Report

Quality Assurance Project Plan Taku Gardens Former Communications Site

Fort Wainwright, Alaska

Prepared for

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Abbreviations

ADEC	Alaska Department of Environmental Conservation
amu	atomic mass unit
ASTM	ASTM International (formerly American Society for Testing and Materials)
°C	degrees Celsius
CCC	continuing calibration criteria
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chain of custody
COD	coefficient of determination
COELT	Corps of Engineers Loading Tool
CQAR	Chemical Quality Assurance Report
DQO	data quality objective
DQR	Data Quality Report
EDF	Electronic Deliverable Format
EPA	U.S. Environmental Protection Agency
FCS	Former Communications Site
FSP	Field Sampling Plan
H_2SO_4	Sulfuric acid
HCl	hydrochloric acid
HDPE	high-density polyethylene
HNO_3	Nitric acid
ICS	interference check samples
ICV	initial calibration verification
IDW	investigation-derived waste
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LCL	lower control limit

MB	method blank
MDL	method detection limit
ME	marginal exceedance
mg/L	milligrams per liter
mg/Kg	milligrams per kilogram
mL	milliliter
MS	matrix spike
MSD	matrix spike duplicate
NaOH	sodium hydroxide
NELAC	National Environmental Laboratory Accreditation Conference
ng/Kg	nanograms per kilogram
PARCC	precision, accuracy, representativeness, comparability, completeness
PCB	polychlorinated biphenyl
PE	performance evaluation
pg/L	picograms per liter
PID	photoionization detector
POL	Petroleums, oils and lubricants
PSE	Preliminary Source Evaluation
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	quality assurance program plan
QC	quality control
%R	percent recovery
RI/FS	Remedial Investigation/Feasibility Study
RF	response factor
RL	reporting limit
RPD	relative percent difference
RRT	relative retention time
RSD	relative standard deviation
RT	retention time

SAP	Sampling and Analysis Plan
SOP	standard operating procedure
SPCC	system performance check compounds
SVOC	semivolatile organic compounds
TAT	turnaround time
TIC	tentatively identified compound
ug/L	micrograms per liter
USACE	U.S. Army Corps of Engineers
UCL	upper control limit
VOC	volatile organic compound

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Site Name: Taku Gardens Former Communication Site, Fort Wainwright, Alaska

Location: Fort Wainwright, Alaska

Anticipated Sampling Dates: Summer 2007

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1.0 Project Description

1.1 Introduction

CH2M HILL has been contracted by the U.S. Army Corps of Engineers (USACE) in Alaska to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Taku Gardens Former Communication Site (FCS) at Fort Wainwright in order to investigate the nature and extent of contamination, develop and evaluate remedial alternatives, and evaluate the actual or potential risk to human health and the environment.

This Quality Assurance Project Plan (QAPP) is the second of two parts of the Sampling and Analysis Plan (SAP), it presents the quality assurance (QA) and quality control (QC) requirements designed to ensure that environmental data collected will be of the appropriate quality to achieve the project objectives. Specific protocols for sampling, sample handling and storage, chain of custody (COC), laboratory analyses, data handling, and data evaluation will be discussed.

The elements included in this QAPP are consistent with those specified in the *Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version 3* (January 2006). The QAPP is intended for use by all contractors and subcontractors that provide services associated with the environmental data collection effort. This QAPP supplements the work plans and any other site-specific documents. Although the QAPP attempts to cover the data collection effort, it may not address future changes in sampling and analytical needs. If the need for such changes arises, the QAPP and the relevant site-specific documents will be updated and submitted to the regulatory agencies charged with project oversight for approval. Only the affected portions of the QAPP will be submitted for review.

The Field Sampling Plan (FSP; Part 1 of the SAP) details field assessment activities, field sampling methods, sample naming conventions, field documentation requirements, sampling equipment, decontamination procedures, sample packing and shipping requirements, and investigation-derived waste management. This QAPP references the applicable sections of the FSP where appropriate.

1.2 Background

The Taku Gardens FCS at Fort Wainwright was selected as a location for future Army family housing in 2002-2003. During housing construction in June 2005, petroleum contamination was encountered in the northwest corner of the FCS and high levels of polychlorinated biphenyl (PCB) Aroclor-1260 and associated chlorinated solvents were encountered during construction activities near the former location of Building 52 in the southwest corner of the construction site. Due to the potential movement of soil around the construction site, a PCB site clearance of the construction site was initiated in August 2005. During the PCB clearance, the US Army environmental project team discovered that

military munitions and unknown chemicals were encountered and removed during the 2005 construction activities.

In March 2006, the Army developed a planning matrix and area map of site of potential concern within the entire potential source area. The matrix identified locations primarily through review of the field notes and pictures, as well as potential contaminants of concern. Two documents were then initiated: a Preliminary Source Evaluation (PSE) I, which includes all known information about the source area up to the 2006 field season, as well as conceptual site models; and a PSE II, which includes all data during the 2006 field season. The PSE II work plans were developed to include installation of test pits to determine the extent of any potential remaining metal debris, installation of groundwater monitoring wells, additional sampling in the exclusion zone, and soil contamination investigations.

The Army has been working under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Fort Wainwright Federal Facility Agreement since the discovery of contamination at the FCS with full input from the EPA and ADEC.

1.3 Project Objective and Scope

The objectives of the investigation activities are to investigate the nature and extent of contamination at the Taku Gardens FCS, develop and evaluate remedial alternatives, and evaluate the actual or potential risk to human health and the environment. The data quality objectives (DQO) for each site are specified in the Work Plan and briefly described below.

1.1.1 Data Quality Objectives

The DQOs for each site are specified in a site-specific work plan or equivalent document. They are the basis for the design of the data collection plan, and as such, they specify the type, quality, and quantity of data to be collected, and how the data are to be used to make the appropriate decisions for the project. The DQOs are developed through a seven-step process, each step of which derives valuable criteria that are used to establish the final data collection design. The first five steps of the process identify mostly qualitative criteria such as what problem has initiated the project and what decision it attempts to resolve. These steps also define the type of data to be collected, where and when the data will be collected, and a decision criteria that define the decision process. The sixth step defines quantitative criteria expressed as limits on decision errors that can be tolerated by the decision maker. The final step is the development of the data collection design based on the criteria developed in the previous six steps. The final output of the process is a data collection design that meets the qualitative and quantitative needs of the specific project.

The DQOs for this project are listed below. More detailed information regarding the DQO process, inputs and decision rules are described in the Work Plan.

- Decide whether future site residents or excavation workers in residential areas may be exposed to constituent concentrations in soil that pose a potential for unacceptable risk (by direct contact).

- Decide whether future site visitors, recreational users, maintenance workers or excavation workers in nonresidential areas may be exposed to constituent concentrations in nonresidential area soil that pose a potential for unacceptable risks (by direct contact).
- Decide whether site-related constituents have migrated to the offsite drainage swale (in soil/sediment) at levels that pose a potential for unacceptable risk to aquatic life and terrestrial wildlife.
- Decide whether future indoor residents may be exposed to volatile organic compound (VOC) concentrations in soil gas that pose a potential for unacceptable risks via a vapor intrusion pathway.
- Decide whether constituents present in site groundwater could migrate offsite at concentrations that pose a potential for unacceptable risks to Fort Wainwright drinking water supply wells, or impact offsite surface water, or cause an offsite vapor intrusion concern.
- Decide whether soil stock piles generated during excavation for building foundations and utilities are suitable for reuse onsite or must be disposed of offsite.

2.0 Project Organization and Responsibility

2.1 Project/Task Organization

The organization chart and descriptive text identifying task managers and individuals charged with specific responsibilities for each site can be found in the site-specific Work Plan. Lines of authority, as well as the scope of authority given to each key member of the project team, including the extent of his/her authority to initiate and approve corrective actions, are discussed in the work plans. All contractors and subcontractors and the scope of their work assignments are identified.

Table 2-1 identifies and describes the responsibilities of key project positions related to project management, field task management, QA/QC management, and data management. Contact information for the CH2M HILL staff.

TABLE 2-1
Project Staff

Title	Name/Address	Phone	Fax	Email
Project Manager	Cory Hinds 301 West Northern Lights Blvd, Suite 601 Anchorage, AK 99503	907-646-0348	907-257-2000	Cory.Hinds @ch2m.com
Field Task Manager	Bobby Horan Fairbanks, Alaska	714-856-5812	714-429-2050	Bobby.Horan@ch2m .com
Project Chemist	Berney Kidd 2525 Airpark Drive Redding, CA 96001	530-229-3203	530-339-3203	bkidd@ch2m.com
Data Manager	Dan Moore 727 North 1st Street Suite 400 St Louis, MO 63102	(314) 421-0313 x43029	(314)421-3927	Daniel.Moore4@ch2 m.com

2.2 Project Laboratory

The project laboratory for the Taku Gardens project will be TestAmerica in West Sacramento, California. Some methods will be sent to other TestAmerica Laboratories within the laboratory network, these were identified and approved in the original laboratory proposal. All samples will be sent to the primary laboratory in West Sacramento. All contact with the subcontract laboratories will be through the project manager at the primary laboratory in West Sacramento. Contact information for the project manager and client services manager at the primary laboratory are included in Table 2-2.

TABLE 2-2
Laboratory Staff

Title	Name/Address	Phone	Fax	Email
Project Manager	Jill Kellmann TestAmerica 880 Riverside Pkwy W. Sacramento, CA 95605	916-374-4402	916.372.7768	Jill.Kellmann@testamericainc.com
Client Services Manager	Dave Herbert TestAmerica 880 Riverside Pkwy W. Sacramento, CA 95605	916-374-4357 Cell 916-813-5151	916.372.7768	Dave.Herbert@testamericainc.com

2.3 Training and Certification Requirements

All personnel engaged in field activities will have completed the Occupational Safety and Health Administration 40-hour health and safety training that meet the requirements of Title 29, Chapter 1910.120, of the *Code of Federal Regulations* and state and local requirements. All project personnel will read the site-specific health and safety plans. Documentation will be maintained to demonstrate that all requirements of the plans are followed.

All laboratories providing analytical services will hold current NELAC certification for the analytical methods listed in this QAPP. The laboratories will also hold current State of Alaska certification for all methods listed in this QAPP for which such certification is available. The laboratory managers will be responsible for ensuring that all personnel have been properly trained and are qualified to perform their assigned tasks.

All field personnel collecting samples during this project will meet ADEC criteria for qualified persons. In addition, the field personnel will also be Occupational Safety & Health Administration Hazardous Waste Operations and Emergency Response Standard trained.

3.0 Field Quality Control Samples

3.1 Quality Control Samples

Quality control samples will be collected to monitor accuracy, precision, and the presence of field contamination for definitive analytical methods to be performed by the contracted primary laboratories. All field QC samples will be sent double-blind to the laboratory along with regular field samples. They will be labeled similar to regular field samples. The frequency of quality control samples is set out in the FSP and will be monitored by the field crew by use of field logbooks and by the chemistry team by use of a sample tracking database.

Data will be flagged in accordance with Tables 8-1 through 8-4 when the criteria are exceeded for the QC samples described in this section. Potential bias of sample results and impacts to data usability will be discussed in the data quality report described in Section 13.1.

3.1.1 Field Duplicate Samples

A field duplicate is an independent sample collected as close as possible to the original sample from the same source under identical conditions and is used to document sampling and analytical precision. Field duplicates will be collected at a minimum frequency of 10 percent, or one per sampling event, whichever is more frequent, for each matrix and for each type of analysis. The sampling locations for field duplicate samples will be recorded in the field logbook. Field duplicate QC criteria are described in Tables 8-1 through 8-4.

3.1.2 Field Triplicate Samples

Multi increment (MI) sampling will be used during this project and is described in the FSP. Triplicate samples must be collected with this sampling technique in order to verify that a MI sample is truly representative of the decision unit from which it was collected. A decision unit is the defined area or volume in question. The collection of triplicate samples allows for the calculation of relative standard deviation (RSD). Triplicate samples will be collected at a minimum frequency of one per every 10 decision units and must have an RSD of less than or equal to 30 percent.

3.1.3 Equipment Rinsate Blanks

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring deionized water over the decontaminated equipment. Equipment rinsate blanks will be collected at a five percent frequency or one per sampling event if fewer than 20 samples are collected each day that sampling equipment is decontaminated in the field. The equipment blanks will be analyzed in the primary laboratory for the same parameters specified for the corresponding matrix.

If the equipment rinsate blanks exhibit excessive contamination, the field crew will be instructed to evaluate decontamination procedures and to also investigate the source of the rinsate blank water.

3.1.4 Ambient Blanks

Ambient blanks are collected in order to monitor for contamination from ambient sources (active runways, engine test cells, operating motor vehicles) during collection of samples for volatile components. An ambient blank is prepared by pouring organic-free water into a volatile component sample container at the sampling site where samples for volatile components are taken. The blank is preserved, handled, and analyzed in the same manner as the samples. At least one ambient blank will be collected per sampling episode for volatile components.

If the ambient blanks exhibit excessive contamination, the field crew will be instructed to evaluate sample collection procedures and to also investigate the source of the ambient blank water.

3.1.5 Trip Blanks

Trip blanks are used to monitor for contamination during sample shipping and handling, and for cross-contamination through volatile component migration among the collected samples. They are prepared in the laboratory by pouring organic-free water into a volatile component sample container. They are then sealed, transported to the field, stay sealed while volatile component samples are taken, and transported back to the laboratory in the same cooler as the volatile component samples. One trip blank should accompany each volatile component sample cooler.

If the trip blanks exhibit excessive contamination, the field crew will be instructed to evaluate sample collection and shipping and handling procedures. The laboratory will also be instructed to investigate the source of the trip blank water and their trip blank preparation procedures.

3.1.6 Matrix Spike/Matrix Spike Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) samples consist of duplicate field sample aliquots spiked by the laboratory with analytes of concern to evaluate the effects of the matrix on the recoveries of these analytes. For every 20 field samples of each matrix collected from each site, additional duplicate aliquots of one of the samples should be collected for each analysis, and designated on the COC for use as MS/MSD analysis by the laboratory. The duplicate aliquots for MS/MSD analyses should be collected simultaneously or in immediate succession with the parent sample. They will be treated in exactly the same manner as the parent sample during storage and shipment. The sampling locations for the MS/MSD samples will be documented in the field logbook.

3.2 Sample Documentation and Tracking

3.2.1 Sample Labeling

Sample containers should be received from the laboratory pre-labeled with the analysis designation and required preservative. Site- and time-dependent information will be added to the labels with indelible ink. The labels will be protected from water and solvents with clear, label-protection tape. Each label will contain the following information:

- Project name
- Name of collector
- Date and time of collection
- Place of collection
- Sample number
- Preservation
- Method of analysis

Sample identification and tracking procedures will incorporate the sample numbering system outlined in the FSP. Field QA and QC samples will be labeled and numbered so that the laboratory cannot distinguish them from other site samples.

4.0 Sample Handling and Custody Requirements

4.1 Containers and Preservatives

Laboratories will provide the required sample containers for all samples. All containers will have been cleaned and certified to be free of the analytes of concern for the project. No sample containers will be reused. Preservatives, if required, will be added by the laboratories prior to shipment of the sample containers to the field. The adequacy of preservation will be verified by the laboratory upon receipt of the samples, and additional preservative will be added, if necessary.

The containers, minimum sample quantities, required preservatives, and maximum holding times are shown in Tables 4-1 through 4-3.

TABLE 4-1
Sample Collection Summary–Soil/Sediment

Parameter	Analytical Method[a]	Container[b,c]	Preservative	Maximum Holding Times
Gasoline-Range Organics	AK101	1 x 4-oz wide-mouth amber glass	Add 25 grams sample to 4-oz jar. Add 25 mls methanol that is prespiked with surrogate, 4°C (VOC – SW8260 analyzed from same container)	28 days to analysis
Diesel-Range Organics/Residual Range Organics	AK102/AK103	1 x 4-oz. wide-mouth amber glass[d]	4°C	14 days to extraction 40 days to analysis
Extractable Hydrocarbon Speciation	NW EPH	1 x 4-oz. wide-mouth amber glass	4°C	14 days to extraction 40 days to analysis
Volatile Hydrocarbon Speciation	NW VPH	2 x 40-mL VOA vial, septa lid	Add 5 grams sample to 40-mL VOA vial with methanol	14 days to analysis
Metals	SW6010B/SW6020/ SW7000	1 x 4-oz. glass[d]	4°C	28 days for mercury; 6 months for all others
Organochlorine Pesticides	SW8081A	1 x 4-oz. glass[d]	4°C	14 days to extraction 40 days to analysis

TABLE 4-1
Sample Collection Summary–Soil/Sediment

Parameter	Analytical Method[a]	Container[b,c]	Preservative	Maximum Holding Times
Polychlorinated Biphenyls	SW8082	1 x 4-oz. glass[d]	4°C	14 days to extraction 40 days to analysis
Chlorinated Herbicides	SW8151A	1 x 4-oz. glass[d]	4°C	14 days to extraction 40 days to analysis
Volatile Organic Compounds	SW8260B	1 x 4-oz wide-mouth amber glass	Add 25 grams sample to 4-oz jar. Add 25 mls methanol that is prespiked with surrogate, 4°C (GRO – AK101 analyzed from same container)	14 days to analysis
Low-level Volatile Organic Compounds	SW8260B	2 x 40 ml VOA vials	Add 5 grams sample to 40-mL VOA vial pre-preserved with 1 gram sodium bisulfate/5 mL water, 4°C	14 days to analysis
Semivolatile Organic Compounds	SW8270C/SW8270C -SIM	1 x 4-oz. glass[d]	4°C	14 days to extraction 40 days to analysis
Dioxins/Furans	SW8290	1 x 4-oz. glass[d]	4°C, store in dark	30 days to extraction 40 days to analysis
Transitional Explosives	SW8321	1 x 4-oz. glass[d]	4°C	14 days to extraction 40 days to analysis
Explosives	SW8330	1 x 4-oz. glass[d]	4°C	14 days to extraction 40 days to analysis

[a]Unless otherwise specified, method numbers refer to U.S. Environmental Protection Agency *Test Methods for Evaluation of Solid Waste, Physical and Chemical Methods*, SW-846, 3rd edition, Revision 4, 1996.
[b]All glass containers have polytetrafluoroethylene-lined lids.
[c]Triple the amount per laboratory for samples designated for matrix spike/matrix spike duplicate.
[d]Samples may be collected together in one 16-ounce jar.

Notes:
°C = degrees Celsius
mL = milliliter

TABLE 4-2
Sample Collection Summary–Aqueous/Liquid

Parameter	Analytical Method[a]	Container[b,c]	Preservative	Maximum Holding Times
Gasoline-Range Organics	AK101	3 x 40-mL amber glass, septa lid	No headspace HCl to pH<2 4°C	14 days to analysis
Diesel/Residual Range Organics	AK102/AK103	1 x 1-liter amber glass	HCl to pH<2 4°C	14 days to extraction 40 days to analysis
Extractable Hydrocarbon Speciation	NW EPH	1 x 1-liter amber glass	HCl to pH<2 4°C	14 days to extraction 40 days to analysis
Volatile Hydrocarbon Speciation	NW VPH	3 x 40-mL amber glass, septa lid	No headspace HCl to pH<2 4°C	14 days to analysis
Metals (except Chromium VI)	SW6010B/SW6020/ SW7000	1 x 500-mL HDPE	HNO_3 to pH<2 4°C	28 days for mercury 6 months for all others
Organochlorine Pesticides/	SW8081A	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Polychlorinated Biphenyls	SW8082	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Chlorinated Herbicides	SW8151A	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Volatile Organic Compounds	SW8260B	3 x 40-mL amber glass, septa lid	HCl to pH<2, 4°C; no headspace	14 days to analysis
Semivolatile Organic Compounds	SW8270C/ SW8270C-SIM	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Dioxins/Furans	SW8290	2 x 1-liter amber glass	4°C, store in dark	30 days to extraction 40 days to analysis
Transitional Explosives	SW8321	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Explosives	SW8330	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis

[a]Unless otherwise specified, method numbers refer to U.S. Environmental Protection Agency *Test Methods for Evaluation of Solid Waste, Physical and Chemical Methods*, SW-846, 3rd edition, Revision 4. 1996.
[b]All glass containers have polytetrafluoroethylene-lined lids.
[c]Triple the amount per laboratory for samples designated for matrix spike/matrix spike duplicate.

Notes:
°C = degrees Celsius
HCl = hydrochloric acid
HDPE = high-density polyethylene
HNO3 = nitric acid
H_2SO_4 = sulfuric acid
mL = milliliter

TABLE 4-3
Sample Collection Summary - Air

Parameter	Analytical Method	Container	Preservative	Maximum Holding Times
Volatile Organic Compounds	TO-15	SUMMA Canister	None	14 days

4.2 Chain of Custody

Procedures must be taken to preserve and ensure the integrity of all samples from the time of collection all through analysis. Records of the custody of samples must be maintained both in the field and in the laboratory. A sample is considered to be in someone's custody if it is either in his or her physical possession or view, locked up, or kept in a secured and restricted area. Until the samples are shipped, their custody will be the responsibility of the sampling team leader.

COC records document sample collection and shipment to the laboratory. A COC form will be completed in duplicate, as a minimum, for each sampling event. The original COC form will be delivered with the sample shipping cooler, and the copy will be retained in the field documentation files. The COC form will identify the contents of each shipment and maintain the custodial integrity of the samples. All COC forms will be signed and dated by the responsible sampling team personnel. The "relinquished by" box will be signed by the responsible sampling team personnel, and the date, time, and air bill number will be noted on the COC.

A self-adhesive custody seal will be placed across the lid of each sample cooler to maintain its integrity until it is opened by the laboratory. The shipping coolers containing the samples will be sealed with a custody seal any time they are not in someone's possession or view before shipping. All custody seals will be signed and dated by the responsible sampling team personnel.

The following information must be documented on the COC as a minimum:

- Unique sample identification
- Date and time of sample collection
- Source of sample (including name, location, and sample type)
- Designation of MS/MSD samples
- Preservative used
- Analyses required
- Name of sampler
- Project NPDLWO number 07-072
- Pertinent field data (pH, temperature, etc.)
- Serial numbers of custody seals and coolers
- Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratories
- Bill of lading or transporter tracking number (if applicable)

If analyses are to be subcontracted to another laboratory or another location within the laboratory network, copies of COCs transferring custody to the secondary laboratory must also be included in the laboratory data package and must also include the information listed above. The primary laboratory must notify the CH2M HILL chemist for approval prior to subcontracting analyses to a laboratory not identified in the original proposal.

Custody must be maintained at the laboratory once samples are received until all tests are completed. This will be accomplished using an internal custody system that requires samples to be kept in a secured and restricted area when not in use, and to be checked out and checked back in by the analysts who use them. Internal custody records must be maintained by the laboratory as part of the documentation file for each sample.

4.3 Transfer of Custody and Shipment

When transferring the samples, from field to laboratory or from laboratory to laboratory, the individuals relinquishing and receiving the samples will sign, date, and note the time on the COC form. If the samples are required to be shipped, the laboratory coordinators will be notified of when and how samples were sent. Notification will include the following information:

- Date of shipment
- Name of shipping company
- Air bill number
- Number of coolers
- Name, phone number, and facsimile number of point of contact
- Estimated date of shipment arrival
- Type of samples (water, sediment, soil or air)

On receipt of each sample cooler and after verification of the COC records, the laboratory will provide a sample confirmation report within 24 hours to the CH2M HILL project chemist that will document samples received and methods requested as well as any discrepancies such as, but not limited to, the following:

- Inappropriate sample containers or preservation
- Broken sample containers
- Cooler temperature outside range of 2 to 6°C (where applicable)
- Missing COC form or QA sample form
- Errors on COC or QA sample form
- Missing custody seals

The laboratory project manager will notify the CH2M HILL project chemist of any such discrepancies within 24 hours of its receipt of the samples. Notification can be via phone or email. The project chemist will discuss the discrepancy with the project team and inform the laboratory of the corrective action to be taken.

A subcontract laboratory must notify the primary laboratory of any such discrepancies within 24 hours of its receipt of the samples. The primary laboratory will relay this information to the CH2M HILL project chemist within 24 hours of notification.

All sample receipt documentation from the primary laboratory must also be emailed to receipt.cooler@poa02.usace.army.mil within 24 hours of sample receipt.

5.0 Quality Assurance Program

5.1 Data Categories

Both screening and definitive data may be generated during the project covered by this QAPP. Screening data are generated by rapid analytical methods, and involve less rigid sample preparation than that required for definitive data. Quantitation from a screening method is usually imprecise. Definitive data are generated by rigorous analytical methods using standardized calibration and quality controls, and are reported on specified deliverables. The data are analyte-specific, and both identification and quantitation are definite.

The QC requirements specified in the remainder of this section will apply to definitive data only. QC requirements for field screening methods are described in the FSP, data validation will not be performed on field screening data. Field screening methods to be used for this project are listed in Section 6 of this QAPP.

5.2 Precision, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity

Data quality will be evaluated based on their precision, accuracy, representativeness, completeness, comparability and sensitivity (PARCCS). For convenience, Tables 5-1 through 5-37 are grouped at the end of this section.

5.2.1 Precision

Precision is a measure of reproducibility of analytical results. It can be defined as the degree of mutual agreement among individual measurements obtained under similar conditions. Total precision is a function of the variability associated with both sampling and analysis. Precision will be evaluated as the relative percent difference (RPD) between field duplicate sample results, laboratory control sample/laboratory control sample duplicate (LCS/LCSD) results, or between the MS/MSD results. The precision limits are listed in Tables 5-13 through 5-30.

Precision is also evaluated for the MI sampling as the RSD between field triplicate results. The precision limit for MI triplicate samples is 30 percent.

5.2.2 Accuracy

Accuracy is the degree of agreement between a measured value and the "true" or expected value. As such, it represents an estimate of total error from a single measurement, including both systematic error, or "bias," and random error that may reflect variability due to imprecision. Accuracy is evaluated in terms of percent recoveries determined from results of MS/MSD and laboratory control sample (LCS)/laboratory control sample duplicate (LCSD)

analyses. Surrogate recoveries from samples analyzed for organic parameters are also used to assess accuracy. The accuracy limits are listed in Tables 5-13 through 5-30.

5.2.3 Representativeness

Representativeness is a qualitative term which refers to the degree in which data accurately and precisely depict the characteristics of a population, whether referring to the distribution of contaminant within a sample, a sample within a matrix, or the distribution of a contaminant at a site. Representativeness is determined by appropriate program design, with consideration of elements such as proper well locations, drilling and installation procedures, and sampling locations. Objectives for representativeness are defined for each sampling and analysis task and are a function of the investigative objectives. Assessment of representativeness shall be achieved through use of the standard field, sampling, and analytical procedures. Standard analytical procedures are described in this QAPP. Decisions regarding sample/well/ boring locations and numbers and the statistical sampling design shall be documented in the FSP.

5.2.4 Completeness

Completeness is a measure of the amount of valid data obtained compared with the amount that was expected to be obtained under correct, normal conditions. Valid data is data which is usable in the context of the project goals. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not qualified with an R-flag after a usability assessment has been performed. The completeness goal for this project is 90 percent.

5.2.5 Comparability

Comparability is a qualitative indicator of the confidence with which one data set can be compared to another data set. The objective for this QA/QC program is to produce data with the greatest possible degree of comparability. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions, and using standard and comprehensive reporting formats. Complete field documentation using standardized data collection forms shall support the assessment of comparability. Analysis of PE samples and reports from audits shall also be used to provide additional information for assessing the comparability of analytical data produced among subcontracting laboratories. Historical comparability shall be achieved through consistent use of methods and documentation procedures throughout the project. Assessment of comparability is primarily subjective and results should be interpreted by experienced environmental professionals with a clear knowledge of the DQOs and project decisions. Assessment should include a discussion of the level of uncertainty associated with the comparability of the specific data set and the potential consequences of using non-comparable data.

5.2.6 Sensitivity

Sensitivity is the ability of an analytical method or instrument to discriminate between measurement responses representing different concentrations. It is important to be able to detect the target analytes at the levels of interest. Sensitivity requirements include the establishment of various limits such as calibration requirements, method detection limits (MDLs), and project-specific reporting limits (RL). The sensitivity limits are listed as RL objectives in Tables 5-1 through 5-12.

5.3 Method Detection Limits, Reporting Limits, Instrument Calibration Requirements, and Tentatively Identified Compounds

5.3.1 Method Detection Limits

The MDL is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. Each participating laboratory will determine the MDL for each method, matrix, and analyte for each instrument that will be used to analyze samples. The MDLs will be initially determined prior to analyzing samples, and will be redetermined at least once every 12 months. Where multiple instruments are used, the MDL of the least sensitive instrument will be used for reporting purposes.

The MDL determinations will be conducted as follows:

- Spike seven replicates of matrix (reagent water for aqueous methods, Ottawa sand for soil methods) with an analyte concentration equivalent to either instrument signal/noise ratio of 2.5 to 5, or 3 times the standard deviation of replicate measurements of the analyte in reagent water, or the region of the standard curve where there is a significant change in sensitivity (i.e., a break in the slope).
- Prepare and analyze the seven replicate spikes.
- MDLs shall be generated for all preparatory and cleanup methods routinely used on samples.
- Calculate the MDL as 3.14 times the standard deviation of the seven replicate results.
- If the spike level used in the first step is more than 10 times the calculated MDL, repeat the process using a smaller spike level.

5.3.2 Reporting Limits

The calculated MDL may not be more than the reporting limit (RL). The RL should be three times the MDL. Instances where this is not the case must be called out in the laboratory case narrative and noted in the data quality reports following validation.

When calibrating instruments, a standard at a concentration equal to or less than the RL must be included. Analytes at concentrations greater than the laboratory's MDL, but less than the RL will be flagged as estimated with a "J" qualifier. Analytes that are not detected

at or above the laboratory's MDL will be reported as not detected at the RL, and flagged "U". Reporting limits, as well as sample results shall be reported to two significant figures if less than 10 (regardless of the unit) and to three significant figures otherwise. They shall be reported on a dry-weight basis for soil samples.

5.3.3 Instrument Calibration

Laboratory instruments shall be appropriately calibrated by qualified personnel prior to sample analysis according to the procedures specified in each method. Calibration shall be verified at the specified intervals throughout the analysis sequence. The frequency and acceptance criteria for calibration are specified for each analytical method. When multi-point calibration is specified, the concentrations of the calibration standards should bracket those expected in the samples. Samples should be diluted, if necessary, to bring analyte responses within the calibration range. Data that exceed the calibration range cannot be reported by the laboratory. Those that are below the lowest calibration point must be flagged as estimated with a "J" qualifier. When the shape of the calibration curve requires that a quadratic or higher order equation be used, the number of additional standards specified in the method must be analyzed. The initial calibration curve shall be verified as accurate with a standard purchased or prepared from an independent second source. The initial calibration verification involves the analysis of a standard containing all the target analytes, typically in the middle of the calibration range, each time the initial calibration is performed, unless specified otherwise for a particular method in the QAPP.

For Method SW8082, the initial five-point calibration will be performed using a mixture of Aroclor-1016 and Aroclor-1260 to evaluate the linearity of the detector response. For the remaining Aroclors, a mid-level standard will be analyzed to aid in pattern recognition. If any of these remaining Aroclors is positively identified in a sample, five-point calibration will be performed for that Aroclor, and sample quantitation will be performed using the five-point calibration.

Laboratory instruments will be appropriately calibrated by qualified personnel prior to sample analysis. The requirements specified in Section 5.3.3 and Tables 5-31 through 5-37 of this QAPP must be followed. Otherwise, the method specifications will be followed. Only certified standards of known purity may be used for calibration. Calibration will be verified at specified intervals throughout the analysis sequence as specified for each analytical method in Tables 5-31 through 5-37.

5.3.4 Evaluating Tentatively Identified Compounds

The ion current chromatograms of multicompound analytical methods based upon gas chromatograph/mass spectrometer (GC/MS) or liquid chromatograph/mass spectrometer (LC/MS) (for example, USEPA SW8260 and SW8270) can contain information on nontarget analyses. Qualitative and quantitative information about the substances responsible for nontarget peaks in such chromatograms can be included in the laboratory data reports if the peaks are handled using the procedure for tentatively identified compounds (TICs) as described in USEPA Methods SW8260B and SW8270C (Section 7.6.2 in both methods).

Compounds detected will be identified and quantified as TICs if they have peak areas equal to or greater than 10 percent of the nearest (retention time) internal standard. All such peaks will be reported in special section of the laboratory data report for each sample.

For nontarget peaks meeting the 10 percent threshold, the mass spectrum will be compared to referenced spectra in the current National Institute of Standards and Technology library, using a computer search routine. If the spectral match has a fit of 80 percent or better, the substance name representing the best fit will be reported as the tentative identity of the compound. If the spectral fit is less than 80 percent, the peak will be reported as "Unknown RRT x.xxx", where x.xxx is the relative retention time in minutes. In either case, an estimated concentration will be calculated by comparing the peak area to that of the internal standard, using a response factor of 1.00. The estimated concentration will be shown on the laboratory data report and will not be considered as definitive data, however, if toxicity data is available the TIC data may be included in the risk assessment.

5.4 Elements of Quality Control

Laboratory QC checks are used to provide indications of the state of control that prevailed at the time of sample analysis. QC checks that involve field samples, such as matrix and surrogate spikes and field duplicates, also provide an indication of the presence of matrix effects. Field-originated blanks provide a way to monitor for potential contamination that field samples are subjected to. The QAPP specifies requirements for method blanks (MB), LCSs, surrogate spikes, and MS/MSD samples that must be followed by laboratories participating in the data collection effort. Laboratory QC samples must be included with each preparation or analytical batch of 20 or fewer environmental samples (including MS/MSD samples) of similar matrix. Each preparation or analytical batch should be identified in such a way as to be able to associate environmental samples with the appropriate laboratory QC samples. Elements of quality control will evaluated by the project chemistry team following data validation guidelines defined in Section 8.3.

5.4.1 Laboratory Blanks

5.4.1.1 Method Blank

Method blanks are used to monitor each preparation or analytical batch for interference and/or contamination from glassware, reagents, and other potential contaminant sources within the laboratory. A method blank is analyte-free matrix (laboratory reagent water for aqueous samples or Ottawa sand for soil samples) to which all reagents are added in the same amount or proportions as are added to samples. It is processed through the entire sample preparation and analytical procedures along with the samples in the batch. There should be at least one MB per preparation or analytical batch. If a target analyte is found at a concentration that exceeds one-half the reporting limit, corrective action must be performed to identify and eliminate the contamination source. All associated samples must be reprepared and/or reanalyzed after the contamination source has been eliminated. No analytical data may be corrected for the concentration found in the blank.

5.4.1.2 Instrument Blank

Instrument blanks are used to check for carryover contamination after analysis of high concentration samples. An instrument blank is an aliquot of ASTM Type II water following the same analytical procedures as the samples. An instrument blank should be analyzed following a sample with high concentrations of target analytes. If a target analyte is found at a concentration that exceeds the MDL, the instrument blank is reanalyzed until no carryover is observed. If project samples are thought to be affected by carryover, they must be reprepared and/or reanalyzed after the carryover has been eliminated. No analytical data may be corrected for the concentration found in the blank.

5.4.2 Laboratory Control Sample

The LCS/LCSD will consist of analyte-free matrix (laboratory reagent water for aqueous samples or Ottawa sand for soil samples) spiked with known amounts of analytes that come from a source different than that used for calibration standards. Target analytes specified in the QAPP will be spiked into the LCS/LCSD. The spike levels should be less than or equal to the mid-point of the calibration range. If LCS/LCSD recoveries and RPD between the recoveries are outside the specified control limits, corrective action must be taken, including sample repreparation and/or reanalysis, if appropriate. If more than one LCS/LCSD sets are analyzed in a preparation or analytical batch, the results of all the sets must be reported.

Only Aroclors 1016 and 1260 need be spiked into the LCS/LCSD for Method SW8082. All target analytes must be spiked for all other methods.

5.4.3 Surrogates

Surrogates are organic analytes that behave similarly to the analytes of interest but that are not expected to occur naturally in the samples. They are spiked into the standards, and into the samples and QC samples prior to sample preparation. Recoveries of surrogates are used as an indicator of accuracy, method performance, and extraction efficiency. If surrogate recoveries are outside the specified control limits, corrective action must be taken, including sample repreparation and/or reanalysis, if appropriate.

5.4.4 Matrix Spike/Matrix Spike Duplicates

A sample matrix fortified with known quantities of specific compounds is a MS. It is subjected to the same preparation and analytical procedures as the native sample. Target analytes specified in the QAPP are spiked into the sample. MS recoveries are used to evaluate the effect of the sample matrix on the recovery of the analytes of interest. An MSD is a second fortified sample matrix. The RPD between the results of the MSDs is used as a measure of the precision of sample results. Only project-specific samples designated on the COC will be spiked. The spike levels will be less than or equal to the mid-point of the calibration range.

For metals analysis, it is not necessary to spike sodium, potassium, calcium, and magnesium into aqueous samples, or sodium, potassium, calcium, magnesium, iron, manganese, and aluminum into soil samples. The native concentrations of these low-toxicity metals are usually relatively high.

Multicomponent pesticides need not be spiked into the MS/MSD for Method SW8081A.

Only Aroclors 1016 and 1260 need be spiked into the MS/MSD for Method SW8082.

5.4.5 Internal Standards

Some methods require the use of internal standards to compensate for losses during injection or purging or losses due to viscosity effects. Internal standards are compounds that have similar properties as the analytes of interest, but are not expected to occur naturally in the samples. A measured amount of the internal standard is added to the standards, and to the samples and QC samples following preparation. When the internal standard results are outside the control limits, corrective action must be taken, including sample reanalysis, if appropriate.

5.4.6 Interference Check Samples

The interference check samples (ICS) are used in inductively coupled plasma analyses to verify background and interelement correction factors. They consist of two solutions, A and B. Solution A contains the interfering analytes, and Solution B contains both the analytes of interest and the interfering analytes. Both solutions are analyzed at the beginning and at the end of each analytical sequence. When the ICS results are outside the control limits, corrective action must be taken, including sample reanalysis, if appropriate.

5.4.7 Retention Time Windows

Retention time windows for gas, liquid chromatographic and ion chromatographic analyses must be established by replicate injections of the calibration standard over multiple days as described in the appropriate method. The absolute retention time of the calibration verification standard at the start of each analytical sequence will be used as the centerline of the window. In order for an analyte to be reported as positive, its retention time must be within the window.

5.5 Additional Quality Control Requirements

5.5.1 Holding Time

The holding time requirements specified in this QAPP must be met. For methods requiring both sample preparation and analysis, the preparation holding time will be calculated from the time of sampling to the completion of preparation. The analysis holding time will be calculated from the time of completion of preparation to the time of completion of the analysis, including any required dilutions, confirmation analysis, and reanalysis. For methods requiring analysis only, the holding time is calculated from the time of sampling to completion of the analysis, including any required dilutions, confirmation analysis, and reanalysis.

5.5.2 Confirmation

Confirmation analysis must be carried out as specified for specific methods when the result is at or above the reporting limit. The result designated as the primary result will be reported, except that for Method SW8290, the result obtained from the DB-225 column will

be reported. All calibration, QC and holding-time requirements must be met when confirmation analysis is carried out.

5.5.3 Laboratory Control Sample Marginal Exceedances

A marginal exceedance (ME) is defined as a LCS recovery that is outside of the control limits but still within the ME limits (set at four standard deviations around the mean). A number of sporadic MEs of the LCS will be allowed. The number of exceedances is based on the total number of analytes spiked in the LCS. As the number of analytes in the LCS increases, more MEs are allowed. Table 5-A presents the allowable number of MEs for a given number of analytes in the LCS.

TABLE 5-A
Number of Marginal Exceedances Allowed

Number of Analytes in the LCS	Allowable Number of Marginal Exceedances of LCS Control Limits
>90	5
71-90	4
51-70	3
31-50	2
11-30	1
<11	0

MEs must be sporadic. If the same analyte exceeds the LCS control limits repeatedly in two out of three consecutive LCSs, that is an indication that the problem is systematic and something is wrong with the measurement system.

Each LCS must be evaluated against the appropriate control limits and ME limits before being accepted. First, the recoveries for the analytes spiked in the LCS should be compared with the LCS control limits. If a recovery is less than the lower control limit or greater than the upper control limit, that is an exceedance. The laboratory should note which analytes exceeded the control limits and make a comparison to the list of project-specific analytes of concern. **If a project-specific analyte of concern exceeds its LCS control limit, the LCS has failed**. Next, the laboratory should add up the total number of exceedances for the LCS. Based on the number of analytes spiked in the LCS, the total number of exceedances should be compared with the allowable number from Table 5-A. **If a LCS has more than the allowable number of marginal exceedances, the LCS has failed**. Finally, the recoveries for those analytes that exceeded the LCS-CL should be compared to the ME limits from Tables 5-13 through 5-30. **If a single analyte exceeds its marginal exceedance limit, the LCS has failed.** (This applies only to methods with greater than 10 analytes.)

5.5.4 Poor-Performing Analytes

Certain compounds do not perform well with specific methods. These compounds produce low mean recoveries and high standard deviations, resulting in wide LCS control limits with particularly low lower control limits (sometimes negative values). Table 5-B below lists the poor performers.

TABLE 5-B
Poor Performers

Analyte	Method	Matrix
4-Nitrophenol	SW8270C	Water
Benzoic Acid	SW8270C	Water and Soil
Phenol	SW8270C	Water
3,3-Dichlorobenzidine	SW8270C	Soil
4-Chloroaniline	SW8270C	Soil
Dinoseb	SW8151A	Soil
Tetryl	SW8330	Soil

5.5.5 Cleanup Procedures to Minimize Matrix Effects

In order to maintain the lowest possible reporting limits, appropriate cleanup procedures should be employed when necessary. Methods for sample cleanup include, but are not limited to, gel permeation chromatography, silica gel, alumna, florisil, mercury (sulfur removal), sulfuric acid and acid/base partitioning. MBs, MS/MSDs, and LCSs must be subjected to the same cleanup procedures performed on the samples to monitor the efficiencies of these procedures.

5.5.6 Sample Dilution

Dilution of a sample results in elevated reporting limits and ultimately affects the usability of the data related to potential actions at the sampling site. It is important to minimize dilutions and maintain the lowest possible reporting limits. When dilutions are necessary due to high concentrations of target analytes, lesser dilutions should also be reported in order to fully characterize the sample for each analyte. The level of the lesser dilution should be such that it will provide the lowest possible reporting limits without having a lasting deleterious effect on the analytical instrumentation.

5.5.7 Standard Materials and Other Supplies and Consumables

Standard materials must be of known high purity and traceable to an approved source. Pure standards must not exceed the manufacturer's expiration date or one year following receipt, whichever comes first. Solutions prepared by the laboratory from the pure standards must be used within the expiration date specified in the laboratory's standard operating procedure (SOP).

All other supplies and consumables must be inspected prior to use to ensure that they meet the requirements specified in the appropriate SOP. The laboratory's inventory and storage system should ensure their use within the manufacturer's expiration date, and storage under proper conditions.

5.6 Reporting Limits and Analytical Requirements

The methods to be used, RL objectives, associated ADEC Screening Levels and EPA Region VI Screening Levels are listed in Tables 5-1 through 5-12. The accuracy and precision limits are listed in Tables 5-13 through 5-30. Calibration and QC requirements are specified in Tables 5-31 through 5-37.

Site-specific preliminary remediation goals have not yet been prepared. Screening levels presented in this QAPP are used to select the appropriate RLs. Screening levels are likely well below risk based remediation goals. Analytical data will be used to calculate baseline risk following ADEC and EPA guidance. If risk is identified, site-specific remediation goals will be developed.

TABLE 5-1
Reporting Limit Objectives for Methods AK101, AK102/AK103

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residentia l Cleanup Level (mg/kg)
Gasoline Range Organics	50	50	10	1300	NA	1	5	2.5	1400	1400	300	NA
Diesel Range Organics	100	50	16	1500	NA	5	1	0.3	10250	12500	250	NA
Residual Range Organics	250	300	84	1100	NA	10	10	1.6	10000	22000	11000	NA

Note: QAPP specified Reporting Limits are ADEC method-specific.

TABLE 5-2
Reporting Limit Objectives Method NWEPH/VPH Total Petroleum Hydrocarbon Speciation[a]

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
VPH												
C8-C10 Aromatics	50	50	0.71	NA	NA	5	5	0.09	NA	NA	NA	NA
C10-C12 Aromatics	50	50	0.24	NA	NA	5	5	0.021	NA	NA	NA	NA
C12-C13 Aromatics	50	50	1.6	NA	NA	5	5	0.012	NA	NA	NA	NA
C5-C6 Aliphatics	50	50	0.69	NA	NA	5	5	0.031	NA	NA	NA	NA
C6-C8 Aliphatics	50	50	0.32	NA	NA	5	5	0.055	NA	NA	NA	NA
C8-C10 Aliphatics	50	50	0.6	NA	NA	5	5	0.072	NA	NA	NA	NA
C10-C12 Aliphatics	50	50	0.35	NA	NA	5	5	0.039	NA	NA	NA	NA
EPH												
C8-C10 Aromatics	50	50	15	NA	NA	5	5	1	NA	NA	NA	NA
C10-C12 Aromatics	50	50	4.1	NA	NA	5	5	0.072	NA	NA	NA	NA
C12-C16 Aromatics	50	50	5.7	NA	NA	5	5	1	NA	NA	NA	NA
C16-C21 Aromatics	50	50	7	NA	NA	5	5	1	NA	NA	NA	NA
C21-C34 Aromatics	50	50	15	NA	NA	5	5	1	NA	NA	NA	NA
C8-C10 Aliphatics	50	50	2	NA	NA	5	5	0.027	NA	NA	NA	NA
C10-C12 Aliphatics	50	50	3.1	NA	NA	5	5	0.095	NA	NA	NA	NA
C12-C16 Aliphatics	50	50	1.5	NA	NA	5	5	1	NA	NA	NA	NA
C16-C21 Aliphatics	50	50	4.6	NA	NA	5	5	1	NA	NA	NA	NA
C21-C34 Aliphatics	50	50	11	NA	NA	5	5	1	NA	NA	NA	NA

Note: QAPP specified Reporting Limits are method-specific.

[a]VPH/EPH data may be used to assess contaminant extent and fate and transport in the development of feasibility strategies, but it will not be used for risk assessment purposes.

TABLE 5-3
Reporting Limit Objectives Methods SW6010B, SW6020, SW7000

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
Aluminum	100	200	35	NA	37000	10	21	7	NA	NA	NA	76000
Antimony	1	6	2	6	15	0.2	0.6	0.2	41	NA	3.6	31
Arsenic	2	3	1	50	0.045	1	0.5	0.15	5.5	NA	2	0.39
Barium	3	1.5	0.5	2000	7300	30	0.3	0.1	7100	NA	1100	16000
Beryllium	1	1	0.1	4	73	0.5	0.1	0.01	200	NA	42	150
Boron	5	50	15	NA	7300	0.5	5	1.5	NA	NA	NA	16000
Cadmium	2	1.5	0.5	5	18	1	0.15	0.05	100	NA	5	39
Calcium	200	500	100	NA	NA	20	100	25	NA	NA	NA	NA
Chromium	4	5	1.5	100	55000	2	0.6	0.2	300	NA	26	100000
Cobalt	1	3	1	NA	730	1	0.3	0.1	NA	NA	NA	900
Copper	6	3	1	1300	1400	2	0.5	0.15	4060	NA	7000	2900
Iron	100	100	16	NA	26000	10	10	3.1	NA	NA	NA	55000
Lead	1	2.5	0.6	15	15	1	0.2	0.06	400	400	400	400
Magnesium	200	500	75	NA	NA	20	50	7.5	NA	NA	NA	NA
Manganese	2	6	2	NA	1700	1	0.8	0.25	NA	NA	NA	3200
Mercury	0.2	0.3	0.1	2	11	0.2	0.04	0.0086	18	18	1.4	23
Nickel	2	3	1	100	730	4	0.3	0.1	2000	NA	87	1600
Potassium	1000	1000	250	NA	NA	2	100	25	NA	NA	NA	NA
Selenium	2	3	1	50	180	1	0.3	0.1	510	NA	3.5	390
Silver	2	1	0.3	180	180	100	0.1	0.03	510	NA	21	390
Sodium	1000	1000	250	NA	NA	200	500	25	NA	NA	NA	NA

TABLE 5-3
Reporting Limit Objectives Methods SW6010B, SW6020, SW7000

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
Thallium	1	1.5	0.5	2	2.6	1	0.15	0.05	NA	NA	NA	5.5
Vanadium	5	12	4	260	180	2.5	2	0.6	710	NA	3400	390
Zinc	20	12	4	11000	11000	2	2	0.6	30000	NA	9100	23000

QAPP Specified Reporting Limits are taken from QSM Version 3.

TABLE 5-4
Reporting Limit Objectives for Method SW8081A

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
4,4-DDD	0.02	0.1	0.004	3.6	0.28	0.002	0.0034	0.00026	35	NA	47	2.4
4,4-DDE	0.02	0.1	0.0061	2.5	0.2	0.002	0.0034	0.00022	24	NA	150	1.7
4,4-DDT	0.02	0.1	0.0051	2.5	0.2	0.002	0.0034	0.0004	24	5300	88	1.7
Aldrin	0.01	0.05	0.0021	0.05	0.004	0.0015	0.0017	0.00021	0.5	24	1.6	0.029
alpha-BHC	0.01	0.05	0.0059	0.1	0.011	0.0015	0.0017	0.00022	1.3	5.5	0.0026	0.09
alpha-Chlordane	0.01	0.05	0.0027	NA	NA	0.0015	0.0017	0.0002	NA	NA	NA	NA
beta-BHC	0.01	0.05	0.0047	0.47	0.037	0.0015	0.0017	0.00033	4.6	43	0.009	0.32
delta-BHC	0.01	0.05	0.0029	NA	NA	0.0015	0.0017	0.00016	NA	NA	NA	NA
Dieldrin	0.02	0.1	0.0051	0.05	0.0042	0.002	0.0034	0.00032	0.5	8	0.015	0.03
Endosulfan I	0.02	0.05	0.0043	NA	220	0.0015	0.0017	0.00014	610	NA	7	370
Endosulfan II	0.02	0.1	0.012	NA	NA	0.002	0.0034	0.00066	610	NA	7	NA
Endosulfan Sulfate	0.02	0.1	0.0042	NA	NA	0.002	0.0034	0.00022	NA	NA	NA	NA
Endrin	0.02	0.1	0.0054	2	11	0.002	0.0034	0.00024	30	NA	0.3	18
Endrin Aldehyde	0.02	0.1	0.0042	NA	NA	0.002	0.0034	0.00027	NA	NA	NA	NA
Endrin Ketone	0.02	0.1	0.02	NA	NA	0.002	0.0034	0.00034	NA	NA	NA	NA
gamma-BHC	0.01	0.05	0.005	0.2	0.052	0.0015	0.0017	0.00017	6.4	NA	0.003	0.44
gamma-Chlordane	0.01	0.05	0.0028	NA	NA	0.0015	0.0017	0.00033	NA	NA	NA	NA
Heptachlor	0.01	0.05	0.0032	0.4	0.015	0.002	0.0017	0.00019	2	0.8	8	0.11
Heptachlor Epoxide	0.01	0.05	0.0021	0.2	0.0074	0.002	0.0017	0.00012	0.9	33	0.2	0.053
Methoxychlor	0.03	2	0.027	40	180	0.002	0.017	0.0013	510	NA	52	310
Toxaphene	0.1			3	NA	0.1			8	620	10	NA

QAPP specified Reporting Limits are taken from QSM Version 3.

TABLE 5-5
Reporting Limit Objectives for Method SW8082

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
Aroclor 1016	0.1	1	0.27	0.05	0.96	0.05	0.033	0.0083	1	1	NA	3.9
Aroclor 1221	0.1	1.5	0.35	0.05	0.034	0.05	0.033	0.01	1	1	NA	0.22
Aroclor 1232	0.1	1	0.13	0.05	0.034	0.05	0.033	0.0083	1	1	NA	0.22
Aroclor 1242	0.1	1	0.2	0.05	0.034	0.05	0.033	0.0083	1	1	NA	0.22
Aroclor 1248	0.1	1	0.11	0.05	0.034	0.05	0.033	0.0083	1	1	NA	0.22
Aroclor 1254	0.1	1	0.32	0.05	0.034	0.05	0.033	0.0083	1	1	NA	0.22
Aroclor 1260	0.1	1	0.25	0.05	0.034	0.05	0.033	0.0083	1	1	NA	0.22
Aroclor 1262	0.1			NA	NA	0.05	0.033	0.0083	NA	NA	NA	NA
Aroclor 1268	0.1			NA	NA	0.05	0.033	0.0083	NA	NA	NA	NA

QAPP specified Reporting Limits are taken from QSM Version 3.

TABLE 5-6
Reporting Limit Objectives for Method SW8151A

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
2,4-D	10	0.025	0.001	NA	NA	0.2	0.0013	0.00016	NA	NA	NA	NA
2,4-DB	20	0.025	0.002	NA	NA	0.5	0.0013	0.00032	NA	NA	NA	NA
2,4,5-T	20	0.025	0.001	NA	NA	0.5	0.0013	0.00011	NA	NA	NA	NA
2,4,5-TP (Silvex)	10	0.025	0.002	NA	NA	0.2	0.0013	0.00041	NA	NA	NA	NA
Dalapon	30	0.05	0.004	NA	1100	0.8	0.0033	0.00092	NA	NA	1800	1800
Dicamba	20	0.025	0.002	NA	1100	0.5	0.0013	0.00018	NA	NA	1800	1800
Dichlorprop	20	0.025	0.002	NA	NA	0.5	0.0013	0.00029	NA	NA	NA	NA
Dinoseb	3	0.025	0.006	NA	37	0.1	0.0033	0.00045	NA	NA	61	61
MCPA	100	0.025	0.002	NA	NA	10	0.0013	0.00017	NA	NA	NA	NA

QAPP specified Reporting Limits are taken from QSM Version 3.

TABLE 5-7
Reporting Limit Objectives for Method SW8260B

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
1,1,1,2-Tetrachloroethane	1	1	0.1	NA	0.43	0.01	0.05	0.0059	NA	NA	NA	3
1,1,1-Trichloroethane	1	1	0.41	200	840	0.01	0.05	0.0065	NA	460	1	1400
1,1,2,2-Tetrachloroethane	0.5	1	0.37	4	0.055	0.01	0.05	0.0057	42	5.4	0.017	0.38
1,1,2-Trichloroethane	1	1	0.31	5	0.2	0.01	0.05	0.0055	150	10	0.017	0.84
1,1-Dichloroethane	1	1	0.1	3650	1200	0.01	0.05	0.0056	10000	890	12	850
1,1-Dichloroethene	1	1	0.36	7	340	0.01	0.05	0.0086	14	0.9	0.03	280
1,1-Dichloropropene	1	1	0.14	NA	NA	0.01	0.05	0.0043	NA	NA	NA	NA
1,2,3-Trichlorobenzene	1	1	0.14	NA	NA	0.01	0.05	0.0062	NA	NA	NA	NA
1,2,3-Trichloropropane	1	1	0.3	NA	0.0016	0.01	0.15	0.05	NA	NA	NA	0.0014
1,2,4-Trichlorobenzene	1	1	0.23	70	8.2	0.01	0.05	0.0072	1000	570	2	140
1,2,4-Trimethylbenzene	1	1	0.12	NA	12	0.01	0.05	0.0035	NA	NA	NA	52
1,2-Dibromo-3-chloropropane	2	1	0.95	NA	0.0002	0.01	0.15	0.05	NA	NA	NA	0.0026
1,2-Dibromoethane (EDB)	1	2	0.22	0.05	0.0056	0.01	0.05	0.0054	0.1	1.2	0.0000306	0.028
1,2-Dichlorobenzene	1	1	0.14	600	49	0.01	0.05	0.0039	9100	110	7	280
1,2-Dichloroethane	0.5	1	0.22	5	0.12	0.01	0.05	0.0086	91	5	0.015	0.35
1,2-Dichloropropane	1	1	0.15	5	0.16	0.01	0.05	0.0047	120	17	0.017	0.35
1,3,5-Trimethylbenzene	1	1	0.14	NA	12	0.01	0.05	0.0035	NA	NA	NA	21
1,3-Dichlorobenzene	1	1	0.11	1100	14	0.01	0.05	0.0033	3040	NA	12.1	69
1,3-Dichloropropane	1	1	0.2	NA	NA	0.01	0.05	0.0045	NA	NA	NA	NA

TABLE 5-7
Reporting Limit Objectives for Method SW8260B

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
1,4-Dichlorobenzene	0.5	1	0.13	75	0.47	0.01	0.05	0.0036	350	8000	0.8	3.2
2,2-Dichloropropane	1	1	0.13	NA	NA	0.01	0.05	0.0043	NA	NA	NA	NA
2-Butanone	10	2	1	22000	7100	0.01	0.1	0.026	60800	28100	60	32000
2-Chlorotoluene	1	1	0.26	NA	120	0.01	0.05	0.0036	NA	NA	NA	160
2-Hexanone	10	2	1	NA	NA	0.01	0.1	0.0068	NA	NA	NA	NA
4-Chlorotoluene	1	1	0.1	NA	NA	0.01	0.05	0.0028	NA	NA	NA	NA
4-Methyl-2-pentanone	10	2	1	NA	NA	0.01	0.1	0.0123	NA	NA	NA	NA
Acetone	10	10	1	3650	5500	0.01	0.5	0.1	10000	NA	10	14000
Benzene	0.4	1	0.13	5	0.35	0.01	0.05	0.0033	1150	9	0.02	0.66
Bromobenzene	1	1	0.18	NA	23	0.01	0.05	0.0093	NA	NA	NA	73
Bromochloromethane	1	1	0.31	NA	NA	0.01	0.05	0.0073	NA	NA	NA	NA
Bromodichloromethane	0.5	1	0.14	100	0.18	0.01	0.05	0.005	NA	NA	NA	1
Bromoform	1	1	0.1	100	8.5	0.01	0.05	0.011	1050	500	0.38	62
Bromomethane	3	1	0.08	NA	8.7	0.01	0.1	0.021	NA	NA	NA	3.9
Carbon disulfide	2	2	1	3650	1000	0.01	0.1	0.011	10000	453	17	720
Carbon tetrachloride	1	1	0.15	5	0.17	0.01	0.05	0.0059	64	3.4	0.03	0.24
Chlorobenzene	0.5	1	0.12	100	91	0.01	0.05	0.044	2000	110	0.6	270
Chlorodibromomethane	0.5	1	0.4	NA	0.13	0.01	0.05	0.0063	NA	NA	NA	1
Chloroethane	1	1	0.34	NA	NA	0.01	0.05	0.015	NA	NA	NA	NA
Chloroform	1	1	0.12	100	0.17	0.01	0.05	0.0026	1000	3.4	0.34	0.25
Chloromethane	1	1	0.25	NA	2.1	0.01	0.05	0.011	NA	NA	NA	1.3

TABLE 5-7
Reporting Limit Objectives for Method SW8260B

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
cis-1,2-Dichloroethene	1	1	0.1	70	61	0.01	0.05	0.0082	1000	NA	5.5	43
cis-1,3-Dichloropropene	0.5	1	0.22	9	0.4	0.005	0.05	0.0041	83	14	0.02	0.7
Dibromomethane	1	1	0.21	NA	NA	0.01	0.05	0.0065	NA	NA	NA	NA
Dichlorodifluoromethane	1	1	0.16	7300	390	0.01	0.05	0.0094	20300	260	60	94
Ethylbenzene	1	1	0.27	700	1300	0.01	0.05	0.0066	10000	89	5.5	230
Hexachlorobutadiene	1	1	0.22	NA	0.86	0.01	0.05	0.011	NA	NA	8	6.2
Isopropylbenzene	1	1	0.12	3650	660	0.01	0.05	0.017	10100	585	227	370
m,p-Xylenes	1	1	0.18	NA	210	0.01	0.1	0.005	NA	NA	NA	210
Methyl tert-butyl ether (MTBE)	5	2	1	NA	11	0.01	0.1	0.0036	NA	NA	NA	32
Methylene chloride	5	1	0.35	5	4.3	0.01	0.05	0.0054	1100	180	0.015	8.9
Naphthalene	1	1	0.15	700	6.2	0.01	0.05	0.0047	2000	120	21	120
n-Butylbenzene	1	1	0.12	NA	61	0.01	0.05	0.0049	NA	NA	NA	140
n-Propylbenzene	1	1	0.15	NA	61	0.01	0.05	0.0047	NA	NA	NA	140
o-Xylene	1	1	0.1	NA	1400	0.01	0.05	0.0052	NA	NA	NA	280
p-Isopropyltoluene	1	1	0.13	NA	NA	0.01	0.05	0.0042	NA	NA	NA	NA
sec-Butylbenzene	1	1	0.12	NA	61	0.01	0.05	0.0024	NA	NA	NA	110
Styrene	1	1	0.15	100	1600	0.01	0.05	0.0031	20300	280	1.3	1700
tert-Butylbenzene	1	11	0.14	NA	61	0.01	0.05	0.0041	NA	NA	NA	130
Tetrachloroethene	1	1	0.38	5	0.1	0.01	0.05	0.0042	160	80	0.03	0.55
Toluene	1	1	0.25	1000	2300	0.01	0.05	0.0045	20300	180	5.4	520
Total Xylenes	2			10000	200	0.01			203000	81	78	210

TABLE 5-7
Reporting Limit Objectives for Method SW8260B

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
trans-1,2-Dichloroethene	1	1	0.11	100	110	0.01	0.05	0.0062	2000	NA	0.4	120
trans-1,3-Dichloropropene	1	1	0.3	9	0.4	0.005	0.05	0.0045	83	14	0.02	0.7
Trichloroethene	1	1	0.31	5	0.028	0.01	0.05	0.0055	750	43	0.027	0.043
Trichlorofluoromethane	1	1	0.23	NA	1300	0.01	0.05	0.0049	NA	NA	NA	390
Vinyl chloride	1	1	0.12	2	0.015	0.01	0.05	0.0071	6	4	0.009	0.043

QAPP specified Reporting Limits are taken from QSM Version 3.

TABLE 5-8
Reporting Limit Objectives for Low-Level Method SW8260B in Soils

Analyte	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
1,1,1,2-Tetrachloroethane	0.01	0.005	0.003	NA	NA	NA	3
1,1,1-Trichloroethane	0.01	0.005	0.0008	NA	460	1	1400
1,1,2,2-Tetrachloroethane	0.01	0.005	0.0007	42	5.4	0.017	0.38
1,1,2-Trichloroethane	0.01	0.005	0.0029	150	10	0.017	0.84
1,1-Dichloroethane	0.01	0.005	0.0008	10000	890	12	850
1,1-Dichloroethene	0.01	0.005	0.0012	14	0.9	0.03	280
1,1-Dichloropropene	0.01	0.005	0.0009	NA	NA	NA	NA
1,2,3-Trichlorobenzene	0.01	0.005	0.0008	NA	NA	NA	NA
1,2,3-Trichloropropane	0.01	0.005	0.0008	NA	NA	NA	0.0014
1,2,4-Trichlorobenzene	0.01	0.005	0.0008	1000	570	2	140
1,2,4-Trimethylbenzene	0.01	0.005	0.0005	NA	NA	NA	52
1,2-Dibromo-3-chloropropane	0.01	0.01	0.0072	NA	NA	NA	0.0026
1,2-Dibromoethane (EDB)	0.01	0.01	0.0008	0.1	1.2	0.0000306	0.028
1,2-Dichlorobenzene	0.01	0.005	0.0006	9100	110	7	280
1,2-Dichloroethane	0.01	0.005	0.0007	91	5	0.015	0.35
1,2-Dichloropropane	0.01	0.005	0.0006	120	17	0.017	0.35
1,3,5-Trimethylbenzene	0.01	0.005	0.0024	NA	NA	NA	21
1,3-Dichlorobenzene	0.01	0.005	0.0008	3040	NA	12.1	69
1,3-Dichloropropane	0.01	0.005	0.0006	NA	NA	NA	NA
1,4-Dichlorobenzene	0.01	0.005	0.0008	350	8000	0.8	3.2
2,2-Dichloropropane	0.01	0.005	0.0011	NA	NA	NA	NA
2-Butanone	0.01	0.01	0.005	60800	28100	60	32000

TABLE 5-8
Reporting Limit Objectives for Low-Level Method SW8260B in Soils

Analyte	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
2-Chlorotoluene	0.01	0.005	0.0006	NA	NA	NA	160
2-Hexanone	0.01	0.01	0.005	NA	NA	NA	NA
4-Chlorotoluene	0.01	0.005	0.0009	NA	NA	NA	NA
4-Methyl-2-pentanone	0.01	0.01	0.005	NA	NA	NA	NA
Acetone	0.01	0.02	0.005	10000	NA	10	14000
Benzene	0.01	0.005	0.0007	1150	9	0.02	0.66
Bromobenzene	0.01	0.005	0.0005	NA	NA	NA	73
Bromochloromethane	0.01	0.005	0.0009	NA	NA	NA	NA
Bromodichloromethane	0.01	0.005	0.0005	NA	NA	NA	1
Bromoform	0.01	0.005	0.0041	1050	500	0.38	62
Bromomethane	0.01	0.005	0.0009	NA	NA	NA	3.9
Carbon disulfide	0.01	0.01	0.005	10000	453	17	720
Carbon tetrachloride	0.01	0.005	0.0005	64	3.4	0.03	0.24
Chlorobenzene	0.01	0.005	0.0008	2000	110	0.6	270
Chlorodibromomethane	0.01	0.005	0.0027	NA	NA	NA	1
Chloroethane	0.01	0.005	0.0026	NA	NA	NA	NA
Chloroform	0.01	0.005	0.0008	1000	3.4	0.34	0.25
Chloromethane	0.01	0.005	0.0015	NA	NA	NA	1.3
cis-1,2-Dichloroethene	0.01	0.005	0.0009	1000	NA	5.5	43
cis-1,3-Dichloropropene	0.005	0.005	0.0006	83	14	0.02	0.7
Dibromomethane	0.01	0.005	0.0006	NA	NA	NA	NA
Dichlorodifluoromethane	0.01	0.005	0.0009	20300	260	60	94
Ethylbenzene	0.01	0.005	0.0009	10000	89	5.5	230

TABLE 5-8
Reporting Limit Objectives for Low-Level Method SW8260B in Soils

Analyte	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
Hexachlorobutadiene	0.01	0.005	0.0009	NA	NA	8	6.2
Isopropylbenzene	0.01	0.005	0.0005	10100	585	227	370
m,p-Xylenes	0.01	0.005	0.0008	NA	NA	NA	210
Methyl tert-butyl ether (MTBE)	0.01	0.01	0.005	NA	NA	NA	32
Methylene chloride	0.01	0.01	0.0008	1100	180	0.015	8.9
Naphthalene	0.01	0.005	0.0006	2000	120	21	120
n-Butylbenzene	0.01	0.005	0.0007	NA	NA	NA	140
n-Propylbenzene	0.01	0.005	0.0009	NA	NA	NA	140
o-Xylene	0.01	0.005	0.0027	NA	NA	NA	280
p-Isopropyltoluene	0.01	0.005	0.0006	NA	NA	NA	NA
sec-Butylbenzene	0.01	0.005	0.0008	NA	NA	NA	110
Styrene	0.01	0.005	0.0008	20300	280	1.3	1700
tert-Butylbenzene	0.01	0.005	0.0005	NA	NA	NA	130
Tetrachloroethene	0.01	0.005	0.0006	160	80	0.03	0.55
Toluene	0.01	0.005	0.0006	20300	180	5.4	520
Total Xylenes	0.01			203000	81	78	210
trans-1,2-Dichloroethene	0.01	0.005	0.0009	2000	NA	0.4	120
trans-1,3-Dichloropropene	0.005	0.005	0.0008	83	14	0.02	0.7
Trichloroethene	0.01	0.005	0.0006	750	43	0.027	0.043
Trichlorofluoromethane	0.01	0.005	0.0008	NA	NA	NA	390
Vinyl chloride	0.01	0.005	0.0016	6	4	0.009	0.043

QAPP specified Reporting Limits are taken from QSM Version 3.

TABLE 5-9
Reporting Limit Objectives for Methods SW8270C, SW8270C-SIM

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
Polynuclear Aromatics												
2-Methylnaphthalene	5	0.05	0.0028	780	NA	0.25	0.005	0.0003	2030	NA	60.9	NA
Acenaphthene	5	0.05	0.0032	2200	365	0.25	0.005	0.0009	6100	NA	210	3700
Acenaphthylene	5	0.05	0.0031	2200	NA	0.25	0.005	0.0009	6100	NA	210	NA
Anthracene	5	0.05	0.0044	11000	1825	0.25	0.005	0.0004	30000	NA	4300	22000
Benzo(a) anthracene	5	0.05	0.012	1	0.03	0.25	0.005	0.0003	11	NA	6	0.15
Benzo(a) pyrene	10	0.05	0.013	0.2	0.003	0.25	0.005	0.0004	1	NA	3	0.015
Benzo(b)fluoranthene	10	0.05	0.012	1	0.03	0.25	0.005	0.0005	11	NA	20	0.15
Benzo(k)fluoranthene	10	0.05	0.02	10	0.3	0.25	0.005	0.0003	110	NA	200	1.5
Benzo(g,h,i) perylene	5	0.05	0.016	1100	NA	0.25	0.005	0.0003	3000	NA	1500	NA
Chrysene	10	0.05	0.015	100	2.9	0.25	0.005	0.0003	1100	NA	620	15
Dibenzo(a,h) anthracene	10	0.05	0.014	0.1	0.003	0.25	0.005	0.0002	1	NA	6	0.015
Fluoranthene	5	0.05	0.012	1460	1460	0.25	0.005	0.0003	4100	NA	2100	2300
Fluorene	5	0.05	0.004	1460	240	0.25	0.005	0.0011	4100	NA	270	2600
Indeno(1,2,3-c,d)pyrene	10	0.05	0.014	1	0.03	0.25	0.005	0.0005	11	NA	54	0.15
Naphthalene	5	0.05	0.001	700	6.2	0.25	0.005	0.0003	2000	120	21	120
Phenanthrene	5	0.05	0.006	11000	NA	0.25	0.005	0.0004	30000	NA	4300	NA
Pyrene	5	0.05	0.013	1100	180	0.25	0.005	0.0004	3000	NA	1500	2300
Phenolic/Acidic												
2,4,5-Trichlorophenol	10	10	2	3650	3650	0.25	0.33	0.036	10000	NA	90	6100
2,4,6-Trichlorophenol	5	10	2	77	6.1	0.25	0.33	0.053	750	1500	0.6	44

TABLE 5-9
Reporting Limit Objectives for Methods SW8270C, SW8270C-SIM

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
2,4-Dichlorophenol	5	10	2.6	100	110	0.25	0.33	0.021	300	NA	0.45	180
2,4-Dimethylphenol	5	10	2.2	700	730	0.25	0.5	0.167	2000	NA	4	1200
2,4-Dinitrophenol	20	60	20	70	73	0.25	2	0.66	200	NA	0.2	120
2-Chlorophenol	5	10	0.44	200	30	0.25	0.33	0.022	510	NA	1.4	64
2-Methylphenol	5	10	0.93	1800	1800	0.25	0.33	0.058	5100	NA	7	3100
2-Nitrophenol	5	10	1	NA	NA	0.25	0.33	0.03	NA	NA	NA	NA
3-Methylphenol/4-methylphenol	5	30	10	NA	180	0.25	1	0.33	NA	NA	NA	310
4,6-Dinitro-2-methylphenol	20	60	20	NA	NA	0.25	2	0.66	NA	NA	NA	NA
4-Chloro-3-methylphenol	5	10	2	NA	NA	0.25	0.33	0.014	NA	NA	NA	NA
4-Nitrophenol	20	60	20	NA	290	0.25	2	0.66	NA	NA	NA	490
Benzoic Acid	5	75	20	146000	150000	0.25	1.6	0.168	410000	NA	390	100000
Pentachlorophenol	50	60	20	1	0.56	0.8	2	0.66	35	NA	0.01	3
Phenol	5	10	0.48	22000	11000	0.25	0.33	0.019	60800	NA	67	18000
Basic												
3,3-Dichlorobenzidine	5	50	5	2	0.15	0.25	1.6	0.33	18	NA	0.02	1.1
4-Chloroaniline	5	10	2	150	150	0.25	0.33	0.058	410	NA	0.5	240
Phthalate Esters												
bis(2-Ethylhexyl)phthalate	5	10	1	6	4.8	0.25	0.33	0.024	590	NA	1200	35
Butylbenzyl phthalate	5	10	0.84	7300	7300	0.25	0.33	0.019	20000	NA	5600	240
di-n-Butyl phthalate	5	10	0.65	3650	NA	0.25	0.33	0.026	10000	NA	1700	NA

TABLE 5-9
Reporting Limit Objectives for Methods SW8270C, SW8270C-SIM

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
di-n-Octyl phthalate	5	10	0.71	700	NA	0.25	0.33	0.024	2000	NA	810000	NA
Diethylphthalate	5	10	0.56	29000	29000	0.25	0.33	0.02	81000	NA	190	49000
Dimethylphthalate	5	10	0.47	NA	370000	0.25	0.33	0.023	1000000	NA	1400	100000
Nitrosoamines												
n-Nitroso-di-n-propylamine	10	10	0.74	0.1	0.0096	0.25	0.33	0.018	1.2	NA	0.00036	0.069
n-Nitroso-dimethylamine	5	15	5	NA	0.00042	0.25	0.33	0.038	1700	NA	3.4	0.0023
n-Nitrosodiphenylamine	5	10	0.54	170	14	0.25	0.33	0.024	1700	NA	3.4	99
Chlorinated Aliphatics												
bis(2-Chloroethoxy)methane	5	10	1	NA	NA	0.25	0.33	0.022	NA	NA	NA	NA
bis(2-Chloroethyl)ether	10	10	0.91	0.77	0.0098	0.25	0.33	0.032	8	NA	0.002	0.21
bis(2-Chloroisopropyl)ether	5	10	0.6	NA	0.27	0.25	0.33	0.032	NA	NA	NA	2.9
Hexachlorobutadiene	5	10	0.56	10	0.86	0.25	0.33	0.033	20	55	8	6.2
Hexachloroethane	5	10	0.61	60	4.8	0.25	0.33	0.046	101	390	1.6	35
Halogenated Aromatics												
1,2,4-Trichlorobenzene	5	10	0.51	70	8.2	0.25	0.33	0.027	1000	NA	NA	140
1,2-Dichlorobenzene	5	10	0.65	600	49	0.25	0.33	0.042	9100	NA	7	280
1,3-Dichlorobenzene	5	10	0.65	1100	14	0.25	0.33	0.039	3040	NA	12.1	69
1,4-Dichlorobenzene	5	10	0.54	75	0.47	0.25	0.33	0.044	350	NA	0.8	3.2
2-Chloronaphthalene	5	10	0.47	2900	490	0.25	0.33	0.019	8100	NA	70	3900
4-Bromophenyl phenyl ether	5	10	0.52	NA	NA	0.25	0.33	0.023	NA	NA	NA	NA

TABLE 5-9
Reporting Limit Objectives for Methods SW8270C, SW8270C-SIM

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
4-Chlorophenyl phenyl ether	5	10	0.44	NA	NA	0.25	0.33	0.014	NA	NA	NA	NA
Hexachlorobenzene	10	10	0.56	1	0.042	0.25	0.33	0.017	5	7	0.73	0.3
Nitroaromatics												
2,4-Dinitrotoluene	5	10	0.48	1.25	73	0.25	0.33	0.021	12	NA	0.005	120
2,6-Dinitrotoluene	5	10	2	1.25	37	0.25	0.33	0.03	12	NA	0.0044	61
2-Nitroaniline	50	50	2	NA	110	0.25	1.6	0.045	NA	NA	NA	180
3-Nitroaniline	20	50	5	NA	NA	0.25	1.6	0.167	NA	NA	NA	NA
4-Nitroaniline	20	50	5	NA	NA	0.25	1.6	0.037	NA	NA	NA	NA
Nitrobenzene	5	10	1	18	3.4	0.25	0.33	0.076	51	90	0.06	20
Neutral Aromatics												
Carbazole	5	10	1.2	40	3.4	0.25	0.33	0.055	420	NA	2	24
Dibenzofuran	5	10	0.4	NA	12	0.25	0.33	0.018	NA	NA	NA	150
Others												
1,2-Diphenylhydrazine	5	Library Search		NA	0.084	0.25	Library Search		NA	NA	NA	0.61
Benzyl alcohol	5	10	2.6	NA	11000	0.25	0.51	0.17	NA	NA	NA	18000
Isophorone	5	10	1	900	71	0.25	0.33	0.017	8700	NA	3	510

QAPP specified Reporting Limits are taken from QSM Version 3.

TABLE 5-10
Reporting Limit Objectives for Method SW8290

Analyte	QAPP Specified Reporting Limit (pg/L)	Laboratory RL (pg/L)	Laboratory MDL (pg/L)	ADEC Table C Cleanup Level (pg/L)	USEPA Region VI Tapwater Screening Level (pg/L)	QAPP Specified Reporting Limit (ng/kg)	Laboratory RL (ng/kg)	Laboratory MDL (ng/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (ng/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (ng/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (ng/kg)	USEPA Region VI Residential Cleanup Level (ng/kg)
2,3,7,8-TCDD	5	10	3.23	0.03	0.00045	1	1	0.2	NA	NA	NA	0.0000039
1,2,3,7,8-PeCDD	50	50	5.1	NA	NA	5	5	0.54	NA	NA	NA	NA
1,2,3,4,7,8-HxCDD	50	50	14.3	NA	NA	5	5	0.64	NA	NA	NA	NA
1,2,3,6,7,8-HxCDD	50	50	13.6	NA	NA	5	5	0.5	NA	NA	NA	NA
1,2,3,7,8,9-HxCDD	50	50	6.67	NA	NA	5	5	0.54	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	50	50	9.79	NA	NA	5	5	0.5	NA	NA	NA	NA
OCDD	100	10	24.9	NA	NA	10	10	4.82	NA	NA	NA	NA
2,3,7,8-TCDF	50	100	2.1	NA	NA	5	1	0.14	NA	NA	NA	NA
1,2,3,7,8-PeCDF	50	50	5.65	NA	NA	5	5	0.5	NA	NA	NA	NA
2,3,4,7,8-PeCDF	50	50	6.63	NA	NA	5	5	0.5	NA	NA	NA	NA
1,2,3,4,7,8-HxCDF	50	50	5.37	NA	NA	5	5	0.5	NA	NA	NA	NA
1,2,3,6,7,8-HxCDF	50	50	20.5	NA	NA	5	5	0.5	NA	NA	NA	NA
2,3,4,6,7,8-HxCDF	50	50	16.9	NA	NA	5	5	0.5	NA	NA	NA	NA
1,2,3,7,8,9-HxCDF	50	50	18.3	NA	NA	5	5	0.5	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDF	50	50	4.19	NA	NA	5	5	0.5	NA	NA	NA	NA
1,2,3,4,7,8,9-HpCDF	50	50	5.31	NA	NA	5	5	0.5	NA	NA	NA	NA
OCDF	100	100	17	NA	NA	10	10	1.32	NA	NA	NA	NA

QAPP specified Reporting Limits are taken from QSM Version 3.

TABLE 5-11
Reporting Limit Objectives for Methods SW8321 and SW8330

Analyte	QAPP Specified Reporting Limit (ug/L)	Laboratory RL (ug/L)	Laboratory MDL (ug/L)	ADEC Table C Cleanup Level (ug/L)	USEPA Region VI Tapwater Screening Level (ug/L)	QAPP Specified Reporting Limit (mg/kg)	Laboratory RL (mg/kg)	Laboratory MDL (mg/kg)	ADEC Table B1 & B2 Soil Ingestion Cleanup Level (mg/kg)	ADEC Table B1 & B2 Soil Inhalation Cleanup Level (mg/kg)	ADEC Table B1 & B2 Migration to Groundwater Cleanup Level (mg/kg)	USEPA Region VI Residential Cleanup Level (mg/kg)
1,3,5-Trinitrobenzene	0.1	0.1	0.031	NA	1100	0.25	0.25	0.02	NA	NA	NA	1800
1,3-Dinitrobenzene	0.15	0.15	0.05	NA	3.7	0.25	0.25	0.05	NA	NA	NA	6.1
2,4-Dinitrotoluene	0.15	0.15	0.05	NA	73	0.25	0.25	0.02	NA	NA	NA	120
2,6-Dinitrotoluene	0.15	0.15	0.05	NA	37	0.25	0.25	0.03	NA	NA	NA	61
2,4,6-Trinitrotoluene (TNT)	0.15	0.15	0.024	NA	2.2	0.25	0.25	0.02	NA	NA	NA	16
2-Amino-4,6-dinitrotoluene	0.3	0.3	0.1	NA	NA	0.25	0.3	0.1	NA	NA	NA	NA
2-Nitrotoluene	0.5	0.5	0.072	NA	0.29	0.25	0.25	0.08	NA	NA	NA	2.8
3-Nitrotoluene	0.5	0.5	0.062	NA	120	0.25	0.25	0.07	NA	NA	NA	1600
4-Amino-4,6-dinitrotoluene	0.15	0.15	0.022	NA	NA	0.25	0.25	0.02	NA	NA	NA	NA
4-Nitrotoluene	0.5	0.5	0.072	NA	4	0.25	0.25	0.08	NA	NA	NA	38
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.25	0.25	0.065	NA	0.61	0.25	0.25	0.04	NA	NA	NA	4.4
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	0.15	0.15	0.05	NA	NA	0.25	0.25	0.05	NA	NA	NA	NA
Nitrobenzene	0.15	0.15	0.05	NA	3.4	0.25	0.25	0.05	NA	NA	NA	20
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.15	0.15	0.027	NA	1800	0.25	0.25	0.03	NA	NA	NA	3100

QAPP specified Reporting Limits are taken from QSM Version 3.

TABLE 5-12
Reporting Limit Objectives for Method TO-15

Analyte	Reporting Limit (ug/m^3)	USEPA Region VI Ambient Air Screening Level (ug/m^3)
1,1,1,2-Tetrachloroethane	1	0.26
1,1,1-Trichloroethane	1	2300
1,1,2,2-Tetrachloroethane	1	0.033
1,1,2-Trichloroethane	1	0.12
1,1-Dichloroethane	1	730
1,1-Dichloroethene	1	210
1,1-Dichloropropene	1	NA
1,2,3-Trichlorobenzene	1	NA
1,2,3-Trichloropropane	1	0.00096
1,2,4-Trichlorobenzene	1	4.2
1,2,4-Trimethylbenzene	1	6.3
1,2-Dibromo-3-chloropropane	1	0.0001
1,2-Dibromoethane (EDB)	1	0.0034
1,2-Dichlorobenzene	1	0.25
1,2-Dichloroethane	1	0.074
1,2-Dichloropropane	1	0.099
1,3,5-Trimethylbenzene	1	6.2
1,3-Dichlorobenzene	1	8.3
1,3-Dichloropropane	1	NA
1,4-Dichlorobenzene	1	0.28
2,2-Dichloropropane	1	NA
2-Butanone	1	5200
2-Chlorotoluene	1	73
2-Hexanone	1	NA
4-Chlorotoluene	1	NA
4-Methyl-2-pentanone	1	3100
Acetone	5	3300
Benzene	1	0.25
Bromobenzene	1	12
Bromochloromethane	1	NA
Bromodichloromethane	1	0.11
Bromoform	1	1.7
Bromomethane	1	5.2
Carbon disulfide	1	730
Carbon tetrachloride	1	0.13
Chlorobenzene	1	52
Chlorodibromomethane	1	0.08
Chloroethane	1	NA
Chloroform	1	0.084
Chloromethane	1	1.1
cis-1,2-Dichloroethene	1	37
cis-1,3-Dichloropropene	1	NA

TABLE 5-12
Reporting Limit Objectives for Method TO-15

Analyte	Reporting Limit (ug/m^3)	USEPA Region VI Ambient Air Screening Level (ug/m^3)
Dibromomethane	1	NA
Dichlorodifluoromethane	1	210
Ethylbenzene	1	1100
Hexachlorobutadiene	1	0.087
Isopropylbenzene	1	400
m,p-Xylenes	1	100
Methyl tert-butyl ether (MTBE)	1	7.4
Methylene chloride	1	4.1
Naphthalene	1	3.1
n-Butylbenzene	1	37
n-Propylbenzene	1	37
o-Xylene	1	730
p-Isopropyltoluene	1	NA
sec-Butylbenzene	1	37
Styrene	1	1100
tert-Butylbenzene	1	37
Tetrachloroethene	1	0.33
Toluene	1	5200
Total Xylenes	1	100
trans-1,2-Dichloroethene	1	63
trans-1,3-Dichloropropene	1	NA
Trichloroethene	1	0.017
Trichlorofluoromethane	1	730
Vinyl chloride	1	0.16

Reporting Limit Objectives are method specific.

TABLE 5-13
LCS and MS/MSD Control Limits for Water and Soil Matrices, Methods AK101 and AK102/AK103

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
Gasoline Range Organics	60	120	20	NA	NA
Diesel Range Organics	75	125	20	NA	NA
Residual Range Organics	75	125	20	NA	NA
Surrogate (choose 1)					
Trifluorotoluene	50	150	(for field samples)		
	60	120	(for laboratory control)		
Bromofluorobenzene	50	150	(for field samples)		
	60	120	(for laboratory control)		

Control limits are ADEC method specific.

TABLE 5-14
LCS and MS/MSD Control Limits for Water and Soil Matrices, Method NWEPH/VPH

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
VPH					
C8-C10 Aromatics	70	130	25	NA	NA
C10-C12 Aromatics	70	130	25	NA	NA
C12-C13 Aromatics	70	130	25	NA	NA
C5-C6 Aliphatics	70	130	25	NA	NA
C6-C8 Aliphatics	70	130	25	NA	NA
C8-C10 Aliphatics	70	130	25	NA	NA
C8-C10 Aliphatics	70	130	25	NA	NA
EPH					
C8-C10 Aromatics	70	130	25	NA	NA
C10-C12 Aromatics	70	130	25	NA	NA
C12-C16 Aromatics	70	130	25	NA	NA
C16-C21 Aromatics	70	130	25	NA	NA
C21-C34 Aromatics	70	130	25	NA	NA
C8-C10 Aliphatics	70	130	25	NA	NA
C10-C12 Aliphatics	70	130	25	NA	NA
C12-C16 Aliphatics	70	130	25	NA	NA
C16-C21 Aliphatics	70	130	25	NA	NA
C21-C34 Aliphatics	70	130	25	NA	NA
Surrogate (choose 1)					
Trifluorotoluene	50	150	FID and PID		
Bromofluorobenzene	60	140	FID and PID		

Control limits are method specific.

TABLE 5-15
LCS and MS/MSD Control Limits for Water Matrix, Methods SW6010B, SW6020, SW7000

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
Aluminum	80	120	≤20	80	120
Antimony	80	120	≤20	80	120
Arsenic	80	120	≤20	80	120
Barium	80	120	≤20	80	120
Beryllium	80	120	≤20	80	120
Boron	80	120	≤20	80	120
Cadmium	80	120	≤20	80	120
Calcium	80	120	≤20	80	120
Chromium	80	120	≤20	80	120
Cobalt	80	120	≤20	80	120
Copper	80	120	≤20	80	120
Iron	80	120	≤20	80	120
Lead	80	120	≤20	80	120
Magnesium	80	120	≤20	80	120
Manganese	80	120	≤20	80	120
Mercury	80	120	≤20	No ME	No ME
Nickel	80	120	≤20	80	120
Potassium	80	120	≤20	80	120
Selenium	80	120	≤20	75	120
Silver	80	120	≤20	75	120
Sodium	80	120	≤20	80	120
Thallium	80	120	≤20	80	120
Vanadium	80	120	≤20	80	120
Zinc	80	120	≤20	80	120

Control limits are taken from QSM Version 3.

TABLE 5-16
LCS and MS/MSD Control Limits for Soil Matrix, Methods SW6010B, SW6020, SW7000

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
Aluminum	80	120	≤20	75	120
Antimony	80	120	≤20	75	120
Arsenic	80	120	≤20	80	120
Barium	80	120	≤20	80	120
Beryllium	80	120	≤20	80	120
Boron	80	120	≤20	80	120
Cadmium	80	120	≤20	80	120
Calcium	80	120	≤20	80	120
Chromium	80	120	≤20	80	120
Cobalt	80	120	≤20	80	120
Copper	80	120	≤20	80	120
Iron	80	120	≤20	80	120
Lead	80	120	≤20	80	120
Magnesium	80	120	≤20	80	120
Manganese	80	120	≤20	80	120
Mercury	80	120	≤20	No ME	No ME
Nickel	80	120	≤20	80	120
Potassium	80	120	≤20	80	120
Selenium	80	120	≤20	75	120
Silver	75	120	≤20	75	125
Sodium	80	120	≤20	80	120
Thallium	80	120	≤20	80	120
Vanadium	80	120	≤20	80	120
Zinc	80	120	≤20	75	120

Control limits are taken from QSM Version 3.

TABLE 5-17
LCS and MS/MSD Control Limits for Water Matrix, Method SW8081A

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
4,4-DDD	25	150	≤30	10	170
4,4-DDE	35	140	≤30	15	160
4,4-DDT	45	140	≤30	30	155
Aldrin	25	140	≤30	10	155
alpha-BHC	60	130	≤30	50	140
alpha-Chlordane	65	125	≤30	55	135
beta-BHC	65	125	≤30	55	135
delta-BHC	45	135	≤30	30	150
Dieldrin	60	130	≤30	50	140
Endosulfan I	50	110	≤30	40	120
Endosulfan II	30	130	≤30	10	150
Endosulfan Sulfate	55	135	≤30	40	150
Endrin	55	135	≤30	45	145
Endrin Aldehyde	55	135	≤30	40	150
Endrin Ketone	75	125	≤30	70	135
gamma-BHC	25	135	≤30	10	155
gamma-Chlordane	60	125	≤30	50	135
Heptachlor	40	130	≤30	30	145
Heptachlor Epoxide	60	130	≤30	50	140
Methoxychlor	55	150	≤30	40	165
Toxaphene	41	126	30	25	140
Surrogates					
DCBP	30	135			
TCMX	25	140			

Control limits are taken from QSM Version 3.

TABLE 5-18
LCS and MS/MSD Control Limits for Soil Matrix, Method SW8081A

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
4,4-DDD	30	135	≤30	10	155
4,4-DDE	70	125	≤30	60	135
4,4-DDT	45	140	≤30	30	155
Aldrin	45	140	≤30	30	155
alpha-BHC	60	125	≤30	50	135
alpha-Chlordane	65	120	≤30	55	130
beta-BHC	60	125	≤30	50	135
delta-BHC	55	130	≤30	45	145
Dieldrin	65	125	≤30	55	135
Endosulfan I	15	135	≤30	10	155
Endosulfan II	35	140	≤30	20	160
Endosulfan Sulfate	60	135	≤30	50	145
Endrin	60	135	≤30	50	145
Endrin Aldehyde	35	145	≤30	20	165
Endrin Ketone	65	135	≤30	55	145
gamma-BHC	60	125	≤30	50	135
gamma-Chlordane	65	125	≤30	55	135
Heptachlor	50	140	≤30	35	155
Heptachlor Epoxide	65	130	≤30	55	140
Methoxychlor	55	145	≤30	45	155
Toxaphene	31	136	≤30	15	155
Surrogates					
DCBP	55	130			
TCMX	70	125			

Control limits are taken from QSM Version 3.

TABLE 5-19
LCS and MS/MSD Control Limits for Water Matrix, Method SW8082

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
Aroclor 1016	25	145	≤30	NA	NA
Aroclor 1260	30	145	≤30	NA	NA
Surrogate					
DCBP	40	135			

Control limits are taken from QSM Version 3.

TABLE 5-20
LCS and MS/MSD Control Limits for Soil Matrix, Method SW8082

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
Aroclor 1016	40	140	≤30	NA	NA
Aroclor 1260	60	130	≤30	NA	NA
Surrogate					
DCBP	60	125			

Control limits are taken from QSM Version 3.

TABLE 5-21
LCS and MS/MSD Control Limits for Water Matrix, Method SW8151A

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
2,4-D	35	115	≤30	NA	NA
2,4-DB	45	130	≤30	NA	NA
2,4,5-T	35	110	≤30	NA	NA
2,4,5-TP (Silvex)	50	115	≤30	NA	NA
Dalapon	40	110	≤30	NA	NA
Dicamba	60	110	≤30	NA	NA
Dichlorprop	70	120	≤30	NA	NA
Dinoseb	20	95	≤30	NA	NA
MCPA	60	145	≤30	NA	NA

Control limits are taken from QSM Version 3.

TABLE 5-22
LCS and MS/MSD Control Limits for Soil Matrix, Method SW8151A

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
2,4-D	35	145	≤30	NA	NA
2,4-DB	50	155	≤30	NA	NA
2,4,5-T	45	135	≤30	NA	NA
2,4,5-TP (Silvex)	45	125	≤30	NA	NA
Dalapon	40	110	≤30	NA	NA
Dicamba	55	110	≤30	NA	NA
Dichlorprop	75	140	≤30	NA	NA
Dinoseb	5	130	≤30	NA	NA
MCPA	60	145	≤30	NA	NA

Control limits are taken from QSM Version 3.

TABLE 5-23
LCS and MS/MSD Control Limits for Water Matrix, Method SW8260B

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
1,1,1,2-Tetrachloroethane	80	130	≤30	75	135
1,1,1-Trichloroethane	65	130	≤30	55	145
1,1,2,2-Tetrachloroethane	65	130	≤30	55	140
1,1,2-Trichloroethane	75	125	≤30	65	135
1,1-Dichloroethane	70	135	≤30	60	145
1,1-Dichloroethene	70	130	≤30	55	140
1,1-Dichloropropene	75	130	≤30	65	140
1,2,3-Trichlorobenzene	55	140	≤30	45	155
1,2,3-Trichloropropane	75	125	≤30	65	130
1,2,4-Trichlorobenzene	65	135	≤30	55	145
1,2,4-Trimethylbenzene	75	130	≤30	65	140
1,2-Dibromo-3-chloropropane	50	130	≤30	35	145
1,2-Dibromoethane (EDB)	80	120	≤30	75	125
1,2-Dichlorobenzene	70	120	≤30	60	130
1,2-Dichloroethane	70	130	≤30	60	140
1,2-Dichloropropane	75	125	≤30	65	135
1,3,5-Trimethylbenzene	75	130	≤30	65	140
1,3-Dichlorobenzene	75	125	≤30	65	130
1,3-Dichloropropane	75	125	≤30	65	135
1,4-Dichlorobenzene	75	125	≤30	65	130
2,2-Dichloropropane	70	135	≤30	60	150
2-Butanone	30	150	≤30	10	170
2-Chlorotoluene	75	125	≤30	65	135
2-Hexanone	55	130	≤30	45	140
4-Chlorotoluene	75	130	≤30	65	135
4-Methyl-2-pentanone	60	135	≤30	45	145
Acetone	40	140	≤30	20	160
Benzene	80	120	≤30	75	130
Bromobenzene	75	125	≤30	70	130
Bromochloromethane	65	130	≤30	55	140
Bromodichloromethane	75	120	≤30	70	130
Bromoform	70	130	≤30	60	140
Bromomethane	30	145	≤30	10	165
Carbon disulfide	35	160	≤30	15	185
Carbon tetrachloride	65	140	≤30	55	150
Chlorobenzene	80	120	≤30	75	130
Chlorodibromomethane	60	135	≤30	45	145
Chloroethane	60	135	≤30	50	145
Chloroform	65	135	≤30	50	150
Chloromethane	40	125	≤30	25	140
cis-1,2-Dichloroethene	70	125	≤30	60	135
cis-1,3-Dichloropropene	70	130	≤30	60	140
Dibromomethane	75	125	≤30	65	135
Dichlorodifluoromethane	30	155	≤30	10	175

TABLE 5-23
LCS and MS/MSD Control Limits for Water Matrix, Method SW8260B

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
Ethylbenzene	75	125	≤30	65	135
Hexachlorobutadiene	50	140	≤30	35	160
Isopropylbenzene	75	125	≤30	65	135
m,p-Xylenes	75	130	≤30	65	135
Methyl tert-butyl ether (MTBE)	65	125	≤30	55	135
Methylene chloride	55	140	≤30	40	155
Naphthalene	55	140	≤30	40	150
n-Butylbenzene	70	135	≤30	55	150
n-Propylbenzene	70	130	≤30	65	140
o-Xylene	80	120	≤30	75	130
p-Isopropyltoluene	75	130	≤30	65	140
sec-Butylbenzene	70	125	≤30	65	135
Styrene	65	135	≤30	55	145
tert-Butylbenzene	70	130	≤30	60	140
Tetrachloroethene	45	150	≤30	25	165
Toluene	75	120	≤30	70	130
trans-1,2-Dichloroethene	60	140	≤30	45	150
trans-1,3-Dichloropropene	55	140	≤30	40	155
Trichloroethene	70	125	≤30	60	135
Trichlorofluoromethane	60	145	≤30	45	160
Vinyl chloride	50	145	≤30	35	165
Surrogates					
4-Bromofluorobenzene	70	120			
Dibromofluoromethane	75	120			
1,2-Dichloromethane-d4	85	115			
Toluene-d8	85	120			

Control limits are taken from QSM Version 3.

TABLE 5-24
LCS and MS/MSD Control Limits for Soil Matrix, Method SW8260B

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
1,1,1,2-Tetrachloroethane	75	125	≤30	65	135
1,1,1-Trichloroethane	70	135	≤30	55	145
1,1,2,2-Tetrachloroethane	55	130	≤30	40	145
1,1,2-Trichloroethane	60	125	≤30	50	140
1,1-Dichloroethane	75	125	≤30	65	135
1,1-Dichloroethene	65	135	≤30	55	150
1,1-Dichloropropene	70	135	≤30	60	145
1,2,3-Trichlorobenzene	60	135	≤30	50	145
1,2,3-Trichloropropane	65	130	≤30	50	140
1,2,4-Trichlorobenzene	65	130	≤30	55	140
1,2,4-Trimethylbenzene	65	135	≤30	55	145
1,2-Dibromo-3-chloropropane	40	135	≤30	25	150
1,2-Dibromoethane (EDB)	70	125	≤30	60	135
1,2-Dichlorobenzene	75	120	≤30	65	125
1,2-Dichloroethane	70	135	≤30	60	145
1,2-Dichloropropane	70	120	≤30	65	125
1,3,5-Trimethylbenzene	65	135	≤30	55	145
1,3-Dichlorobenzene	70	125	≤30	65	135
1,3-Dichloropropane	75	125	≤30	70	130
1,4-Dichlorobenzene	70	125	≤30	65	135
2,2-Dichloropropane	65	135	≤30	55	145
2-Butanone	30	160	≤30	10	180
2-Chlorotoluene	70	130	≤30	60	140
2-Hexanone	45	145	≤30	30	160
4-Chlorotoluene	75	125	≤30	65	135
4-Methyl-2-pentanone	45	145	≤30	30	165
Acetone	20	160	≤30	10	180
Benzene	75	125	≤30	65	135
Bromobenzene	65	120	≤30	55	130
Bromochloromethane	70	125	≤30	60	135
Bromodichloromethane	70	130	≤30	60	135
Bromoform	55	135	≤30	45	150
Bromomethane	30	160	≤30	10	180
Carbon disulfide	45	160	≤30	30	180
Carbon tetrachloride	65	135	≤30	55	145
Chlorobenzene	75	125	≤30	65	130
Chlorodibromomethane	65	130	≤30	55	140
Chloroethane	40	155	≤30	20	175
Chloroform	70	125	≤30	65	135
Chloromethane	50	130	≤30	40	140
cis-1,2-Dichloroethene	65	125	≤30	55	135
cis-1,3-Dichloropropene	70	125	≤30	65	135
Dibromomethane	75	130	≤30	65	135
Dichlorodifluoromethane	35	135	≤30	15	155

TABLE 5-24
LCS and MS/MSD Control Limits for Soil Matrix, Method SW8260B

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
Ethylbenzene	75	125	≤30	65	135
Hexachlorobutadiene	55	140	≤30	40	155
Isopropylbenzene	75	130	≤30	70	140
m,p-Xylenes	80	125	≤30	70	135
Methyl tert-butyl ether (MTBE)	65	125	≤30	55	135
Methylene chloride	55	140	≤30	40	155
Naphthalene	40	125	≤30	25	140
n-Butylbenzene	65	140	≤30	50	150
n-Propylbenzene	65	135	≤30	50	145
o-Xylene	75	125	≤30	70	135
p-Isopropyltoluene	75	135	≤30	65	140
sec-Butylbenzene	65	130	≤30	50	145
Styrene	75	125	≤30	65	135
tert-Butylbenzene	65	130	≤30	55	145
Tetrachloroethene	65	140	≤30	55	150
Toluene	70	125	≤30	60	135
trans-1,2-Dichloroethene	65	135	≤30	55	145
trans-1,3-Dichloropropene	65	135	≤30	55	140
Trichloroethene	75	125	≤30	70	130
Trichlorofluoromethane	25	185	≤30	10	215
Vinyl chloride	60	125	≤30	45	140
Surrogates					
4-Bromofluorobenzene	85	120			
Toluene-d8	85	115			

Control limits are taken from QSM Version 3.

TABLE 5-25
LCS and MS/MSD Control Limits for Water Matrix, Methods SW8270C and SW8270C-SIM

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
Polynuclear Aromatics (SW8270C-SIM)					
2-Methylnaphthalene	45	105	≤30	35	115
Acenaphthene	45	110	≤30	35	120
Acenaphthylene	50	105	≤30	40	115
Anthracene	55	110	≤30	45	120
Benzo(a) anthracene	55	110	≤30	45	120
Benzo(a) pyrene	55	110	≤30	45	120
Benzo(b)fluoranthene	45	120	≤30	35	130
Benzo(k)fluoranthene	45	125	≤30	30	135
Benzo(g,h,i) perylene	40	125	≤30	25	135
Chrysene	55	110	≤30	45	120
Dibenzo(a,h) anthracene	40	125	≤30	30	140
Fluoranthene	55	115	≤30	45	125
Fluorene	50	110	≤30	40	120
Indeno(1,2,3-c,d)pyrene	45	125	≤30	30	140
Naphthalene	40	100	≤30	30	115
Phenanthrene	50	115	≤30	40	130
Pyrene	50	130	≤30	35	140
Phenolic/Acidic (SW8270C)					
2,4,5-Trichlorophenol	50	110	≤30	40	120
2,4,6-Trichlorophenol	50	115	≤30	40	125
2,4-Dichlorophenol	50	105	≤30	40	115
2,4-Dimethylphenol	30	110	≤30	15	125
2,4-Dinitrophenol	15	140	≤30	10	160
2-Chlorophenol	35	105	≤30	25	115
2-Methylphenol	40	110	≤30	25	120
2-Nitrophenol	40	115	≤30	25	125
3-Methylphenol/4-methylphenol	30	110	≤30	20	125
4,6-Dinitro-2-methylphenol	40	130	≤30	25	145
4-Chloro-3-methylphenol	45	110	≤30	35	120
4-Nitrophenol	0	125	≤30	0	145
Benzoic Acid	0	125	≤30	0	150
Pentachlorophenol	40	115	≤30	25	130
Phenol	0	115	≤30	0	135
Basic (SW8270C)					
3,3-Dichlorobenzidine	20	110	≤30	10	125
4-Chloroaniline	15	110	≤30	10	125
Phthalate Esters (SW8270C)					
bis(2-Ethylhexyl)phthalate	40	125	≤30	30	140
Butylbenzyl phthalate	45	115	≤30	35	130
di-n-Butyl phthalate	55	115	≤30	45	125
di-n-Octyl phthalate	35	135	≤30	20	155
Diethylphthalate	40	120	≤30	30	130
Dimethylphthalate	25	125	≤30	10	145

TABLE 5-25
LCS and MS/MSD Control Limits for Water Matrix, Methods SW8270C and SW8270C-SIM

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
Nitrosoamines (SW8270C)					
n-Nitroso-di-n-propylamine	35	130	≤30	20	145
n-Nitroso-dimethylamine	25	110	≤30	10	125
n-Nitrosodiphenylamine	50	110	≤30	35	120
Chlorinated Aliphatics (SW8270C)					
bis(2-Chloroethoxy)methane	45	105	≤30	35	115
bis(2-Chloroethyl)ether	35	110	≤30	25	120
bis(2-Chloroisopropyl)ether	25	130	≤30	10	150
Hexachlorobutadiene	25	105	≤30	15	115
Hexachloroethane	30	95	≤30	15	105
Halogenated Aromatics (SW8270C)					
1,2,4-Triichlorobenzene	35	105	≤30	25	120
1,2-Dichlorobenzene	35	100	≤30	20	115
1,3-Dichlorobenzene	30	100	≤30	20	110
1,4-Dichlorobenzene	30	100	≤30	20	110
2-Chloronaphthalene	50	105	≤30	40	115
4-Bromophenyl phenyl ether	50	115	≤30	40	125
4-Chlorophenyl phenyl ether	50	110	≤30	40	120
Hexachlorobenzene	50	110	≤30	40	120
Nitroaromatics (SW8270C)					
2,4-Dinitrotoluene	50	120	≤30	40	130
2,6-Dinitrotoluene	50	115	≤30	35	130
2-Nitroaniline	50	115	≤30	35	125
3-Nitroaniline	20	125	≤30	10	145
4-Nitroaniline	35	120	≤30	20	130
Nitrobenzene	45	110	≤30	35	120
Neutral Aromatics (SW8270C)					
Carbazole	50	115	≤30	35	130
Dibenzofuran	55	105	≤30	45	115
Others (SW8270C)					
1,2-Diphenylhydrazine	55	115	≤30	45	120
Benzyl alcohol	30	110	≤30	15	125
Isophorone	50	110	≤30	40	125
Surrogates					
2-Fluorobiphenyl	50	110			
Terphenyl-d14	50	135			
2,4,6-Tribromophenol	40	125			
2-Fluorophenol	20	110			
Nitrobenzene-d5	40	100			

Control limits are taken from QSM Version 3.

TABLE 5-26
LCS and MS/MSD Control Limits for Soil Matrix, Methods SW8270C and /SW8270C-SIM

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
Polynuclear Aromatics (SW8270C-SIM)					
2-Methylnaphthalene	45	105	≤30	35	115
Acenaphthene	45	110	≤30	35	120
Acenaphthylene	45	105	≤30	35	115
Anthracene	55	105	≤30	45	115
Benzo(a) anthracene	50	110	≤30	40	120
Benzo(a) pyrene	50	110	≤30	40	120
Benzo(b)fluoranthene	45	115	≤30	35	125
Benzo(k)fluoranthene	45	125	≤30	30	135
Benzo(g,h,i) perylene	40	125	≤30	25	140
Chrysene	55	110	≤30	45	120
Dibenzo(a,h) anthracene	40	125	≤30	25	140
Fluoranthene	55	115	≤30	45	125
Fluorene	50	110	≤30	40	115
Indeno(1,2,3-c,d)pyrene	40	120	≤30	25	135
Naphthalene	40	105	≤30	30	120
Phenanthrene	50	110	≤30	40	120
Pyrene	45	125	≤30	35	135
Phenolic/Acidic (SW8270C)					
2,4,5-Trichlorophenol	50	110	≤30	40	120
2,4,6-Trichlorophenol	45	110	≤30	30	120
2,4-Dichlorophenol	45	110	≤30	35	120
2,4-Dimethylphenol	30	105	≤30	20	115
2,4-Dinitrophenol	15	130	≤30	10	150
2-Chlorophenol	45	105	≤30	35	115
2-Methylphenol	40	105	≤30	30	115
2-Nitrophenol	40	110	≤30	30	120
3-Methylphenol/4-methylphenol	40	105	≤30	30	120
4,6-Dinitro-2-methylphenol	30	135	≤30	10	155
4-Chloro-3-methylphenol	45	115	≤30	35	125
4-Nitrophenol	15	140	≤30	10	160
Benzoic Acid	0	110	≤30	0	130
Pentachlorophenol	25	120	≤30	10	135
Phenol	40	100	≤30	30	110
Basic (SW8270C)					
3,3-Dichlorobenzidine	10	130	≤30	0	145
4-Chloroaniline	10	95	≤30	0	110
Phthalate Esters (SW8270C)					
bis(2-Ethylhexyl)phthalate	45	125	≤30	35	140
Butylbenzyl phthalate	50	125	≤30	35	135
di-n-Butyl phthalate	55	110	≤30	45	120
di-n-Octyl phthalate	40	130	≤30	25	145
Diethylphthalate	50	115	≤30	40	125
Dimethylphthalate	50	110	≤30	40	120

TABLE 5-26
LCS and MS/MSD Control Limits for Soil Matrix, Methods SW8270C and /SW8270C-SIM

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
Nitrosoamines (SW8270C)					
n-Nitroso-di-n-propylamine	40	115	≤30	30	125
n-Nitroso-dimethylamine	20	115	≤30	10	130
n-Nitrosodiphenylamine	50	115	≤30	40	125
Chlorinated Aliphatics (SW8270C)					
bis(2-Chloroethoxy)methane	45	110	≤30	30	120
bis(2-Chloroethyl)ether	40	105	≤30	25	115
bis(2-Chloroisopropyl)ether	20	115	≤30	10	130
Hexachlorobutadiene	40	115	≤30	25	130
Hexachloroethane	35	110	≤30	20	120
Halogenated Aromatics (SW8270C)					
1,2,4-Triichlorobenzene	45	110	≤30	30	120
1,2-Dichlorobenzene	45	95	≤30	35	105
1,3-Dichlorobenzene	40	100	≤30	30	110
1,4-Dichlorobenzene	35	105	≤30	25	115
2-Chloronaphthalene	45	105	≤30	35	115
4-Bromophenyl phenyl ether	45	115	≤30	35	130
4-Chlorophenyl phenyl ether	45	110	≤30	35	120
Hexachlorobenzene	45	120	≤30	35	130
Nitroaromatics (SW8270C)					
2,4-Dinitrotoluene	50	115	≤30	35	130
2,6-Dinitrotoluene	50	110	≤30	35	125
2-Nitroaniline	45	120	≤30	30	130
3-Nitroaniline	25	110	≤30	15	125
4-Nitroaniline	35	115	≤30	20	125
Nitrobenzene	40	115	≤30	30	125
Neutral Aromatics (SW8270C)					
Carbazole	45	115	≤30	30	130
Dibenzofuran	50	105	≤30	40	110
Others (SW8270C)					
1,2-Diphenylhydrazine	55	115	≤30	45	120
Benzyl alcohol	20	125	≤30	10	140
Isophorone	45	110	≤30	30	125
Surrogates					
2-Fluorobiphenyl	45	105			
Terphenyl-d14	30	125			
2,4,6-Tribromophenol	35	125			
2-Fluorophenol	35	105			
Phenol-d5/d6	40	100			
Nitrobenzene-d5	35	100			

Control limits are taken from QSM Version 3.

TABLE 5-27
LCS and MS/MSD Control Limits for Water and Soil Matrices, Method SW8290

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
2,3,7,8-TCDD	NA	NA	≤25	NA	NA
1,2,3,7,8-PeCDD	NA	NA	≤25	NA	NA
1,2,3,4,7,8-HxCDD	NA	NA	≤25	NA	NA
1,2,3,6,7,8-HxCDD	NA	NA	≤25	NA	NA
1,2,3,7,8,9-HxCDD	NA	NA	≤25	NA	NA
1,2,3,4,6,7,8-HpCDD	NA	NA	≤25	NA	NA
OCDD	NA	NA	≤25	NA	NA
2,3,7,8-TCDF	NA	NA	≤25	NA	NA
1,2,3,7,8-PeCDF	NA	NA	≤25	NA	NA
2,3,4,7,8-PeCDF	NA	NA	≤25	NA	NA
1,2,3,4,7,8-HxCDF	NA	NA	≤25	NA	NA
1,2,3,6,7,8-HxCDF	NA	NA	≤25	NA	NA
2,3,4,6,7,8-HxCDF	NA	NA	≤25	NA	NA
1,2,3,7,8,9-HxCDF	NA	NA	≤25	NA	NA
1,2,3,4,6,7,8-HpCDF	NA	NA	≤25	NA	NA
1,2,3,4,7,8,9-HpCDF	NA	NA	≤25	NA	NA
OCDF	NA	NA	≤25	NA	NA

Control limits are taken from QSM Version 3.

TABLE 5-28
LCS and MS/MSD Control Limits for Water Matrix, Methods SW8321 and SW8330

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
1,3,5-Trinitrobenzene	65	140	≤30	50	150
1,3-Dinitrobenzene	45	160	≤30	30	175
2,4-Dinitrotoluene	60	135	≤30	50	145
2,6-Dinitrotoluene	60	135	≤30	50	150
2,4,6-Trinitrotoluene (TNT)	50	145	≤30	35	160
2-Amino-4,6-dinitrotoluene	50	155	≤30	35	170
2-Nitrotoluene	45	135	≤30	30	150
3-Nitrotoluene	50	130	≤30	35	145
4-Amino-4,6-dinitrotoluene	55	155	≤30	40	170
4-Nitrotoluene	50	130	≤30	35	145
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	50	160	≤30	35	180
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	20	175	≤30	10	200
Nitrobenzene	50	140	≤30	35	155
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	80	115	≤30	75	120

Control limits are taken from QSM Version 3.

TABLE 5-29
LCS and MS/MSD Control Limits for Soil Matrix, Methods SW8321 and SW8330

Analyte	LCL	UCL	Precision	Lower ME Limit	Upper ME Limit
1,3,5-Trinitrobenzene	75	125	≤30	65	135
1,3-Dinitrobenzene	80	125	≤30	70	135
2,4-Dinitrotoluene	80	125	≤30	75	130
2,6-Dinitrotoluene	80	120	≤30	70	130
2,4,6-Trinitrotoluene (TNT)	55	140	≤30	45	155
2-Amino-4,6-dinitrotoluene	80	125	≤30	75	130
2-Nitrotoluene	80	125	≤30	70	130
3-Nitrotoluene	75	120	≤30	70	130
4-Amino-4,6-dinitrotoluene	80	125	≤30	75	130
4-Nitrotoluene	75	125	≤30	70	135
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	70	135	≤30	65	145
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	10	150	≤30	0	172
Nitrobenzene	75	125	≤30	70	130
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	75	125	≤30	65	135

Control limits are taken from QSM Version 3.

TABLE 5-30
LCS/LCSD Control Limits for Air Matrix, Method TO-15

Analyte	LCL	UCL	Precision
1,1,1,2-Tetrachloroethane	70	130	≤30
1,1,1-Trichloroethane	70	130	≤30
1,1,2,2-Tetrachloroethane	70	130	≤30
1,1,2-Trichloroethane	70	130	≤30
1,1-Dichloroethane	70	130	≤30
1,1-Dichloroethene	70	130	≤30
1,1-Dichloropropene	70	130	≤30
1,2,3-Trichlorobenzene	70	130	≤30
1,2,3-Trichloropropane	70	130	≤30
1,2,4-Trichlorobenzene	70	130	≤30
1,2,4-Trimethylbenzene	70	130	≤30
1,2-Dibromo-3-chloropropane	70	130	≤30
1,2-Dibromoethane (EDB)	70	130	≤30
1,2-Dichlorobenzene	70	130	≤30
1,2-Dichloroethane	70	130	≤30
1,2-Dichloropropane	70	130	≤30
1,3,5-Trimethylbenzene	70	130	≤30
1,3-Dichlorobenzene	70	130	≤30
1,3-Dichloropropane	70	130	≤30
1,4-Dichlorobenzene	70	130	≤30
2,2-Dichloropropane	70	130	≤30
2-Butanone	70	130	≤30
2-Chlorotoluene	70	130	≤30
2-Hexanone	70	130	≤30
4-Chlorotoluene	70	130	≤30
4-Methyl-2-pentanone	70	130	≤30
Acetone	70	130	≤30
Benzene	70	130	≤30
Bromobenzene	70	130	≤30
Bromochloromethane	70	130	≤30
Bromodichloromethane	70	130	≤30
Bromoform	70	130	≤30
Bromomethane	70	130	≤30
Carbon disulfide	70	130	≤30
Carbon tetrachloride	70	130	≤30
Chlorobenzene	70	130	≤30
Chlorodibromomethane	70	130	≤30
Chloroethane	70	130	≤30
Chloroform	70	130	≤30
Chloromethane	70	130	≤30
cis-1,2-Dichloroethene	70	130	≤30
cis-1,3-Dichloropropene	70	130	≤30
Dibromomethane	70	130	≤30
Dichlorodifluoromethane	70	130	≤30
Ethylbenzene	70	130	≤30

TABLE 5-30
LCS/LCSD Control Limits for Air Matrix, Method TO-15

Analyte	LCL	UCL	Precision
Hexachlorobutadiene	70	130	≤30
Isopropylbenzene	70	130	≤30
m,p-Xylenes	70	130	≤30
Methyl tert-butyl ether (MTBE)	70	130	≤30
Methylene chloride	70	130	≤30
Naphthalene	70	130	≤30
n-Butylbenzene	70	130	≤30
n-Propylbenzene	70	130	≤30
o-Xylene	70	130	≤30
p-Isopropyltoluene	70	130	≤30
sec-Butylbenzene	70	130	≤30
Styrene	70	130	≤30
tert-Butylbenzene	70	130	≤30
Tetrachloroethene	70	130	≤30
Toluene	70	130	≤30
trans-1,2-Dichloroethene	70	130	≤30
trans-1,3-Dichloropropene	70	130	≤30
Trichloroethene	70	130	≤30
Trichlorofluoromethane	70	130	≤30
Vinyl chloride	70	130	≤30
Surrogates			
4-Bromofluorobenzene	70	120	
Dibromofluoromethane	75	120	
1,2-Dichloromethane-d4	85	115	
Toluene-d8	85	120	

Control limits are method specific.

TABLE 5-31
Calibration and Quality Control Requirements for Methods AK101, AK102/AK103 and NWEPH/VPH

Quality Control Check	Frequency	Criteria	Corrective Action and Laboratory Flagging Guidelines
Multipoint initial calibration (minimum five points)	Prior to sample analysis, or when calibration verification fails	RSD ≤ 25%	Correct problem and repeat initial calibration No flagging criteria
CCV	Daily after initial calibration, prior to sample analysis	All analytes within ± 25% of expected value	Correct problem then repeat initial calibration No flagging criteria
Method Blank	One per analytical batch	No analytes detected >½ RL	Correct problem then reprep and reanalyze method blank and all samples processed with the contaminated blank. Apply B flag to all results for the specific analyte(s) in all samples in associated batch.
Surrogate spike	Every standard, sample, method blank, MS/MSD, and LCS/LCSD	Surrogates in samples, method blank, MS/MSD, and LCS/LCSD within control limits in Tables 5-13 and 5-14	Correct the problem and reanalyze (reprep if necessary). If corrective action fails, apply Q flag to specific analytes in the associated sample
MS/MSD	One MS/MSD per every 20 project samples per matrix	All analytes within control limits in Tables 5-13 and 5-14	Contact client for additional measure to be taken For the specific analytes in the parent sample, apply J flag
LCS/LCSD	One LCS per analytical batch	All analytes within control limits in Tables 5-13 and 5-14	Correct problem then reprep and analyze the LCS and all samples in the affected batch If corrective action fails, apply Q flag to specific analytes in the associated batch.
Retention time window	Every standard, sample, method blank, MS/MSD, and LCS/LCSD	Analyte within established retention time window	Correct problem then reanalyze Apply J flag to affected analytes
Results between the MDL and RL	NA	NA	Apply J flag to all results between the MDL and RL
MDL Study	At initial setup and subsequently every 12 months	See 40CFR 136B, MDL checks must produce a signal at least 3 times the instrument noise level	Run MDL check at higher level and set MDL higher or reconduct MDL study. No flagging criteria

Quality control requirements are ADEC method specific.

CCV = continuing calibration verification
LCS/LCSD = laboratory control sample/laboratory control sample duplicate
MDL = method detection limit
MS/MSD = matrix spike/matrix spike duplicate
NA = not applicable
RL = reporting limit
RSD = relative standard deviation

TABLE 5-32
Calibration and Quality Control Requirements for Methods SW6010B and SW7000

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action and Laboratory Flagging Guidelines
SW6010B: Initial calibration (minimum 1 standard and a blank) SW7000: Minimum 5 standards and a calibration blank	Daily initial calibration prior to sample analysis	SW6010B: No criteria unless more than one standard is used, in which case r ≥ 0.995 SW7000: r ≥ 0.995	Correct problem and repeat initial calibration No flagging criteria
ICV	Daily after initial calibration, prior to sample analysis	All analytes within ± 10% of expected value	Correct problem then repeat initial calibration No flagging criteria
CCV	After every 10 samples and at the end of the analysis sequence	SW6010B: All analytes within ± 10% of expected value SW7000: All analytes within ± 20% of expected value	Repeat calibration and reanalyze all samples since last successful calibration No flagging criteria
Low-level Calibration Verification (SW6010B only)	Daily, after one-point initial calibration	All analytes within ± 20% of expected value	Correct problem then reanalyze No flagging criteria
Method blank	One per analytical batch	No analytes detected >½ RL	Correct problem then reprep and reanalyze method blank and all samples processed with the contaminated blank. Apply B flag to all results for the specific analyte(s) in all samples in associated batch.
Calibration blank	After every calibration verification	No analytes detected >½ RL	Correct problem then reprep and reanalyze calibration blank and previous 10 samples Apply B flag to all results for the specific analyte(s) in all samples in associated batch.
ICS (SW6010B only)	At the beginning of an analytical run	ICS-A: Absolute value of concentration for all non-spiked analytes < 2x MDL. ICS-AB: Within ± 20% of expected value	Terminate analysis; correct problem; reanalyze ICS; reanalyze all affected samples No flagging criteria
LCS/LCSD	One LCS/LCSD per analytical batch	All analytes within control limits in Tables 5-15 and 5-16	Correct problem then reprep and analyze the LCS and all samples in the affected batch If corrective action fails, apply Q flag to specific analytes in the associated batch.

TABLE 5-32
Calibration and Quality Control Requirements for Methods SW6010B and SW7000

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action and Laboratory Flagging Guidelines
Dilution test	Each preparatory batch or new sample matrix	1:5 dilution must agree within ±10% of the original determination	SW6010B: Perform post digestion spike addition SW7000: Perform recovery test No flagging criteria
Post digestion spike addition (SW6010B only)	When dilution test fails or analyte concentration in all samples < 50x MDL	Recovery within 75-125% of expected results	Correct problem then reanalyze post digestion spike addition. If still fails, analyze by MSA For the specific analytes in the parent sample, apply J flag
Recovery Test (SW7000 only)	When dilution test fails or analyte concentration in all samples <25 x MDL	Recovery within 85-115% of true value	Correct problem then reanalyze recovery test. If still fails, analyze by MSA For the specific analytes in the parent sample, apply J flag
MSA	When matrix interference is suspected or dilution test AND post-digestion spike fail	r ≥ 0.995	For the specific analytes in the parent sample, apply J flag
MS/MSD	One MS/MSD per every 20 project samples per matrix	All analytes within control limits in Tables 5-15 and 5-16	Contact client for additional measure to be taken For the specific analytes in the parent sample, apply J flag
Results between the MDL and RL	NA	NA	Apply J flag to all results between the MDL and RL
MDL Study	At initial setup and subsequently every 12 months	See 40CFR 136B, MDL checks must produce a signal at least 3 times the instrument noise level	Run MDL check at higher level and set MDL higher or reconduct MDL study. No flagging criteria
Instrument Detection Limit Study (SW6010B only)	At initial setup and after significant change	Detection limits established must be ≤MDL	NA
Linear dynamic range (SW6010B only)	Every 6 months	All analytes within 10% of expected value	NA

Quality control requirements are QSM Version 3 specific.

CCV = continuing calibration verification
ICV = initial calibration verification
ICS = interference check sample
LCS/LCSD = laboratory control sample/laboratory control sample duplicate
MDL = method detection limit
MS/MSD = matrix spike/matrix spike duplicate
MSA = method of standard additions
NA = not applicable
RL = reporting limit
RSD = relative standard deviation

TABLE 5-33
Calibration and Quality Control Requirements for Method SW6020

Quality Control Check	Frequency	Criteria	Corrective Action
Tuning	Prior to initial calibration	Mass calibration ≤ 0.1 amu from the true value; resolution < 0.9 amu full width at 10% peak height; for stability, RSD < 5% for at least four replicate analytes	Retune instrument then reanalyze tuning solutions No flagging criteria
Initial calibration (a blank and at least one standard)	Daily initial calibration prior to sample analysis	No criteria unless more than one standard is used, in which case r ≥ 0.995	Correct problem and repeat initial calibration No flagging criteria
ICV	Daily after initial calibration, prior to sample analysis	All analytes within ± 10% of expected value	Correct problem then repeat initial calibration No flagging criteria
CCV	After every 10 samples and at the end of the analysis sequence	All analytes within ± 10% of expected value	Repeat calibration and reanalyze all samples since last successful calibration No flagging criteria
Low-level Calibration Verification	Daily, after one-point initial calibration	All analytes within ± 20% of expected value	Correct problem then reanalyze No flagging criteria
Method blank	One per analytical batch	No analytes detected >½ RL	Correct problem then reprep and reanalyze method blank and all samples processed with the contaminated blank. Apply B flag to all results for the specific analyte(s) in all samples in associated batch.
Calibration blank	After every calibration verification	No analytes detected >½ RL	Correct problem then reprep and reanalyze calibration blank and previous 10 samples Apply B flag to all results for the specific analyte(s) in all samples in associated batch.
ICS	At the beginning of an analytical run	ICS-A: Absolute value of concentration for all non-spiked analytes < 2x MDL. ICS-AB: Within ± 20% of expected value	Terminate analysis; correct problem; reanalyze ICS; reanalyze all affected samples No flagging criteria
LCS/LCSD	One LCS/LCSD per analytical batch	All analytes within control limits in Tables 5-15 and 5-16	Correct problem then reprep and analyze the LCS and all samples in the affected batch If corrective action fails, apply Q flag to specific analytes in the associated batch.

TABLE 5-33
Calibration and Quality Control Requirements for Method SW6020

Quality Control Check	Frequency	Criteria	Corrective Action
Dilution test	Each preparatory batch or new sample matrix	1:5 dilution must agree within ± 10% of the original determination	Perform post digestion spike addition No flagging criteria
Post digestion spike addition	When dilution test fails or analyte concentration in all samples < 50x MDL	Recovery within 75-125% of expected results	Correct problem then reanalyze post digestion spike addition. If still fails, analyze by MSA For the specific analytes in the parent sample, apply J flag
MSA	When matrix interference is suspected or dilution test AND post-digestion spike fail	NA	NA
MS/MSD	One MS/MSD per every 20 project samples per matrix	All analytes within control limits in Tables 5-15 and 5-16	Contact client for additional measure to be taken For the specific analytes in the parent sample, apply J flag
Internal Standards	Every sample	IS intensity within 30-120% of intensity of the IS in the initial calibration	Perform corrective action as described in Method SW6020 (8.3) No flagging criteria
Results between the MDL and RL	NA	NA	Apply J flag to all results between the MDL and RL
MDL Study	At initial setup and subsequently every 12 months	See 40CFR 136B, MDL checks must produce a signal at least 3 times the instrument noise level	Run MDL check at higher level and set MDL higher or reconduct MDL study. No flagging criteria
Instrument Detection Limit Study	At initial setup and after significant change	Detection limits established must be ≤MDL	NA
Linear dynamic range	Every 6 months	All analytes within 10% of expected value	NA

Quality control requirements are QSM Version 3 specific.

amu = atomic mass unit
CCV = continuing calibration verification
ICV = initial calibration verification
ICS = interference check sample
LCS/LCSD = laboratory control sample/laboratory control sample duplicate
MDL = method detection limit
MS/MSD = matrix spike/matrix spike duplicate
MSA = method of standard additions
NA = not applicable
RL = reporting limit
RSD = relative standard deviation

TABLE 5-34
Calibration and Quality Control Requirements for Methods SW8081A, SW8082, SW8151A, SW8321, SW8330

Quality Control Check	Frequency	Criteria	Corrective Action
Multipoint initial calibration (minimum five points) Multi-point calibration for Aroclors 1016 and 1260 only, but include mid-point standard for all other Aroclors for pattern recognition; if a specific Aroclor is found in any sample, quantitation for that Aroclor must be done using 5-point calibration.	Prior to sample analysis	One of the option below (except for method SW8082, which may only use Option 1 or 2) Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression, r ≥ 0.995 Option 3: non-linear regression: COD r^2 ≥ 0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct the problem and repeat the initial calibration. No flagging criteria
ICV	Once for each multipoint initial calibration	All analytes within ± 20% of expected value	Correct the problem, then recalibrate and reanalyze ICV No flagging criteria
CCV	At the start of each analytical sequence, after every 12 hours or 10 samples, whichever is more frequent, and at the end of the sequence	All analytes within ± 20% of expected value from the ICAL	Correct the problem, then recalibrate and reanalyze all samples since the last acceptable CCV. Apply Q flag to all results in samples since the last acceptable CCV
Breakdown check (Endrin/DDT Method SW8081A only)	At start of each 12-hour period	Breakdown of either Endrin or DDT ≤ 15%	Correct problem then repeat breakdown check No flagging criteria
Method blank	One per analytical batch	No analytes detected >½ RL For common lab contaminants, no analytes detected ≥ RL	Correct problem then reprep and reanalyze method blank and all samples processed with the contaminated blank. Apply B flag to all results for the specific analyte(s) in all samples in associated batch.
LCS/LCSD	One LCS/LCSD per analytical batch	All analytes within control limits specified in Tables 5-17 through 5-22, 5-28 and 5-29.	Correct problem then reprep and analyze the LCS and all samples in the affected batch If corrective action fails, apply Q flag to specific analytes in the associated batch.
MS/MSD	One MS/MSD per every 20 project samples per matrix	All analytes within control limits specified in Tables 5-17 through 5-22, 5-28 and 5-29.	Contact client for additional measure to be taken For the specific analytes in the parent sample, apply J flag

TABLE 5-34
Calibration and Quality Control Requirements for Methods SW8081A, SW8082, SW8151A, SW8321, SW8330

Quality Control Check	Frequency	Criteria	Corrective Action
Surrogate spike	Every standard, sample, method blank, MS/MSD, and LCS/LCSD	All analytes within control limits specified in Tables 5-17 through 5-22, 5-28 and 5-29.	Correct the problem and reanalyze (reprep if necessary). If corrective action fails, apply Q flag to specific analytes in the associated batch
Second column confirmation	All samples with results above the reporting limit objectives must be confirmed within the holding time. (in method SW8081A exclude toaxaphene and technical chlordane)	Confirmation to be done using second column of dissimilar phase and retention). All calibration and quality control acceptance criteria specified for primary analysis must be met in the confirmation analysis. Results between primary and confirmation column RPD ≤ 40%	Failure to perform confirmation will result in potential resampling and analysis at no cost to the project. Apply J flag if RPD >40% or Q flag is confirmation is not performed
Retention Time Window	sample, method blank, MS/MSD, and LCS/LCSD	All analytes must fall within established retention time window	Correct problem then reanalyze Apply J flag to affected analytes
Results between the MDL and RL	NA	NA	Apply J flag to all results between the MDL and RL
MDL Study	At initial setup and subsequently every 12 months	See 40CFR 136B, MDL checks must produce a signal at least 3 times the instrument noise level	Run MDL check at higher level and set MDL higher or reconduct MDL study. No flagging criteria

Quality control requirements are QSM Version 3 specific.

CCV = continuing calibration verification
COD – coefficient of determination
ICAL = initial calibration
ICV = initial calibration verification
LCS/LCSD = laboratory control sample/laboratory control sample duplicate
MDL = method detection limit
MS/MSD = matrix spike/matrix spike duplicate
NA = not applicable
RL = reporting limit
RSD = relative standard deviation

TABLE 5-35
Calibration and Quality Control Requirements for Methods SW8260B, SW8270C and SW8270C-SIM

Quality Control Check	Frequency	Criteria	Corrective Action
Instrument Tuning	Prior to initial calibration and calibration verification (every 12 hours)	Refer to criteria listed in the method	Retune instrument and verify No flagging criteria
Multipoint initial calibration (minimum five points)	Prior to sample analysis, or when calibration verification fails	Average RF for SPCCs: VOC - ≥ 0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane, ≥0.1 for chloromethane, bromoform and 1,1-dichloroethane. SVOC - ≥ 0.05 RSD for RFs for CCCs: VOCs and SVOCs - ≤ 30% and one option below: Option 1: RSD for each analyte ≤ 15% Option 2: Linear least squares regression r ≥ 0.995 Option 3: non-linear regression: COD r^2 ≥ 0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct the problem and repeat the initial calibration. No flagging criteria
ICV	Once for each multi-point initial calibration	All analytes within ± 25% of expected value	Correct the problem and repeat initial calibration. No flagging criteria
CCV	At the start of each analytical sequence, after every 12 hours or 10 samples, whichever is more frequent, and at the end of the sequence	1. Average RFs for SPCCs: VOC - ≥ 0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane, ≥ 0.1 for chloromethane, bromoform and 1,1-dichloroethane. SVOC - ≥0.05	Correct the problem, then recalibrate and reanalyze all samples since the last acceptable CCV. Apply Q flag to all results in samples since the last acceptable CCV

TABLE 5-35
Calibration and Quality Control Requirements for Methods SW8260B, SW8270C and SW8270C-SIM

Quality Control Check	Frequency	Criteria	Corrective Action
		2. %Difference/Drift for CCCs: VOCs and SVOCs ≤ 20% of expected value from the ICAL (Note: %difference when using RFs or %drift when using least squares regression of non-linear calibration)	
Internal Standards	Each sample, method blank, MS/MSD and LCS/LCSD	Retention time within ±30 seconds from retention time of the midpoint standard in the ICAL. EICP area within –50% to +100% of ICAL midpoint standard	Inspect mass spectrometer and gas chromatographer for malfunctions; reanalyze all affected samples Apply Q flag to all results in samples since the last acceptable CCV
Method blank	One per analytical batch	No analytes detected >½ RL For common lab contaminants, no analytes detected ≥ RL	Correct problem then reprep and reanalyze method blank and all samples processed with the contaminated blank. Apply B flag to all results for the specific analyte(s) in all samples in associated batch.
LCS/LCSD	One LCS/LCSD per analytical batch	All analytes within control limits specified Tables 5-23 through 5-26	Correct problem then reprep and analyze the LCS and all samples in the affected batch If corrective action fails, apply Q flag to specific analytes in the associated batch.
Surrogate spike	Every standard, sample, method blank, MS/MSD, and LCS/LCSD	Surrogates in within control limits specified in Tables 5-23 through 5-26	Correct the problem and reanalyze (reprep if necessary). If corrective action fails, apply Q flag to specific analytes in the associated batch
MS/MSD	One MS/MSD per every 20 project samples per matrix	All analytes within control limits specified in Tables 5-23 through 5-26	Contact client for additional measure to be taken For the specific analytes in the parent sample, apply J flag

TABLE 5-35
Calibration and Quality Control Requirements for Methods SW8260B, SW8270C and SW8270C-SIM

Quality Control Check	Frequency	Criteria	Corrective Action
Retention Time Window	Every standard, sample, method blank, MS/MSD, and LCS/LCSD	All analytes must fall within established retention time window	Correct problem then reanalyze Apply J flag to affected analytes
Results between the MDL and RL	NA	NA	Apply J flag to all results between the MDL and RL
MDL Study	At initial setup and subsequently every 12 months	See 40CFR 136B, MDL checks must produce a signal at least 3 times the instrument noise level	Run MDL check at higher level and set MDL higher or reconduct MDL study. No flagging criteria

[a]SPCC average relative response factor ≥ 0.10 for bromoform, chloromethane, 1,1-dichloroethane

Quality control requirements are QSM Version 3 specific

CCC = calibration check compound
CCV = continuing calibration verification
COD – coefficient of determination
ICAL = initial calibration
ICV = initial calibration verification
LCS/LCSD = laboratory control sample/laboratory control sample duplicate
MDL = method detection limit
MS/MSD = matrix spike/matrix spike duplicate
NA = not applicable
RF = response factor
RL = reporting limit
RSD = relative standard deviation
SPCC = system performance check compound
SVOC = semi-volatile organic compound
VOC = volatile organic compound

TABLE 5-36
Calibration and Quality Control Requirements for Method SW8290

Quality Control Check	Frequency	Criteria	Corrective Action
Instrument Tuning	Prior to initial calibration and calibration verification (every 12 hours)	Refer to criteria listed in the method	Retune instrument and verify No flagging criteria
GC column performance check	Prior to initial calibration of calibration verification	Refer to criteria listed in the method	Retune instrument and verify No flagging criteria
Initial calibration for all analytes identified in Table 5 of Method SW8290	Prior to sample analysis, or when calibration verification fails	Ion abundance rations in accordance with criteria in Table 8 of Method SW8290 and S/N ratio ≥10 for all target analyte ions and RSD ≤20% for the RFs for all 17 unlabeled standards and RSD ≤30% for the RFs for the 9 labeled ISs	Correct the problem and repeat the initial calibration. No flagging criteria
CCV	At the start of each analytical sequence, after every 12 hours	Ion abundance rations in accordance with criteria in Table 8 of Method SW8290 and For unlabeled standards, RF within ± 20% D of RF established in initial calibration and For labeled standards, RF within ± 30% D of RF established in initial calibration <u>End-of-run CCV:</u> If the RF for unlabeled standards ≤25% and the RF for labeled standards ≤35%, the mean RF from the two daily CCVs must be used for quantitation of impacted samples instead of the ICAL mean RF value. If ending CCV >25%D or >35% D for unlabeled and labeled standards, a new ICAL must be run immediately (within 2 hrs).	No flagging criteria for routine CCV For ending CCV, apply Q flag to specific analytes in the associated batch
Internal Standards	Each sample, method blank, MS/MSD, and laboratory duplicate	40-135% recovery	Inspect mass spectrometer and gas chromatographer for malfunctions; reanalyze all affected samples Apply Q flag to results of all affected samples

TABLE 5-36
Calibration and Quality Control Requirements for Method SW8290

Quality Control Check	Frequency	Criteria	Corrective Action
Method blank	One per analytical batch	No analytes detected >½ RL	Correct problem then reprep and reanalyze method blank and all samples processed with the contaminated blank. Apply B flag to all results for the specific analyte(s) in all samples in associated batch.
MS/MSD	One MS/MSD per every 20 project samples per matrix	All analytes within control limits specified in Table 5-27	Contact client for additional measure to be taken For the specific analytes in the parent sample, apply J flag
Laboratory duplicate	At least one set per analytical batch	RPD ≤ 25%	Correct the problem, then reprep and reanalyze the original sample and laboratory duplicate. Apply J flag to affected analytes if criteria are not met
Sample estimated maximum possible concentration	Every sample that indicates a detection ≥2.5 times the S/N response	Identification criteria in method SW8290 must be met	NA
Sample PCDD/PCDF Identification	Identify all positive sample detections per Method SW8290	Refer to criteria listed in the method	Reprep and reanalyze the sample with the failed criteria If PCDPE is detected or if sample peaks present do not meet ion abundance ration criteria, calculate the EMPC according to method SW8290. No flagging criteria
MDL Study	At initial setup and subsequently every 12 months	See 40CFR 136B, MDL checks must produce a signal at least 3 times the instrument noise level	Run MDL check at higher level and set MDL higher or reconduct MDL study. No flagging criteria
Results between the MDL and RL	NA	NA	Apply J flag to all results between the MDL and RL

Quality control requirements are QSM Version 3 specific.

CCV = continuing calibration verification
ICAL = initial calibration
LCS/LCSD = laboratory control sample/laboratory control sample duplicate
MDL = method detection limit
MS/MSD = matrix spike/matrix spike duplicate
NA = not applicable
RF = response factor
RL = reporting limit
RSD = relative standard deviation
RPD = relative percent difference

TABLE 5-37
Summary of Calibration and QC Procedures for Method TO-15

QC Check	Frequency	Criteria	Corrective Action
BFB Tune Check	Once per 24 hour tune window	Must meet the method tune criteria	Re-tune
Multi-point initial calibration (minimum five points)	Prior to sample analysis, or when calibration verification fails	%RSD of ≤ 30%, with up to two analytes ≤ 40%	Correct the problem and repeat the initial calibration. No flagging criteria
ICV	Once following each initial calibration	All analytes within ±30% of expected value	Correct the problem and repeat the ICV. If fails, repeat initial calibration No flagging criteria
CCV	At the start of each analytical sequence	All analytes within ±30% of expected value	Correct the problem, then recalibrate and reanalyze all samples since the last acceptable CCV. Apply Q flag to all results in samples since the last acceptable CCV
Method Blank	At least one per analytical batch	No analytes detected >½ RL For common lab contaminants, no analytes detected ≥ RL	Correct problem then reprep and reanalyze method blank and all samples processed with the contaminated blank. Apply B flag to all results for the specific analyte(s) in all samples in associated batch.
Surrogate spike	Every standard, sample, method blank, and LCS	Surrogates within control limits specified in Table 5-30	Correct the problem and reanalyze (reprep if necessary). If corrective action fails, apply Q flag to specific analytes in the associated batch
Internal Standards	Each sample, method blank, MS/MSD and LCS/LCSD	Retention time within ±30 seconds from retention time of the midpoint standard in the ICAL. EICP area within –50% to +100% of ICAL midpoint standard	Inspect mass spectrometer and gas chromatographer for malfunctions; reanalyze all affected samples Apply Q flag to all results in samples since the last acceptable CCV
LCS/LCSD	One LCS/LCSD per analytical batch	All analytes within control limits specified in Table 5-30	Correct problem then reprep and analyze the LCS and all samples in the affected batch If corrective action fails, apply Q flag to specific analytes in the associated batch.

TABLE 5-37
Summary of Calibration and QC Procedures for Method TO-15

QC Check	Frequency	Criteria	Corrective Action
Laboratory Duplicate	At least one per analytical batch	RPD ≤ 25%	Correct the problem, then reprep and reanalyze the original sample and laboratory duplicate. Apply Q flag to affected analytes if criteria are not met
MDL Study	At initial setup and subsequently every 12 months	See 40CFR 136B, MDL checks must produce a signal at least 3 times the instrument noise level	Run MDL check at higher level and set MDL higher or reconduct MDL study. No flagging criteria
Results between the MDL and RL	NA	NA	Apply J flag to all results between the MDL and RL

Quality control requirements are method specific.

CCV = continuing calibration verification
ICAL = initial calibration
ICV = initial calibration verification
LCS/LCSD = laboratory control sample/laboratory control sample duplicate
MDL = method detection limit
MS/MSD = matrix spike/matrix spike duplicate
NA = not applicable
RL = reporting limit
RSD = relative standard deviation
RPD = relative percent difference

6.0 Field Analytical Methods

6.1 Analytical Methods

Field analytical methods will be performed during this project. A PID will be used to screen soils for placement of monitoring wells within the POL plume and to select samples for analysis during soil borings. Calibration on the PID will be checked daily per manufacturer recommendations. Analysis of pH, conductivity, temperature, and dissolved oxygen will be performed to confirm stabilization of field parameters prior to groundwater sample collection. A "flow-through cell" will be used to analyze these parameters at one time. The flow-through instrument will be calibrated daily per instrument manufacturer recommendations.

More information on the field analytical methods is included in the project FSP.

7.0 Analytical Procedures

The parameters to be measured, the required methods, and reporting limits are listed in Tables 5-1 through 5-12. The QAPP attempts to present a comprehensive list of methods and analytes that are expected to be used for the duration of the project. The QAPP may not address future changes in analytical needs specific to certain sites. If the need for such changes arises, the QAPP and the relevant site-specific documents will be updated and submitted to the regulatory agencies charged with project oversight for approval. Only the affected portions of the QAPP will be submitted for review.

The allowed sample preparation methods, if not incorporated in the analytical method, are in Table 7-1. Once a method is chosen, it must be used throughout the duration of the project to maintain data comparability.

Analytical services will be provided by laboratories contracted by CH2M HILL or USACE. The contract laboratory will be evaluated to make sure that analytical DQOs are met by comparison of laboratory RLs, QC criteria, and analytical requirements with those listed in Tables 5-1 through 5-37. This process is accomplished prior to project startup by evaluating the USACE required submittals that include MDLs and RLs for all methods to be performed, results of last three PE studies, and QC limits for all methods to be performed. This information will also be submitted and reviewed for all sister and subcontract laboratories the main laboratory will use throughout the course of the project. Compliance with DQOs will also be evaluated throughout the project during the data validation process.

The calibration and QC requirements specified for each method will be followed. These are discussed in Sections 5.3.3, 5.4 and 5.5 and in Tables 5-13 through 5-37. Appropriate corrective action will be taken when acceptance criteria are not met. If corrective action is not effective, and data quality is potentially impacted, the occurrence must be documented in a corrective action report and in the data package case narrative. The laboratory manager or a designated person must notify the CH2M HILL Project Chemist.

The laboratory turnaround time (TAT) for each project will be 30 calendar days or as specified in the work plan, from sample receipt. TAT is calculated from the date the laboratory receives the samples and is not complete until both the hardcopy and electronic data are delivered and complete. Exceptions to TAT will be communicated to the project chemist. For samples received at the laboratory after 6:00PM, Day 1 for determining the TAT will begin on the next calendar day.

TABLE 7-1
Sample Preparation Methods

Analytical Method	Parameter	Preparatory Methods
AK101	Gasoline-Range Organics	See analytical method
AK102/AK103	Diesel/Residual Range Organics	See analytical method
NWEPH/VPH	Total Petroleum Hydrocarbon Speciation	See analytical method
SW6010B	Metals by ICP (water and soil)	3005A, 3010A, 3015, 3050B, 3051
SW6020	Trace metals by ICP-MS (water and soil)	3005A, 3010A, 3015, 3050B, 3051
SW7470/SW7471A	Mercury in water and soil	See analytical method
SW6850	Perchlorate	See analytical method
SW8081A	Organochlorine and organophosphorous (3550B not allowed for organophosphorous) pesticides (water and soil)	3510C, 3520C, 3540C, 3541, 3545, 3550B
SW8082	Polychlorinated biphenyls (water and soil)	3510C, 3520C, 3540C, 3541
SW8151A	Herbicides	See analytical method
SW8260B	Volatile organics (water and soil)	3585, 5021, 5030BB, 5031, 5032, 5035
SW8270C/SW8270 C-SIM	Semivolatile organics (water and soil)	3510C, 3520C, 3535, 3540C, SW3541, 3545, 3550B
SW8290	Dioxins/Furans	See analytical method
TO-15	Volatile organics (air)	See analytical method

8.0 Data Management, Reporting, and Assessment

8.1 Data Management and Archival

CH2M HILL will have a system for maintaining, controlling, and archiving field records and will require that the primary laboratories maintain a similar system for laboratory records. This system will facilitate retrieval of any documentation that affects reported analytical results.

All raw data will be maintained on file in the laboratory, and will be available upon request. Complete documentation of sample preparation and analysis and associated QC information will be maintained in a manner that allows easy retrieval in the event that additional information is required. The following minimum documentation should be kept for each project:

- Original work order, COC records, and other pertinent documents received with the samples
- Records of communication between the laboratory, field, and the client
- Any associated corrective action reports
- Laboratory data reports
- Laboratory log books and all raw sample preparation and analytical data
- Electronic data and all pertinent SOPs

Field records to be retained as a minimum shall include correspondence, COC records, field notes, field equipment performance records, maintenance logs, field procedures, corrective action reports, field personnel files, and project-related reports.

Field and laboratory record retention will be for a period of 10 years minimum after data acquisition.

8.2 Laboratory Data Reduction, Review, and Reporting

8.2.1 Data Reduction and Review

Data reduction will be done manually or using appropriate application software. Quantitation procedures specified for each method must be followed. If data reduction is done manually, the documentation must include the formulas used. Any application software used for data reduction must have been previously checked for accuracy. Documentation on the software must be maintained on file in the laboratory. All documentation of data reduction must allow recreation of the calculations.

All data will undergo two levels of review at the laboratory prior to release. The analyst performing the tests shall initially review 100 percent of the data. After the analyst's review

has been completed, 100 percent of the data shall be reviewed independently by a senior analyst or by the section supervisor for accuracy, compliance with calibration and QC requirements, holding time compliance, and for completeness. Analyte identification and quantitation must be verified. Calibration and QC results will be compared with the applicable control limits. Reporting limits should be reviewed to make sure they meet the project objectives. Results of multiple dilutions should be reviewed for consistency. Any discrepancies must be resolved and corrected. Laboratory qualifiers will be applied when there are nonconformances that could potentially affect data usability. These qualifiers must be properly defined as part of the deliverables. All issues that are relevant to the quality of the data must be addressed in a case narrative. A final data review will be conducted by the Laboratory Manager or Client Services representative to ensure that all required analyses were performed on all samples, and that all documentation is complete. Data review performed by the laboratory personnel must be documented.

The hardcopy and electronic laboratory reports for all samples and analyses will contain the information necessary to perform data evaluation.

Two types of reporting deliverables will be required for this project. Following is a brief synopsis of when it is appropriate to use each deliverable:

Level 3 — Appropriate for investigative, confirmatory, or closure results. Critical project decisions may be made using these data.

Level 4 — Appropriate for investigative, confirmatory, or closure results. Critical decisions may be made using these data and will be used for projects that require a high degree of confidence in the accuracy of the data.

8.2.2 Hardcopy Deliverables

Hardcopy deliverables, in summary format, containing the necessary information to perform data evaluation/data validation are required. Reporting formats similar to those specified in the latest versions of USEPA Contract Laboratory Program Statements of Work for Organics, Inorganics and Dioxin/Furan Analyses are preferred (USEPA 1999, 2002, 2005). The laboratory data report will be organized in a format that facilitates identification and retrieval of data. Alternate reporting formats require approval from the Program or Project Chemist.

A Level 3 will include, at a minimum (when applicable):

- Cover letter complete with:
  - Title of report and laboratory unique report identification (Sample Delivery Group Number).
  - Project name and location.
  - Name and location of laboratory and second-site or subcontracted laboratory.
  - Client name and address.
  - Statement of authenticity and official signature and title of person authorizing report release.
- Table of contents.
- Summary of samples received that correlates field sample IDs with the laboratory IDs.

- Laboratory qualifier flags and definitions.
- Field identification number.
- Sample matrix.
- Sample collection date.
- Date received.
- Date prepared.
- Date analyzed (and time of analysis if the holding time is less than or equal to 48 hours).
- Preparation and analytical methods.
- Preparation, analysis or other batch reference numbers.
- Analyte name.
- Result for each analyte (dry-weight basis for soils).
- Percent solids results for soil samples.
- Data qualifiers, if used.
- Dilution factor (provide both diluted and undiluted results when available).
- Sample-specific reporting limit adjusted for sample size, dilution/concentration.
- Sample-specific MDL adjusted for sample size, dilution/concentration (when project objectives require reporting less than the reporting limit).
- Units.
- Case Narrative that contains a table summarizing samples received, providing correlation between field sample identification and laboratory identification numbers, and analytical test methods performed.
  - If a second-site or subcontracted laboratory was used, the table should show which analytical test methods were performed by each laboratory.
  - Samples that were received but not analyzed should be identified.
  - Any holding time, calibration, or QC deviations should be noted.
  - Corrective actions taken by the laboratory in connection with these deviations should be discussed.
  - The case narrative should also discuss any other information, such as sample temperature outside acceptable range, presence of air bubbles in volatile organic compounds (VOC) sample containers, presence of multiple sample phases or other visible signs of sample non-homogeneity, that could potentially affect the quality of the data.

- Surrogate percent recoveries. Associated quality control limits must also be provided.
- MS/MSD and LCS/LCSD spike concentrations, native sample results, spiked sample results, percent recoveries, and RPD. Associated quality control limits must also be provided.
- Method blank results.
- Analytical batch reference number that cross references samples to quality control sample analyses.
- Executed chain of custody and sample receipt checklist.
- Analytical sequence or laboratory run log that contains sufficient information to correlate samples reported in the summary results to the associated method quality control information, such as initial and continuing calibration analyses.
- Confirmation results.
- Calibration blank results for inorganic analyses (required in hardcopy format only).

- ICP interference check sample true and measured concentrations and percent recoveries (required in hardcopy format only).
- Method of standard addition results (if applicable; required in hardcopy format only).
- Post-digestion spike recoveries (if applicable; required in hardcopy format only).
- Serial Dilution results (if applicable; required in hardcopy format only).
- Internal standard recovery and retention time information, as applicable.
- Initial calibration summary, including standard concentrations, response factors, average response factors, RSDs or correlation coefficients, and calibration plots or equations, if applicable (required in hardcopy format only).
- Initial and continuing calibration verification summaries, including expected and recovered concentrations and percent differences (required in hardcopy format only).
- Instrument tuning and mass calibration information for gas chromatography/mass spectrometry and ICP/mass spectrometry analyses.
- Chromatograms for Alaska methods AK101 and AK102/AK103.
- Any other method-specific quality control sample results.

A Level 4 report will include all elements outlined above for the Level 3 report format and all of the associated raw data. It is imperative that the chromatographic and other instrument data be supplied in a scale that facilitates review from hardcopy. Sufficient "blow ups" of complex areas of sample chromatograms will be provided. Additional information to be supplied will include:

- Sample preparation logs that include the following information:
  - Preparation start and end times.
  - Beginning and ending temperatures of water baths and digestion blocks.
- Example calculation for obtaining numerical results from at least one sample for each matrix analyzed (provide algorithm).
  - Reconstructed total ion chromatograms or selected ion current profiles for each sample (or blank) analyzed and mass spectra(s) for each compound identified including:
  - Raw compound spectra.
  - Enhanced or background spectra.
  - Laboratory-generated library spectra (for tentatively identified compounds provide the reference mass spectra(s) from software spectra library.
- Ion ratio information for dioxin/furan methods.

8.2.3 Electronic Deliverables

Concurrent with the submittal of the hardcopy deliverables, the laboratory shall deliver electronic data in the CH2M HILL LabSpec7 format as defined in the project-specific Laboratory Statement of Work.. There shall be no discrepancies between the hardcopy reports and the electronic reports.

All raw data will be maintained on file in the laboratory and will be available on request by project management. Complete documentation of sample preparation and analysis and associated quality control information will be maintained in a manner that allows easy

retrieval in the event that additional validation or information is required. All data generated using gas chromatography/mass spectrometry must be maintained on magnetic tapes and will be made available to CH2M HILL upon request. All documentation must be retained for a minimum of 10 years after data acquisition.

The primary responsibility for the implementation of these procedures within the laboratory will reside with the Laboratory Manager or equivalent. The Laboratory Manager will approve laboratory reports before transferring the information to the client.

8.3 Data Validation and Verification

The analytical results of the data collection effort will be validated by CH2M HILL. There will be two levels of validation employed for the program that correspond to the reports described in Section 8.2.2. Level 3 may be performed by the Project Chemist or other program team members. Level 4 validation will always be performed by the Project Chemist or his/her designee.

Level 3 Verification that samples were analyzed for the methods requested and review of the data for outliers and anomalies. Verification that samples were analyzed for the methods requested, review of the laboratory case narrative for events in the laboratory that affect the accuracy or precision of the data, review of quality control indicator data and a "reasonableness" review of the data. Validation of the analytical data as described below without review of any raw data or analyte verification.

Level 4 Validation of the analytical data will be performed as described below, including review of the analytical raw data.

Level 3 and 4 Validation Procedures

Personnel involved in the data validation function will be independent of any data generation effort. The Project Chemist will have responsibility for oversight of the data validation effort. Data validation will be carried out when the data packages are received from the laboratory. The frequency of Level III and Level IV data validation is site-wide, not per individual sub area. It will be performed on an analytical batch basis using the summary results of calibration and laboratory quality control, as well as those of the associated field samples. Data packages will be reviewed for all constituents of concern. Level III data validation will be performed on 90 percent of the data by method and matrix and procedures will include:

- A review of the data set narrative to identify any issues that the lab reported in the data deliverable;
- A check of sample integrity (sample collection, preservation, and holding times);
- An evaluation of basic QC measurements used to assess the accuracy, precision and representativeness of data including QC blanks, LCS/LCSD, MS/MSD, surrogate recovery when applicable, and field or laboratory duplicate results.
- A review of sample results, target compound lists, and detection limits to verify that project analytical requirements are met.
- Initiation of corrective actions, as necessary, based on the data review findings.

- Verification that hardcopy results match electronic deliverable results.
- Qualification of the data using appropriate qualifier flags, as necessary, to reflect data usability limitations.
- Evaluation of calibration and quality control summary results against the project requirements.
- Other method specific QC requirements

Level 4 validation will be performed on 10 percent of the data by method and matrix and will include

- Review of sample chromatograms
- Verification of analyte identification
- Calculations for at least 10 percent of the data which will include back-calculating from the initial and continuing calibrations to confirm the result reported.

The data review process will be patterned after the *USEPA Contract Laboratory National Functional Guidelines for Organic Data Review* (EPA, 1999), *National Functional Guidelines for Inorganic Data Review* (EPA, 2002), and *National Functional Guidelines for Chlorinated Dioxin/Furan Data Review* (EPA, 2005), substituting the QC requirements specified in this QAPP for those specified in the Guidelines. The flagging criteria in Tables 8-1 through 8-4 will be used. The qualifier flags are defined in Table 8-5.

Qualifier flags, if required, will be applied to the electronic sample results. If multiple flags are required for a result, the most severe flag will be applied to the electronic result. The hierarchy of flags from the most severe to the least severe will be as follows: R, U, UJ, J-, J+ and J.

TABLE 8-1
Data Qualifying Conventions – Methods SW6010B, SW6020, SW7000

Quality Control Check	Evaluation	Flag	Samples Affected
Holding Time	Holding time exceeded for extraction, digestion or analysis by less than a factor of two	J- positive results, UJ non-detects	Sample
	Holding time exceeded for digestion or analysis by a factor of two	J- positive results; R non-detects	
Sample Preservation	Sample not preserved (If sample preservation was not done in the field but was performed at the laboratory upon sample receipt, no flagging is required)	J positive results; UJ non-detects	Sample
MS Tuning Sample (SW6020)	RSD >5% for at least four replicate analyses; resolution >0.9 amu at 10% peak height; mass calibration >0.1 amu from true value	R all results	All associated samples in analysis batch
Initial Calibration (Multi-Point only)	Correlation Coefficient $\leq$ 0.995	J positive results; R non-detects	All associated samples in analysis batch
Calibration Verification (ICV and CCV)	%R >UCL	J+ positive results	All associated samples in analysis batch
	%R < LCL	J- positive results, UJ non-detects	
Low Level Calibration Check Standard (at or below RL)	%R >UCL	J+ positive results	All associated samples in analysis batch
	%R < LCL	J- positive results, UJ non-detects	
Laboratory Control Sample (LCS)	%R > UCL	J+ positive results	All samples in preparation batch
	%R < LCL	J- positive results, UJ non-detects	
	%R < 30%	J- positive results, R non-detects	
Interference Check Sample (ICS)	%R >UCL	J+ positive results	All samples in preparation batch
	%R < LCL	J- positive results, UJ non-detects	
Internal Standards (SW6020)	Intensity must be within 30-120% of intensity of IS in the initial calibration	R all results	Associated analytes in sample

TABLE 8-1
Data Qualifying Conventions – Methods SW6010B, SW6020, SW7000

Quality Control Check	Evaluation	Flag	Samples Affected
Method Blank	Analyte(s) detected > MDL	U positive sample results ≤ 5x highest blank concentration	All samples in preparation batch or analytical batch, whichever one applies, associated with method blank
Calibration Blank	Analyte(s) detected >MDL	U positive sample results ≤ 5x highest blank concentration	All samples in preparation batch or analytical batch, whichever one applies, associated with calibration blank
Equipment Blank	Analyte(s) detected > MDL	U positive sample results ≤ 5x highest blank	All samples, same site, matrix and date (water) or all samples, same site, matrix (soil) associated with equipment blank
Matrix Spikes	%R > UCL	J+ positive results	Matrix spike analytes parent.
	%R < LCL	J- positive results, UJ non-detects	
	%R < 10%	J- positive results, R non-detects	None
	RPD > UCL	J positive results	
	Sample concentration >4x spike concentration	None, note problem in data validation report	
Dilution Test	If concentration is >25 times MDL and % difference >10%	J positive results if no passing post-digestion spike or recovery test	Associated analyte in the sample if post digestion spike not performed.
Post Digestion Spike/Recovery Test (SW6010B and SW6020)	%R >UCL	J+ positive results	All samples in digestion batch if MSA not performed from same site as parent sample
	%R < LCL	J- positive results, UJ non-detects	
Recovery Test (SW7000)	%R >UCL	J+ positive results	All samples in digestion batch if MSA not performed from same site as parent sample
	%R < LCL	J- positive results, UJ non-detects	

TABLE 8-1
Data Qualifying Conventions – Methods SW6010B, SW6020, SW7000

Quality Control Check	Evaluation	Flag	Samples Affected
Field duplicates	Both sample results ≥RL, and RPD > 25% for water or 35% for soil	J positive results	Normal and field duplicate
	One sample detected ≥RL and one sample non-detect, difference > 2xRL for water or >4xRL for soil	J positive result, UJ non-detect	Normal and field duplicate
MI triplicates	RSD ≤ 30%	J positive result, UJ non-detect	Normal, duplicate, and triplicate
MSA (SW7000 Methods) for samples where post-digestion spike (performed as a result of unacceptable serial dilution) fails	R <0.995	J positive results; UJ non-detects	Sample

%R = Percent recovery
CCV = Continuing calibration verification
ICS = interference check sample
ICV = Initial calibration verification
IS = internal standard
LCL = Lower control limit
LCS = laboratory control sample
MDL = Method detection limit
MSA = Method of standard additions
RL = reporting limit
RPD = Relative percent difference
UCL = Upper control limit

TABLE 8-2
Data Qualifying Conventions – Methods AK101, AK102/AK103, NW EPH/VPH, SW8081A, SW8082, SW8151A, SW8321, SW8330

Quality Control Check	Evaluation	Flag	Samples Affected
Holding Time	Holding time exceeded for extraction or analysis by less than a factor of two	J- positive results; UJ non-detects	Sample
	Holding time exceeded by a factor of two	J- positive results; R non-detects	
Temperature	> 6°C	J- positive results ; UJ non-detects	All samples in same cooler
Breakdown Check (Endrin and DDT, Method SW8081)	Degradation ≥ 15% for each analyte	J positive results ; UJ non-detects	All associated samples in analysis batch
Initial Calibration	SW8081A, SW8082, SW8151A, SW8321, SW8330: %RSD >20.0% and calibration curve not used, OR calibration curve used, but with correlation coefficient <0.995 OR calibration curve used but with coefficient of correlation or determination < 0.99 AK101, AK102/AK103, NW EPH/VPH: %RSD >25%	J positive results ; UJ non-detects	All associated samples in analysis batch
Second Source Calibration Verification	%drift > UCL	J+ positive results	All associated samples in analysis batch
	%drift <LCL	J- positive results, UJ non-detects	
Continuing Calibration Verification (ICV and CCV)	%drift > UCL	J+ positive results	All associated samples in analysis batch
	%drift < LCL	J- positive results, UJ non-detects	
Laboratory Control Sample	%R > UCL	J+ positive results	All samples in preparation batch
	%R < LCL	J- positive results, UJ non-detects	
	%R < 10%	J- positive results, R non-detects	
Method Blank	Analyte(s) detected > MDL	U positive sample results ≤ 5x highest blank	All samples in preparation batch or analytical batch, whichever one applies, associated with method blank or calibration blank

TABLE 8-2
Data Qualifying Conventions – Methods AK101, AK102/AK103, NW EPH/VPH, SW8081A, SW8082, SW8151A, SW8321, SW8330

Quality Control Check	Evaluation	Flag	Samples Affected
Equipment Blank and Trip Blank	Analyte(s) detected > MDL	U positive sample results ≤ 5x highest blank concentration	All samples, same site, matrix and date (water) or all samples, same site, matrix (soil) associated with equipment blank or all samples shipped in the same cooler as the trip blank
Matrix Spikes	%R > UCL	J+ positive results	Matrix spike analytes parent.
	%R < LCL	J- positive results, UJ non-detects	
	%R < 10%	J- positive results, R non-detects	
	RPD > UCL	J positive results	
	Sample concentration > 4x spike concentration	None, note problem in data validation report	None
Surrogates	Surrogate with %R > UCL	J+ positive results	All analytes in same fraction in sample
(for SW8081A, flag for TCMX only; for SW8082, flag for DCBP only)	Surrogate with %R < LCL but not <10%	J- positive results; UJ non-detects	
	Any surrogate with %R <10%	J- positive results; R non-detects	
Field duplicates	Both sample results ≥RL, and RPD > 25% for water or 35% for soil	J positive results	Normal and field duplicate
	One sample detected ≥RL and one sample non-detect, difference > 2xRL for water or >4xRL for soil	J positive result; UJ non-detect	Normal and field duplicate
MI triplicates	RSD ≤ 30%	J positive result, UJ non-detect	Normal, duplicate, and triplicate
Retention Time	Analyte not within established retention time window	R all results	Sample
Confirmation	RPD between primary and confirmation results > 40%	J positive results	Sample

TABLE 8-2
Data Qualifying Conventions – Methods AK101, AK102/AK103, NW EPH/VPH, SW8081A, SW8082, SW8151A, SW8321, SW8330

Quality Control Check	Evaluation	Flag	Samples Affected
For methods requiring confirmation, the qualification applies to primary analysis results (either of the two columns/detectors may be designated as the primary column/detector).			
Qualifier may not apply in cases where a surrogate coelutes with a non-target analyte.			
Qualifier may not apply in cases where low surrogate or matrix spike recoveries are due to sample dilution.			

%R = Percent recovery
CCV = Continuing calibration verification
ICV = Initial calibration verification
LCL = Lower control limit
LCS = laboratory control sample
MDL = Method detection limit
RL = reporting limit
RPD = Relative percent difference
UCL = Upper control limit

TABLE 8-3
Data Qualifying Conventions –Methods SW8260B, SW8270, SW8270C-SIM

Quality Control Check	Evaluation	Flag	Samples Affected
Holding Time	Holding time exceeded for extraction or analysis by less than a factor of two	J- positive results; UJ non-detects	Sample
	Holding time exceeded by a factor of two	J- positive results; R non-detects	
Temperature	> 6°C	J- positive results ; UJ non-detects	All samples in same cooler
Sample Integrity (SW8260)	Bubbles in VOA vial >¼ inch used for analysis	J- positive results ; UJ non-detects	Sample
GC/MS Tune Standard	Ion abundance method-specific criteria not met	R all results	All associated samples in analysis batch
Initial Calibration	SPCCs: Average RF <0.030[a] (SW8260B), ≤0.050 (SW8270C)	J positive results ; UJ non-detects	All associated samples in analysis batch
	CCCs: %RSD for RFs >30% (SW8260 and SW8270C)	J positive results ; UJ non-detects	
	%RSD >15% for non-CCC compounds	J positive results ; UJ non-detects	
	OR calibration curve used, but with correlation coefficient <0.995		
	OR calibration curve used but with coefficient of correlation or determination < 0.99		
Second Source Calibration Verification	%drift >UCL	High Bias: J+ positive results	All associated samples in analysis batch
	%drift <LCL	Low Bias: J- positive results, UJ non-detects	
Calibration Verification (ICV and CCV)	SPCCs: Average RF ≤0.030[a] (SW8260B), ≤0.050 (SW8270C)	J positive results ; UJ non-detects	All associated samples in analysis batch
	CCCs: %D ±20% (SW8260 and SW8270)	J positive results ; UJ non-detects	
	All non-CCC analytes %D >UCL	J+ positive results	
	All non-CCC analytes %D <LCL	J- positive results, UJ non-detects	

TABLE 8-3
Data Qualifying Conventions –Methods SW8260B, SW8270, SW8270C-SIM

Quality Control Check	Evaluation	Flag	Samples Affected
Laboratory Control Sample	%R > UCL	J+ positive results	All samples in preparation batch
	%R < LCL	J- positive results, UJ non-detects	
	%R < 10%	J- positive results, R non-detects	
Method Blank	Analyte(s) detected > MDL	U positive sample results ≤ 5x highest blank concentration (10x for common lab contaminants[b])	All samples in preparation batch or analytical batch, whichever one applies, associated with method blank or calibration blank
Equipment Blank and Trip Blank	Analyte(s) detected > MDL	U positive sample results ≤ 5x highest blank concentration (10x for common lab contaminants[b])	All samples, same site, matrix and date (water) or all samples, same site, matrix (soil) associated with equipment blank or all samples shipped in the same cooler as the trip blank
Matrix Spikes	%R > UCL	J+ positive results	Matrix spike analytes parent sample.
	%R < LCL	J- positive results, UJ non-detects	
	%R < 10%	J- positive results, R non-detects	
	RPD > UCL	J positive results	
	Sample concentration > 4x spike concentration	None, note problem in data validation report	None
Surrogates	Surrogate with %R > UCL	J+ positive results	All analytes in same fraction in sample
(for Method SW8270C – flags are not applied unless more than one surrogate per fraction is outside of criteria)	Surrogate with %R < LCL but not <10%	J- positive results; UJ non-detects	
	Any surrogate with %R <10%	J- positive results; R non-detects	
Internal Standards	Area >UCL	J- positive results; UJ non-detects	Associated analytes in sample
	Area <LCL	J+ positive results	

TABLE 8-3
Data Qualifying Conventions –Methods SW8260B, SW8270, SW8270C-SIM

Quality Control Check	Evaluation	Flag	Samples Affected
Field duplicates	Both sample results ≥RL, and RPD > 25% for water or 35% for soil	J positive results	Normal and field duplicate
	One sample detected ≥RL and one sample non-detect, difference > 2xRL for water or >4xRL for soil	J positive result; UJ non-detect	Normal and field duplicate
MI triplicates	RSD ≤ 30%	J positive result, UJ non-detect	Normal, duplicate, and triplicate

[a] SW8260B: RF ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane
[b] Common lab contaminants are methylene chloride, acetone, and 2-butanone for SW8260B and all phthalates for SW8270C
Qualifier may not apply in cases where a surrogate coelutes with a non-target analyte.
Qualifier may not apply in cases where low surrogate or matrix spike recoveries are due to sample dilution.

%R = Percent recovery
CCV = Continuing calibration verification
ICV = Initial calibration verification
LCL = Lower control limit
LCS = laboratory control sample
MDL = Method detection limit
RL = reporting limit
RPD = Relative percent difference
UCL = Upper control limit

TABLE 8-4
Data Qualifying Conventions – Method SW8290

Quality Control Check	Evaluation	Flag	Samples Affected
Holding Time	Holding time exceeded for extraction or analysis by less than a factor of two	J- positive results; UJ non-detects	Sample
	Holding time exceeded by a factor of two	J- positive results; R non-detects	
Tune Standard	Mass of 380.9760 is not within ± 5 ppm of required value	R all results	All associated samples in analysis batch
GC Column Performance Check	Peak separation between 2,3,7,8-TCDD and other TCDD isomers valley >25%	R all results	All associated samples in analysis batch
Initial Calibration	%RSD >20% for 17 unlabeled standards	J positive results ; R non-detects	All associated samples in analysis batch
	%RSD >30% for the 9 labeled IS		
Routine and Ending Calibration Verification	%RSD >UCL for 17 unlabeled standards from mean RF from initial calibration	J+ positive results	All associated samples in analysis batch
	%RSD >UCL for the 9 labeled IS from mean RF from initial calibration	J- positive results, UJ non-detects	
Laboratory Control Sample	%R > UCL	J+ positive results	All samples in preparation batch
	%R < LCL	J- positive results, UJ non-detects	
	%R < 10%	J- positive results, R non-detects	
Method Blank	Analyte(s) detected > MDL	U positive sample results ≤ 5x highest blank concentration	All samples in preparation batch or analytical batch, whichever one applies, associated with method blank or calibration blank
Equipment Blank	Analyte(s) detected > MDL	U positive sample results ≤ 5x highest blank concentration	All samples, same site, matrix and date (water) or all samples, same site, matrix (soil) associated with equipment blank
Internal Standards	%R within 40 – 135% prior to dilution	J positive results; UJ non-detects	Associated analytes in sample
S/N Ratio	S/N ratio <10 for all target analyte ions	J positive results	Associated analytes in sample

TABLE 8-4
Data Qualifying Conventions – Method SW8290

Quality Control Check	Evaluation	Flag	Samples Affected
Matrix Spikes	%R > UCL	J+ positive results	Matrix spike analytes parent.
	%R < LCL	J- positive results, UJ non-detects	
	%R < 10%	J- positive results, R non-detects	
	RPD > UCL	J positive results	
	Sample concentration >4x spike concentration	None, note problem in data validation report	None
Laboratory Duplicate	RPD > UCL	J positive results	Sample
Field duplicates	Both sample results ≥RL, and RPD > 25% for water or 35% for soil	J positive results	Normal and field duplicate
	One sample detected ≥RL and one sample non-detect, difference > 2xRL for water or >4xRL for soil	J positive result; UJ non-detect	Normal and field duplicate
MI triplicates	RSD ≤ 30%	J positive result, UJ non-detect	Normal, duplicate, and triplicate

Qualifier may not apply in cases where a surrogate coelutes with a non-target analyte.
Qualifier may not apply in cases where low surrogate or matrix spike recoveries are due to sample dilution

%R = Percent recovery
CCV = Continuing calibration verification
ICV = Initial calibration verification
LCL = Lower control limit
LCS = laboratory control sample
MDL = Method detection limit
RL = reporting limit
RPD = Relative percent difference
UCL = Upper control limit

TABLE 8-5
Qualifier Flag Definitions

J	Analyte was present but reported value may not be accurate or precise.
J+	Analyte was present but reported value may be biased high.
J-	Analyte was present but reported value may be biased low.
R	This result has been rejected.
U	This analyte was analyzed for but not detected at the specified detection limit.
UJ	The analyte was not detected above the detection limit objective. However, the reported detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

9.0 Performance Evaluations and Audits

9.1 Laboratory Approval

Prior to project startup, each laboratory will be required to submit USACE documentation that includes the following:

- USACE Self-Declaration Form
- RLs and MDLs for all methods to be performed under the project
- QC limits for all methods to be performed under the project
- Results from last three performance evaluation studies.

9.2 Performance Evaluations

Performance evaluations (PE) of the primary laboratories using performance evaluation samples will be done exclusively by USACE at a frequency decided by USACE. This will happen early in the project so we a second PE sample can be ordered in case of a failure.

Performance audits quantitatively assess the data produced by a measurement system. A performance audit involves submitting project-specific PE samples for analysis for each analytical method used in the project. The project-specific PE samples are selected to reflect the expected range of concentrations for the sampling program. The performance audit answers questions about whether the measurement system is operating within control limits and whether the data produced meet the analytical QA specifications.

The project-specific PE samples are made to look as similar to field samples as possible and are submitted as part of a field sample shipment so that the laboratory is unable to distinguish between them and project samples. This approach ensures unbiased sample analysis and reporting by the laboratory.

The critical elements for review of PE sample results include (1) correct identification and quantitation of the PE sample analytes, (2) accurate and complete reporting of the results, and (3) measurement system operation within established control limits for precision and accuracy.

The concentrations reported for the PE samples shall be compared to the known or expected concentrations spiked in the samples. The percent recovery shall be calculated and the results assessed according to the accuracy criteria for the values from the PE sample provider. If the accuracy criteria are not met, the cause of the discrepancy shall be investigated and a second PE sample shall be submitted. If a second PE sample does not meet accuracy criteria, an audit of the laboratory may be performed. Also, a secondary laboratory may be used until acceptable corrective action is implemented and a PE sample meeting criteria for the specific method in question is submitted.

9.3 External Audits

USACE, ADEC and CH2M HILL reserve the right to conduct announced and unannounced audits of the field operations and of the primary laboratories during any stage of the project.

9.4 Internal Audits

Annual audits of the laboratory shall be conducted by the laboratory's Quality Assurance Officer (QAO). The audits shall verify, at a minimum, that written standard operating procedures are being followed; standards are traceable to certified sources; documentation is complete; data review is being done effectively and is properly documented; and data reporting, including electronic and manual data transfer, is accurate and complete. All audit findings shall be documented in QA reports to management. Necessary corrective actions shall be taken within a reasonable time frame. The QAO shall verify that such actions are effective and complete and shall document their implementation in an audit closeout report to management.

10.0 Preventive Maintenance

The primary objective of a preventive maintenance program is to promote the timely and effective completion of a measurement effort. The maintenance program should be designed to minimize the downtime of crucial sampling and/or analytical equipment due to expected or unexpected component failure. In implementing this program, efforts should be focused in the following primary areas:

- Establishment of maintenance responsibilities
- Establishment of maintenance schedules for major and/or critical instrumentation and apparatus
- Establishment of an adequate inventory of critical spare parts and equipment.

10.1 Maintenance Responsibilities

Maintenance of laboratory instruments is the responsibility of the participating laboratory. Generally, the laboratory manager or supervisor of a laboratory is responsible for the instruments in his or her work area. This responsible person will establish maintenance procedures and schedules for each instrument.

Maintenance responsibilities for field equipment are assigned to the field team leader for specific sampling tasks. However, the field team using the equipment is responsible for checking the status of the equipment prior to use and reporting any problems encountered. The field team is also responsible for ensuring that critical spare parts are included as part of the field equipment checklist. Non-operational field equipment should be removed from service and a replacement obtained.

All field instruments will be properly protected against inclement weather conditions during the field investigation.

10.2 Maintenance Schedules

The effectiveness of any maintenance program depends to a large extent on adherence to specific maintenance schedules for each piece of equipment. Other maintenance activities are conducted on an as-needed basis. Manufacturers' recommendations should provide the primary basis for establishing maintenance schedules. Manufacturers' service contracts may be used for implementing the scheduled maintenance.

Each analytical instrument should be assigned an instrument logbook. All maintenance activities will be documented in this logbook. The information to be entered includes:

- Date of service
- Person performing service
- Type of service performed and reason for service

- Replacement parts installed (if appropriate)
- Date of next scheduled service
- Any other useful information

10.3 Spare Parts

In addition to a schedule for maintenance activities, an adequate inventory of spare parts is required to minimize equipment downtime. The inventory includes those parts and supplies that:

- Are subject to frequent failure
- Have limited useful lifetimes
- Cannot be obtained in a timely manner should failure occur

Field managers and the respective laboratory managers are responsible for maintaining an adequate inventory of spare parts. In addition to spare parts and supply inventories, an in-house source of backup equipment and instrumentation should be available.

11.0 Data Assessment

11.1 Data Quality Assurance

All data generated for this project will be evaluated according to the procedures discussed in Section 8.3, using the QA acceptance criteria specified in Tables 5-13 through 5-37. Limitations on data usability will be assigned, if appropriate, as a result of the data verification and review process described in Section 8.3.

11.2 Reconciliation with Data Quality Objectives

The project includes multiple investigation areas. The data for each investigation area will be evaluated against the project DQOs. The data generated will be compared against the most stringent ADEC Screening Level. If no ADEC screening level is available, the data are compared against EPA Region VI Screening Levels. For analytes where the RL exceeds the ADEC and EPA Region VI Screening Levels, the risk will be assessed using one-half the RL. For analytes that do not have an ADEC or EPA Region VI Screening Level, the result will be evaluated to assess whether it falls within historical detection levels.

Site-specific preliminary remediation goals have not yet been prepared. Analytical data will be used to calculate baseline risk following ADEC and EPA guidance. If risk is identified, site-specific remediation goals will be developed. Statistical data analysis consistent with the approaches recommended in the *USEPA Guidance for Data Quality Assessment, Practical Methods for Data Analysis* (EPA, 1998b), will be performed when appropriate to achieve the objectives being sought in a particular investigation area.

12.0 Corrective Action

Corrective action may be required as a result of deviations from field and/or analytical procedures. Deficiencies identified in audits and data quality assessments may also call for corrective action.

The QAPP has specified specific corrective action to be taken when deviations from calibration and QC acceptance criteria occur. These are listed in Tables 5-31 through 5-37. The type of action to be taken in other situations would require judgment on the part of somebody directly involved with the situation. There should be a mechanism in place in the laboratory to allow for supervisory review of all deviations or deficiencies. A corrective action reporting system that requires immediate documentation of deviations or deficiencies and for supervisory review of the actions taken to correct them should be established. The corrective action report should include as a minimum:

- The type of deviation or deficiency
- The date of occurrence
- The impact of the deviation or deficiency, such as samples affected
- The corrective action taken

The only time that a corrective action report may be waived is when a deviation or deficiency is immediately corrected and its impact is precluded. An example would be an unacceptable initial calibration that is repeated before samples are analyzed.

Each corrective action report must be reviewed and approved by a person of authority, such as the field team leader or laboratory supervisor. Corrective action reports that could potentially affect data quality must be brought to the attention of the CH2M HILL Project Chemist. Disposition of the reports will be the responsibility of the Project Chemist. The Project Manager may be notified about a particular report at the Project Chemist's discretion. Copies of corrective action reports must be maintained in the project files.

13.0 Quality Assurance Deliverables

The items listed below will be submitted by CH2M HILL to USACE and/or ADEC.

13.1 Data Quality Report

The results of the data verification and review will be summarized in a Data Quality Report (DQR), which will be prepared by CH2M HILL and submitted to the USACE. The purpose of the DQR is to succinctly convey the overall results of the QA/QC effort to the reader. The number, matrices, and types of samples that were collected as well as the tests that were performed will be discussed. The major findings of the data assessment effort and their potential effects on the sensitivity, accuracy, precision, representativeness, completeness, and comparability of the project sample data will be discussed. Summary analytical data tables with associated data qualification flags, and a complete sample summary table with location information for each sample, will be provided in the hard copy.

13.2 Alaska Department of Environmental Conservation-Required Laboratory Checklists

The Alaska Department of Environmental Conservation (ADEC) Division of Spill Prevention and Response Contaminated Sites Program laboratory checklists will be filled out by the data validator per laboratory analytical data package and submitted to USACE and ADEC with the draft/final reports.

13.3 Electronic Deliverables

The results for laboratory data will be delivered to USACE and ADEC in Corps of Engineers Loading Tool (COELT) electronic deliverable format 1.2a. The COELT will be generated by CH2M HILL following data validation.

Summary analytical data tables with associated data qualification flags, and a complete sample summary table with location information for each sample, will be provided in the electronic deliverables.

14.0 References

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U.S. Environmental Protection Agency. Guidance for Geospatial Data Quality Assurance Project Plans. EPA QA/G5-G. March 2003.