.00125
1,2-Dibromo-3-chloropropane (DBCP)	**96-12-8**	**0.0000028**	0.0352	**RBSSL**	R5 ESL-S	**9.3E-07**	**0.005**	**0.0025**	**0.00125**
1,2-Dibromoethane (EDB)	**106-93-4**	**0.000036**	1.23	**RBSSL**	R5 ESL-S	**1.2E-05**	**0.005**	**0.0025**	**0.00125**
1,2-Dichlorobenzene	95-50-1	7.2	2.96	RBSSL	R5 ESL-S	0.99	0.005	0.0025	0.00125
1,2-Dichloroethane	**107-06-2**	**0.00084**	21.2	**RBSSL**	R5 ESL-S	**2.8E-04**	**0.005**	**0.0025**	**0.00125**
1,2-Dichloropropane	**78-87-5**	**0.0026**	32.7	**RBSSL**	R5 ESL-S	**8.7E-04**	**0.005**	**0.0025**	**0.00125**
1,3-Dichlorobenzene	541-73-1	2.3	37.7	R-DCL	R5 ESL-S	0.77	0.005	0.0025	0.00125
1,4-Dichlorobenzene	106-46-7	0.0082	0.546	RBSSL	R5 ESL-S	0.0027	0.005	0.0025	0.00125
2-Butanone (MEK)	78-93-3	30	89.6	RBSSL	R5 ESL-S	10	0.010	0.005	0.0025
2-Hexanone	591-78-6	0.22	12.6	RBSSL	R5 ESL-S	0.073	0.010	0.005	0.0025

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
4-Methyl-2-pentanone (MIBK)	108-10-1	9.0	443	RBSSL	R5 ESL-S	3.0	0.010	0.005	0.0025
Acetone	67-64-1	28	2.5	R-DCL	R5 ESL-S	0.83	0.010	0.005	0.0025
Benzene	**71-43-2**	**0.0042**	0.255	**RBSSL**	R5 ESL-S	**0.0014**	**0.005**	**0.0025**	**0.00125**
Bromochloromethane	74-97-5	NC	NC	None	None	NC	0.005	0.0025	0.00125
Bromodichloromethane	**75-27-4**	**0.00064**	0.54	**RBSSL**	R5 ESL-S	**2.1E-04**	**0.005**	**0.0025**	**0.00125**
Bromoform	75-25-2	0.046	15.9	RBSSL	R5 ESL-S	0.015	0.005	0.0025	0.00125
Bromomethane	74-83-9	0.044	0.235	RBSSL	R5 ESL-S	0.015	0.010	0.005	0.0025
Carbon disulfide	75-15-0	6.2	0.0941	RBSSL	R5 ESL-S	0.031	0.005	0.0025	0.00125
Carbon tetrachloride	**56-23-5**	**0.0034**	2.98	**RBSSL**	R5 ESL-S	**0.0011**	**0.005**	**0.0025**	**0.00125**
Chlorobenzene	108-90-7	1.2	13.1	RBSSL	R5 ESL-S	0.40	0.005	0.0025	0.00125
Chloroethane	75-00-3	0.65	0.65	R-DCL	R5 ESL-S	0.22	0.010	0.005	0.0025
Chloroform	**67-66-3**	**0.0011**	1.19	**RBSSL**	R5 ESL-S	**3.7E-04**	**0.005**	**0.0025**	**0.00125**
Chloromethane	74-87-3	0.98	10.4	RBSSL	R5 ESL-S	0.33	0.010	0.005	0.0025
cis-1,2-Dichloroethene	156-59-2	0.4	0.7837	R-DCL	R5 ESL-S	0.13	0.005	0.0025	0.00125
cis-1,3-Dichloropropene	**10061-01-5**	**0.0030**	0.3979	**RBSSL**	R5 ESL-S	**0.0010**	**0.005**	**0.0025**	**0.00125**
Cyclohexane	110-82-7	69	NC	R-DCL	None	23	0.005	0.0025	0.00125
Dibromochloromethane	**124-48-1**	**0.00078**	2.05	**RBSSL**	R5 ESL-S	**2.6E-04**	**0.005**	**0.0025**	**0.00125**
Dichlorodifluoromethane	75-71-8	12.2	39.5	RBSSL	R5 ESL-S	4.1	0.010	0.005	0.0025
Ethylbenzene	100-41-4	0.034	5.16	RBSSL	R5 ESL-S	0.011	0.005	0.0025	0.00125
Isopropylbenzene	98-82-8	11	NC	R-DCL	None	3.7	0.005	0.0025	0.00125
Methyl acetate	79-20-9	150	NC	RBSSL	None	50	0.010	0.005	0.0025
Methylcyclohexane	108-87-2	NC	NC	None	None	NC	0.005	0.0025	0.00125
Methylene chloride	75-09-2	0.023	4.05	R-DCL	R5 ESL-S	0.0077	0.010	0.005	0.0025

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Methyl-tert-butyl ether	1634-04-4	0.056	NC	RBSSL	None	0.019	0.005	0.0025	0.00125
Styrene	100-42-5	3.5	4.69	R-DCL	R5 ESL-S	1.2	0.005	0.0025	0.00125
Tetrachloroethene	**127-18-4**	**0.00098**	9.92	**RBSSL**	**R5 ESL-S**	**3.3E-04**	**0.005**	**0.0025**	**0.00125**
Toluene	108-88-3	12	5.45	R-DCL	R5 ESL-S	1.8	0.005	0.0025	0.00125
trans-1,2-Dichloroethene	156-60-5	0.62	0.784	RBSSL	R5 ESL-S	0.21	0.005	0.0025	0.00125
trans-1,3-Dichloropropene	**10061-02-6**	**0.0030**	0.3979	**RBSSL**	R5 ESL-S	**0.0010**	**0.005**	**0.0025**	**0.00125**
Trichloroethene	79-01-6	0.014	12.4	RBSSL	R5 ESL-S	0.0047	0.005	0.0025	0.00125
Trichlorofluoromethane	75-69-4	17	16.4	RBSSL	R5 ESL-S	5.5	0.010	0.005	0.0025
Vinyl chloride	**75-01-4**	**0.00011**	0.646	**RBSSL**	R5 ESL-S	**3.7E-05**	**0.010**	**0.005**	**0.0025**
Xylenes (total)	1330-20-7	4.0	10	RBSSL	R5 ESL-S	1.3	0.015	0.0075	0.00375

CAS – Chemical Abstracts Service
mg/kg – milligrams per kilogram
PQLG – Project Quantitation Limit Goal
NC – No Criteria

[1] The PSL references for surface and subsurface soil are: RBSSL - USEPA Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, Dilution Attenuation Factor (DAF) = 20 (November, 2010); R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 ESL-S – USEPA Region 5 Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. The Project Team has agreed to accept this data for decision making if results below the LOQ are "J" qualified and the results are discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaded rows indicate the PSL is less than the LOD; therefore, the Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.

Matrix: Soil
Analytical Group: SVOCs (including Low Level PAHs)

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
1,1'-Biphenyl	92-52-4	380	NC	RBSSL	None	130	0.333	0.167	0.083
1,2,4,5-Tetrachlorobenzene	95-94-3	1.0	2.02	RBSSL	R5 ESL-S	0.33	0.333	0.167	0.083
1,4-Dioxane	**123-91-1**	**0.0028**	**2.05**	**RBSSL**	**R5 ESL-S**	**0.00093**	**0.333**	**0.167**	**0.083**
2,2'-Oxybis(1-chloropropane)	**108-60-1**	**0.0024**	19.9	**RBSSL**	R5 ESL-S	**8.0E-04**	**0.333**	**0.167**	**0.083**
2,3,4,6-Tetrachlorophenol	**58-90-2**	130	**0.199**	RBSSL	**R5 ESL-S**	**0.066**	**0.333**	**0.167**	**0.083**
2,4,5-Trichlorophenol	95-95-4	250	14.1	R-DCL	R5 ESL-S	4.7	0.333	0.167	0.083
2,4,6-Trichlorophenol	**88-06-2**	**0.07**	9.94	**R-DCL**	R5 ESL-S	**0.023**	**0.333**	**0.167**	**0.083**
2,4-Dichlorophenol	120-83-2	1.1	87.5	R-DCL	R5 ESL-S	0.37	0.333	0.167	0.083
2,4-Dimethylphenol	**105-67-9**	9	**0.01**	R-DCL	**R5 ESL-S**	**0.0033**	**1.33**	**0.667**	**0.333**
2,4-Dinitrophenol	**51-28-5**	0.29	**0.0609**	R-DCL	**R5 ESL-S**	**0.020**	**0.333**	**0.167**	**0.083**
2,4-Dinitrotoluene	**121-14-2**	**0.0058**	1.28	**RBSSL**	R5 ESL-S	**0.0019**	**0.333**	**0.167**	**0.083**
2,6-Dinitrotoluene	**606-20-2**	1.0	**0.0328**	RBSSL	**R5 ESL-S**	**0.011**	**0.333**	**0.167**	**0.083**
2-Chloronaphthalene	**91-58-7**	42	**0.0122**	R-DCL	**R5 ESL-S**	**0.0041**	**0.333**	**0.167**	**0.083**
2-Chlorophenol	**95-57-8**	0.75	**0.243**	R-DCL	**R5 ESL-S**	**0.081**	**0.333**	**0.167**	**0.083**
2-Methylphenol (o-Cresol)	95-48-7	14	40.4	R-DCL	R5 ESL-S	4.7	0.333	0.167	0.083
2-Nitroaniline	**88-74-4**	**0.67**	74.1	**R-DCL**	R5 ESL-S	**0.22**	**1.33**	**0.667**	**0.333**
2-Nitrophenol	88-75-5	1.6	1.6	RBSSL	R5 ESL-S	0.53	1.33	0.667	0.333
3,3'-Dichlorobenzidine	**91-94-1**	**0.020**	0.646	**RBSSL**	R5 ESL-S	**0.0067**	**0.333**	**0.167**	**0.083**
3-Methylphenol (m-Cresol)	108-39-4	9.8	3.49	R-DCL	R5 ESL-S	1.2	0.333	0.167	0.083
3-Nitroaniline	99-09-2	NC	3.16	None	R5 ESL-S	1.05	1.33	0.667	0.333
4,6-Dinitro-2-methylphenol	**534-52-1**	**0.10**	0.144	**RBSSL**	R5 ESL-S	**0.033**	**3.3**	**1.67**	**0.83**

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
4-Bromophenyl phenyl ether	101-55-3	NC	NC	None	None	NC	0.333	0.167	0.083
4-Chloro-3-methyl phenol	59-50-7	86	7.95	RBSSL	R5 ESL-S	2.6	0.333	0.167	0.083
4-Chloroanaline	**106-47-8**	**0.0028**	1.1	**RBSSL**	R5 ESL-S	**9.3E-04**	**0.333**	**0.167**	**0.083**
4-Chlorophenyl phenyl ether	7005-72-3	NC	NC	None	None	NC	0.333	0.167	0.083
4-Methylphenol (p-Cresol)	106-44-5	1.1	163	R-DCL	R5 ESL-S	0.37	0.333	0.167	0.083
4-Nitroaniline	**100-01-6**	**0.028**	21.9	**RBSSL**	R5 ESL-S	**0.0093**	**1.33**	**0.667**	**0.333**
4-Nitrophenol	100-02-7	NC	5.12	None	R5 ESL-S	1.7	1.33	0.667	0.333
Acetophenone	98-86-2	22	300	RBSSL	R5 ESL-S	7.3	0.333	0.167	0.083
Atrazine	**1912-24-9**	**0.0038**	NC	**RBSSL**	None	**0.0013**	**0.333**	**0.167**	**0.083**
Benzaldehyde	100-52-7	16.2	NC	RBSSL	None	5.4	0.333	0.167	0.083
Bis(2-chloroethoxy)methane	**111-91-1**	0.50	**0.302**	RBSSL	**R5 ESL-S**	**0.10**	**0.333**	**0.167**	**0.083**
Bis(2-chloroethyl)ether	**111-44-4**	**0.000062**	23.7	**RBSSL**	R5 ESL-S	**2.1E-05**	**0.333**	**0.167**	**0.083**
Bis(2-ethylhexyl)phthalate	117-81-7	22	0.925	RBSSL	R5 ESL-S	0.31	0.333	0.167	0.083
Butyl benzyl phthalate	**85-68-7**	10	**0.239**	RBSSL	**R5 ESL-S**	**0.080**	**0.333**	**0.167**	**0.083**
Caprolactam	105-60-2	90	NC	RBSSL	None	30	0.333	0.167	0.083
Carbazole	86-74-8	5.9	NC	R-DCL	None	2.0	0.333	0.167	0.083
Dibenzofuran	132-64-9	4.9	NC	R-DCL	None	1.6	0.333	0.167	0.083
Diethyl phthalate	84-66-2	240	24.8	RBSSL	R5 ESL-S	8.3	0.333	0.167	0.083
Dimethyl phthalate	131-11-3	240	734	RBSSL	R5 ESL-S	80	0.333	0.167	0.083
Di-n-butyl phthalate	**84-74-2**	184	**0.15**	RBSSL	**R5 ESL-S**	**0.050**	**0.333**	**0.167**	**0.083**
Di-n-octyl phthalate	117-84-0	2,000	709	R-DCL	R5 ESL-S	240	0.333	0.167	0.083
Hexachlorobenzene	**118-74-1**	**0.011**	0.199	**RBSSL**	R5 ESL-S	**0.0037**	**0.333**	**0.167**	**0.083**
Hexachlorobutadiene	**87-68-3**	**0.034**	0.0398	**RBSSL**	R5 ESL-S	**0.011**	**0.333**	**0.167**	**0.083**

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Hexachlorocyclopentadiene	77-47-4	14	0.755	RBSSL	R5 ESL-S	0.25	0.333	0.167	0.083
Hexachloroethane	**67-72-1**	**0.058**	**0.596**	**RBSSL**	**R5 ESL-S**	**0.019**	**0.333**	**0.167**	**0.083**
Isophorone	78-59-1	0.46	139	RBSSL	R5 ESL-S	0.15	0.333	0.167	0.083
Nitrobenzene	**98-95-3**	**0.0016**	**1.31**	**RBSSL**	**R5 ESL-S**	**5.3E-04**	**0.333**	**0.167**	**0.083**
N-Nitrosodi-n-propylamine	**621-64-7**	**0.00014**	**0.544**	**RBSSL**	**R5 ESL-S**	**4.7E-05**	**0.333**	**0.167**	**0.083**
N-Nitrosodiphenylamine	86-30-6	1.5	0.545	RBSSL	R5 ESL-S	0.18	0.333	0.167	0.083
Pentachlorophenol	**87-86-5**	**0.028**	**2.1**	**R-DCL**	**Eco-SSL**	**0.0093**	**1.33**	**0.667**	**0.333**
Phenol	108-95-2	56	120	R-DCL	R5 ESL-S	19	0.333	0.167	0.083
PAHs[2]									
2-Methylnaphthalene	91-57-6	3.1	29	R-DCL	Eco-SSL	1.0	0.010	0.005	0.0025
Acenaphthene	83-32-9	130	29	R-DCL	Eco-SSL	9.7	0.010	0.005	0.0025
Acenaphthylene	208-96-8	18	29	R-DCL	Eco-SSL	6.0	0.010	0.005	0.0025
Anthracene	120-12-7	1,700	29	R-RSL	Eco-SSL	9.7	0.010	0.005	0.0025
Benzo(a)anthracene	56-55-3	0.15	1.1	R-RSL	Eco-SSL	0.050	0.010	0.005	0.0025
Benzo(a)pyrene	50-32-8	0.015	1.1	R-RSL	Eco-SSL	0.0050	0.010	0.005	0.0025
Benzo(b)fluoranthene	205-99-2	0.15	1.1	R-RSL	Eco-SSL	0.050	0.010	0.005	0.0025
Benzo(g,h,i)perylene	191-24-2	170	1.1	R-RSL	Eco-SSL	0.37	0.010	0.005	0.0025
Benzo(k)fluoranthene	207-08-9	1.5	1.1	R-RSL	Eco-SSL	0.37	0.010	0.005	0.0025
Chrysene	218-01-9	15	1.1	R-RSL	Eco-SSL	0.37	0.010	0.005	0.0025
Dibenzo(a,h)anthracene	53-70-3	0.015	1.1	R-RSL	Eco-SSL	0.0050	0.010	0.005	0.0025
Fluoranthene	206-44-0	230	29	R-RSL	Eco-SSL	9.7	0.010	0.005	0.0025
Fluorene	86-73-7	170	29	R-DCL	Eco-SSL	9.7	0.010	0.005	0.0025
Indeno(1,2,3-c,d)pyrene	193-39-5	0.15	1.1	R-RSL	Eco-SSL	0.050	0.010	0.005	0.0025

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Naphthalene	**91-20-3**	**0.0094**	29	**RBSSL**	Eco-SSL	**0.0031**	**0.010**	**0.005**	**0.0025**
Phenanthrene	85-01-8	13	29	R-DCL	Eco-SSL	4.3	0.010	0.005	0.0025
Pyrene	129-00-0	170	1.1	R-RSL	Eco-SSL	0.37	0.010	0.005	0.0025

Notes:

[1] The PSL references for surface and subsurface soil are: RBSSL - USEPA Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, DAF = 20 (November, 2010); R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 ESL-S – USEPA Region 5 Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

[2] The low level PAHs will be analyzed by SW-846 Method 8270C Full Scan to obtain lower detection limits.

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Matrix: Soil
Analytical Group: Pesticides

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
alpha-BHC	319-84-6	0.0012	0.0994	RBSSL	R5 ESL-S	4.0E-04	0.0007	0.00035	0.00017
beta-BHC	319-85-7	0.044	0.00398	RBSSL	R5 ESL-S	0.0013	0.0007	0.00035	0.00017
delta-BHC	319-86-8	0.0012	9.94	RBSSL	R5 ESL-S	4.0E-04	0.0007	0.00035	0.00017
gamma-BHC (Lindane)	58-89-9	0.072	0.005	RBSSL	R5 ESL-S	0.0017	0.0007	0.00035	0.00017
Heptachlor	76-44-8	0.024	0.00598	RBSSL	R5 ESL-S	0.0020	0.0007	0.00035	0.00017
Aldrin	309-00-2	0.013	0.00332	RBSSL	R5 ESL-S	0.0011	0.0007	0.00035	0.00017
Heptachlor epoxide	1024-57-3	0.003	0.152	RBSSL	R5 ESL-S	0.0010	0.0007	0.00035	0.00017
Endosulfan I	959-98-8	37	0.119	R-RSL	R5 ESL-S	0.040	0.0007	0.00035	0.00017
Dieldrin	60-57-1	0.0034	0.0049	RBSSL	Eco-SSL	0.0011	0.0007	0.00035	0.00017
4,4'-DDE	72-55-9	0.94	0.021	RBSSL	Eco-SSL	0.0070	0.0007	0.00035	0.00017
Endrin	72-20-8	8.8	0.0101	RBSSL	R5 ESL-S	0.0034	0.0007	0.00035	0.00017
Endosulfan II	33213-65-9	37	0.119	R-RSL	R5 ESL-S	0.040	0.0007	0.00035	0.00017
4,4'-DDD	72-54-8	1.3	0.021	RBSSL	Eco-SSL	0.0070	0.0007	0.00035	0.00017
Endosulfan sulfate	1031-07-8	37	0.0358	R-RSL	R5 ESL-S	0.012	0.0007	0.00035	0.00017
4,4'-DDT	50-29-3	1.3	0.021	RBSSL	Eco-SSL	0.0070	0.0007	0.00035	0.00017
Methoxychlor	72-43-5	198	0.0199	RBSSL	R5 ESL-S	0.0066	0.0007	0.00035	0.00017
Endrin ketone	53494-70-5	1.8	0.0105	R-RSL	R5 ESL-S	0.0035	0.0007	0.00035	0.00017
Endrin aldehyde	7421-93-4	1.8	0.0105	R-RSL	R5 ESL-S	0.0035	0.0007	0.00035	0.00017
alpha-Chlordane	5103-71-9	0.26	0.224	RBSSL	R5 ESL-S	0.075	0.0007	0.00035	0.00017
gamma-Chlordane	5103-74-2	0.26	0.224	RBSSL	R5 ESL-S	0.075	0.0007	0.00035	0.00017
Toxaphene	8001-35-2	0.19	0.119	RBSSL	R5 ESL-S	0.040	0.033	0.022	0.011

Notes:

[1] The PSL references for surface and subsurface soil are: RBSSL - USEPA Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, DAF = 20 (November, 2010); R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 ESL-S – USEPA Region 5 Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

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Matrix: Soil
Analytical Group: PCBs

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Aroclor-1016	**12674-11-2**	0.39	**0.000332**	R-RSL	**R5 ESL-S**	**1.1E-04**	**0.017**	**0.008**	**0.004**
Aroclor-1221	**11104-28-2**	0.0024	**0.000332**	RBSSL	**R5 ESL-S**	**1.1E-04**	**0.017**	**0.008**	**0.004**
Aroclor-1232	**11141-16-5**	0.0024	**0.000332**	RBSSL	**R5 ESL-S**	**1.1E-04**	**0.017**	**0.008**	**0.004**
Aroclor-1242	**53469-21-9**	0.11	**0.000332**	RBSSL	**R5 ESL-S**	**1.1E-04**	**0.017**	**0.008**	**0.004**
Aroclor-1248	**12672-29-6**	0.10	**0.000332**	RBSSL	**R5 ESL-S**	**1.1E-04**	**0.017**	**0.008**	**0.004**
Aroclor-1254	**11097-69-1**	0.11	**0.000332**	R-RSL	**R5 ESL-S**	**1.1E-04**	**0.017**	**0.008**	**0.004**
Aroclor-1260	**11096-82-5**	0.22	**0.000332**	R-RSL	**R5 ESL-S**	**1.1E-04**	**0.017**	**0.008**	**0.004**
Total PCBs	1336-36-3	1.8	NC	R-DCL	None	0.60	-	-	-

Notes:

[1] The PSL references for surface and subsurface soil are: RBSSL - USEPA Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, DAF = 20 (November, 2010); R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 ESL-S – USEPA Region 5 Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

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Matrix: Soil
Analytical Group: Metals and Cyanide

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Aluminum	7429-90-5	7,700	NC	R-RSL	None	2,600	10	5.0	2.5
Antimony	**7440-36-0**	3.1	**0.27**	R-RSL	**Eco-SSL**	**0.090**	**0.75**	**0.40**	**0.25**
Arsenic	**7440-38-2**	**0.026**	18	**RBSSL**	Eco-SSL	**0.0087**	**0.30**	**0.30**	**0.15**
Barium	7440-39-3	1,500	330	R-RSL	Eco-SSL	110	2.0	0.50	0.25
Beryllium	7440-41-7	16	21	R-RSL	Eco-SSL	5.3	0.25	0.10	0.05
Cadmium	7440-43-9	7.0	0.36	R-RSL	Eco-SSL	0.12	0.25	0.10	0.05
Calcium	7440-70-2	NC	NC	None	None	NC	250	100	50
Chromium	**7440-47-3**	**0.017**	26	**RBSSL**	Eco-SSL	**0.0057**	**0.25**	**0.20**	**0.10**
Cobalt	7440-48-4	2.3	13	R-RSL	Eco-SSL	0.77	0.63	0.50	0.25
Copper	7440-50-8	310	28	R-RSL	Eco-SSL	9.3	0.5	0.4	0.25
Iron	7439-89-6	5,500	NC	R-RSL	None	1800	5.0	3.0	1.5
Lead	7439-92-1	81	11	R-DCL	Eco-SSL	3.7	0.15	0.15	0.075
Magnesium	7439-95-4	NC	NC	None	None	NC	250	150	50
Manganese	7439-96-5	180	220	R-RSL	Eco-SSL	60	0.75	0.30	0.15
Mercury	7439-97-6	2.3	0.10	R-RSL	R5 ESL-S	0.033	0.03	0.026	0.013
Nickel	7440-02-0	150	38	R-RSL	Eco-SSL	13	0.5	0.3	0.25
Potassium	7440-09-7	NC	NC	None	None	NC	250	150	50
Selenium	7782-49-2	5.2	0.52	R-DCL	Eco-SSL	0.17	0.30	0.25	0.15
Silver	7440-22-4	31	4.2	R-DCL	Eco-SSL	1.4	0.25	0.10	0.05
Sodium	7440-23-5	NC	NC	None	None	NC	250	150	50
Thallium	**7440-28-0**	2.8	**0.0569**	R-DCL	**R5 ESL-S**	**0.019**	**0.40**	**0.20**	**0.15**

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Vanadium	7440-62-2	39	7.8	R-RSL	Eco-SSL	2.6	0.63	0.50	0.25
Zinc	7440-66-6	2,300	46	R-RSL	Eco-SSL	15	1.0	0.5	0.25
Cyanide	57-12-5	0.94	1.3	R-DCL	R5 ESL-S	0.31	0.5	0.25	0.125

Notes:

[1] The PSL references for surface and subsurface soil are: RBSSL - USEPA Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, DAF = 20 (November, 2010); R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 ESL-S – USEPA Region 5 Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. The Project Team has agreed to accept this data for decision making if results below the LOQ are "J" qualified and the results are discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaded rows indicate the PSL is less than the LOD; therefore, the Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.

Matrix: Soil
Analytical Group: Dioxins/Furans

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	CFA		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
1,2,3,4,6,7,8,9-OCDD	3268-87-9	1.5E-02	1.99E-07	R-RSL	R5 ESL-S	6.6E-08	1.0E-05	6.67E-06	2.86E-07
1,2,3,4,6,7,8,9-OCDF	39001-02-0	1.5E-02	3.86E-05	R-RSL	R5 ESL-S	1.3E-05	1.0E-05	6.67E-06	3.14E-07
1,2,3,4,6,7,8-HpCDD	35822-46-9	4.5E-04	1.99E-07	R-RSL	R5 ESL-S	6.6E-08	5.0E-06	3.33E-06	1.18E-07
1,2,3,4,6,7,8-HpCDF	67562-39-4	4.5E-04	3.86E-05	R-RSL	R5 ESL-S	1.3E-05	5.0E-06	3.33E-06	1.45E-07
1,2,3,4,7,8,9-HpCDF	55673-89-7	4.5E-04	3.86E-05	R-RSL	R5 ESL-S	1.3E-05	5.0E-06	3.33E-06	2.05E-07
1,2,3,4,7,8-HxCDD	39227-28-6	4.5E-05	1.99E-07	R-RSL	R5 ESL-S	6.6E-08	5.0E-06	3.33E-06	1.93E-07
1,2,3,4,7,8-HxCDF	70648-26-9	4.5E-05	3.86E-05	R-RSL	R5 ESL-S	1.3E-05	5.0E-06	3.33E-06	2.02E-07
1,2,3,6,7,8-HxCDD	57653-85-7	4.5E-05	1.99E-07	R-RSL	R5 ESL-S	6.6E-08	5.0E-06	3.33E-06	1.75E-07
1,2,3,6,7,8-HxCDF	57117-44-9	4.5E-05	3.86E-05	R-RSL	R5 ESL-S	1.3E-05	5.0E-06	3.33E-06	2.02E-07
1,2,3,7,8,9-HxCDD	19408-74-3	4.5E-05	1.99E-07	R-RSL	R5 ESL-S	6.6E-08	5.0E-06	3.33E-06	1.41E-07
1,2,3,7,8,9-HxCDF	72918-21-9	4.5E-05	3.86E-05	R-RSL	R5 ESL-S	1.3E-05	5.0E-06	3.33E-06	1.10E-07
1,2,3,7,8-PeCDD	40321-76-4	4.5E-06	1.99E-07	R-RSL	R5 ESL-S	6.6E-08	5.0E-06	3.33E-06	1.03E-07
1,2,3,7,8-PeCDF	57117-41-6	1.5E-04	3.86E-05	R-RSL	R5 ESL-S	1.3E-05	5.0E-06	3.33E-06	2.00E-07
2,3,4,6,7,8-HxCDF	60851-34-5	4.5E-05	3.86E-05	R-RSL	R5 ESL-S	1.3E-05	5.0E-06	3.33E-06	1.23E-07
2,3,4,7,8-PeCDF	57117-31-4	1.5E-05	3.86E-05	R-RSL	R5 ESL-S	5.0E-06	5.0E-06	3.33E-06	2.61E-07
2,3,7,8-TCDD	1746-01-6	4.5E-06	1.99E-07	R-RSL	R5 ESL-S	6.6E-08	1.0E-06	6.67E-07	5.2E-08
2,3,7,8-TCDF	51207-31-9	4.5E-05	3.86E-05	R-RSL	R5 ESL-S	1.3E-05	1.0E-06	6.67E-07	1.04E-07
Total HpCDD	37871-00-4	NC	NC	None	None	NC	NA	NA	NA
Total HpCDF	38998-75-3	NC	NC	None	None	NC	NA	NA	NA
Total HxCDD	34465-46-8	NC	NC	None	None	NC	NA	NA	NA
Total HxCDF	55684-94-1	NC	NC	None	None	NC	NA	NA	NA

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	CFA		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Total PeCDD	36088-22-9	NC	NC	None	None	NC	NA	NA	NA
Total PeCDF	30402-15-4	NC	NC	None	None	NC	NA	NA	NA
Total TCDD	41903-57-5	NC	NC	None	None	NC	NA	NA	NA
Total TCDF	55722-27-5	NC	NC	None	None	NC	NA	NA	NA

Notes:

[1] The PSL references for surface and subsurface soil are: RBSSL - USEPA Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, DAF = 20 (November, 2010); R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens and derived by multiplying criteria for 2,3,7,8-TCDD by World Health Organization Toxicity Equivalent Factor (May, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 ESL-S – USEPA Region 5 Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. The Project Team has agreed to accept this data for decision making if results below the LOQ are "J" qualified and the results are discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaded rows indicate the PSL is less than the LOD; therefore, the Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.

Matrix: Sediment
Analytical Group: SVOCs (including Low Level PAHs)

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
1,1'-Biphenyl	92-52-4	390	NC	R-RSL	None	130	0.333	0.167	0.083
1,2,4,5-Tetrachlorobenzene	95-94-3	1.8	1.252	R-RSL	R5 SED	0.42	0.333	0.167	0.083
1,4-Dioxane	123-91-1	4.9	2.05	R-RSL	R5 ESL-S	0.68	0.333	0.167	0.083
2,2'-Oxybis(1-chloropropane)	**108-60-1**	**0.027**	19.9	**R-DCL**	R5 ESL-S	**0.0090**	**0.333**	**0.167**	**0.083**
2,3,4,6-Tetrachlorophenol	58-90-2	180	0.129	R-RSL	R5 SED	0.043	0.333	0.167	0.083
2,4,5-Trichlorophenol	95-95-4	250	14.1	R-DCL	R5 ESL-S	4.7	0.333	0.167	0.083
2,4,6-Trichlorophenol	**88-06-2**	**0.07**	0.208	**R-DCL**	R5 SED	**0.023**	**0.333**	**0.167**	**0.083**
2,4-Dichlorophenol	**120-83-2**	1.1	**0.0817**	R-DCL	**R5 SED**	**0.027**	**0.333**	**0.167**	**0.083**
2,4-Dimethylphenol	**105-67-9**	9.0	**0.304**	R-DCL	**R5 SED**	**0.10**	**1.33**	**0.667**	**0.333**
2,4-Dinitrophenol	**51-28-5**	0.29	**0.00621**	R-DCL	**R5 SED**	**0.0021**	**0.333**	**0.167**	**0.083**
2,4-Dinitrotoluene	**121-14-2**	1.6	**0.0144**	R-RSL	**R5 SED**	**0.0048**	**0.333**	**0.167**	**0.083**
2,6-Dinitrotoluene	**606-20-2**	6.1	**0.0398**	R-RSL	**R5 SED**	**0.013**	**0.333**	**0.167**	**0.083**
2-Chloronaphthalene	91-58-7	42	0.417	R-DCL	R5 SED	0.14	0.333	0.167	0.083
2-Chlorophenol	**95-57-8**	0.75	**0.0319**	R-DCL	**R5 SED**	**0.011**	**0.333**	**0.167**	**0.083**
2-Methylphenol (o-Cresol)	**95-48-7**	14	**0.0554**	R-DCL	**R5 SED**	**0.018**	**0.333**	**0.167**	**0.083**
2-Nitroaniline	**88-74-4**	**0.67**	74.1	**R-DCL**	R5 ESL	**0.22**	**1.33**	**0.667**	**0.333**
2-Nitrophenol	88-75-5	12	1.6	R-RSL	R5 ESL	0.53	1.33	0.667	0.333
3,3'-Dichlorobenzidine	**91-94-1**	**0.062**	0.127	**R-DCL**	R5 SED	**0.021**	**0.333**	**0.167**	**0.083**
3-Methylphenol (m-Cresol)	108-39-4	9.8	0.0524	R-DCL	R5 SED	0.017	0.333	0.167	0.083
3-Nitroaniline	99-09-2	NC	3.16	None	R5 ESL-S	1.0	1.33	0.667	0.333
4,6-Dinitro-2-methylphenol	**534-52-1**	0.49	**0.104**	R-RSL	**R5 SED**	**0.035**	**3.3**	**1.67**	**0.83**

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
4-Bromophenyl phenyl ether	101-55-3	NC	1.55	None	R5 SED	0.52	0.333	0.167	0.083
4-Chloro-3-methyl phenol	59-50-7	610	0.388	R-RSL	R5 SED	0.13	0.333	0.167	0.083
4-Chloroanaline	**106-47-8**	0.97	**0.146**	R-DCL	**R5 SED**	**0.049**	**0.333**	**0.167**	**0.083**
4-Chlorophenyl phenyl ether	7005-72-3	NC	NC	None	None	NC	0.333	0.167	0.083
4-Methylphenol (p-Cresol)	**106-44-5**	1.1	**0.0202**	R-DCL	**R5 SED**	**0.0067**	**0.333**	**0.167**	**0.083**
4-Nitroaniline	100-01-6	24	21.9	R-RSL	R5 ESL-S	7.3	1.33	0.667	0.333
4-Nitrophenol	**100-02-7**	NC	**0.0133**	None	**R5 SED**	**0.0044**	**1.33**	**0.667**	**0.333**
Acetophenone	98-86-2	780	300	R-RSL	R5 ESL-S	100	0.333	0.167	0.083
Atrazine	**1912-24-9**	**0.048**	NC	**R-DCL**	None	**0.016**	**0.333**	**0.167**	**0.083**
Benzaldehyde	100-52-7	780	NC	R-RSL	None	260	0.333	0.167	0.083
Bis(2-chloroethoxy)methane	**111-91-1**	18	**0.302**	R-RSL	**R5 ESL-S**	**0.10**	**0.333**	**0.167**	**0.083**
Bis(2-chloroethyl)ether	**111-44-4**	**0.0007**	3.52	**R-DCL**	R5 SED	**2.3E-04**	**0.333**	**0.167**	**0.083**
Bis(2-ethylhexyl)phthalate	**117-81-7**	35	**0.182**	R-RSL	**R5 SED**	**0.061**	**0.333**	**0.167**	**0.083**
Butyl benzyl phthalate	85-68-7	260	1.97	R-RSL	R5 SED	0.66	0.333	0.167	0.083
Caprolactam	105-60-2	3,100	NC	R-RSL	None	1000	0.333	0.167	0.083
Carbazole	86-74-8	5.9	NC	R-DCL	None	2.0	0.333	0.167	0.083
Dibenzofuran	132-64-9	4.9	0.449	R-DCL	R5 SED	0.15	0.333	0.167	0.083
Diethyl phthalate	**84-66-2**	450	**0.295**	R-DCL	**R5 SED**	**0.098**	**0.333**	**0.167**	**0.083**
Dimethyl phthalate	131-11-3	1,100	734	R-DCL	R5 ESL-S	240	0.333	0.167	0.083
Di-n-butyl phthalate	84-74-2	610	1.114	R-RSL	R5 SED	0.37	0.333	0.167	0.083
Di-n-octyl phthalate	117-84-0	2,000	40.6	R-DCL	R5 SED	14	0.333	0.167	0.083
Hexachlorobenzene	**118-74-1**	0.30	**0.02**	R-RSL	**R5 SED**	**0.0067**	**0.333**	**0.167**	**0.083**
Hexachlorobutadiene	**87-68-3**	6.1	**0.0265**	R-RSL	**R5 SED**	**0.0088**	**0.333**	**0.167**	**0.083**

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Hexachlorocyclopentadiene	77-47-4	37	0.901	R-RSL	R5 SED	0.30	0.333	0.167	0.083
Hexachloroethane	67-72-1	2.8	0.584	R-DCL	R5 SED	0.19	0.333	0.167	0.083
Isophorone	78-59-1	5.3	0.432	RBSSL	R5 SED	0.14	0.333	0.167	0.083
Nitrobenzene	**98-95-3**	**0.028**	0.145	**R-DCL**	R5 SED	**0.0093**	**0.333**	**0.167**	**0.083**
N-Nitrosodi-n-propylamine	**621-64-7**	**0.0006**	0.544	**R-DCL**	R5 ESL-S	**2.0E-04**	**0.333**	**0.167**	**0.083**
N-Nitrosodiphenylamine	86-30-6	9.7	0.545	R-DCL	R5 ESL-S	0.18	0.333	0.167	0.083
Pentachlorophenol	**87-86-5**	**0.028**	23	**R-DCL**	R5 SED	**0.0093**	**1.33**	**0.667**	**0.333**
Phenol	108-95-2	56	120	R-DCL	R5 ESL-S	19	0.333	0.167	0.083
PAHs[2]									
2-Methylnaphthalene	91-57-6	3.1	0.0202	R-DCL	R5 SED	0.0067	0.010	0.005	0.0025
Acenaphthene	**83-32-9**	130	**0.00671**	R-DCL	**R5 SED**	**0.0022**	**0.010**	**0.005**	**0.0025**
Acenaphthylene	**208-96-8**	18	**0.00587**	R-DCL	**R5 SED**	**0.0020**	**0.010**	**0.005**	**0.0025**
Anthracene	120-12-7	1,700	0.0572	R-RSL	R5 SED	0.019	0.010	0.005	0.0025
Benzo(a)anthracene	56-55-3	0.15	0.108	R-RSL	R5 SED	0.036	0.010	0.005	0.0025
Benzo(a)pyrene	50-32-8	0.015	0.15	R-RSL	R5 SED	0.0050	0.010	0.005	0.0025
Benzo(b)fluoranthene	205-99-2	0.15	10.4	R-RSL	R5 SED	0.050	0.010	0.005	0.0025
Benzo(g,h,i)perylene	191-24-2	170	0.17	R-RSL	R5 SED	0.057	0.010	0.005	0.0025
Benzo(k)fluoranthene	207-08-9	1.5	0.24	R-RSL	R5 SED	0.080	0.010	0.005	0.0025
Chrysene	218-01-9	15	0.166	R-RSL	R5 SED	0.055	0.010	0.005	0.0025
Dibenzo(a,h)anthracene	53-70-3	0.015	0.033	R-RSL	R5 SED	0.0050	0.010	0.005	0.0025
Fluoranthene	206-44-0	230	0.423	R-RSL	R5 SED	0.14	0.010	0.005	0.0025
Fluorene	86-73-7	170	0.0774	R-DCL	R5 SED	0.026	0.010	0.005	0.0025
Indeno(1,2,3-c,d)pyrene	193-39-5	0.15	0.2	R-RSL	R5 SED	0.050	0.010	0.005	0.0025

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Naphthalene	91-20-3	0.7	0.176	R-RSL	R5 SED	0.059	0.010	0.005	0.0025
Phenanthrene	85-01-8	13	0.204	R-DCL	R5 SED	0.068	0.010	0.005	0.0025
Pyrene	129-00-0	170	0.195	R-RSL	R5 SED	0.065	0.010	0.005	0.0025

Notes:

[1] The PSL references for sediment are: R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); R5 SED – USEPA Region 5 Ecological Screening Level, Sediment (August, 2003); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 SED – USEPA Region 5 Ecological Screening Level, Sediment (August, 2003); R5 ESL-S – USEPA Region 5 Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

[2] The low level PAHs will be analyzed by SW-846 Method 8270C Full Scan to obtain lower detection limits.

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. The Project Team has agreed to accept this data for decision making if results below the LOQ are "J" qualified and the results are discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaded rows indicate the PSL is less than the LOD; therefore, the Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.

Matrix: Sediment
Analytical Group: Pesticides

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
alpha-BHC	319-84-6	0.0072	0.006	R-DCL	R5 SED	0.0020	0.0007	0.00035	0.00017
beta-BHC	319-85-7	0.026	0.005	R-DCL	R5 SED	0.0017	0.0007	0.00035	0.00017
delta-BHC	319-86-8	0.0072	71.5	R-DCL	R5 SED	0.0024	0.0007	0.00035	0.00017
gamma-BHC (Lindane)	58-89-9	0.0094	0.00237	R-DCL	R5 SED	7.9E-04	0.0007	0.00035	0.00017
Heptachlor	**76-44-8**	0.11	**0.0006**	R-RSL	**R5 SED**	**2.0E-04**	**0.0007**	**0.00035**	**0.00017**
Aldrin	309-00-2	0.029	0.002	R-RSL	R5 SED	6.7E-04	0.0007	0.00035	0.00017
Heptachlor epoxide	1024-57-3	0.053	0.00247	R-RSL	R5 SED	8.2E-04	0.0007	0.00035	0.00017
Endosulfan I	959-98-8	20	0.00326	R-DCL	R5 SED	0.0011	0.0007	0.00035	0.00017
Dieldrin	60-57-1	0.0072	0.0019	R-DCL	R5 SED	6.3E-04	0.0007	0.00035	0.00017
4,4'-DDE	72-55-9	1.4	0.00316	R-RSL	R5 SED	0.0010	0.0007	0.00035	0.00017
Endrin	72-20-8	0.99	0.00222	R-DCL	R5 SED	7.4E-04	0.0007	0.00035	0.00017
Endosulfan II	33213-65-9	20	0.00194	R-DCL	R5 SED	6.5E-04	0.0007	0.00035	0.00017
4,4'-DDD	72-54-8	2.0	0.00488	R-RSL	R5 SED	0.0016	0.0007	0.00035	0.00017
Endosulfan sulfate	1031-07-8	20	0.0346	R-DCL	R5 SED	0.012	0.0007	0.00035	0.00017
4,4'-DDT	50-29-3	1.7	0.00416	R-RSL	R5 SED	0.0014	0.0007	0.00035	0.00017
Methoxychlor	72-43-5	31	0.0136	R-RSL	R5 SED	0.0045	0.0007	0.00035	0.00017
Endrin ketone	53494-70-5	0.99	0.48	R-DCL	R5 SED	0.16	0.0007	0.00035	0.00017
Endrin aldehyde	7421-93-4	0.99	0.48	R-DCL	R5 SED	0.16	0.0007	0.00035	0.00017
alpha-Chlordane	5103-71-9	1.6	0.0045	R-RSL	R5 SED	0.0015	0.0007	0.00035	0.00017
gamma-Chlordane	5103-74-2	1.6	0.0045	R-RSL	R5 SED	0.0015	0.0007	0.00035	0.00017
Toxaphene	**8001-35-2**	0.44	**7.70E-06**	R-RSL	**R5 SED**	**2.6E-06**	**0.033**	**0.022**	**0.011**

Notes:

[1] The PSL references for sediment are: R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); R5 SED – USEPA Region 5 Ecological Screening Level, Sediment (August, 2003); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 SED – USEPA Region 5 Ecological Screening Level, Sediment (August, 2003); R5 ESL-S – USEPA Region 5 Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

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Matrix: Sediment
Analytical Group: PCBs

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Aroclor-1016	12674-11-2	0.39	0.0598	R-RSL	R5 SED	0.020	0.017	0.008	0.004
Aroclor-1221	11104-28-2	0.14	0.0598	R-RSL	R5 SED	0.020	0.017	0.008	0.004
Aroclor-1232	11141-16-5	0.14	0.0598	R-RSL	R5 SED	0.020	0.017	0.008	0.004
Aroclor-1242	53469-21-9	0.22	0.0598	R-RSL	R5 SED	0.020	0.017	0.008	0.004
Aroclor-1248	12672-29-6	0.22	0.0598	R-RSL	R5 SED	0.020	0.017	0.008	0.004
Aroclor-1254	11097-69-1	0.11	0.0598	R-RSL	R5 SED	0.020	0.017	0.008	0.004
Aroclor-1260	11096-82-5	0.22	0.0598	R-RSL	R5 SED	0.020	0.017	0.008	0.004
Total PCBs	1336-36-3	NC	NC	None	None	NC	-	-	-

Notes:

[1] The PSL references for sediment are: R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); R5 SED – USEPA Region 5 Ecological Screening Level, Sediment (August, 2003); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 SED – USEPA Region 5 Ecological Screening Level, Sediment (August, 2003); R5 ESL-S – USEPA Region 5 Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

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Matrix: Sediment
Analytical Group: Metals and Cyanide

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Aluminum	7429-90-5	7,700	NC	R-RSL	None	2,600	10	5.0	2.5
Antimony	**7440-36-0**	3.1	**0.27**	R-RSL	**Eco-SSL**	**0.090**	**0.75**	**0.40**	**0.25**
Arsenic	7440-38-2	0.39	9.79	R-RSL	R5 SED	0.13	0.30	0.30	0.15
Barium	7440-39-3	1,500	330	R-RSL	Eco-SSL	110	2.0	0.50	0.25
Beryllium	7440-41-7	16	21	R-RSL	Eco-SSL	5.3	0.25	0.10	0.05
Cadmium	7440-43-9	7.0	0.99	R-RSL	R5 SED	0.33	0.25	0.10	0.05
Calcium	7440-70-2	NC	NC	None	None	NC	250	100	50
Chromium	7440-47-3	0.29	43.4	R-RSL	R5 SED	0.097	0.25	0.20	0.10
Cobalt	7440-48-4	2.3	50	R-RSL	R5 SED	0.77	0.63	0.50	0.25
Copper	7440-50-8	310	31.6	R-RSL	R5 SED	10	0.5	0.4	0.25
Iron	7439-89-6	5,500	35.8	R-RSL	R5 SED	12	5.0	3.0	1.5
Lead	7439-92-1	81	11	R-DCL	Eco-SSL	3.7	0.15	0.15	0.075
Magnesium	7439-95-4	NC	NC	None	None	NC	250	150	50
Manganese	7439-96-5	180	220	R-RSL	Eco-SSL	60	0.75	0.30	0.15
Mercury	7439-97-6	2.3	0.10	R-RSL	R5 ESL-S	0.033	0.03	0.026	0.013
Nickel	7440-02-0	150	22.7	R-RSL	R5 SED	7.6	0.5	0.3	0.25
Potassium	7440-09-7	NC	NC	None	None	NC	250	150	50
Selenium	7782-49-2	5.2	0.52	R-DCL	Eco-SSL	0.17	0.30	0.25	0.15
Silver	7440-22-4	31	0.5	R-DCL	R5 SED	0.17	0.25	0.10	0.05
Sodium	7440-23-5	NC	NC	None	None	NC	250	150	50
Thallium	**7440-28-0**	2.8	**0.0569**	R-DCL	**R5 ESL-S**	**0.019**	**0.40**	**0.20**	**0.15**

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	Empirical		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Vanadium	7440-62-2	39	7.8	R-RSL	Eco-SSL	2.6	0.63	0.50	0.25
Zinc	7440-66-6	2,300	121	R-RSL	R5 SED	40	1.0	0.5	0.25
Cyanide	**57-12-5**	**0.94**	**0.0001**	**R-DCL**	**R5 SED**	**3.3E-05**	**0.5**	**0.25**	**0.125**

Notes:

[1] The PSL references for sediment are: R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); R5 SED – USEPA Region 5 Ecological Screening Level, Sediment (August, 2003); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 SED – USEPA Region 5 Ecological Screening Level, Sediment (August, 2003); R5 ESL-S – USEPA Region 5 Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

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Matrix: Sediment
Analytical Group: Dioxins/Furans

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	CFA		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
1,2,3,4,6,7,8,9-OCDD	3268-87-9	1.5E-02	3.3E-06	R-RSL	R5 SED	1.1E-06	1.0E-05	6.67E-06	2.86E-07
1,2,3,4,6,7,8,9-OCDF	39001-02-0	1.5E-02	1.3E-08	R-RSL	R5 SED	4.3E-09	1.0E-05	6.67E-06	3.14E-07
1,2,3,4,6,7,8-HpCDD	35822-46-9	4.5E-04	3.3E-06	R-RSL	R5 SED	1.1E-06	5.0E-06	3.33E-06	1.18E-07
1,2,3,4,6,7,8-HpCDF	67562-39-4	4.5E-04	1.3E-08	R-RSL	R5 SED	4.3E-09	5.0E-06	3.33E-06	1.45E-07
1,2,3,4,7,8,9-HpCDF	55673-89-7	4.5E-04	1.3E-08	R-RSL	R5 SED	4.3E-09	5.0E-06	3.33E-06	2.05E-07
1,2,3,4,7,8-HxCDD	39227-28-6	4.5E-05	3.3E-06	R-RSL	R5 SED	1.1E-06	5.0E-06	3.33E-06	1.93E-07
1,2,3,4,7,8-HxCDF	70648-26-9	4.5E-05	1.3E-08	R-RSL	R5 SED	4.3E-09	5.0E-06	3.33E-06	2.02E-07
1,2,3,6,7,8-HxCDD	57653-85-7	4.5E-05	3.3E-06	R-RSL	R5 SED	1.1E-06	5.0E-06	3.33E-06	1.75E-07
1,2,3,6,7,8-HxCDF	57117-44-9	4.5E-05	1.3E-08	R-RSL	R5 SED	4.3E-09	5.0E-06	3.33E-06	2.02E-07
1,2,3,7,8,9-HxCDD	19408-74-3	4.5E-05	3.3E-06	R-RSL	R5 SED	1.1E-06	5.0E-06	3.33E-06	1.41E-07
1,2,3,7,8,9-HxCDF	72918-21-9	4.5E-05	1.3E-08	R-RSL	R5 SED	4.3E-09	5.0E-06	3.33E-06	1.10E-07
1,2,3,7,8-PeCDD	40321-76-4	4.5E-06	3.3E-06	R-RSL	R5 SED	1.1E-06	5.0E-06	3.33E-06	1.03E-07
1,2,3,7,8-PeCDF	57117-41-6	1.5E-04	1.3E-08	R-RSL	R5 SED	4.3E-09	5.0E-06	3.33E-06	2.00E-07
2,3,4,6,7,8-HxCDF	60851-34-5	4.5E-05	1.3E-08	R-RSL	R5 SED	4.3E-09	5.0E-06	3.33E-06	1.23E-07
2,3,4,7,8-PeCDF	57117-31-4	1.5E-05	1.3E-08	R-RSL	R5 SED	4.3E-09	5.0E-06	3.33E-06	2.61E-07
2,3,7,8-TCDD	1746-01-6	4.5E-06	1.2E-07	R-RSL	R5 SED	4.0E-08	1.0E-06	6.67E-07	5.2E-08
2,3,7,8-TCDF	51207-31-9	4.5E-05	3.86E-05	R-RSL	R5 ESL-S	1.3E-05	1.0E-06	6.67E-07	1.04E-07
Total HpCDD	37871-00-4	NC	NC	None	None	NC	NA	NA	NA
Total HpCDF	38998-75-3	NC	NC	None	None	NC	NA	NA	NA
Total HxCDD	34465-46-8	NC	NC	None	None	NC	NA	NA	NA
Total HxCDF	55684-94-1	NC	NC	None	None	NC	NA	NA	NA

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	CFA		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Total PeCDD	36088-22-9	NC	NC	None	None	NC	NA	NA	NA
Total PeCDF	30402-15-4	NC	NC	None	None	NC	NA	NA	NA
Total TCDD	41903-57-5	NC	NC	None	None	NC	NA	NA	NA
Total TCDF	55722-27-5	NC	NC	None	None	NC	NA	NA	NA

Notes:

[1] The PSL references for sediment are: R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); R5 SED – USEPA Region 5 Ecological Screening Level, Sediment (August, 2003); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 SED – USEPA Region 5 Ecological Screening Level, Sediment (August, 2003); R5 ESL-S – USEPA Region 5 Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

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Matrix: Groundwater
Analytical Group: VOCs

Analyte	CAS Number	PSL (µg/L)	PSL Reference[1]	PQLG (µg/L)	Empirical		
		HHRA	HHRA		LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
1,1,1-Trichloroethane	71-55-6	200	G-DCL	67	1.0	0.5	0.25
1,1,2,2-Tetrachloroethane	**79-34-5**	**0.067**	**T-RSL**	**0.022**	**1.0**	**0.5**	**0.25**
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	140	VAPOR	47	1.0	0.5	0.25
1,1,2-Trichloroethane	**79-00-5**	**0.24**	**T-RSL**	**0.080**	**1.0**	**0.5**	**0.25**
1,1-Dichloroethane	75-34-3	2.4	T-RSL	0.80	1.0	0.5	0.25
1,1-Dichloroethene	75-35-4	7.0	G-DCL	2.3	1.0	0.5	0.25
1,2,3- Trichlorobenzene	87-61-6	2.9	T-RSL	0.97	1.0	0.5	0.25
1,2,4-Trichlorobenzene	**120-82-1**	**0.41**	**T-RSL**	**0.14**	**1.0**	**0.5**	**0.25**
1,2-Dibromo-3-chloropropane (DBCP)	**96-12-8**	**0.00032**	**T-RSL**	**1.1E-04**	**2.0**	**1.0**	**0.5**
1,2-Dibromoethane (EDB)	**106-93-4**	**0.0065**	**T-RSL**	**0.0022**	**1.0**	**0.5**	**0.25**
1,2-Dichlorobenzene	95-50-1	37	T-RSL	12	1.0	0.5	0.25
1,2-Dichloroethane	**107-06-2**	**0.15**	**T-RSL**	**0.050**	**1.0**	**0.5**	**0.25**
1,2-Dichloropropane	**78-87-5**	**0.39**	**T-RSL**	**0.13**	**1.0**	**0.5**	**0.25**
1,3-Dichlorobenzene	541-73-1	80	G-DCL	27	1.0	0.5	0.25
1,4-Dichlorobenzene	**106-46-7**	**0.43**	**T-RSL**	**0.14**	**1.0**	**0.5**	**0.25**
2-Butanone (MEK)	78-93-3	710	T-RSL	240	10	5.0	2.5
2-Hexanone	**591-78-6**	**4.7**	**T-RSL**	**1.6**	**5.0**	**2.5**	**1.5**
4-Methyl-2-pentanone (MIBK)	108-10-1	200	T-RSL	67	10	5.0	2.5
Acetone	67-64-1	2,200	T-RSL	730	10	5.0	2.5
Benzene	**71-43-2**	**0.41**	**T-RSL**	**0.14**	**1.0**	**0.5**	**0.25**
Bromochloromethane	74-97-5	NC	None	NC	1.0	0.5	0.25

Analyte	CAS Number	PSL (µg/L)	PSL Reference[1]	PQLG (µg/L)	Empirical		
		HHRA	HHRA		LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Bromodichloromethane	**75-27-4**	**0.12**	**T-RSL**	**0.040**	**1.0**	**0.5**	**0.25**
Bromoform	75-25-2	8.5	T-RSL	2.8	2.0	1.0	0.5
Bromomethane	**74-83-9**	**0.87**	**T-RSL**	**0.29**	**1.0**	**0.5**	**0.25**
Carbon disulfide	75-15-0	100	T-RSL	33	1.0	0.5	0.25
Carbon tetrachloride	**56-23-5**	**0.37**	**VAPOR**	**0.12**	**1.0**	**0.5**	**0.25**
Chlorobenzene	108-90-7	9.1	T-RSL	3.0	1.0	0.5	0.25
Chloroethane	75-00-3	62	G-DCL	21	1.0	0.5	0.25
Chloroform	**67-66-3**	**0.19**	**T-RSL**	**0.063**	**1.0**	**0.5**	**0.25**
Chloromethane	74-87-3	19	T-RSL	6.3	1.0	0.5	0.25
cis-1,2-Dichloroethene	156-59-2	7.3	T-RSL	2.4	1.0	0.5	0.25
cis-1,3-Dichloropropene	10061-01-5	4.0	T-RSL	1.3	1.0	0.5	0.25
Cyclohexane	110-82-7	100	VAPOR	33	1.0	0.5	0.25
Dibromochloromethane	**124-48-1**	**0.15**	**T-RSL**	**0.050**	**1.0**	**0.5**	**0.25**
Dichlorodifluoromethane	75-71-8	1.5	VAPOR	0.50	1.0	0.5	0.25
Ethylbenzene	100-41-4	1.5	T-RSL	0.50	1.0	0.5	0.25
Isopropylbenzene	98-82-8	68	T-RSL	23	1.0	0.5	0.25
Methyl acetate	79-20-9	3,700	T-RSL	1,200	2.0	1.0	0.5
Methylcyclohexane	108-87-2	NC	None	NC	1.0	0.5	0.25
Methylene chloride	75-09-2	4.8	T-RSL	1.6	4.0	2.0	1.0
Methyl-tert-butyl ether	1634-04-4	12	T-RSL	4.0	1.0	0.5	0.25
Styrene	100-42-5	100	G-DCL	33	1.0	0.5	0.25
Tetrachloroethene	**127-18-4**	**0.11**	**T-RSL**	**0.037**	**1.0**	**0.5**	**0.25**
Toluene	108-88-3	230	T-RSL	77	1.0	0.5	0.25

Analyte	CAS Number	PSL (µg/L)	PSL Reference[1]	PQLG (µg/L)	Empirical		
		HHRA	HHRA		LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
trans-1,2-Dichloroethene	156-60-5	11	T-RSL	3.7	1.0	0.5	0.25
trans-1,3-Dichloropropene	10061-02-6	4.0	T-RSL	1.3	1.0	0.5	0.25
Trichloroethene	79-01-6	2.0	T-RSL	0.67	1.0	0.5	0.25
Trichlorofluoromethane	75-69-4	18	VAPOR	6.0	1.0	0.5	0.25
Vinyl chloride	**75-01-4**	**0.016**	**T-RSL**	**0.0053**	**1.0**	**0.5**	**0.25**
Xylenes (total)	1330-20-7	20	T-RSL	6.7	4.0	2.0	1.0

µg/L – micrograms per liter

Notes:

[1] The PSL references for groundwater are: T-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Tapwater, adjusted to 1/10 of value for noncarcinogens (November, 2010); MCL – USEPA Maximum Contaminant Level (December, 2009); VAPOR – USEPA vapor screening values calculated from 2002 Vapor guidance and 2010 toxicity factors (November, 2002; May, 2010); G-DCL – IDEM Groundwater Default Closure Level (May, 2009). Refer to Appendix E for further explanation and justification of PSLs.

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Matrix: Groundwater
Analytical Group: SVOCs (including Low Level PAHs)

Analyte	CAS Number	PSL (µg/L)	PSL Reference[1]	PQLG (µg/L)	Empirical		
		HHRA	HHRA		LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
1,1'-Biphenyl	92-52-4	180	T-RSL	60	5.0	2.5	1.25
1,2,4,5-Tetrachlorobenzene	95-94-3	1.1	T-RSL	0.37	5.0	2.5	1.25
1,4-Dioxane	**123-91-1**	**0.67**	**T-RSL**	**0.22**	**5.0**	**2.5**	**1.25**
2,2'-Oxybis(1-chloropropane)	**108-60-1**	**0.32**	**T-RSL**	**0.11**	**5.0**	**2.5**	**1.25**
2,3,4,6-Tetrachlorophenol	58-90-2	110	T-RSL	37	5.0	2.5	1.25
2,4,5-Trichlorophenol	95-95-4	370	T-RSL	120	5.0	2.5	1.25
2,4,6-Trichlorophenol	**88-06-2**	**3.6**	**G-DCL**	**1.2**	**5.0**	**2.5**	**1.25**
2,4-Dichlorophenol	120-83-2	11	T-RSL	3.7	5.0	2.5	1.25
2,4-Dimethylphenol	105-67-9	73	T-RSL	24	20	10	5.0
2,4-Dinitrophenol	**51-28-5**	**7.3**	**T-RSL**	**2.4**	**50**	**25**	**10**
2,4-Dinitrotoluene	**121-14-2**	**0.22**	**T-RSL**	**0.073**	**5.0**	**2.5**	**1.25**
2,6-Dinitrotoluene	**606-20-2**	**3.7**	**T-RSL**	**1.2**	**5.0**	**2.5**	**1.25**
2-Chloronaphthalene	91-58-7	290	T-RSL	97	5.0	2.5	1.25
2-Chlorophenol	95-57-8	18	T-RSL	6.0	5.0	2.5	1.25
2-Methylphenol (o-Cresol)	95-48-7	180	T-RSL	60	5.0	2.5	1.25
2-Nitroaniline	88-74-4	37	T-RSL	12	20	10	5.0
2-Nitrophenol	88-75-5	7.3	T-RSL	2.4	5.0	2.5	1.25
3,3'-Dichlorobenzidine	**91-94-1**	**0.15**	**T-RSL**	**0.050**	**5.0**	**2.5**	**1.25**
3-Methylphenol (m-Cresol)	108-39-4	180	T-RSL	60	5.0	2.5	1.25
3-Nitroaniline	99-09-2	NC	None	NC	20	10	5.0
4,6-Dinitro-2-methylphenol	**534-52-1**	**0.29**	**T-RSL**	**0.097**	**20**	**10**	**5.0**

Analyte	CAS Number	PSL (µg/L)	PSL Reference[1]	PQLG (µg/L)	Empirical		
		HHRA	HHRA		LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
4-Bromophenyl phenyl ether	101-55-3	NC	None	NC	5.0	2.5	1.25
4-Chloro-3-methyl phenol	59-50-7	370	T-RSL	120	5.0	2.5	1.25
4-Chloroanaline	**106-47-8**	**0.34**	**T-RSL**	**0.11**	**5.0**	**2.5**	**1.25**
4-Chlorophenyl phenyl ether	7005-72-3	NC	None	NC	5.0	2.5	1.25
4-Methylphenol (p-Cresol)	106-44-5	18	T-RSL	6.0	5.0	2.5	1.25
4-Nitroaniline	**100-01-6**	**3.4**	**T-RSL**	**1.1**	**20**	**10**	**5.0**
4-Nitrophenol	100-02-7	NC	None	NC	20	10	5.0
Acetophenone	98-86-2	370	T-RSL	120	5.0	2.5	1.25
Atrazine	**1912-24-9**	**0.29**	**T-RSL**	**0.097**	**5.0**	**2.5**	**1.25**
Benzaldehyde	100-52-7	370	T-RSL	120	5.0	2.5	1.25
Bis(2-chloroethoxy)methane	111-91-1	11	T-RSL	3.7	5.0	2.5	1.25
Bis(2-chloroethyl)ether	**111-44-4**	**0.012**	**T-RSL**	**0.0040**	**5.0**	**2.5**	**1.25**
Bis(2-ethylhexyl)phthalate	**117-81-7**	**4.8**	**T-RSL**	**1.6**	**5.0**	**2.5**	**1.25**
Butyl benzyl phthalate	85-68-7	35	T-RSL	12	5.0	2.5	1.25
Caprolactam	105-60-2	1,800	T-RSL	600	5.0	2.5	1.25
Carbazole	86-74-8	43	G-DCL	14	5.0	2.5	1.25
Dibenzofuran	**132-64-9**	**3.7**	**T-RSL**	**1.2**	**5.0**	**2.5**	**1.25**
Diethyl phthalate	84-66-2	2,900	T-RSL	970	5.0	2.5	1.25
Dimethyl phthalate	131-11-3	2,900	T-RSL	970	5.0	2.5	1.25
Di-n-butyl phthalate	84-74-2	370	T-RSL	120	5.0	2.5	1.25
Di-n-octyl phthalate	117-84-0	20	G-DCL	6.7	5.0	2.5	1.25
Hexachlorobenzene	**118-74-1**	**0.042**	**T-RSL**	**0.014**	**5.0**	**2.5**	**1.25**
Hexachlorobutadiene	**87-68-3**	**0.86**	**T-RSL**	**0.29**	**5.0**	**2.5**	**1.25**

Analyte	CAS Number	PSL (µg/L)	PSL Reference[1]	PQLG (µg/L)	Empirical		
		HHRA	HHRA		LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Hexachlorocyclopentadiene	**77-47-4**	**0.019**	**VAPOR**	**0.0063**	**5.0**	**2.5**	**1.25**
Hexachloroethane	**67-72-1**	**3.7**	**T-RSL**	**1.2**	**5.0**	**2.5**	**1.25**
Isophorone	78-59-1	71	T-RSL	24	5.0	2.5	1.25
Nitrobenzene	**98-95-3**	**0.12**	**T-RSL**	**0.040**	**5.0**	**2.5**	**1.25**
N-Nitrosodi-n-propylamine	**621-64-7**	**0.0096**	**T-RSL**	**0.0032**	**5.0**	**2.5**	**1.25**
N-Nitrosodiphenylamine	86-30-6	14	T-RSL	4.7	5.0	2.5	1.25
Pentachlorophenol	**87-86-5**	**0.17**	**T-RSL**	**0.057**	**20**	**10**	**5.0**
Phenol	108-95-2	1,100	T-RSL	370	5.0	2.5	1.25
PAHs[2]							
2-Methylnaphthalene	91-57-6	15	T-RSL	5.0	0.2	0.1	0.05
Acenaphthene	83-32-9	220	T-RSL	73	0.2	0.1	0.05
Acenaphthylene	208-96-8	71	G-DCL	24	0.2	0.1	0.05
Anthracene	120-12-7	1,100	T-RSL	370	0.2	0.1	0.05
Benzo(a)anthracene	**56-55-3**	**0.029**	**T-RSL**	**0.0097**	**0.2**	**0.1**	**0.05**
Benzo(a)pyrene	**50-32-8**	**0.0029**	**T-RSL**	**9.7E-04**	**0.2**	**0.1**	**0.05**
Benzo(b)fluoranthene	**205-99-2**	**0.029**	**T-RSL**	**0.0097**	**0.2**	**0.1**	**0.05**
Benzo(g,h,i)perylene	191-24-2	110	T-RSL	37	0.2	0.1	0.05
Benzo(k)fluoranthene	207-08-9	0.29	T-RSL	0.097	0.2	0.1	0.05
Chrysene	218-01-9	2.9	T-RSL	0.97	0.2	0.1	0.05
Dibenzo(a,h)anthracene	**53-70-3**	**0.0029**	**T-RSL**	**9.7E-04**	**0.2**	**0.1**	**0.05**
Fluoranthene	206-44-0	150	T-RSL	50	0.2	0.1	0.05
Fluorene	86-73-7	150	T-RSL	50	0.2	0.1	0.05
Indeno(1,2,3-c,d)pyrene	**193-39-5**	**0.029**	**T-RSL**	**0.0097**	**0.2**	**0.1**	**0.05**

Analyte	CAS Number	PSL (µg/L)	PSL Reference[1]	PQLG (µg/L)	Empirical		
		HHRA	HHRA		LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Naphthalene	**91-20-3**	**0.14**	**T-RSL**	**0.047**	**0.2**	**0.1**	**0.05**
Phenanthrene	85-01-8	23	G-DCL	7.7	0.2	0.1	0.05
Pyrene	129-00-0	110	T-RSL	37	0.2	0.1	0.05

Notes:

[1] The PSL references for groundwater are: T-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Tapwater, adjusted to 1/10 of value for noncarcinogens (November, 2010); MCL – USEPA Maximum Contaminant Level (December, 2009); VAPOR – USEPA vapor screening values calculated from 2002 Vapor guidance and 2010 toxicity factors (November, 2002; May, 2010); G-DCL – IDEM Groundwater Default Closure Level (May, 2009). Refer to Appendix E for further explanation and justification of PSLs.

[2] The low level PAHs will be analyzed by SW-846 Method 8270C Full Scan to obtain lower detection limits.

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. The Project Team has agreed to accept this data for decision making if results below the LOQ are "J" qualified and the results are discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaped rows indicated the PSL is less than the LOD; therefore, the Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.

Matrix: Groundwater
Analytical Group: Pesticides

Analyte	CAS Number	PSL (µg/L)	PSL Reference[1]	PQLG (µg/L)	Empirical		
		HHRA	HHRA		LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
alpha-BHC	**319-84-6**	**0.011**	**T-RSL**	**0.0037**	**0.02**	**0.01**	**0.005**
beta-BHC	319-85-7	0.037	T-RSL	0.012	0.02	0.01	0.005
delta-BHC	**319-86-8**	**0.011**	**T-RSL**	**0.0037**	**0.02**	**0.01**	**0.005**
gamma-BHC (Lindane)	58-89-9	0.061	T-RSL	0.020	0.02	0.01	0.005
Heptachlor	**76-44-8**	**0.015**	**T-RSL**	**0.0050**	**0.02**	**0.01**	**0.005**
Aldrin	**309-00-2**	**0.0040**	**T-RSL**	**0.0013**	**0.02**	**0.01**	**0.005**
Heptachlor epoxide	**1024-57-3**	**0.0074**	**T-RSL**	**0.0025**	**0.02**	**0.01**	**0.005**
Endosulfan I	959-98-8	22	T-RSL	7.3	0.02	0.01	0.005
Dieldrin	**60-57-1**	**0.0042**	**T-RSL**	**0.0014**	**0.02**	**0.01**	**0.005**
4,4'-DDE	72-55-9	0.20	T-RSL	0.067	0.02	0.01	0.005
Endrin	72-20-8	1.1	T-RSL	0.37	0.02	0.01	0.005
Endosulfan II	33213-65-9	22	T-RSL	7.3	0.02	0.01	0.005
4,4'-DDD	72-54-8	0.28	T-RSL	0.093	0.02	0.01	0.005
Endosulfan sulfate	1031-07-8	22	T-RSL	7.3	0.02	0.01	0.005
4,4'-DDT	50-29-3	0.20	T-RSL	0.067	0.02	0.01	0.005
Methoxychlor	72-43-5	18	T-RSL	6.0	0.02	0.01	0.005
Endrin ketone	53494-70-5	1.1	T-RSL	0.37	0.02	0.01	0.005
Endrin aldehyde	7421-93-4	1.1	T-RSL	0.37	0.02	0.01	0.005
alpha-Chlordane	5103-71-9	0.19	T-RSL	0.063	0.02	0.01	0.005
gamma-Chlordane	5103-74-2	0.19	T-RSL	0.063	0.02	0.01	0.005
Toxaphene	**8001-35-2**	**0.061**	**T-RSL**	**0.020**	**1.0**	**0.667**	**0.333**

Notes:

[1] The PSL references for groundwater are: T-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Tapwater, adjusted to 1/10 of value for noncarcinogens (November, 2010); MCL – USEPA Maximum Contaminant Level (December, 2009); VAPOR – USEPA vapor screening values calculated from 2002 Vapor guidance and 2010 toxicity factors (November, 2002; May, 2010); G-DCL – IDEM Groundwater Default Closure Level (May, 2009). Refer to Appendix E for further explanation and justification of PSLs.

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. The Project Team has agreed to accept this data for decision making if results below the LOQ are "J" qualified and the results are discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaded rows indicate the PSL is less than the LOD; therefore, the Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.

Matrix: Groundwater
Analytical Group: PCBs

Analyte	CAS Number	PSL (µg/L)	PSL Reference[1]	PQLG (µg/L)	Empirical		
		HHRA	HHRA		LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Aroclor-1016	12674-11-2	0.96	T-RSL	0.32	0.5	0.25	0.125
Aroclor-1221	**11104-28-2**	**0.0068**	**T-RSL**	**0.0023**	**0.5**	**0.25**	**0.125**
Aroclor-1232	**11141-16-5**	**0.0068**	**T-RSL**	**0.0023**	**0.5**	**0.25**	**0.125**
Aroclor-1242	**53469-21-9**	**0.034**	**T-RSL**	**0.011**	**0.5**	**0.25**	**0.125**
Aroclor-1248	**12672-29-6**	**0.034**	**T-RSL**	**0.011**	**0.5**	**0.25**	**0.125**
Aroclor-1254	**11097-69-1**	**0.034**	**T-RSL**	**0.011**	**0.5**	**0.25**	**0.125**
Aroclor-1260	**11096-82-5**	**0.034**	**T-RSL**	**0.011**	**0.5**	**0.25**	**0.125**
Total PCBs	-	NC	None	NC	0.5	0.25	0.125

Notes:

[1] The PSL references for groundwater are: T-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Tapwater, adjusted to 1/10 of value for noncarcinogens (November, 2010); MCL – USEPA Maximum Contaminant Level (December, 2009); VAPOR – USEPA vapor screening values calculated from 2002 Vapor guidance and 2010 toxicity factors (November, 2002; May, 2010); G-DCL – IDEM Groundwater Default Closure Level (May, 2009). Refer to Appendix E for further explanation and justification of PSLs.

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. The Project Team has agreed to accept this data for decision making if results below the LOQ are "J" qualified and the results are discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaded rows indicate the PSL is less than the LOD; therefore, the Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.

Matrix: Groundwater
Analytical Group: Metals (Total and Dissolved) and Cyanide

Analyte	CAS Number	PSL (µg/L)	PSL Reference[1]	PQLG (µg/L)	Empirical		
		HHRA	HHRA		LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Aluminum	7429-90-5	3,700	T-RSL	1200	200	100	50
Antimony	**7440-36-0**	**1.5**	**T-RSL**	**0.50**	**3.0**	**2.0**	**1.0**
Arsenic	**7440-38-2**	**0.045**	**T-RSL**	**0.015**	**1.5**	**1.5**	**0.75**
Barium	7440-39-3	730	T-RSL	240	40	20	10
Beryllium	**7440-41-7**	**4.0**	**G-DCL**	**1.3**	**5.0**	**2**	**1.0**
Cadmium	7440-43-9	1.8	T-RSL	0.60	1.5	0.50	0.25
Calcium	7440-70-2	NC	None	NC	5000	2000	1000
Chromium	**7440-47-3**	**0.043**	**T-RSL**	**0.014**	**10**	**4.0**	**2.0**
Cobalt	**7440-48-4**	**1.1**	**T-RSL**	**0.37**	**3.1**	**2.5**	**1.3**
Copper	7440-50-8	150	T-RSL	50	10	8.0	4.0
Iron	7439-89-6	2,600	T-RSL	870	100	60	30
Lead	7439-92-1	15	T-RSL	5.0	3.0	3.0	1.5
Magnesium	7439-95-4	NC	None	NC	5000	3000	1000
Manganese	7439-96-5	88	T-RSL	29	15	10	5.0
Mercury	7439-97-6	1.1	T-RSL	0.37	0.2	0.16	0.08
Nickel	7440-02-0	73	T-RSL	24	10	6.0	3.0
Potassium	7440-09-7	NC	None	NC	5000	3000	1000
Selenium	7782-49-2	18	T-RSL	6.0	6.0	5.0	3.0
Silver	7440-22-4	18	T-RSL	6.0	10	2.0	1.0
Sodium	7440-23-5	NC	None	NC	5000	3000	1000
Thallium	7440-28-0	2.0	G-DCL	0.67	2.0	1.0	0.75

Analyte	CAS Number	PSL (µg/L)	PSL Reference[1]	PQLG (µg/L)	Empirical		
		HHRA	HHRA		LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Vanadium	7440-62-2	18	T-RSL	6.0	13	10	5.0
Zinc	7440-66-6	1,100	T-RSL	370	20	10	5.0
Cyanide	57-12-5	73	T-RSL	24	0.02	0.01	0.005

Notes:

[1] The PSL references for groundwater are: T-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Tapwater, adjusted to 1/10 of value for noncarcinogens (November, 2010); MCL – USEPA Maximum Contaminant Level (December, 2009); VAPOR – USEPA vapor screening values calculated from 2002 Vapor guidance and 2010 toxicity factors (November, 2002; May, 2010); G-DCL – IDEM Groundwater Default Closure Level (May, 2009). Refer to Appendix E for further explanation and justification of PSLs.

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. The Project Team has agreed to accept this data for decision making if results below the LOQ are "J" qualified and the results are discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaded rows indicate the PSL is less than the LOD; therefore, the Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.

SAP Worksheet No. 16 -- Project Schedule / Timeline Table

(UFP-QAPP Manual Section 2.8.2)

Activities	Organization	Dates (MM/DD/YYYY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Initial screening soil, sediment and groundwater sampling	Tetra Tech	04/01/2011	04/15/2011	RFI Report (if no additional sampling)	12/26/2011 (draft) 10/05/2012 (final)
Additional "step-out" and other sampling if necessary	Tetra Tech	07/01/2011	07/15/2011	RFI Report (if additional sampling is performed)	03/26/2012 (draft) 01/05/2013 (final)

SAP Worksheet No. 17 -- Sampling Design and Rationale

(UFP-QAPP Manual Section 3.1.1)

The RFI field data collection program will be within the boundaries of SWMU 11 including the drainage channel to Broom Branch and area downgradient of the Building 2981 concrete tank. Initial sampling will be performed to determine if there are target analytes in environmental media as a result of operations, and the fire and firefighting measures including the drainage channel that discharges to Broom Branch. If the maximum concentration of any target analyte exceeds an applicable human health or ecological PSL, additional sampling may be required to define the nature and extent of COPC contamination and to support human health and ecological risk assessments. The planned initial screening sample locations are presented on Figures 17-1, 17-2, 17-3, and 17-4.

Chemicals that may have been present in former Building 225 during the 1976 fire and have the potential to impact environmental media include the following:

- Solvents, paints, and other chemical compounds: Various chemicals were stored onsite, and may have leaked onto the ground and leached into the subsurface during operations, and the fire and subsequent firefighting efforts. Analyses will include the Target Compound List (TCL) for VOCs and SVOCs (including low level PAHs).

- Pesticides and PCBs: Although there is an inventory list of what was being stored in Building 225 at the time of the fire, its accuracy and reliability is unknown. Pesticides and PCBs have been detected at other NSA Crane sites and may have been present at this site. Therefore, analyses will include the 21 TCL pesticides and 7 TCL PCBs.

- Dioxins/Furans: Dioxins and furans occur as byproducts from the incineration of chlorinated substances as well as a naturally occurring byproduct of combustion. Analyses will include a standard screen of dioxin and furan congeners. Surface soil and sediment samples from the investigative areas (except the concrete tank), in the vicinity of the former building, and at the downwind areas will be analyzed for dioxins/furans.

- Metals: Various metals may have been present on site in the form of paints and other chemical compounds. Analyses will include the full list of 23 Target Analyte List (TAL) Metals and cyanide

- Cyanide. Cyanide is on the full TAL and may have been present at the site

Soil Sampling

The initial screening soil sampling program consists of collecting surface soil and subsurface soil from biased locations across the site. Generally, surface and subsurface soil samples will be horizontally

aligned. Subsurface soil samples will be collected from the sampling interval with the greatest potential for contamination based on field screening techniques. This approach, coupled with the ability to make field decisions to determine the extent of contamination, supports both the delineation of contamination and the risk assessment objectives.

Initial screening surface and subsurface samples will be collected from locations that have a greater potential to have subsurface contamination (based on site history). The proposed initial screening soil sampling locations are shown on Figures 17-1, 17-2, and 17-3. If site conditions require a location to be moved (i.e., boulder, tree, etc.), the field sampler will move to an alternate location to collect the necessary sample. If this occurs, the field sampler will document the reason in the field logbook. Generally, surface and subsurface soil samples will be analyzed for SVOCs (including low level PAHs), pesticides, PCBs, metals, and cyanide. In addition, surface soil samples collected under the floor slab and subsurface soil samples will also be analyzed for VOCs. Also, select soil samples collected from the following areas will be analyzed for dioxins/furans: below the floor slab, in the ditch, the three adjacent areas, and the four downwind areas.

Soil sampling will be performed in the investigative areas (IA) as described below and as shown on Figures 17-1, 17-2, and 17-3.

- **IA-1 – Building 225 Sub-slab.** Contaminants may have infiltrated through joints in the concrete floor slab. Four surface soil samples and four subsurface soil samples will be collected from below the floor slab and aggregate material. The four locations will be selected in the field along joints in the floor slab and will be horizontally aligned. One of the four surface soil samples will be analyzed for dioxins/furans. Based on the CSM, eight soil samples will be collected from IA-1. Four surface soil samples from discrete locations will be analyzed for VOCs, SVOCs (including low level PAHs), pesticides, PCBs, metals, and cyanide; one surface soil sample collected from the sub-slab will be analyzed for dioxins/furans. Four subsurface soil samples from discrete locations will be analyzed for VOCs, SVOCs (including low level PAHs), pesticides, PCBs, metals, and cyanide.

- **IA-2 – Ditch.** The ditch along the west side of the site conveyed runoff from the site and contaminants may have infiltrated into the soil in the area. Surface soil samples will be collected from the ditch. The first sampling location will be where the ditch drains into the culvert at the north end of the site. There will be five additional sampling locations south of that point approximately every 50' along the ditch. Because it is an open area, surface soil samples from this area will not be analyzed also be analyzed for VOCs. One soil sample collected in the ditch will be analyzed for dioxins/furans. Based on the CSM, six surface soil samples will be collected from IA-2. Six samples from discrete locations will be analyzed for SVOCs (including low level PAHs), pesticides, PCBs, metals, and cyanide; one sample will be analyzed for dioxins/furans.

- **IA-3 – Adjacent Areas.** The adjacent areas consist of three distinct areas near Building 225. The areas are the grassed area east and adjacent to the Building 225 floor slab; the adjacent area north of the floor slab containing both paved and grassed areas; and the adjacent area south of the floor slab containing both paved and grassed areas. These areas may have been contaminated during the fire. Surface samples will be collected from four locations from the grassed area east and adjacent to the Building 225 floor slab and from two locations in the each of the two adjacent areas south and north of the Building 225 floor slab. Because it is an open area, the surface soil samples from these areas will not be analyzed for VOCs. In each of the three adjacent areas, one sample will be analyzed for dioxins/furans.. Based on the CSM, eight surface soil samples will be collected from the three adjacent areas that comprise IA-3. Eight surface soil samples from discrete locations at three of the adjacent areas (immediately north, south, and east of the building) will be analyzed for SVOCs (including low level PAHs), pesticides, PCBs, metals, and cyanide; three soil samples collected at the adjacent areas (one sample representing each of these three areas) will be analyzed for dioxins/furans.

- **IA-4 – Downwind Areas.** The downwind areas consist of four distinct areas and consist of 1) two grassed areas northeast of Building 225 and across Highway 101; and 2) two unpaved areas southwest of Building 225. Based on the CSM, the two areas northeast of Building 225 are believed to be upwind of the fire. The areas southwest of Building 225 are believed to be downwind of the fire. These areas may have been contaminated during the fire by airborne particulates containing residual dioxins/furans. Two discrete surface soil samples will be collected from the upwind northeast areas, while four discrete surface soil samples will be collected from the downwind southwest areas. Samples will be collected from open, grassy areas to be determined in the field, identified using GPS, and recorded in the field log book. Based on the CSM, six surface soil samples will be collected from the downwind areas that comprise IA-4; the six samples will be analyzed for dioxins/furans.

- **IA-5 – UST Area.** Historical drawings indicate that a UST was located approximately 40 feet south of Building 225; the disposition of this UST is not known. Subsurface soil samples from this area will be analyzed for fuel contaminants. Subsurface soil samples will be collected from near the approximate bottom elevation of the UST as estimated by field observations and field measurements. Based on the CSM, four subsurface soil samples will be collected from IA-5. These soil samples will be analyzed for VOCs and SVOCs (including low level PAHs).

- **IA-6 - Building 2981 Concrete Tank.** Green water used to fight the fire was contaminated with the chemicals released during the fire. Some of the contaminated water was transported to the Building 2981 concrete tank for holding. The disposition of this water is unknown and may have been released in to the nearby drainage. Therefore, four surface soil samples will be collected downstream from the concrete tank outlet; the locations of these samples will be determined in the field based on the location of the tank and the hydrology of the surrounding area. Because it is an open area, samples from this area will not be analyzed for VOCs. Four surface soil samples will be collected

from IA-6. Two samples from discrete locations will be analyzed for SVOCs (including low level PAHs), pesticides, PCBs, metals, and cyanide.

Sample Depth – A DPT rig will be used to collect surface and subsurface soil samples. Samples for all applicable analytical groups will be collected from the 0- to 2-foot interval for surface soil. Subsurface soil samples will be collected from IA-1 – Building 225 Sub-slab and IA-5 – UST Area. The samples will be collected from the specific 2-foot boring that has the greatest potential for contamination based on visual and field instrument screening as determined in the field. At IA-1, the soil borings will be advanced to refusal or 15 feet, whichever is shallower. At IA-5, the subsurface soil samples may be collected to 10 feet bgs or to the estimated bottom of fill or UST elevation, whichever is shallower. If there are no obvious signs of contamination, the subsurface soil samples will be collected from the 4- to 6-foot interval.

Soil Sample Quantities – As described above, 28 surface soil samples (plus 4 duplicate samples for QC purposes) and 8 subsurface soil samples (plus 1 duplicate samples for QC purposes) will be collected and analyzed for certain target analytes, which require analysis to low levels to support future risk assessments, if necessary. Due to the volatile nature of VOCs, surface soil samples will not be analyzed for VOCs except those from below the floor slab. The planned soil sample locations are presented on Figures 17-1, 17-2, and 17-3. Additionally, at the discretion of the Tetra Tech FOL, the sampler may collect up to 12 "step-out" samples when areas of obvious or likely contamination are encountered during the initial screening sampling event. The flexibility to collect these additional samples extends both horizontally and vertically. Areas requiring additional sampling will be discerned by visual signs and the experience of the Tetra Tech FOL. Emphasis will be placed on collecting samples required to delineate contaminated areas.

One round of "step-out" samples will be collected at the boundaries of the area(s) to be sampled if PSL exceedances are detected in initial screening surface and subsurface soil samples to delineate areas of COPCs. Up to 30 additional "step-out" samples will be collected from 25 feet away in each general direction (north, east, south, or west) where PSL exceedances from the initial screening are unbounded, and "step-out" samples can be collected. For instance, if there are buildings, roads, or other impediments that preclude extending the boundary by 25 feet in a general direction, no sample will be collected and the impediment will be documented in the field sampler's notes. These "step-out" samples will be collected from the same depth as the corresponding initial screening sample and analyzed for only those target analytes that exceeded PSLs (and exceeded background levels for metals). If the Project Team deems them necessary, additional "step-out" samples will be collected from a depth of two feet below the initial screening sample that exceeds one or more PSLs to vertically delineate COPCs. Samples are expected to be collected by a DPT; however, a hand auger or backhoe may be used, if necessary.

Based on a review of the analytical data and risk screening calculations from the initial screening sampling event a HHRA and an ERA will be conducted in accordance with Sections 11.4 and 11.5.

Sediment Sampling

The initial screening sediment sampling program consists of collecting surface sediment samples from the drainage channel which conveyed runoff from the fire to Broom Branch. Surface sediment samples will be collected from two depth intervals at horizontally aligned locations. This approach, coupled with the ability to make field decisions to delineate the extent of contamination as described as follows, supports both the delineation of contamination and the calculation of risk estimates.

The proposed sediment sample location grid was adjusted to follow the drainage path, and further adjustments may be necessary in the field if sediment is not available at the proposed locations. An attempt will be made to minimize relocation of sampling points because it affects the representativeness of individual samples; however, collecting the total number of proposed sediment samples is deemed more important to achieving project goals than strict adherence to the sampling grid. The planned sediment sample locations are presented on Figure 17-4.

- **IA-7 – Drainage Channel.** Surface sediment samples will be collected from four locations in the drainage channel at two depth intervals. The first sampling location will be where the culvert from the site discharges to the channel. Three additional sampling locations will be selected west (downgradient) of that point approximately every 100 feet along the channel. The first set of surface sediment samples will be collected from 0 to 6 inches bgs. The second set of surface sediment samples will be collected from the same locations between 6 to 12 inches bgs. Sediment samples will be analyzed for SVOCs (including low level PAHs), pesticides, PCBs, metals, and cyanide. Sediment samples will also be analyzed for TOC to support site-specific risk calculations. Because it is an open area, surface sediment samples from this area will not be analyzed for VOCs. One sediment sample from each depth set of the four surface sediment samples identified above will be analyzed for dioxins/furans. Based on the CSM, eight sediment samples will be collected from IA-7. Four discrete shallow surface samples and four discrete deeper surface soil samples will be analyzed for SVOCs (including low level PAHs), PCBs, pesticides, metals, cyanide, and TOC; two samples from one of the sediment locations (one sample representing each depth set) will be analyzed for dioxins/furans.

Sediment Sample Quantities

Eight sediment samples (plus one duplicate sample for QC purposes) will be collected from the drainage channel to Broom Branch during the initial screening sampling event. Based on the initial screening sample results, the Project Team will determine if one round of "step-out" sample collection is required. Up to six additional "step-out" sediment samples (three locations at two depths) will be collected 50 feet or 100 feet from where PSL exceedances from the initial screening are unbounded, and "step-out" samples can be collected. Based on initial screening sediment sample results, additional soil samples

from the floodplain may also be collected. Sections 11.4 and 11.5 will be used to guide the Project Team in this decision.

Groundwater Sampling

Groundwater samples will be collected from three locations during the initial screening sampling event using the DPT rig. Two samples will be collected from locations located downgradient of potentially contaminated areas of the site, and one sample will be collected from a location upgradient of the site as shown on Figure 17-4. The downgradient locations will be downgradient of areas with the greatest potential for contamination based on historical data and field screening observations. The need for installation of permanent monitoring wells will be determined by Project Team consensus based on the results from the initial screening sampling event groundwater samples.

Three groundwater samples (plus one duplicate sample for QC purposes) will be collected and analyzed for VOCs, SVOCs (including low level PAHs), pesticides, PCBs, and total (and dissolved, if groundwater is highly turbid) metals and cyanide. Groundwater samples will also be analyzed for field parameters, including water levels, pH, specific conductivity, turbidity, temperature, Oxidation-Reduction Potential (ORP), and dissolved oxygen (DO) to support field sampling decisions and site-specific risk calculations.

Based on the results from the initial screening sampling event, permanent groundwater monitoring wells may be deemed necessary by the Project Team as a selected remedy from a CMS and would be placed in areas where subsurface soil contamination concentrations and groundwater sample analysis data indicate the greatest potential for groundwater contamination. If permanent groundwater monitoring wells are required, monitoring well locations will be identified in a separate SAP.

Additional Sampling for Delineation of COPCs and Risk Assessments

One additional round of "step out" sampling will be performed if initial screening sampling (as described above) results indicate that contaminant levels exceed PSLs and COPCs are identified. Additional samples may include surface soil, subsurface soil, surface water, sediment, and/or groundwater.

Field Quality Control Samples

Field QC samples will be collected as part of the investigation, including FDs, trip blanks, equipment rinsate blanks, and field blanks. Worksheet No. 20 presents the field QC sample summary. Also, additional sample volume will be collected as necessary for the laboratory QC of Matrix Spike (MS)/ Matrix Spike Duplicate (MSD) analyses (for VOCs, SVOCs, including low level PAHs, pesticides, and PCBs) and MS/laboratory duplicate analyses (for metals and cyanide).

SAP Worksheet No. 18 -- Sampling Locations and Methods/SOP Requirements Table

(UFP-QAPP Manual Section 3.1.1)

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]
11SB01	11SS010002 and 11SSFDMMDDYYNN[2]	Soil	0 - 2	VOCs	1 + 1 FD	SOP-07, SOP-08, SOP-11
				SVOCs/Low Level PAHs	1 + 1 FD	
				Pesticides/PCBs	1 + 1 FD	
				Metals/Cyanide	1 + 1 FD	
	11SB01NNNN[3] and 11SBFDMMDDYYNN[2]	Soil	>2[4]	VOCs	1 + 1 FD	SOP-07, SOP-08, SOP-11
				SVOCs/Low Level PAHs	1 + 1 FD	
				Pesticides/PCBs	1 + 1 FD	
				Metals/Cyanide	1 + 1 FD	
11SB02	11SS020002	Soil	0 - 2	VOCs	1	SOP-07, SOP-08, SOP-11
				SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
				Dioxins/Furans	1	
	11SB02NNNN[3]	Soil	>2[4]	VOCs	1	SOP-07, SOP-08, SOP-11
				SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB03	11SS030002	Soil	0 - 2	VOCs	1	SOP-07, SOP-08, SOP-11
				SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
	11SB03NNNN[3]	Soil	>2[4]	VOCs	1	SOP-07, SOP-08, SOP-11
				SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]
11SB04	11SS040002	Soil	0 - 2	VOCs	1	SOP-07, SOP-08, SOP-11
				SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
	11SB04NNNN[3]	Soil	>2[4]	VOCs	1	SOP-07, SOP-08, SOP-11
				SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB05	11SS050002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB06	11SS060002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB07	11SS070002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB08	11SS080002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB09	11SS090002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
				Dioxins/Furans	1	
11SB10	11SS100002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB11	11SS110002 and 11SSFDMMDDYYNN[2]	Soil	0 – 2	SVOCs/Low Level PAHs	1 + 1 FD	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1 + 1 FD	
				Metals/Cyanide	1 + 1 FD	
				Dioxins/Furans	1 + 1 FD	

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]
11SB12	11SS120002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB13	11SS130002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB14	11SS140002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
				Dioxins/Furans	1	
11SB15	11SS150002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB16	11SS160002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB17	11SS170002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB18	11SS180002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
				Dioxins/Furans	1	
11SB19	11SS190002	Soil	0 – 2	Dioxins/Furans	1	SOP-07, SOP-08, SOP-11
11SB20	11SS200002	Soil	0 – 2	Dioxins/Furans	1	SOP-07, SOP-08, SOP-11
11SB21	11SS210002 and 11SSFDMMDDYYNN[2]	Soil	0 – 2	Dioxins/Furans	1 + 1 FD	SOP-07, SOP-08, SOP-11
11SB22	11SS220002	Soil	0 – 2	Dioxins/Furans	1	SOP-07, SOP-08, SOP-11
11SB23	11SS230002	Soil	0 – 2	Dioxins/Furans	1	SOP-07, SOP-08, SOP-11
11SB24	11SS240002	Soil	0 – 2	Dioxins/Furans	1	SOP-07, SOP-08, SOP-11

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]
11SB25	11SB25NNNN[3]	Soil	>2[4]	VOCs	1	SOP-07, SOP-08, SOP-11
				SVOCs/Low Level PAHs	1	
11SB26	11SB26NNNN[3]	Soil	>2[4]	VOCs	1	SOP-07, SOP-08, SOP-11
				SVOCs/Low Level PAHs	1	
11SB27	11SB27NNNN[3]	Soil	>2[4]	VOCs	1	
				SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
11SB28	11SB28NNNN[3]	Soil	>2[4]	VOCs	1	
				SVOCs/Low Level PAHs	1	
11SB29	11SS290002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB30	11SS300002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB31	11SS310002 and 11SSFDMMDDYYNN[2]	Soil	0 – 2	SVOCs/Low Level PAHs	1 + 1 FD	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1 + 1 FD	
				Metals/Cyanide	1 + 1 FD	
11SB32	11SS3			SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB33 to 11SBXX[5]	11SS(25-XX)0002	Soil	0 – 2	SVOCs/Low Level PAHs	1	SOP-07, SOP-08, SOP-11
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
	11SB(25-XX)NNNN[3]	Soil	>2[4]	VOCs	1	
				SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11SB(XX+1) to 11SBYY[6]	TBD	Soil	TBD	COPCs (TBD)	1 (each location)	SOP-07, SOP-08, SOP-11

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]
11SB(YY+1) to 11SBZZ[7]	TBD	Soil	TBD	COPCs (TBD)	1 (each location)	SOP-07, SOP-08, SOP-11
11SD01	11SD010006	Sediment	0-0.5	SVOCs/Low Level PAHs	1	SOP-09
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
				TOC	1	
	11SD010612	Sediment	0.5-1.0	SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
				TOC	1	
11SD02	11SD020006 and 11SDF	Sediment	0-0.5	SVOCs/Low Level PAHs	1 + 1 FD	SOP-09
				Pesticides/PCBs	1 + 1 FD	
				Metals/Cyanide	1 + 1 FD	
				Dioxins/Furans	1 + 1 FD	
				TOC	1 + 1 FD	
	11SD020612	Sediment	0.5-1.0	SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
				Dioxins/Furans	1	
				TOC	1	
11SD03	11SD030006	Sediment	0-0.5	SVOCs/Low Level PAHs	1	SOP-09
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
				TOC	1	
	11SD030612	Sediment	0.5-1.0	SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
				TOC	1	

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]
11SD04	11SD040006	Sediment	0-0.5	SVOCs/Low Level PAHs	1	SOP-09
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
				TOC	1	
	11SD040612	Sediment	0.5-1.0	SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
				TOC	1	
11TW01	11GW0101 and 11GWFDMMDDYYNN[2]	Groundwater	Shallow (<20)	VOCs	1 + 1 FD	SOP-11, SOP-14, SOP-15, SOP-16, SOP-17
				SVOCs/Low Level PAHs	1 + 1 FD	
				Pesticides/PCBs	1 + 1 FD	
				Metals/Cyanide	1 + 1 FD	
11TW02	11GW0201	Groundwater	Shallow (<20)	VOCs	1	SOP-11, SOP-14, SOP-15, SOP-16, SOP-17
				SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11TW03	11GW0301	Groundwater	Shallow (<20)	VOCs	1	SOP-11, SOP-14, SOP-15, SOP-16, SOP-17
				SVOCs/Low Level PAHs	1	
				Pesticides/PCBs	1	
				Metals/Cyanide	1	
11MWT01 to MWTXX[8]	11MWT0101 to 11MWTXX01	Groundwater	TBD	COPCs (TBD)	1 (each location)	SOP-11, SOP-12, SOP-13, SOP-14, SOP-15, SOP-16, SOP-17

1 SOP or worksheet that describes the sample collection procedures (Worksheet No. 21).
2 FD locations may change in the field based on visual and olfactory observations and PID readings; "MMDDYY" represents date collected; NN represents the sequential number of this type of QC sample collected on that date
3 Depth of samples will be determined in the field; "NNNN" represents top and bottom sample depth. For example, if sample is collected from 4- to 6-feet bgs, the depth will be recorded as 0406.
4 If there are no PID readings or visual observations that cause a subsurface depth to be selected in a biased manner, then the 4- to 6-foot bgs depth interval will be selected.
5 Up to 12 additional "step-out" samples may be collected at the discretion of the Tetra Tech FOL during the initial screening sampling event.
6 Up to 30 additional "step-out" samples may be collected to delineate COPCs.
7 Additional random background samples may be collected to support risk assessments. The sample quantities and sample locations will be determined using VSP.
8 The number of permanent monitoring wells and their locations will be determined by the Project Team based on the initial screening sample event data.

SAP Worksheet No. 19 -- Analytical SOP Requirements Table

(UFP-QAPP Manual Section 3.1.1)

MATRIX	ANALYTICAL GROUP	ANALYTICAL AND PREPARATION METHOD/ SOP REFERENCE [1]	CONTAINERS (number, size, and type)	SAMPLE VOLUME (units)	PRESERVATION REQUIREMENTS (chemical, temperature, light protected)	MAXIMUM HOLDING TIME (preparation/ analysis)
Groundwater and aqueous QC samples	VOCs	SW-846 5030/8260B, Empirical SOP-202	Three 40-milliliter (mL) glass vials	5 mL	Hydrochloric acid (HCl) to pH<2; cool to ≤6 °C; no headspace	14 days to analysis
Soil and sediment	VOCs	SW-846 5035/8260B, Empirical SOP-202/225	Three 5-gram (g) Encore samplers or terracores	5 g	Sodium bisulfate in water, Cool to ≤6 °C; methanol, freeze to < -10 °C	48 hours from sampling to preparation, 14 days to analysis
Groundwater and aqueous QC samples	SVOCs (Including Low Level PAHs)	SW-846 3510C/3520/ 8270C/8270C-Low, Empirical SOP-201/300	Two 1-liter (L) glass amber bottles	1,000 mL	Cool to ≤6 °C	7 days until extraction, 40 days to analysis
Soil and sediment	SVOCs (Including Low Level PAHs)	SW-846 3546/8270C/ 8270C-Low, Empirical SOP-201/343	One 4-ounce (oz) glass jar	30 g	Cool to ≤6 °C	14 days until extraction, 40 days to analysis
Groundwater and aqueous QC samples	Pesticides/ PCBs	SW-846 3510C/3520/ 8081B/8082A, Empirical SOP-211/302	Two 1-L glass amber bottles	1,000 mL	Cool to ≤6 °C	7 days until extraction, 40 days to analysis
Soil and sediment	Pesticides/ PCBs	SW-846 3546/ 3550/8081B/8082A, Empirical SOP-211/343	One 4-oz glass jar	30 g	Cool to ≤6 °C	14 days until extraction, 40 days to analysis
Groundwater and aqueous QC samples	Metals, Including Mercury (and Dissolved Metals)	SW-846 3010A/ 6010C/7470A, Empirical SOP-100/103/105	One 500-mL plastic bottle	50 mL / 30 mL for mercury	Nitric acid to pH <2; Cool to ≤6 °C	180 days to analysis except mercury, 28 days for mercury
Soil and sediment	Metals, Including Mercury	SW-846 3050B/ 6010C/7471A, Empirical SOP-100/104/105	One 4-oz glass jar	1 to 2 grams / 0.3 g for mercury	Cool to ≤6 °C	180 days to analysis except mercury, 28 days for mercury

MATRIX	ANALYTICAL GROUP	ANALYTICAL AND PREPARATION METHOD/ SOP REFERENCE [1]	CONTAINERS (number, size, and type)	SAMPLE VOLUME (units)	PRESERVATION REQUIREMENTS (chemical, temperature, light protected)	MAXIMUM HOLDING TIME (preparation/ analysis)
Groundwater and aqueous QC samples	Cyanide	SW-846 9012A, Empirical SOP-164/175	One 250-mL plastic bottle	50 mL	Sodium hydroxide (NaOH) to a pH > 12; Cool to ≤6 °C	14 days to analysis
Soil and sediment	Cyanide	SW-846 9012A, Empirical SOP-164	One 4-oz glass jar	5 g	Cool to ≤6 °C	14 days to analysis
Aqueous QC samples	Dioxins/ Furans	SW-846 8290A, CFA CF-OA-E-001, CF-OA-E-002	Two 1-L glass amber bottles	1,000 mL	Cool to ≤6 °C	30 days for extraction, 45 days for analysis
Soil and sediment	Dioxins/ Furans	SW-846 8290A, CFA CF-OA-E-001, CF-OA-E-002	One 8-oz glass jar with Teflon®-lined lid	30 g	Cool to ≤6 °C	30 days for extraction, 45 days for analysis
Sediment	TOC	Lloyd Kahn, Empirical SOP-221	One 4-oz glass jar	30 g	Cool to ≤6 °C	14 days to analysis

Notes:

1 Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet No.23).

SAP Worksheet No. 20 -- Field Quality Control Sample Summary Table

(UFP-QAPP Manual Section 3.1.1)

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates	No. of MS/MSDs[1]	No. of Equip. Blanks	No. of Trip Blanks	Total No. of Samples to Lab
Soil	VOCs	12	2	2/2	1	1	16
	SVOCs/Low Level PAHs	30	4	3/3	2	NA	36
	PCBs	26	4	3/3	2	NA	32
	Pesticides	26	4	3/3	2	NA	32
	Metals/Cyanide	26	4	3/3	2	NA	32
	Dioxins/Furans	11	2	1/1	1	NA	14
Sediment	SVOCs/Low Level PAHs	8	1	1/1	0	NA	9
	Pesticides	8	1	1/1	0	NA	9
	PCBs	8	1	1/1	0	NA	9
	Metals/Cyanide	8	1	1/1	0	NA	9
	TOC	8	1	1/1	0	NA	9
	Dioxins/Furans	2	1	1/1	0	NA	3
Groundwater	VOCs	3	1	1/1	1	1	6
	SVOCs/Low Level PAHs	3	1	1/1	1	NA	5
	PCBs	3	1	1/1	1	NA	5
	Pesticides	3	1	1/1	1	NA	5
	Total Metals/Cyanide	3	1	1/1	1	NA	5
	Dissolved Metals	0 Minimum, 3 Maximum	1	1/1	1[2]	NA	5

[1] Although the MS/MSD is not typically considered a field QC, it is included here because location determination is often established in the field. The MS/MSD are not included in the Total No. of Samples sent to the Lab. For Total and Dissolved Metals, an MD will be collected in place of an MSD.

[2] The equipment blank for the Dissolved Metals, if collected, will be obtained by passing rinse water through a 0.45-micron filter.

The quantities identified above are for the initial screening sampling event. Additional samples may be required, but cannot be quantified at this time.

SAP Worksheet No. 21 -- Project Sampling SOP References Table

(UFP-QAPP Manual Section 3.1.2)

Reference Number	Title, Revision Date and/or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP-01	Global Positioning System, 12/10 Rev. 0	Tetra Tech	GPS unit	Y (project-specific)	Contained in Appendix A
SOP-02	Sample Labeling, 12/10, Rev. 0	Tetra Tech	NA	Y (project-specific)	Contained in Appendix A
SOP-03	Sample Identification Nomenclature, 02/11 , Rev. 1	Tetra Tech	NA	Y (project-specific)	Contained in Appendix A
SOP-04	Sample Custody and Documentation of Field Activities, ,02/11 Rev. 1	Tetra Tech	Field logbook, sample log sheets, boring logs	Y (project-specific)	Contained in Appendix A
SOP-05	Sample Preservation, Packaging, and Shipping, , Rev. 0	Tetra Tech	NA	Y (project-specific)	Contained in Appendix A
SOP-06	Decontamination of Field Sampling Equipment, 12/10, Rev. 0	Tetra Tech	Decontamination equipment, scrub brushes, 5-gallon buckets, spray bottles, phosphate free detergent, deionized water	Y (project-specific)	Contained in Appendix A
SOP-07	Soil Coring and Sampling Using Hand Auger Techniques, 02/11, Rev. 1	Tetra Tech	Stainless steel auger bucket, extension rods, and T-handle	Y (project-specific)	Contained in Appendix A
SOP-08	Soil Sample Logging, 12/10, Rev. 0	Tetra Tech	NA	Y (project-specific)	Contained in Appendix A
SOP-09	Sediment Sampling, 02/11, Rev. 1	Tetra Tech	Stainless steel or disposable trowels	Y (project-specific)	Contained in Appendix A
SOP-10	Management of Investigation-Derived Waste, 12/10, Rev. 0	Tetra Tech	NA	Y (project-specific)	Contained in Appendix A
SOP-11	Subsurface Soil and Groundwater Sampling Using Direct-Push Technology, 12/10, Rev. 0	Tetra Tech	DPT Rig	Y (project-specific)	Contained in Appendix A
SOP-12	Monitoring Well Installation, 12/10, Rev. 0	Tetra Tech	NA	Y (project-specific)	
SOP-13	Monitoring Well Development, 12/10, Rev. 0	Tetra Tech	NA	Y (project-specific)	Contained in Appendix A
SOP-14	Measurement of Water Levels, 12/10, Rev. 0	Tetra Tech	NA	Y (project-specific)	Contained in Appendix A
SOP-15	Low-Flow Well Purging and Stabilization, 12/10, Rev. 0	Tetra Tech	NA	Y (project-specific)	Contained in Appendix A
SOP-16	Monitoring Well Sampling, 12/10, Rev. 0	Tetra Tech	NA	Y (project-specific)	Contained in Appendix A
SOP-17	Calibration and Care of Water Quality Meters, 12/10, Rev. 0	Tetra Tech	Multi-parameter water quality meter, such as a Horiba U-22	Y (project-specific)	Contained in Appendix A

SAP Worksheet No. 22 -- Field Equipment Calibration, Maintenance, Testing, and Inspection Table

(UFP-QAPP Manual Section 3.1.2.4)

FIELD EQUIPMENT	ACTIVITY[1]	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION (CA)	RESPONSIBLE PERSON	SOP REFERENCE[2]	COMMENTS
Water Quality Meter (YSI 600 Series or Equivalent)	Visual Inspection Calibration/ Verification	Daily Beginning and end of day	Manufacturer's guidance	Operator correction or replacement	Tetra Tech FOL or designee	GH-2.8, SA-1.1, SA-1.2, Manufacturer's Guidance Manual	None.
Turbidity Meter (LaMotte 2020 or equivalent)	Visual Inspection Calibration/ Verification	Daily Beginning and end of day	Manufacturer's guidance; calibrations must bracket expected values; Initial Calibration Verification (ICV) must be <5 Nephelometric Turbidity Units (NTUs).	Operator correction or replacement	Tetra Tech FOL or designee	Manufacturer's Guidance Manual	To be used to determine the need to collect Dissolved Metals samples (if >5 NTUs).
Electric Water Level Indicator and Oil/Water Interface Probe	Visual Inspection Field checks as per manufacturer	Daily Once upon receiving from vendor	0.01 foot accuracy	Operator correction or replacement	Tetra Tech FOL or designee	GH-1.2, Manufacturer's Guidance Manual	None.
Photoionization Detector	Visual Inspection Calibration/ Verification	Daily Beginning and end of day	Manufacturer's Guidance	Operator correction or replacement	Tetra Tech FOL or designee	SA-1.1, SA-1.2, SA-1.3, GH-1.2, GH-1.3, GH-1.5, GH-2.8, Manufacturer's Guidance Manual	To be used to determine the soil boring depth that is most impacted for biased sample collection.

Notes:

1 Activities may include: calibration, verification, testing, maintenance, and/or inspection.
2 Specify the appropriate reference letter or number from the Project Sampling SOP References table (Worksheet No.21).

SAP Worksheet No. 23 – Analytical SOP References Table

(UFP-QAPP Manual Section 3.2.1)

LAB SOP NUMBER	TITLE, REVISION DATE, AND/OR NUMBER	DEFINITIVE OR SCREENING DATA	MATRIX AND ANALYTICAL GROUP	INSTRUMENT	ORGANIZATION PERFORMING ANALYSIS	MODIFIED FOR PROJECT WORK? (Y/N)
Empirical SOP-100	Metals Digestion/ Preparation, Methods 3005A/ USEPA CLP ILMO 4.1 Aqueous, 3010A, 3030C, 3050B, USEPA CLP ILMO 4.1 (Soil/Sediment), 200.7, Standard Methods 3030C (Revision 21, 09/21/10)	Definitive	Soil, sediment, groundwater, and aqueous QC samples/ Metals Digestion	NA/Preparation	Empirical	N
Empirical SOP-103	Mercury Analysis in Water by Manual Cold Vapor Technique, Methods USEPA SW846 7470A and 245.1, CLP-M 4.1 (Revision 18, 04/11/10)	Definitive	Groundwater, and aqueous QC samples/ Mercury	Flow Injection Mercury Analyzer	Empirical	N
Empirical SOP-104	Mercury Analysis in Soil/Sediment by Manual Cold Vapor Technique, Methods SW846 7471A, 7471B, 245.5, and CLP-ILM 4.1 (Revision 19, 04/11/10)	Definitive	Soil and sediment/ Mercury	Flow Injection Mercury Analyzer	Empirical	N
Empirical SOP-105	Metals by Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) Technique, SW-846 Methods 6010B, 6010C, USEPA Method 200.7, Standard Methods 19th Edition 2340B, USEPA CLP ILMO 4.1 (Revision 16, 04/11/10)	Definitive	Soil, sediment, groundwater, and aqueous QC samples/ Metals	ICP-AES	Empirical	N
Empirical SOP-164	Distillation of Aqueous/Solid Samples for Cyanide, Total and Amenable, SW846 Method 9012A, USEPA Methods 335.1, 335.4, Standard Methods SM4500-CN C, G, 18th and 19th ED/ USEPA CLP ILMO 4.1 (Revision 15, 03/25/10)	Definitive	Soil, sediment, groundwater, and aqueous QC samples/ Cyanide Digestion	NA/ Distillation	Empirical	N

LAB SOP NUMBER	TITLE, REVISION DATE, AND/OR NUMBER	DEFINITIVE OR SCREENING DATA	MATRIX AND ANALYTICAL GROUP	INSTRUMENT	ORGANIZATION PERFORMING ANALYSIS	MODIFIED FOR PROJECT WORK? (Y/N)
Empirical SOP-175	Post-Distillation Analysis for Cyanide by Lachat Flow Injection Analyzer, Methods 335.4, SW846 9012A, USEPA-CLP 4.1; Addendum for USEPA CLP ILM 05.2 Aqueous/Soil/ Sediment (Revision 11, 09/07/10)	Definitive	Soil, sediment, groundwater, and aqueous QC samples/ Cyanide	Automated Ion Analyzer	Empirical	N
Empirical SOP-201	Gas Chromatography Mass Spectrometry (GC/MS) semivolatiles and Low-Concentration PAHs using USEPA Method 625 and SW846 Method 8270C and 8270D, Including Appendix IX Compounds (Revision 20, 04/26/10)	Definitive	Soil, sediment, groundwater, and aqueous QC samples/ SVOCs	GC/MS	Empirical	N
Empirical SOP-202	GC/MS Volatiles using USEPA Method 624 and SW846 Method 8260B, Including Appendix IX Compounds (Revision 23, 09/09/10)	Definitive	Soil, sediment, groundwater, and aqueous QC samples/ VOCs	GC/MS	Empirical	N
Empirical SOP-211	Gas Chromatography/ Electron Capture Detector (GC/ECD) Organochlorine Pesticides/ PCBs using USEPA Method 608608.2 or SW846 Method 8081A/8082 or 8081B/8082A (Revision 22, 07/07/10)	Definitive	Soil, sediment, groundwater, and aqueous QC samples/ PCBs	GC/ECD	Empirical	N
Empirical SOP-221	TOC SM5310C, SW846 Method 9060/9060A and Lloyd Kahn Method (Revision 9, 07/12/10)	Definitive	Sediment/ TOC	TOC Analyzer	Empirical	N
Empirical SOP-225	GC/MS Volatile Non-Aqueous Matrix Extraction using SW-846 Method 5035 for 8260B Analysis (Revision 9, 9/07/10)	Definitive	Soil and sediment/ VOCs Extraction	GC/MS	Empirical	N
Empirical SOP-300	GC/MS- Semivolatile BNA-Aqueous Matrix Extraction using SW-846 Method 3510C for 8270/625 Analysis (Revision 18, 04/26/10)	Definitive	Groundwater, and aqueous QC samples/ SVOCs Extraction	NA/ Extraction	Empirical	N

LAB SOP NUMBER	TITLE, REVISION DATE, AND/OR NUMBER	DEFINITIVE OR SCREENING DATA	MATRIX AND ANALYTICAL GROUP	INSTRUMENT	ORGANIZATION PERFORMING ANALYSIS	MODIFIED FOR PROJECT WORK? (Y/N)
Empirical SOP-302	Pesticide/PCBs, Aqueous Matrix Extraction for USEPA 608/608.2 and SW846 Method 8081A/8082 Using SW846 Method 3510C (Revision 17, 04/26/10)	Definitive	Groundwater, and aqueous QC samples/ PCBs Extraction	NA/ Extraction	Empirical	N
Empirical SOP-343	BNA, Pesticides/PCBs, and TPH non-Aqueous Matrix (Microwave Extraction) using SW-846 3546 (Revision 01, 09/09/10)	Definitive	Soil and sediment/ SVOCs and PCBs Extraction	NA/ Extraction	Empirical	N
Empirical SOP-QS-10	Laboratory Sample Receiving Log-in and Storage Standard Operating Procedures (Revision 14, 09/07/10)	NA	Log-in	NA/ Log-in	Empirical	N
Empirical SOP-QS-14	Analytical Laboratory Waste Disposal (Revision 6, 08/31/10)	Definitive	Disposal	NA / Disposal	Empirical	N
CFA CF-OA-E-001	SOP for Dioxin/ Furan/ PCB Congener Sample Processing (Revision 2, February 2010) (not in Appendix B)	Definitive	Soil, sediment, groundwater, and aqueous QC samples/ Dioxins/Furans	NA/ Extraction	CFA	N
CFA CF-OA-E-002	Standard Operating Procedure for the Analysis of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans using High Resolution GC/MS (USEPA SW-846 Method 8290, USEPA Method 1613B, USEPA SW-846 Method 0023A) (Revision 4, September 2009) (not in Appendix B)	Definitive	Soil, sediment, groundwater, and aqueous QC samples/ Dioxins/Furans	High Resolution GC/MS	CFA	N
CFA CF-SR-E-001	Sample Receipt, Login, and Storage (not in Appendix B)	Definitive	Log-in	NA/ Log-in	CFA	N
CFA CF-LB-G-001	Laboratory Waste Management Plan (not in Appendix B)	Definitive	Disposal	NA/ Disposal	CFA	N

Copies of laboratory SOPs listed are included in Appendix B, except for proprietary SOPs, which are noted as not included, but are available for review.

SAP Worksheet No. 24 – Analytical Instrument Calibration Table

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
GC/MS VOCs	Bromofluoro-benzene (BFB) Tune	Prior to each Initial Calibration (ICAL) and at the beginning of each 12-hour period.	Must meet the ion abundance criteria required by the method (SW8260B; Section 7.3.1; Table 4).	Retune and/or clean or replace source. No samples may be accepted without a valid tune.	Analyst/ Supervisor	Empirical SOP-202
	ICAL – a minimum of a 5-point calibration is prepared for all target analytes	Upon instrument receipt, for major instrument changes, or when continuing calibration verification (CCV) does not meet criteria.	The average response factor (RF) for System Performance Check Compound (SPCCs) must be ≥ 0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane, ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane. The percent relative standard deviation (%RSD) for RFs for calibration check compounds (CCCs) must be ≤ 30%; and %RSD for each target analyte must be ≤ 15%, or the linear regression correlation coefficient (r) must be ≥ 0.995; or the coefficient of determination (r^2) must be ≥ 0.99 (6 points are required for second order).	Correct problem then repeat ICAL. No samples may be run until ICAL has passed.	Analyst/ Supervisor	
	Retention Time (RT) Window Position Establishment	Once per ICAL for each analyte and surrogate.	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA.	Analyst / Supervisor	
	Evaluation of Relative Retention Times (RRTs)	With each sample.	RRT of each target analyte must be within ± 0.006 RRT units.	Correct problem, then rerun ICAL.	Analyst / Supervisor	
	Initial Calibration Verification (ICV) – Second Source	Once after each ICAL, prior to beginning a sample run.	The percent recovery (%R) for all target analytes must be within 80-120% of true values.	Correct problem and verify ICV. If that fails, correct problem and repeat ICAL. No samples may be run until ICV has been verified.	Analyst/ Supervisor	

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
GC/MS VOCs (continued)	CCV	Perform one per 12-hour analysis period after tune and before sample analysis.	The minimum RF for SPCCs must be ≥ 0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane, ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane. The percent difference or percent drift (%D) for all target analytes and surrogates must be ≤ 20%.	Correct problem and rerun CCV. If that fails, repeat ICAL and reanalyze all samples analyzed since the last successful CCV.	Analyst/ Supervisor	Empirical SOP-202
GC/MS SVOCs and Low Level PAHs	Tune Verification – decafluoro-triphenyl-phosphine (DFTPP)	Prior to each ICAL and at the beginning of each 12-hour analytical sequence.	Must meet the ion abundance criteria required by the method (SW8270D; Section 7.3.1; Table 3), dichlorodiphenyltrichloroethane (DDT) degradation ≤20% (exclusion for LOW PAH analysis).	Retune and/or clean or replace source. No samples may be accepted without a valid tune.	Analyst/ Supervisor	Empirical SOP-201
	Breakdown Check (DDT only)	At the beginning of each 12-hour analytical sequence.	The degradation must be ≤ 20% for DDT to verify inertness of the injection port.	Correct the problem then repeat breakdown check. No samples shall be run until degradation is ≤20% for DDT.	Analyst/ Supervisor	
	ICAL – A minimum of a 5-point calibration is prepared for all target analytes	Upon instrument receipt, instrument change (new column, source cleaning, etc.), when CCV is out of criteria.	The average RF for SPCCs must be ≥ 0.050. The %RSD for RFs for CCCs must be ≤ 30%; and %RSD for each target analyte must be ≤ 15%, or r must be ≥ 0.995; or r^2 must be ≥ 0.99 (minimum of 6 points required for second order).	Correct problem then repeat ICAL. No samples may be run until ICAL has passed.	Analyst/ Supervisor	
	ICV – Second Source	Perform after each ICAL, prior to beginning a sample run.	The %R of all target analytes must be within 75-125% of the true value. SPCC RFs must be ≥ 0.050; CCCs must be ≤ 20%D.	Correct problem and verify ICV. If that fails, correct problem and repeat ICAL. No samples may be run until ICV has been verified.	Analyst/ Supervisor	
	RT Window Position Establishment	Once per ICAL for each analyte and surrogate.	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA.	Analyst / Supervisor	
	Evaluation of RTs	With each sample.	RT of each target analyte must be within ± 0.006 RRT units.	Correct problem, then rerun ICAL.	Analyst / Supervisor	

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
GC/MS SVOCs and Low Level PAHs (continued)	CCV	Analyze a standard at the beginning of each 12-hour shift after tune and before sample analysis.	SPCC RFs must be ≥ 0.050; All target analytes and surrogates must be ≤ 20%D.	If %D is high and sample result is non detect (ND), qualify/narrate with project approval. If %D is low or project approval not received, reanalyze all samples since the last successful CCV.	Analyst/ Supervisor	Empirical SOP-201
GC/ECD Pesticides	Breakdown Check – Endrin/DDT	At the beginning of each 12 hour period, prior to analysis of samples.	The degradation must be ≤ 15% for both DDT and Endrin to verify the inertness of the injection port.	Correct the problem then repeat breakdown check. No samples shall be run until degradation is ≤15% for both DDT and Endrin.	Analyst/ Supervisor	Empirical SOP-211
	ICAL – A minimum of a 5-point calibration of individual pesticides, with a mid-point calibration of toxaphene and chlordane, is prepared for all target analytes	Upon instrument receipt, major instrument change, or when the CCV does not meet criteria, prior to sample analysis.	The % RSD for RFs for each target analyte must be ≤ 20%, or r must be ≥ 0.995, or r^2 must be ≥ 0.99 (minimum of 6 points required for second order).	Correct problem and repeat ICAL. If a single-point calibration for toxaphene or chlordane is used and toxaphene or chlordane is identified in analysis of a sample, a minimum of a 5-point ICAL of the identified compound with reanalysis of sample must be performed. No samples may be run until ICAL has passed.	Analyst/ Supervisor	
	ICV – Second Source	Once after each ICAL prior to sample analysis.	The %R of all target analytes must be within 80-120% of true value.	Correct problem and verify ICV. If that fails, correct problem and repeat ICAL. No samples may be run until ICV has been verified.	Analyst/ Supervisor	
	CCV	Analyze standard at the beginning and end of sequence and after every 10 samples.	The %D of all target analytes must be ≤20%.	If %D is high and sample result is nondetect, qualify/narrate with project approval. If %D is low or project approval not received, reanalyze all samples since the last successful CCV.	Analyst/ Supervisor	

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
GC/ECD PCBs	ICAL - A minimum of a 5-point calibration of Aroclor 1660 (1016/1260 mixture) is prepared	Upon instrument receipt, major instrument change, when CCV does not meet criteria.	Option 1: %RSD must ≤20% for Aroclor 1016/1260. If not met, Option 2: r must be ≥ 0.995; or Option 3: r^2 must be ≥ 0.99 for 6-point calibration. Mid-point calibration of other Aroclors – if an Aroclor is detected in a sample, a minimum of 5-point ICAL must be performed and meet the above criteria.	Correct problem then repeat ICAL. No samples may be run until ICAL has passed.	Analyst/ Supervisor	Empirical SOP-211
	ICV – Second Source	Once after each ICAL prior to sample analysis.	The %R of all target analytes must be within 80-120% of true value.	Correct problem and verify ICV. If that fails, correct problem and repeat ICAL. No samples may be run until ICV has been verified.	Analyst/ Supervisor	
	CCV	Analyze standard at the beginning and end of sequence and after every 10 samples.	The %D of all target analytes must be ≤20%.	If %D is high and sample result is ND, qualify/narrate with project approval. If %D is low or project approval not received, reanalyze all samples since the last successful CCV.	Analyst/ Supervisor	
ICP-AES Metals	ICAL - a 1-point calibration per manufacturer's guidelines is prepared for all target analytes	At the beginning of each day, or if the QC is out of criteria, prior to sample analysis.	None; only one high standard and a calibration blank must be analyzed. If more than one calibration standard is used, r must be ≥ 0.995.	Recalibrate and/or perform the necessary equipment maintenance. Check the calibration standards. Reanalyze the affected data.	Analyst/ Supervisor	Empirical SOP-100/105
	ICV – Second Source	Following ICAL, prior to the analysis of samples.	The %R of all target analytes must be within 90-110% of true value.	Investigate reasons for failure, reanalyze once. If still unacceptable, correct problem and repeat ICAL.	Analyst/ Supervisor	
	CCV	At the beginning and end of the sequence and after every 10 samples.	The %R of all target analytes must be within 90-110% of true value.	Recalibrate and/or perform the necessary equipment maintenance. Check the calibration standards. Reanalyze all affected samples.	Analyst/ Supervisor	
	Initial Calibration Blank (ICB)	Before beginning a sample sequence.	No target analytes detected > LOD.	Correct the problem, then re-prepare and reanalyze.	Analyst / Supervisor	

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
	Continuing Calibration Blank (CCB)	After the initial CCV, after every 10 samples, and at the end of the sequence.	No target analytes detected > LOD.	Correct the problem, then re-prepare and reanalyze calibration blank and all affected samples.	Analyst / Supervisor	
	Low-Level Check Standard (if using 1-point ICAL)	Daily after 1-point ICAL and before samples.	The %R of all target analytes must be within 80-120% of true value.	Investigate and perform necessary equipment maintenance. Recalibrate and reanalyze all affected samples.	Analyst / Supervisor	
	Interference Check Standards (ICS – ICS A and ICS B)	At the beginning of an analytical run.	The absolute value of ICS A recoveries for non-spiked analytes must be < LOD; and ICS B recoveries must be within 80-120 %R of true value.	Terminate analysis; locate and correct problem; reanalyze ICS.	Analyst / Supervisor	
Mercury Analyzer Mercury	ICAL – A minimum of a 5-point calibration is prepared	Perform daily prior to sample analysis.	The %RSD for RFs must be ≤ 20%, or r must be ≥ 0.995.	Correct problem then repeat ICAL. No samples may be run until ICAL has passed.	Analyst/ Supervisor	Empirical SOP-103/104
	ICB	Before beginning a sample sequence.	No mercury detected > LOD.	Correct problem, then re-prepare and reanalyze.	Analyst / Supervisor	
	ICV - Second Source	Once after each ICAL and prior to sample analysis	The %R must be within 90-110% of the true value.	Correct problem and verify ICV. If that fails, correct problem and repeat ICAL. No samples may be run until ICV has been verified.	Analyst / Supervisor	
	CCB	After each CCV, after every 10 samples, and at the end of the sequence	No mercury detected > LOD.	Investigate source of contamination, rerun any samples not bracketed by passing blanks.	Analyst / Supervisor	
	CCV	At beginning and end of each run sequence and every 10 samples.	The %R must be within 80-120% of the true value.	Correct problem and rerun CCV. If that fails, repeat ICAL and reanalyze all samples analyzed since the last successful CCV.	Analyst / Supervisor	

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
	CCV (undistilled)	CCV (undistilled) at the beginning and end of each run sequence and after every 10 samples.	The %R must be within 90-100% of true value.	If the CCV (undistilled) fails high, report samples that are <LOQ. Recalibrate and/or reanalyze samples back to last acceptable CCV.	Analyst / Supervisor	
Lachat Cyanide	ICAL– A minimum of a 6-point calibration is prepared	Perform daily prior to sample analysis.	r must be ≥ 0.995. All calibration standards must be distilled if samples are expected to contain sulfides.	Correct problem then repeat ICAL. No samples may be run until ICAL has passed.	Analyst, Supervisor	Empirical SOP-164/175
	ICV – Second Source	At the start of every sequence prepared fresh daily (undistilled), prior to sample analysis.	The %R must be within 85-115% of true value.	Correct problem and verify ICV. If that fails, correct problem and repeat ICAL. No samples may be run until ICV has been verified.	Analyst, Supervisor	
	ICB	After the ICV (undistilled).	Must be < LOQ for the target analyte.	Determine source of contamination, correct problem, and restart sequence.	Analyst, Supervisor	
	CCV	Every 10 samples (undistilled).	The %R must be within 85-115% of true value.	Correct problem and rerun CCV. If that fails, repeat ICAL and reanalyze all samples analyzed since the last successful CCV.	Analyst, Supervisor	
	ICV (distilled, high and low)	Once per ICAL.	The %R must be within 85-115% of true value.	Determine cause for failure, correct problem, and redistill standards.	Analyst, Supervisor	
High Resolution GC/MS Dioxins/ Furans	Tune / Mass Resolution Check	At the beginning and the end of each 12-hour period of analysis.	Static resolving power must be ≥ 10,000 (10% valley) for identified masses per method and lock-mass ion between lowest and highest masses for each descriptor and level of reference must be ≤ 10% full-scale deflection.	Retune instrument and verify. Assess data for impact. If end resolution is less than 10,000, narrate or re-inject, as necessary.	Analyst, Supervisor	CFA CF-OA-E-002

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
	GC Column Performance Check Solution (CPCS)	Prior to ICAL or CCV.	Peak separation between 2,3,7,8-TCDD and other TCDD isomers must result in a valley of ≤ 25% per method; and identification of all first and last eluters of the eight homologue retention time windows and documentation by labeling (F/L) on the chromatogram; and absolute retention times for switching from one homologous series to the next ≥ 10 seconds for all components of the mixture.	1) Readjust windows. 2) Evaluate system. 3) Perform maintenance. 4) Reanalyze CPSM. 5) No CA is necessary if 2,3,7,8-TCDD is not detected and the % valley is greater than 25%.	Analyst, Supervisor	
	ICAL – a minimum of a 5-point calibration is prepared for all target analytes	Prior to sample analysis, as needed by the failure of CCV, and when a new lot is used as a standard source.	Ion abundance ratios must be within limits specified in SOP; and signal to noise ratio (S/N) must be ≥ 10:1 for all target analyte ions; and RSD must be ≤ 20% for RFs for all 17 unlabelled standards and 9 labeled ISs.	Correct problem, then repeat ICAL. No samples may be run until ICAL has passed.	Analyst, Supervisor	
	CCV	At the beginning of each 12-hour period, and at the end of each analytical sequence.	Ion abundance ratios must be in accordance with SOP; and RF (unlabelled standards) must be ≤ 20%D of average RF from ICAL; and RF (labeled standards) must be ≤ 30%D of average RF from ICAL.	Correct problem, repeat CCV. If CCV fails, repeat ICAL and reanalyze all samples analyzed since last successful CCV End of Run CCV: If RF (unlabeled standards) >20%D and ≤25%D and/or RF (labeled standards) >30%D and ≤35%D of the average RF from ICAL, then use mean RF from bracketing CCVs to quantitate impacted samples instead of the ICAL mean RF value. If bracketing CCVs differ by more than 25% RPD (unlabeled) or 35% RPD (labeled), then run a new ICAL within 2 hours, and re-quantitate samples. Otherwise, reanalyze samples with positive detections.	Analyst, Supervisor	

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
TOC Analyzer TOC	ICAL – a minimum of a 5-point calibration is prepared	Upon instrument receipt, major instrument change, or when the CCV does not meet criteria.	The RSD for RFs for the target analyte must be ≤ 20%, or r must be ≥ 0.995.	Correct problem then repeat ICAL. No samples may be run until ICAL has passed.	Analyst, Department Manager	Empirical SOP-221
	ICV – Second Source	Once after each ICAL prior to sample analysis.	The %R must be within 90-110% of true value.	Correct problem and verify ICV. If that fails, correct problem and repeat ICAL. No samples may be run until ICV has been verified.	Analyst, Department Manager	
	CCV	Analyze standard at the beginning and end of sequence and after every 10 samples.	The %R must be within 90-110% of true value.	Correct problem and rerun CCV. If that fails, repeat ICAL and reanalyze all samples analyzed since the last successful CCV.	Analyst, Department Manager	

SAP Worksheet No. 25 – Analytical Instrument/Equipment Maintenance, Testing, and Inspection Table

(UFP-QAPP Manual Section 3.2.3)

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference[1]
GC/MS	Check pressure and gas supply daily. Bake out trap and column, change septa as needed, cut column as needed, change trap as needed. Other maintenance specified in Equipment Maintenance SOP.	VOCs/ SVOCs (Including Low Level PAHs)	Ion source, injector liner, column, column flow, purge lines, purge flow, trap.	Prior to ICAL and/or as necessary.	Acceptable ICAL and CCV.	Correct the problem and repeat ICAL or CCV.	Analyst/ Supervisor	Empirical SOP-201/202
GC/ECD	Check pressure and gas supply daily. Bake out column, change septa and/or liner as needed, replace or cut column as needed. Other maintenance specified in Equipment Maintenance SOP.	Pesticides and PCBs	Injector liner, septa, column, column flow.	Prior to ICAL and/or as necessary.	Acceptable ICAL and CCV.	If % D > 20% and samples are < LOD, narrate. If %D > 20% only on one column, narrate. If % D > 20% for closing CCV, and is likely due to matrix interference, narrate. Otherwise, reanalyze all samples since the last acceptable CCV.	Analyst/ Supervisor	Empirical SOP-211/329
ICP-AES	Clean the torch assembly and the spray chamber when they become discolored or when degradation in data quality is observed. Clean the nebulizer, and check the argon supply. Replace the peristaltic pump tubing as needed.	Metals (Except Mercury)	Inspect the torch, nebulizer chamber, pump, and tubing	Prior to ICAL and as necessary.	Acceptable ICAL and CCV.	Correct the problem and repeat ICAL or CCV.	Analyst/ Supervisor	Empirical SOP-100/105
Mercury Analyzer	Replace peristaltic pump tubing, replace mercury lamp, replace drying tube, clean optical cell and/or clean liquid/gas separator as needed. Other maintenance specified in Equipment Maintenance SOP.	Mercury	Inspect the tubing, filter, and the optical cell	Prior to ICAL and as necessary.	Acceptable ICAL and CCV.	Correct the problem and repeat ICAL or CCV.	Analyst/ Supervisor	Empirical SOP-103/104

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference[1]
Lachat	Check and clean segments weekly, clean reagent tubes monthly. Change lamp, change diluent and wash tubes, change mixing paddles and syringes, and change dispensing needle, all as needed. Other maintenance specified in laboratory Equipment Maintenance SOP.	Cyanide	Tubing and rollers.	Prior to ICAL or as necessary.	Acceptable ICAL and CCV.	Recalibrate and/or perform necessary equipment maintenance. Reanalyze samples not bracketed by passing CCV.	Analyst, Supervisor	Empirical SOP-164/175
High Resolution GC/MS	Parameter Setup	Dioxins/ Furans	Physical check.	Initially; prior to daily calibration check.	Correct Parameters.	Reset if incorrect.	Analyst, Supervisor	CFA CF-OA-E-002
	Tune Check		Conformance to instrument tuning.	Initially; prior to daily calibration check.	Compliance to ion abundance criteria.	Correct the problem and repeat tune check.	Analyst, Supervisor	
TOC Analyzer	Replace sample tubing, clean sample boat, replace syringe.	TOC	Tubing, sample boat, syringe.	As needed.	Must meet ICAL and continuing calibration criteria.	Repeat maintenance activity or remove from service.	Analyst/ Supervisor	Empirical SOP-221

Notes:

1 Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet No.23).

SAP Worksheet No. 26 -- Sample Handling System

(UFP-QAPP Manual Appendix A)

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): George Ten Eyck / Tetra Tech
Sample Packaging (Personnel/Organization): George Ten Eyck / Tetra Tech
Coordination of Shipment (Personnel/Organization): George Ten Eyck / Tetra Tech
Type of Shipment/Carrier: Overnight courier service (Federal Express)
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Custodians/ Empirical and CFA
Sample Custody and Storage (Personnel/Organization): Sample Custodians/ Empirical and CFA
Sample Preparation (Personnel/Organization): Extraction Laboratory, Metals Preparation Laboratory, Dioxins Preparation Laboratory / Empirical and CFA
Sample Determinative Analysis (Personnel/Organization): GC Laboratory, GC/MS Laboratory, Metals Laboratory, Dioxins Laboratory/ Empirical and CFA
SAMPLE ARCHIVING
Field Sample Storage (Number of days from sample collection): 60 days from receipt
Sample Extract/Digestate Storage (number of days from extraction/digestion): 3 months from sample digestion/extraction
Biological Sample Storage (Number of days from sample collection): NA
SAMPLE DISPOSAL
Personnel/Organization: Sample Custodians/ Empirical and CFA

SAP Worksheet No. 27 – Sample Custody Requirements Table

(UFP-QAPP Manual Section 3.3.3)

Field Sample Custody Procedures

The laboratories will provide pre-preserved sample containers for sample collection. Following sample collection into the appropriate bottle ware, all samples will be immediately placed on ice in a cooler. Glass sample containers will be enclosed in bubble-wrap in order to protect the bottle ware during shipment. The cooler will be secured using strapping tape along with a signed custody seal. Sample coolers will be delivered to a local courier location for priority overnight delivery to the selected laboratory for analysis. Samples will be preserved as appropriate based on the analytical method. Samples will be maintained at <6 °C until delivery to the laboratories. Proper custody procedures will be followed throughout sample collection and handling.

Chain-of-custody protocols will be used throughout sample handling to establish the evidentiary integrity of samples. These protocols will be used to demonstrate that the samples were handled and transferred in a manner that would eliminate possible tampering. Samples for the laboratory will be packaged and shipped in accordance with Tetra Tech SOP-05 (Appendix A).

Chain-of-Custody Procedures

After collection, each sample will be maintained in the sampler's custody until formally transferred to another party (e.g., Federal Express). For all samples collected, chain-of-custody forms will document the date and time of sample collection, the sampler's name, and the names of all others who subsequently held custody of the sample. Specifications for chemical analyses will also be documented on the chain-of-custody form. Tetra Tech SOP-04 provides further details on the chain-of-custody procedure (Appendix A). Chain-of-custody requirements are also documented with instructions contained in each shipment from the laboratories.

Laboratory Sample Custody Procedures

Chain-of-custody requirements are also documented with instructions contained in each shipment from the laboratory (Empirical SOP-QS-10 [Sample Receiving and Sample Storage] and CFA Sample Receipt, Login, and Storage SOP CF-SR-E-001), which are provided in Appendix B.

Sample Designation System

Each sample collected for analysis will be assigned a unique sample tracking number that will consist of a multi-segment alphanumeric code that identifies the site, sample location, sample type (sample medium or QC sample designation), sample location, and sample depth. SOP-03 addresses sample identification nomenclature (Appendix A).

SAP Worksheet No. 28 -- Laboratory QC Samples Table

(UFP-QAPP Manual Section 3.4)

Matrix	**Soil, Sediment, Groundwater, and Aqueous QC Samples**
Analytical Group	**VOCs**
Analytical Method / SOP Reference	**SW-846 8260B Empirical SOP-202**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria
Method Blank	One per preparatory batch of 20 or fewer samples	All target analytes must be ≤ ½ LOQ, except common lab contaminants, which must be < LOQ.	Investigate source of contamination and rerun method blank prior to analysis of samples, if possible. Evaluate the samples and associated QC: if blank results are above LOQ, then report sample results that are <LOQ or >10X the blank concentration. Re-prepare and reanalyze blank and those samples that were >LOQ and <10X the blank.	Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits
Laboratory Control Sample (LCS)/ Laboratory Control Sample Duplicate (LCSD) (not required)	One per preparatory batch of 20 or fewer samples.	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM. RPD must be ≤ 30% (for LCS/LCSD, if LCSD is performed).	Evaluate and reanalyze if possible. If an MS/MSD was performed in the same 12 hour clock and acceptable, then narrate. If the LCS %Rs are high, but the sample results are <LOQ, then narrate. Otherwise, re-prepare and reanalyze the LCS and associated samples.	Analyst, Laboratory Department Manager, and Data Validator	Accuracy/ Bias Precision also, if LCSD is analyzed	Same as QC Acceptance Limits
MS/MSD	One per preparatory batch of 20 or fewer samples of similar matrix	%Rs must meet the DoD Quality Systems Manual (QSM) Version 4.1 limits as per Appendix G of the DoD QSM. The RPD between MS and MSD should be ≤ 30%.	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPDs indicate obvious extraction/ analysis difficulties, then re-prepare and reanalyze MS/MSD.	Analyst, Supervisor, Data Validator	Accuracy/ Bias/ Precision	Same as QC Acceptance Limits

Matrix	**Soil, Sediment, Groundwater, and Aqueous QC Samples**
Analytical Group	**VOCs**
Analytical Method / SOP Reference	**SW-846 8260B Empirical SOP-202**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards (IS)	Every field sample, standard, and QC sample - three per sample- Fluorobenzene Chlorobenzene-d5 1,4-dichlorobezene-d4	RTs must be within ± 30 seconds and the response areas must be within -50% to +100% of the ICAL midpoint standard for each IS.	Inspect mass spectrometer and gas chromatograph for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits
Surrogates	All field and QC samples - four per sample- Dibromofluoromethane 1,2-dichloroethane-d4 Toluene-d8 BFB	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM.	If sample volume is available, then re-prepare and reanalyze sample for confirmation of matrix interference when appropriate.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results detected between DL and LOQ.	NA	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits

Matrix	**Soil, Sediment, Groundwater, and Aqueous QC Samples**
Analytical Group	**SVOCs and Low Level PAHs**
Analytical Method / SOP Reference	**SW-846 8270C, 8270C-Low Empirical SOP-201**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparatory batch of 20 or fewer samples of similar matrix	All target analytes must be ≤ ½ LOQ, except common lab contaminants, which must be < LOQ.	Investigate source of contamination. Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results are above RL, report sample results that are < RL or > 10X the blank concentration. Reanalyze blank and samples >RL and < 10X the blank.	Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits
LCS	One per preparatory batch of 20 or fewer samples of similar matrix	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM (except low level PAHs that are provided in Appendix B).	Evaluate and reanalyze if possible. If an MS/MSD was performed in the same 12-hour clock and is acceptable, then narrate. If the LCS recoveries are high, but the sample results are <LOQ, then narrate. Otherwise, re-prepare and reanalyze the LCS and associated samples.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
MS/MSD	One per preparatory batch of 20 or fewer samples of similar matrix	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM (except low level PAHs that are provided in Appendix B). The RPD between MS and MSD should be ≤ 30%.	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met, unless RPDs indicate obvious extraction/ analysis difficulties, then re-prepare and reanalyze MS/MSD.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits

Matrix	**Soil, Sediment, Groundwater, and Aqueous QC Samples**
Analytical Group	**SVOCs and Low Level PAHs**
Analytical Method / SOP Reference	**SW-846 8270C, 8270C-Low/ Empirical SOP-201**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
IS	Every field sample, standard, and QC sample - six per sample 1,4-Dichlorobenzene-d4 Naphthalene-d8 Acenaphthene-d10 Phenanthrene-d10 Chrysene-d12 Perylene-d12	RTs must be within ± 30 seconds and the response areas must be within -50% to +100% of the ICAL midpoint standard for each IS.	Re-analyze affected samples.	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits
Surrogates	All field and QC samples - six per sample 2-Fluorophenol Phenol-d6 Nitrobenzene-d5 2-Fluorobiphenyl 2,4,6-Tribromophenol Terphenyl-d14	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM (except low level PAHs that are provided in Appendix B).	(1) Check chromatogram for interference; if found, then flag data. (2) If not found, then check instrument performance; if problem is found, then correct and reanalyze sample. (3) If still out, then re-extract and reanalyze sample. (4) If reanalysis is out, then flag data.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results detected between DL and LOQ.	NA	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits

Matrix	**Soil, Sediment, Groundwater, and Aqueous QC Samples**
Analytical Group	**Pesticides/ PCBs**
Analytical Method / SOP Reference	**SW-846 8081B, 8082A Empirical SOP-211**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparatory batch of 20 or fewer samples of similar matrix	All target analytes must be ≤ ½ LOQ.	Investigate source of contamination. Evaluate the samples and associated QC: i.e., if the blank results are above the LOQ, then report sample results that are <LOQ or > 10X the blank concentration. Otherwise, re-prepare a blank and samples >LOQ and <10X LOQ.	Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits
LCS	One per preparatory batch of 20 or fewer samples of similar matrix Pesticide: Spike with single component pesticide mix PCB: Spike with Aroclor 1016/1260 mix	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM.	If an MS/MSD was performed and is acceptable, then narrate. If a LCS/ LCSD were performed and only one of the set was unacceptable, then narrate. If the LCS recovery is high, but the sample results are <LOQ, then narrate. Otherwise, re-extract blank and affected sample batch.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
MS/MSD	One per preparatory batch of 20 or fewer samples of similar matrix (spike same as LCS)	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM. The RPD between MS and MSD should be ≤ 30%.	Evaluate the samples and associated QC and if the LCS results are acceptable, then narrate. If both the LCS and MS/MSD are unacceptable, then re-prepare the samples and QC.	Analyst, Supervisor, Data Validator	Accuracy/ Bias/ Precision	Same as QC Acceptance Limits

Matrix	**Soil, Sediment, Groundwater, and Aqueous QC Samples**
Analytical Group	**Pesticides/ PCBs**
Analytical Method / SOP Reference	**SW-846 8081B, 8082A Empirical SOP-211**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogates	All field and QC samples - two per sample Tetrachloro-m-xylene Decachlorobiphenyl	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM.	No corrective will be taken when one surrogate is within criteria. If surrogates recoveries are high and sample is <LOQ, then no CA is taken. If surrogates recoveries are low, then the affected samples are re-extracted and reanalyzed.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
Second Column Confirmation	All positive results must be confirmed.	Results between primary and second column must be RPD ≤ 40%. For Method 8082, report the higher of the two concentrations, unless there is interference.	None. Apply "J" flag if RPD >40% and discuss in the case narrative.	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits

Matrix	**Soil, Sediment, Groundwater, and Aqueous QC Samples**
Analytical Group	**Metals (Including Mercury), Total and Dissolved**
Analytical Method / SOP Reference	**SW-946 6010C, 7470A, 7471A Empirical SOP-103, 104, 105**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparatory batch of 20 or fewer samples of similar matrix	All target analytes must be ≤ ½ LOQ, except common lab contaminants, which must be < LOQ.	If the blank value > LOQ, then report sample results. If the blank value < LOQ or > 10x the blank value, then redigest. If blank value is less than negative LOQ, then report sample results. If > 10x the absolute value of the blank result, then redigest and reanalyze.	Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits
LCS	One per preparatory batch of 20 or fewer samples of similar matrix	%R must be within 80-120% of true value.	Evaluate and reanalyze, if possible. If the LCS recoveries are high, but the sample results are < LOQ, then narrate. Otherwise, re-digest and reanalyze all associated samples for failed target analyte(s).	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
MS	One per preparatory batch of 20 or fewer samples of similar matrix	%R should be within 80-120% of true value (if sample is < 4x spike added).	Flag results for affected analytes for all associated samples with "N".	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
Sample Duplicate	One per preparatory batch of 20 or fewer samples of similar matrix	The RPD should be ≤ 20% for duplicate samples for both water and soils.	Narrate any results that are outside control limits.	Analyst, Supervisor, and Data Validator	Precision	Same as QC Acceptance Limits
Serial Dilution (ICP Only)	One per preparatory batch with sample concentration(s) >50x LOD	The 5-fold dilution result must agree within ±10%D of the original sample result if result is >50x LOD.	Perform post spike addition.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits

Matrix	**Soil, Sediment, Groundwater, and Aqueous QC Samples**
Analytical Group	**Metals (Including Mercury), Total and Dissolved**
Analytical Method / SOP Reference	**SW-946 6010C, 7470A, 7471A Empirical SOP-103, 104, 105**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Post Spike (ICP Only)	One is performed when serial dilution fails or target analyte concentration(s) in all samples are < 50x LOD	The %R must be within 75-125% of expected value to verify the absence of an interference. Spike addition should produce a concentration of 10-100x LOQ.	Flag results for affected analytes for all associated samples with "J".	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits

Matrix	**Soil, Sediment, Groundwater, and Aqueous QC Samples**
Analytical Group	**Cyanide**
Analytical Method / SOP Reference	**SW-946 9010B, 9012A Empirical SOP-164, 175**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparatory batch of 20 or fewer samples of similar matrix	Cyanide must be ≤ ½ LOQ.	Stop analysis, correct problem, and recalibrate.	Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits
LCS	One per preparatory batch of 20 or fewer samples of similar matrix	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM.	Re-prepare and reanalyze the LCS and all associated samples.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
MS	One per preparatory batch of 20 or fewer samples of similar matrix	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM.	Flag data with an "N", unless recovery is > 4x the spike added; If the sample results exceed 4x the spike added, then spike the un-spiked aliquot of the sample at 2x the indigenous level or 2x the LOQ.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
Sample Duplicate	One per preparatory batch of 20 or fewer samples of similar matrix	RPD should be ≤ 20%, if concentration is > 5x LOQ; or within ± the LOQ, if the concentration is < 5x LOQ.	Flag data for associated samples with an "*".	Analyst, Supervisor, and Data Validator	Precision	Same as QC Acceptance Limits

Matrix	**Soil, Sediment, and Aqueous QC Samples**
Analytical Group	**Dioxins/Furans**
Analytical Method / SOP Reference	**SW-846 8290A/ CFA CF-OA-E-002**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparatory batch of 20 or fewer samples	All target analytes must be ≤ LOQ.	Correct problem. If required, re-prepare and reanalyze method blank and all samples processed with the contaminated blank. "Totals" are not considered "target analytes" – no CA or flagging is necessary for "totals".	Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits
IS	Every field sample, standard and QC sample	The %R for each IS must be within 25-150%, per method.	Correct problem, then re-prepare and reanalyze the samples with failed IS.	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits
LCS	One per preparatory batch of 20 or fewer samples of similar matrix	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM.	Correct problem, then re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for failed target analytes, if sufficient sample material is available.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
MS/MSD	One per preparatory batch of 20 or fewer samples of similar matrix	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM. The RPD between MS and MSD should be ≤ 30%.	Identify problem; if not related to matrix interference, re-extract and reanalyze MS/MSD and all associated batch samples in accordance with DoD QSM requirements.	Analyst, Supervisor, Data Validator	Accuracy/ Bias/ Precision	Same as QC Acceptance Limits

Matrix	**Sediment Samples**
Analytical Group	**TOC**
Analytical Method / SOP Reference	**Lloyd Kahn Empirical SOP-221**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparatory batch of 20 or fewer samples	The target analyte must be ≤ ½ LOQ.	Correct problem, re-prepare and reanalyze along with associated samples.	Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits
Calibration Blank	At the beginning of analytical sequence, after every 10 samples, at the end of the sequence	The target analyte concentration must be < LOD.	Correct problem, re-prepare, and reanalyze along previous 10 samples.	Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits
LCS	One per preparatory batch of 20 or fewer samples	%R must be within 80-120% of true value.	Correct problem, re-prepare, and reanalyze along with associated samples.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
MS/MSD	One per preparatory batch of 20 or fewer samples per matrix	%R should be within 80-120% of true value. RPD should be ≤ 20%.	Contact client for guidance.	Analyst, Supervisor, Data Validator	Accuracy/ Bias/ Precision	Same as QC Acceptance Limits

SAP Worksheet No. 29 -- Project Documents and Records Table

(UFP-QAPP Manual Section 3.5.1)

Document	Where Maintained
Field Documents Field Logbook (and sampling notes) Field Sample Forms forms (e.g. boring logs, sample log sheets, drilling logs, etc.) Chain-of-Custody Records Sample Shipment Air Bills Sampling Instrument Calibration Logs Photographs FTMR Forms This SAP Field Sampling SOPs Health and Safety Plan	Field documents will be maintained in the project file located in the Tetra Tech Cincinnati, Ohio office.
Laboratory Documents Sample Receipt, Custody, and Tracking Record Equipment Calibration Logs Analysis Run Logs Corrective Action Forms Reported Results for Standards, QC Checks, and QC Samples Raw Data Data Completeness Checklist	Laboratory documents will be included in the hardcopy and Portable Document Format (PDF) deliverables from the laboratory. Laboratory data deliverables will be maintained in the Tetra Tech Cincinnati, Ohio project file and in long-term data package storage at a third-party professional document storage firm. Electronic data results will be maintained in a database on a password protected Structured Query Language (SQL) server.
Assessment Findings All versions of the SAP All letter and e-mail correspondence with regulatory agencies, including approvals and comments Data Validation Memoranda (includes tabulated data summary forms)	All assessment documents will be maintained in the Tetra Tech Cincinnati, Ohio project file.
Reports SWMU 11 RFI Report.	All versions of the RFI Report, and all support documents (e.g., Data Validation Reports) will be stored in hardcopy in the Tetra Tech Cincinnati, Ohio project file and electronically in the server library.

SAP Worksheet No. 30 -- Analytical Services Table

(UFP-QAPP Manual Section 3.5.2.3)

MATRIX	ANALYTICAL GROUP	SAMPLE LOCATIONS/ IDENTIFICATION NUMBERS	ANALYTICAL METHOD	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)
Groundwater, soil, and sediment	VOCs	See Worksheet No.18	SW-846 8260B	21 calendar days	Kim Kostzer kkostzer@empirlabs.com Empirical Laboratories, LLC 621 Mainstream Drive, Suite 270 Nashville, TN 37228 615-345-1115	NA
	SVOCs (Including Low Level PAHs)		SW-846 8270C and 8270C-Low			
	Pesticides		SW-846 8081B			
	PCBs		SW-846 8082A			
	Metals, Total and Dissolved (Including Mercury)		SW-846 6010C/ 7470A/ 7471A			
	Cyanide		SW-846 9012A			
	TOC		Lloyd Kahn			
Soil and sediment	Dioxins/Furans	See Worksheet No.18	SW-846 8290A	21 calendar days	Chris Cornwell ccornwell@cfanalytical.com Cape Fear Analytical, LLC 3306 Kitty Hawk Road Suite 120 Wilmington, NC 28405 910-795-0422	NA

SAP Worksheet No. 31 -- Planned Project Assessments Table

(UFP-QAPP Manual Section 4.1.1)

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 CA (title and organizational affiliation)	PERSON(S) RESPONSIBLE FOR MONITORING EFFECTIVENESS OF CA (title and organizational affiliation)
Laboratory System Audit[1]	Every 2 years	External	DoD ELAP Accrediting Body	DoD ELAP Accrediting Body Auditor	Laboratory QAM or Laboratory Manager, Empirical and CFA	Laboratory QAM or Laboratory Manager, Empirical and CFA	Laboratory QAM or Laboratory Manager, Empirical and CFA

[1] Empirical and CFA are DoD ELAP accredited by a recognized Accrediting Body. The DoD ELAP accreditation letter is included in Appendix B.

SAP Worksheet No. 32 -- Assessment Findings and Corrective Action Responses

(UFP-QAPP Manual Section 4.1.2)

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, organization)	Timeframe for Response
Laboratory System Audit	Written audit report	Randy Ward, Laboratory QAM, Empirical Mike Larkins, Laboratory QAM, CFA	Specified by DoD ELAP Accrediting Body	Letter	DoD ELAP Accrediting Body	Specified by DoD ELAP Accrediting Body

SAP Worksheet No. 33 -- QA Management Reports Table

(UFP QAPP Manual Section 4.2)

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)
Data Validation Report	Per Sample Delivery Group (SDG)	Within 3 weeks after receiving the data from the laboratory	Project Chemist or Data Validator, Tetra Tech	PM, Tetra Tech; project file
Major Analysis Problem Identification (Internal Memorandum)	When persistent analysis problems are detected	Immediately upon detection of problem – on the same day	QAM, Tetra Tech	PM, Tetra Tech; QAM, Tetra Tech; Program Manager, Tetra Tech; project file
Project Monthly Progress Report	Monthly for duration of the project	Monthly	PM, Tetra Tech	PM, Tetra Tech; QAM, Tetra Tech; Program Manager, Tetra Tech; project file
Laboratory QA Report	When significant plan deviations result from unanticipated circumstances	Immediately upon detection of problem (on the same day)	Laboratory PM, Empirical and CFA	PM and project file, Tetra Tech

SAP Worksheet No. 34 -- Verification (Step I) Process Table

(UFP-QAPP Manual Section 5.2.1)

VERIFICATION INPUT	DESCRIPTION	INTERNAL/ EXTERNAL	RESPONSIBLE FOR VERIFICATION (name, organization)
Chain-of-Custody Forms	The Tetra Tech FOL or designee will review and sign the chain-of-custody form to verify that the samples listed are included in the shipment to the laboratory and the sample information is accurate. The forms will be signed by the sampler and a copy will be retained for the project file, the Tetra Tech PM, and the Tetra Tech Data Validators.	Internal	Sampler and FOL, Tetra Tech
	The Empirical and CFA Laboratory Sample Custodian will review the sample shipment for completeness, integrity, and sign accepting the shipment. The Tetra Tech Data Validators will check that the chain-of-custody form was signed and dated by the Tetra Tech FOL or designee relinquishing the samples and also by the Laboratory Sample Custodian receiving the samples for analyses.	Internal/ External	1 - Laboratory Sample Custodian, Empirical and CFA 2 - Data Validators, Tetra Tech
SAP Sample Tables/ Chain-of-Custody Forms	Verify that all proposed samples listed in the SAP tables have been collected.	Internal	FOL or designee, Tetra Tech
Sample Log Sheets	Verify that information recorded in the log sheets is accurate and complete.	Internal	FOL or designee, Tetra Tech
SAP/ Field Logs/ Analytical Data Packages	Ensure that all sampling SOPs were followed. Verify that deviations have been documented and MPCs have been achieved. Particular attention should be given to verify that samples were correctly identified, that sampling location coordinates are accurate, and that documentation establishes an unbroken trail of documented chain-of-custody from sample collection to report generation. Verify that the correct sampling and analytical methods/SOPs were applied. Verify that the sampling plan was implemented and carried out as written and that any deviations are documented.	Internal	PM or designee, Tetra Tech
SAP/ Analytical SOPs/ Analytical Data Packages	Ensure that all laboratory SOPs were followed. Verify that the correct analytical methods/SOPs were applied.	Internal	Laboratory QAM, Empirical and CFA
SAP/ Laboratory SOPs/ Raw Data/ Applicable Control Limits Tables	Establish that all method QC samples were analyzed and in control as listed in the analytical SOPs. If method QA is not in control, the Laboratory QAM will contact the Tetra Tech PM verbally or via e-mail for guidance prior to report preparation.	Internal	Laboratory QAM, Empirical and CFA
SAP/ Chain-of-Custody Forms	Check that field QC samples listed in Worksheet No.20 were collected as required.	Internal	FOL or designee, Tetra Tech

VERIFICATION INPUT	DESCRIPTION	INTERNAL/ EXTERNAL	RESPONSIBLE FOR VERIFICATION (name, organization)
EDDs/Analytical Data Packages	Each EDD will be verified against the chain-of-custody and hard copy data package for accuracy and completeness. Laboratory analytical results will be verified and compared to the electronic analytical results for accuracy. Sample results will be evaluated for laboratory contamination and will be qualified for false positives using the laboratory method/preparation blank summaries. Positive results reported between the DL and the LOQ will be qualified as estimated. Extraneous laboratory qualifiers will be removed from the validation qualifier.	External	Data Validators, Tetra Tech

Notes: Verification includes field data verification and laboratory data verification. Verification inputs as per Worksheet No.34 will be checked.

SAP Worksheet No. 35 -- Validation (Steps IIa and IIb) Process Table

(UFP-QAPP Manual Section 5.2.2) (Figure 37 UFP-QAPP Manual) (Table 9 UFP-QAPP Manual)

Step IIa / IIb	Validation Input	Description	Responsible for Validation (name, organization)
IIa	SAP/ Sample Log Sheets	Sample Coordinates - Ensure that sample locations are correct and in accordance with the SAP proposed locations. Document any discrepancies in the final report.	PM, FOL, or designee, Tetra Tech
IIa	Chain-of-Custody Forms	Custody - Ensure that the custody and integrity of the samples was maintained from collection to analysis, the custody records are complete, and any deviations are recorded. Review that the samples were shipped and store at the required temperature and sample pH for chemically preserved samples meet the requirements listed in Worksheet No.19. Ensure that the analyses were performed within the holding times listed in Worksheet No.19.	Project Chemist or Data Validators, Tetra Tech
IIa/IIb	SAP/ Laboratory Data Packages/ EDDs	Accuracy - Ensure that the laboratory QC samples listed in Worksheet No.28 were analyzed and that the MPCs listed in Worksheet No.12 were met for all field samples and QC analyses. Check that specified field QC samples were collected and analyzed and that the analytical QC criteria set up for this project were met.	Project Chemist or Data Validators, Tetra Tech
		Precision - Check the field sampling precision by calculating the RPD for FD samples. Check the laboratory precision by reviewing the RPD or percent difference values from laboratory duplicate analyses; MS/MSDs; and LCS/LCSD, if available. Ensure compliance with the methods and project MPCs accuracy goals listed in Worksheet No.12.	
		Representativeness - Check that the laboratory recorded the temperature at sample receipt and the pH of the chemically preserved samples to ensure sample integrity from sample collection to analysis.	
		Completeness - Review the chain-of-custody forms generated in the field to ensure that the required analytical samples have been collected, appropriate sample identifications have been used, and correct analytical methods have been applied. The Tetra Tech Data Validator will verify that elements of the data package required for validation are present, and if not, the laboratory will be contacted and the missing information will be requested. Validation will be performed as per Worksheet No.36. Check that all data have been transferred correctly and completely to the final Structured Query Language database.	

Step IIa / IIb	Validation Input	Description	Responsible for Validation (name, organization)
IIb	SAP/ Laboratory Data Packages/ EDDs	Sensitivity - Ensure that the project LOQs listed in Worksheet No.15 were achieved.	Project Chemist or Data Validators, Tetra Tech
		PSLs - Discuss the impact on reported DLs due to matrix interferences or sample dilutions performed because of the high concentration of one or more other contaminants, on the other target compounds reported as non-detected. Document this usability issue and inform the Tetra Tech PM. Review and add PSLs to the laboratory EDDs. Flag samples and notify the Tetra Tech PM of samples that exceed PSLs listed in Worksheet No.15.	
		QA/QC - Ensure that all QC samples specified in the SAP were collected and analyzed and that the associated results were within prescribed SAP acceptance limits. Ensure that QC samples and standards prescribed in analytical SOPs were analyzed and within the prescribed control limits. If any significant QC deviations occur, the Laboratory QAM shall have contacted the Tetra Tech PM.	
		Deviations - Summarize deviations from methods, procedures, or contracts in the Data Validation Report. Determine the impact of any deviation from sampling or analytical methods and SOPs requirements and matrix interferences effect on the analytical results. Qualify data results based on method or QC deviation and explain all the data qualifications. Print a copy of the project database qualified data depicting data qualifiers and data qualifiers codes that summarize the reason for data qualifications. Determine if the data met the MPCs and determine the impact of any deviations on the technical usability of the data.	

SAP Worksheet No. 36 -- Analytical Data Validation (Steps IIa and IIb) Summary Table

(UFP-QAPP Manual Section 5.2.2.1)

STEP **IIa / IIb**	MATRIX	ANALYTICAL GROUP	VALIDATION CRITERIA	DATA VALIDATOR (title and organizational affiliation)
IIa and IIb	Groundwater, surface water, soil and sediment	VOCs, SVOCs (Including Low Level PAHs), Pesticides, and PCBs	Data validation will be performed using criteria for SW-846 Methods 8260B, 8270C, 8270C-Low, 8081B, and 8082A listed in Worksheets Nos.12, 15, 24, and 28 and the current DoD QSM. If not included in the aforementioned, then the logic outlined in the "USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review" USEPA-540/R-99-008, (USEPA, October 1999) will be used to apply qualifiers to data.	Data Validation Specialist, Tetra Tech
IIa and IIb	Groundwater, surface water, soil and sediment	Metals and Cyanide	Data validation will be performed using criteria for SW-846 Methods 6010C, 7470A, 7471A, and 9012A listed in Worksheets Nos.12, 15, 24, and 28 and the current DoD QSM. If not included in and the aforementioned, then the logic outlined in the "USEPA CLP National Functional Guidelines for Inorganic Data Review", USEPA 540-R-04-004, (USEPA, October 2004) will be used to apply qualifiers to data.	Data Validation Specialist, Tetra Tech
IIa and IIb	Soil and sediment	Dioxins/Furans	Data validation will be performed using criteria for SW-846 Method 8290A listed in Worksheets Nos.12, 15, 24, and 28 and the current DoD QSM. If not included in the aforementioned, then the logic outlined in the "National Functional Guidelines for Chlorinated Dioxin/Furan Data Validation", (USEPA, September 2005) will be used to apply qualifiers to data.	Data Validation Specialist, Tetra Tech

STEP **IIa / IIb**	MATRIX	ANALYTICAL GROUP	VALIDATION CRITERIA	DATA VALIDATOR (title and organizational affiliation)
IIa and IIb	Sediment	TOC	Limited data validation* will be performed using criteria for Methods Lloyd Kahn listed in Worksheets Nos.12, 15, 24, and 28 and the current DoD QSM.	Data Validation Specialist, Tetra Tech

Notes:

* Limited data validation. Limits the data review to specific review parameters (Data Completeness/Data Verification, Holding Times, Calibrations, Blank Contamination, and Detection Limits) to determine gross deficiencies only. The limited data validation is best expressed as a review to preclude the possibility of false negatives and to eliminate false positives. Raw data are not evaluated and sample result verification is not conducted. A formal report, similar to a full data validation report, is prepared but the scope is more limited than a full validation report. The data packages provided by the laboratory will be expansive enough to allow future complete formal data validation, if necessary.

SAP Worksheet No. 37 -- Usability Assessment

(UFP-QAPP Manual Section 5.2.3)

Data Usability Assessment

The usability of the data generated during the project directly affects whether project objectives can be achieved. The following characteristics will be evaluated at a minimum. The results of these evaluations will be included in the project report. The characteristics will be evaluated for multiple concentration levels if the evaluator determines that this is necessary. To the extent required by the type of data being reviewed, the assessors will consult with other technically competent individuals to render sound technical assessments of these DQI characteristics:

Completeness

- For each matrix that was scheduled to be sampled, the Tetra Tech FOL acting on behalf of the Project Team will prepare a table listing planned samples/analyses to collected samples/analyses. If deviations from the scheduled sample collection or analyses are identified, the Tetra Tech PM and Project Risk Assessor will determine whether the deviations compromise the ability to meet project objectives. If they do, the Tetra Tech PM will consult with the Navy RPM and other project team members, as necessary (determined by the Navy RPM), to develop appropriate corrective actions.

Precision

- The Tetra Tech Project Chemist acting on behalf of the Project Team will determine whether precision goals for FD and laboratory duplicates were met. This will be accomplished by comparing duplicate results to precision goals identified in Worksheets Nos.12 and 28. This will also include a comparison of field and laboratory precision with the expectation that FD results will be no less precise than laboratory duplicate results. If the goals are not met, or data have been flagged as estimated (J qualifier), limitations on the use of the data will be described in the project report.

Accuracy

- The Tetra Tech Project Chemist acting on behalf of the Project Team will determine whether the accuracy/bias goals were met for project data. This will be accomplished by comparing percent recoveries of LCS, LCSD, MS, MSD, and surrogate compounds to accuracy goals identified in Worksheet No. 28. This assessment will include an evaluation of field and laboratory contamination; instrument calibration variability; and analyte recoveries for surrogates, MS, and laboratory control samples. If the goals are not met, limitations on the use of the data will be described in the project report. Bias of the qualified results and a description of the impact of identified non-compliances on a specific data package or on the overall project data will be described in the project report.

Representativeness

- A Project Scientist identified by the Tetra Tech PM and acting on behalf of the Project Team will determine whether the data are adequately representative of intended populations, both spatially and temporally. This will be accomplished by verifying that samples were collected and processed for analysis in accordance with the SAP, by reviewing spatial and temporal data variations, and by comparing these characteristics to expectations. The usability report will describe the representativeness of the data for each matrix and analytical fraction. This will not require quantitative comparisons unless professional judgment of the Project Scientist indicates that a quantitative analysis is required.

Comparability

- The Tetra Tech Project Chemist acting on behalf of the Project Team will determine whether the data generated under this project are sufficiently comparable to historical site data generated by different methods and for samples collected using different procedures and under different site conditions. This will be accomplished by comparing overall precision and bias among data sets for each matrix and analytical fraction. This will not require quantitative comparisons unless professional judgment of the Tetra Tech Project Chemist indicates that such quantitative

analysis is required.

Sensitivity

- The Tetra Tech Project Chemist acting on behalf of the Project Team will determine whether project sensitivity goals listed in Worksheet No. 15 were achieved. The overall sensitivity and quantitation limits from multiple data sets for each matrix and analysis will be compared. If sensitivity goals are not achieved, the limitations on the data will be described. The Tetra Tech Project Chemist will enlist the help of the Tetra Tech Risk Assessor to evaluate deviations from planned sensitivity goals.

Project Assumptions and Data Outliers

- The Tetra Tech PM and designated team members will evaluate whether project assumptions are valid. This will typically be a qualitative evaluation but may be supported by quantitative evaluations. The type of evaluation depends on the assumption being tested. Quantitative assumptions include assumptions related to data distributions (e.g., Normal versus log-normal) and estimates of data variability. Statistical tests for outliers will be conducted using standard statistical techniques appropriate for this task. Potential outliers will be removed if a review of the associated indicates that the results have an assignable cause the renders them inconsistent with the rest of the data. During this evaluation, the team will consider whether outliers could be indications of unanticipated site conditions. Consideration will be given to whether outliers represent an unanticipated site condition.

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

After completion of the data validation, the data and data quality will be reviewed to determine whether sufficient data of acceptable quality are available for decision making. In addition to the evaluations described above, a series of inspections and statistical analyses will be performed to estimate these characteristics. The statistical evaluations will include simple summary statistics for target analytes, such as maximum concentration, minimum concentration, number of samples exhibiting non-detected results, number of samples exhibiting positive results, and the proportion of samples with detected and non-detected results. The project team members identified by the Tetra Tech PM will assess whether the data collectively support the attainment of project objectives. They will consider whether any missing or rejected data have compromised the ability to make decisions or to make the decisions with the desired level of confidence. The data will be evaluated to determine whether missing or rejected data can be compensated by other data. Although rejected data will generally not be used, there may be reason to use them in a weight of evidence argument, especially when they supplement data that have not been rejected. If rejected data are used, their use will be supported by technically defensible rationales.

For statistical comparisons and mathematical manipulations, non-detected values will be represented by a concentration equal to one-half the sample-specific reporting limit. Duplicate results (original and duplicate) will not be averaged for the purpose of representing the range of concentrations. However, the average of the original and duplicate samples will be used to represent the concentration at a particular sampled location.

Identify the personnel responsible for performing the usability assessment:

The Tetra Tech PM, Project Chemist, FOL, and Project Scientist will be responsible for conducting the listed data usability assessments. The data usability assessment will be reviewed with the Navy RPM, the Navy ERSM, and the IDEM RPM. If deficiencies affecting the attainment of project objectives are identified, the review will take place either in a face to face meeting or a teleconference depending on the extent of identified deficiencies. If no significant deficiencies are identified, the data usability assessment will simply be documented in the project report and reviewed during the normal document review cycle.

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:

The data will be presented in tabular format, including data qualifications such as estimation (J, UJ) or rejection (R). Written documentation will support the non-compliance estimated or rejected data results. The project report will identify and describe the data usability limitations and suggest re-sampling or other corrective actions, if necessary.

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FIGURES

10-1 Base and Site Location Map
10-2 Site Layout – 2005 Aerial Photograph
10-3 Site Plan
10-4 IA-6 Site Layout – 2005 Aerial Photograph, Building 2981 Concrete Tank
10-5 Conceptual Site Model Schematic
10-6 Human Conceptual Exposure Model Diagram
10-7 Ecological Conceptual Exposure Model Diagram
17-1 IA-1, IA-2, IA-3, and IA-5 Soil Sampling Locations
17-2 IA-4 Soil Sampling Locations
17-3 IA-6 Soil Sampling Locations - Building 2981 Concrete Tank
17-4 IA-7 Sediment and SWMU 11 Groundwater Sampling Locations

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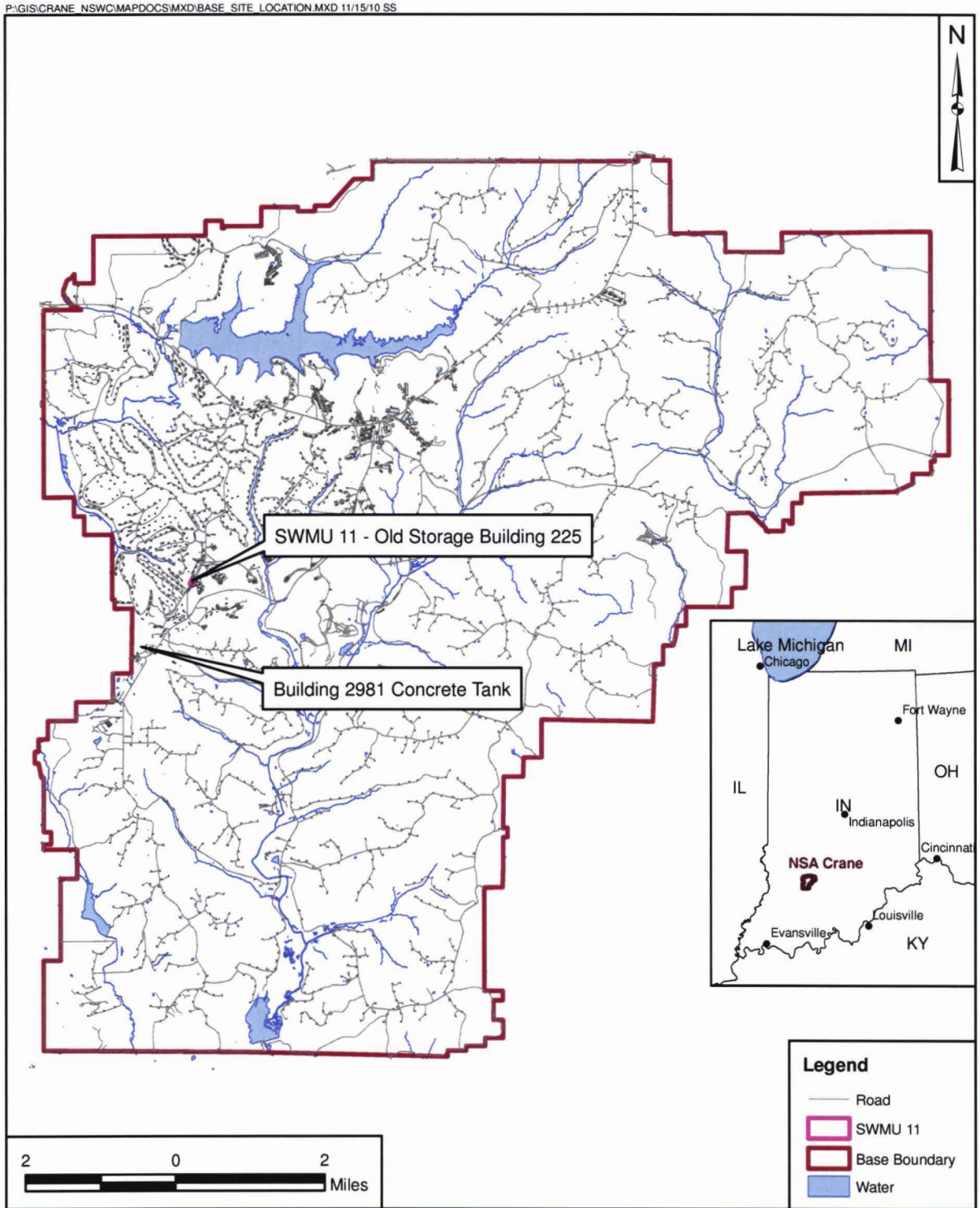

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CHECKED BY G. TEN EYCK	DATE 11/15/10	BASE AND SITE LOCATION MAP SWMU 11 - OLD STORAGE BUILDING 225 NSA CRANE CRANE, INDIANA	APPROVED BY ___ DATE ___
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REVISED BY: S. STROZ	DATE: 12/20/10	
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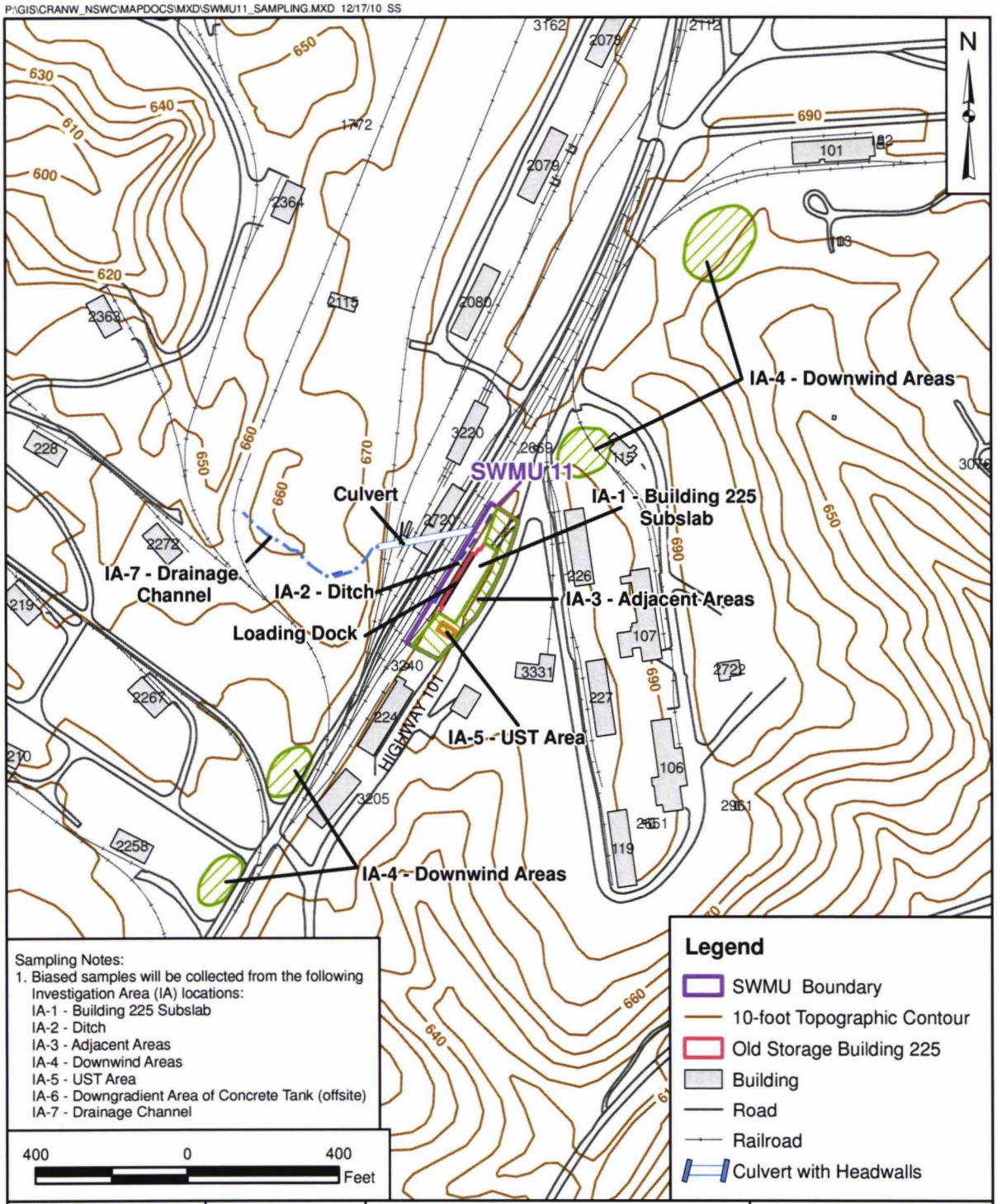

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SITE PLAN
SWMU 11 - OLD STORAGE BUILDING 225
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CRANE, INDIANA

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REVISED BY — DATE	NAVFAC	BUILDING 2981 CONCRETE TANK	APPROVED BY — DATE
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		CRANE, INDIANA	

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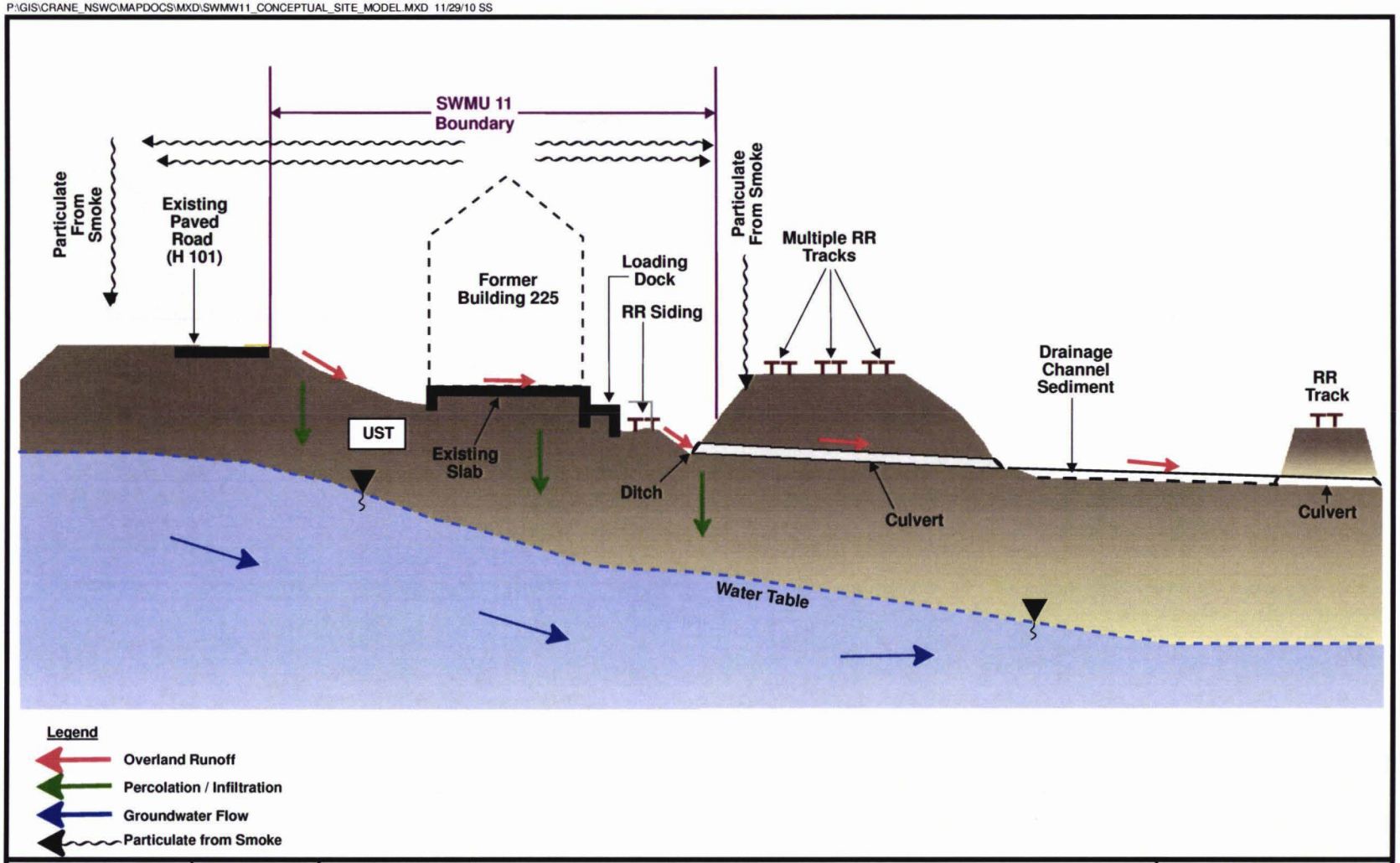
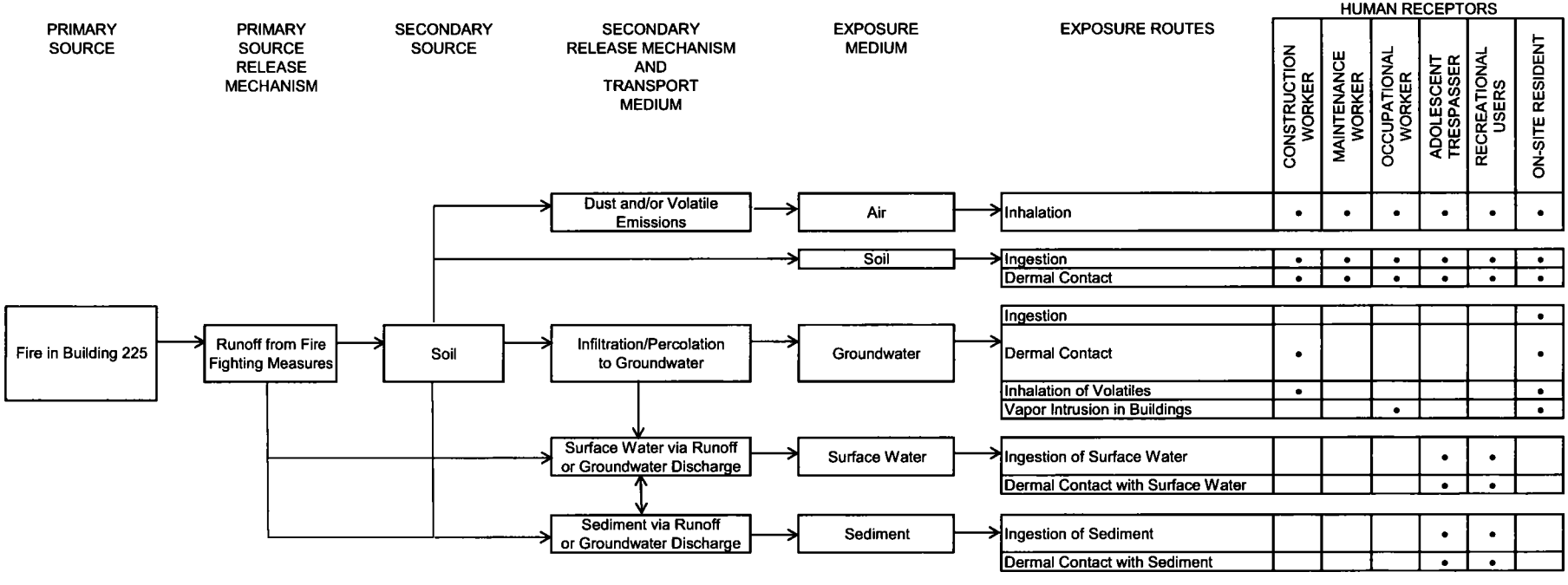


DRAWN BY M. MAGUIRE	DATE 04/09/10	CONCEPTUAL SITE MODEL SCHEMATIC SWMU 11 - OLD STORAGE BUILDING 225 NSA CRANE CRANE, INDIANA
CHECKED BY G. TEN EYCK	DATE 11/16/10	
REVISED BY S. STROZ	DATE 11/29/10	
SCALE NOT TO SCALE		

NAVFAC

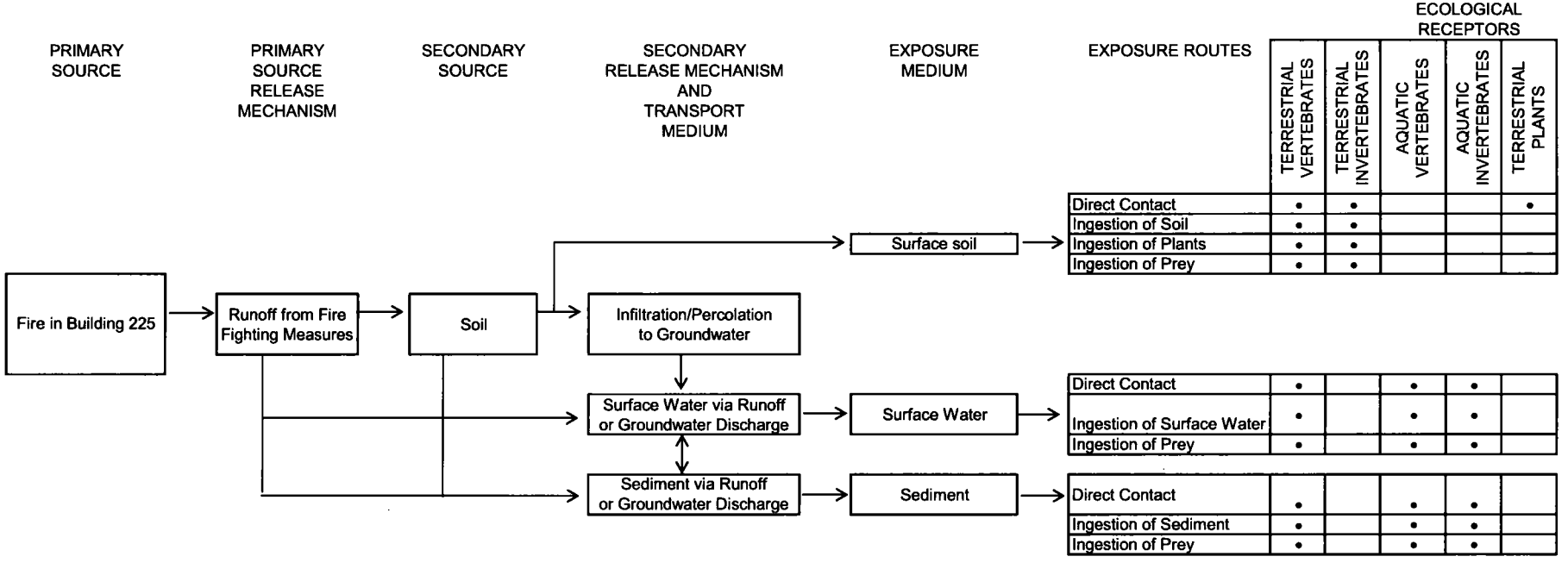
CONTRACT NUMBER	
APPROVED BY ___	DATE ___
APPROVED BY ___	DATE ___
FIGURE NO. FIGURE 10-5	REV 0

FIGURE 10-6
HUMAN CONCEPTUAL EXPOSURE MODEL DIAGRAM
SWMU 11 - OLD STORAGE BUILDING 225
NSA CRANE, INDIANA



• Indicates receptor for evaluation

FIGURE 10-7
ECOLOGICAL CONCEPTUAL EXPOSURE MODEL DIAGRAM
SWMU 11 - OLD STORAGE BUILDING 225
NSA CRANE, INDIANA



• Indicates receptor for evaluation

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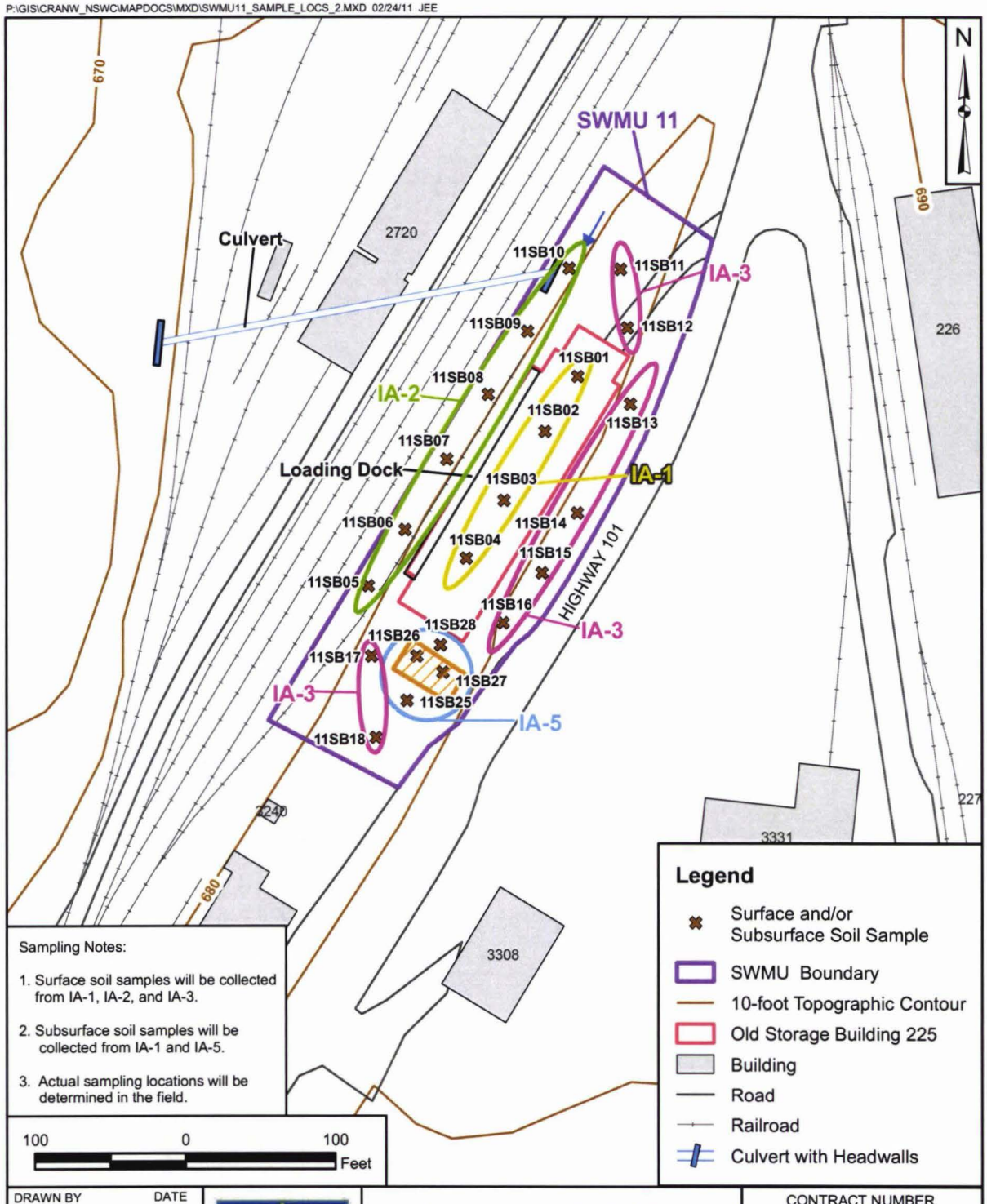

DRAWN BY / DATE	S. STROZ 02/08/10
CHECKED BY / DATE	L. FOSTER 02/24/11
REVISED BY / DATE	J. ENGLISH 02/24/11
SCALE	AS NOTED

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IA-1, IA-2, IA-3, AND IA-5 SOIL SAMPLING LOCATIONS
SWMU 11 - OLD STORAGE BUILDING 225
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO F27E
APPROVED BY / DATE	T. KLIMEK 02/24/11
APPROVED BY / DATE	— —
FIGURE NO.	17-1
REV	0

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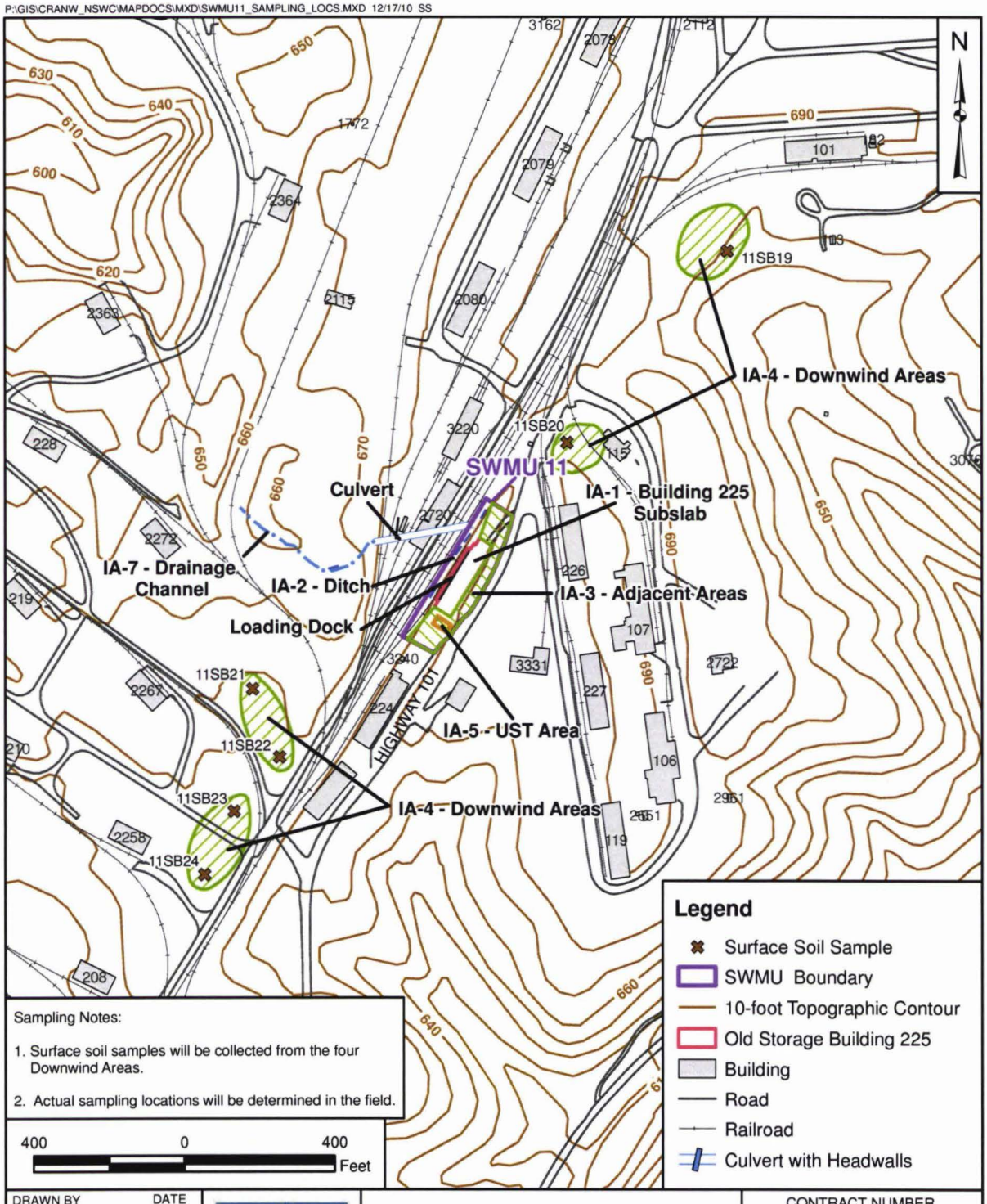

DRAWN BY	DATE
S. STROZ	02/08/10
CHECKED BY	DATE
L. FOSTER	02/24/11
REVISED BY	DATE
J. ENGLISH	02/24/11
SCALE	
AS NOTED	

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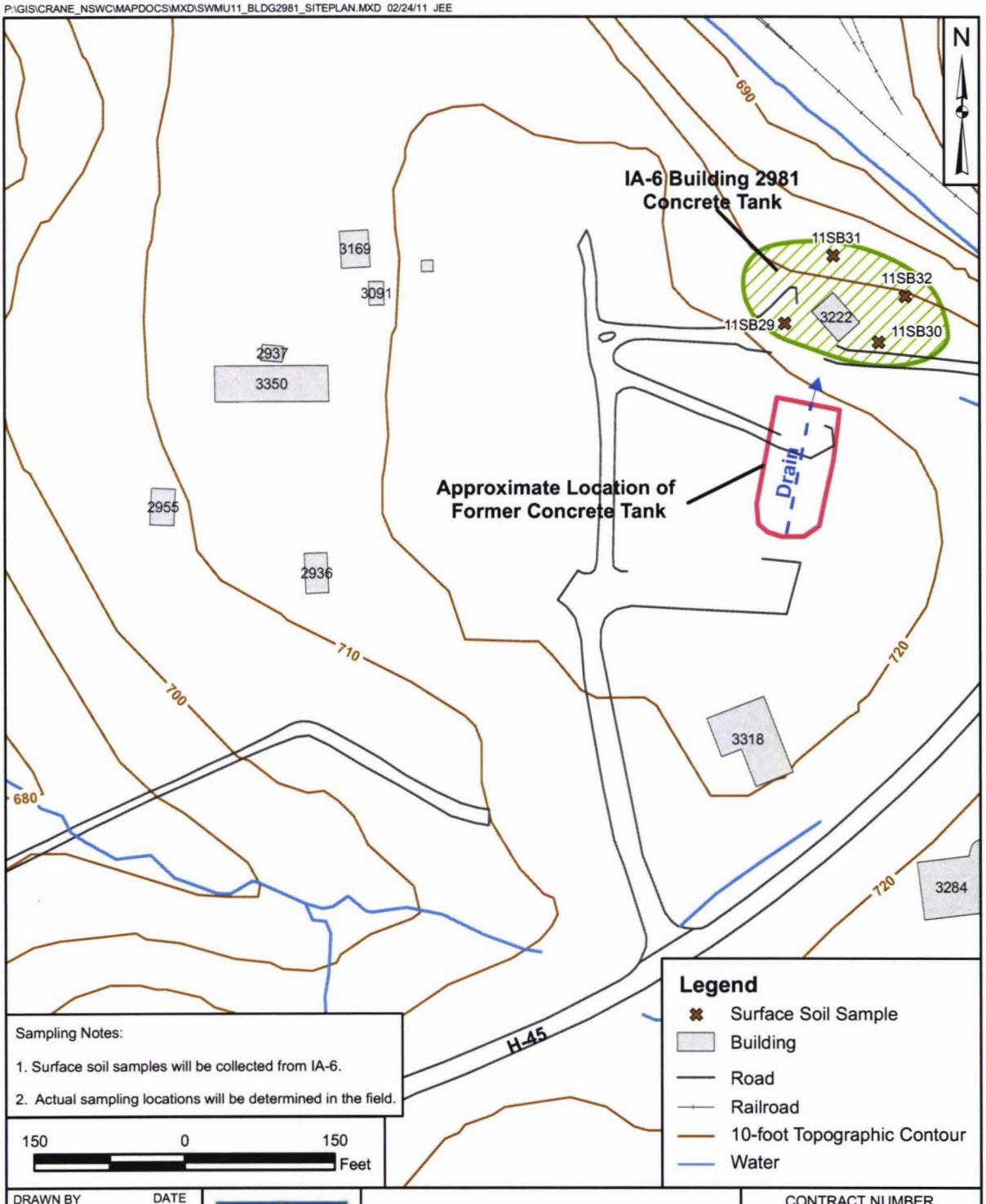
IA-4 SOIL SAMPLING LOCATIONS
SWMU 11 - OLD STORAGE BUILDING 225
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER CTO F27E	
APPROVED BY	DATE
A. KLIMEK	02/24/11
APPROVED BY	DATE
—	—
FIGURE NO.	REV
17-2	0

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU11_BLDG2981_SITEPLAN.MXD 02/24/11 JEE



DRAWN BY S. STROZ	DATE 11/17/10	IA-6 SOIL SAMPLING LOCATIONS BUILDING 2981 CONCRETE TANK OFFSITE AREA FOR SWMU 11 NSA CRANE CRANE, INDIANA	CONTRACT NUMBER CTO F27E
CHECKED BY L. FOSTER	DATE 02/24/11		APPROVED BY A. KLIMEK — DATE 02/24/11
REVISED BY J. ENGLISH	DATE 02/24/11		APPROVED BY — DATE —
SCALE AS NOTED			FIGURE NO. 17-3 — REV 0

NAVFAC

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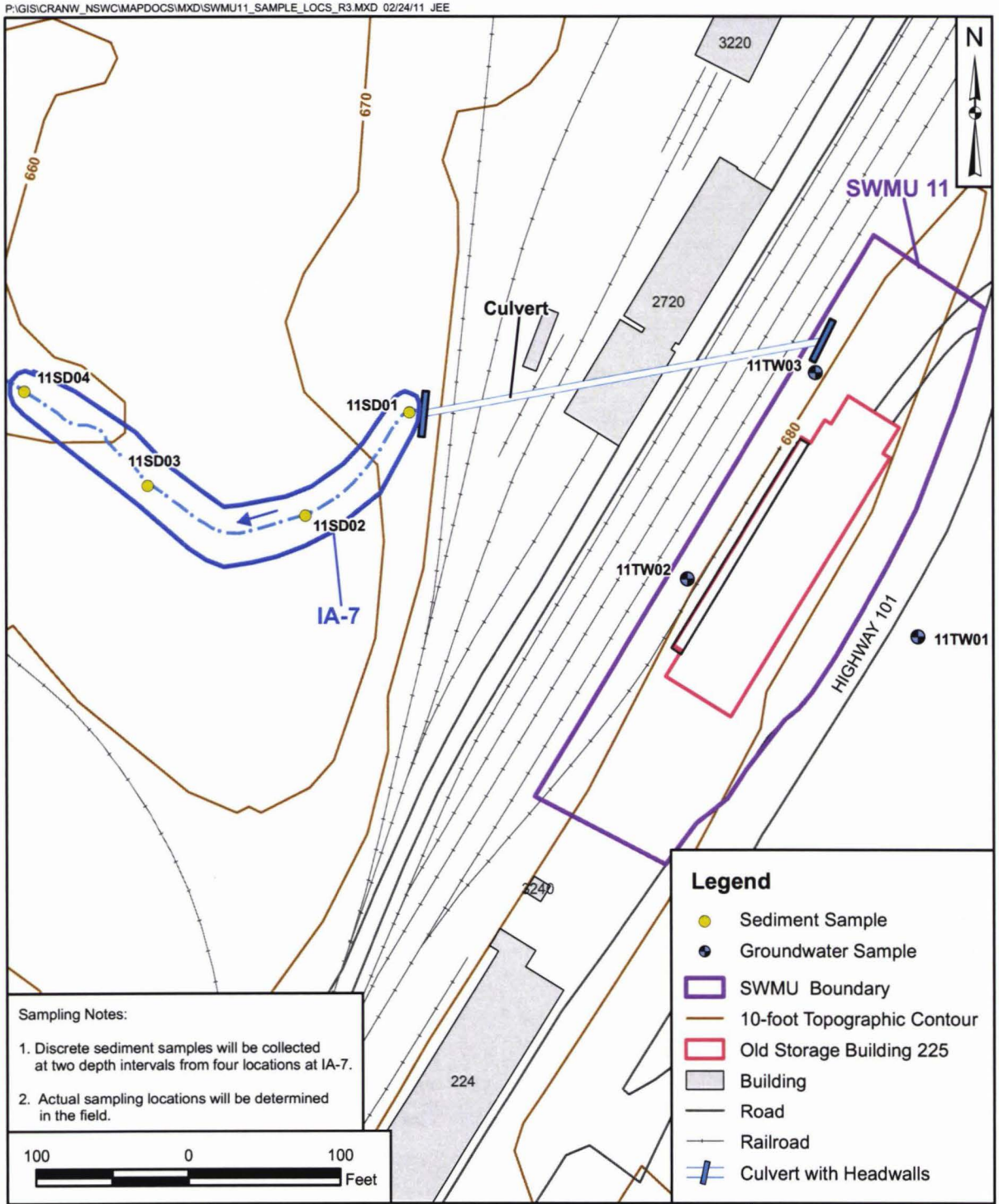

DRAWN BY: S. STROZ — DATE: 12/01/10		IA-7 SEDIMENT AND SWMU 11 GROUNDWATER SAMPLING LOCATIONS SWMU 11 - OLD STORAGE BUILDING 225 NSA CRANE CRANE, INDIANA	CONTRACT NUMBER: CTO F27E
CHECKED BY: L. FOSTER — DATE: 02/24/11			APPROVED BY: T. KLIMEK — DATE: 02/24/11
REVISED BY: J. ENGLISH — DATE: 02/24/11			APPROVED BY: — — DATE: —
SCALE: AS NOTED	NAVFAC		FIGURE NO.: 17-4 — REV: 0