Part II
Quality Assurance Project Plan

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1 Project Description

1.1 Introduction

This Quality Assurance Project Plan (QAPP) is prepared to supplement the Remedial Investigation and Feasibility Study (RI/FS) Work Plan for the RI/FS at Pepco's Benning Road facility (the Site), located at 3400 Benning Road NE, Washington, D.C., and a segment of the Anacostia River adjacent to the Site. The general site location is shown on **Figure 1** of the Field Sampling Plan (FSP). Together, the Site and the adjacent segment of the River are referred to herein as the "Study Area". The RI/FS Study Area consists of a "landside" component which will focus on the Site itself, and a "waterside" component that will focus on the shoreline and sediments in the segment of the river adjacent to and immediately downstream of the Site. The landside and waterside areas of investigation are depicted in **Figure 2** of FSP.

The purpose of this QAPP is to present the organization, objectives, planned activities, and specific quality assurance/quality control (QA/QC) procedures associated with the RI activities to be conducted at the Site. Specific protocols for sampling, sample handling and storage, COC, and laboratory and field analyses are described herein. This QAPP has been prepared in accordance with the United States Environmental Protection Agency (USEPA) QAPP policy as presented in USEPA Requirements for Quality Assurance Project Plans (USEPA QA/R-5, March 2001). This QAPP (Part II of the Sampling and Analysis Plan) is also prepared in accordance with the outline provided in the Final RI/FS Scope of Work (SOW).

1.2 Project Background

The Site is one of several properties along the Anacostia River that are suspected sources of contamination. There have been five instances since 1985 in which materials containing polychlorinated biphenyls (PCBs) were released at the Site. In each case, Pepco promptly cleaned up the releases in accordance with applicable legal requirements. Nonetheless, it is suspected that these releases, and possibly other historical operations or activities at the Site, may have contributed to contamination in the river. In particular, a site inspection conducted for the USEPA in 2009 linked polycyclic aromatic hydrocarbons (PAH), PCBs, and inorganic constituents detected in Anacostia River sediments to potential historical discharges from the Site. The site inspection contractor also stated that currently the Site is properly managed and that any spills or leaks of hazardous substances are quickly addressed and, if necessary, properly remediated. The RI will evaluate all spills at the Site as necessary.

Pepco has agreed to perform the RI/FS pursuant to a consent decree that was entered by the U.S. District Court for the District of Columbia on December 1, 2011 (the Consent Decree). The Consent Decree documents an agreement between Pepco and the District of Columbia (District) which is part of the District's larger effort to address contamination in and along the lower Anacostia River. The purpose of the RI/FS is to (a) characterize environmental conditions within the Study Area, (b) investigate whether and to what extent past or current conditions at the Site have caused or contributed to contamination of the river, (c) assess current and potential risk to human health and environment posed by conditions within the Study Area, and (d) develop and evaluate potential remedial actions.

The 77-acre Site is bordered by a DC Solid Waste Transfer Station to the north, Kenilworth Maintenance Yard (owned by the National Park Service, NPS) to the northwest, the Anacostia River to the west, Benning Road to the south and residential areas to the east and south (across Benning Rd.). Most of the Site is comprised of the Benning Service Center, which involves activities related to construction, operation and maintenance of Pepco's electric power transmission and distribution system serving the Washington, D.C., area. The Service Center accommodates more than 700 Pepco employees responsible for maintenance and construction of Pepco's electric transmission and distribution system; system engineering; vehicle fleet maintenance and refueling; and central warehousing for materials, supplies and equipment. The Site is also the location of the Benning Road Power Plant, which is scheduled to be shut down in 2012.

Pepco conducted several investigations and removal actions at the Site since 1985 (**Table 1** and **Figure 3** in the FSP). The USEPA conducted two studies, a Multi-media Inspection and a Comprehensive Environmental Liability and Compensation Act (CERCLA) Site Inspection, within the Study Area. In addition, the National Park Service (NPS) completed a remedial investigation at the adjacent Kenilworth Landfill and a Preliminary Assessment/Site Investigation (PA/SI) at Langston Golf Course. AECOM reviewed available information from these studies and other studies conducted in the River by various governmental and non-governmental organizations, and incorporated the findings into the Conceptual Site Model (CSM) and Work Plan development. Detailed information on previous investigations, geology, hydrogeology, hydrology, and site and area descriptions can be found in the RI/FS Work Plan.

The RI/FS will be overseen by the District Department of the Environment (DDOE) and will be performed in accordance with the USEPA *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Office of Solid Waste and Emergency Response (OWSER)* Directive 9355.3-01, dated October 1988, and other applicable USEPA and DDOE guidance documents.

1.3 Analytical Task Description

To accomplish the RI/FS objectives, the following field sampling tasks will be implemented:

- Landside surface and subsurface soil sampling and analysis from areas within the Site;
- Landside collection and analysis of groundwater from monitoring wells ;
- Waterside collection and analysis of surface water from the Anacostia River; and
- Waterside collection and analysis of sediments from the Anacostia River.

Tables 4 and **5** of the FSP summarize the analyses that will be performed on the samples collected at the Site as part of the RI/FS on the Landside and Waterside, respectively. In general, analyses to be performed by matrix are:

- Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semi-volatile Organic Compounds (SVOCs), Priority Pollutant Polycyclic Aromatic Hydrocarbons (PP PAHs or PAH16), TCL Organo-chlorine Pesticides (OCPs), TCL PCB-Aroclors, Target Analyte List (TAL) metals (total and dissolved for groundwater), Gasoline Range Organics (GRO), Diesel Range Organics/Oil Range Organics (DRO/ORO), and Polychlorinated Dibenzodioxins and Dibenzofurans (PCDDs/PCDFs) in soil and groundwater.
- TCL VOCs, TCL SVOCS, PP PAHs, TCL OCPs, TCL PCB-Aroclors or PCB-Homologs, TAL metals (total and dissolved), GRO, DRO/ORO, and PCDDs/PCDFs in surface water.
- TCL VOCs, TCL SVOCs, PP PAHs, TCL OCPs, TCL PCB-Aroclors or PCB-Homologs, TAL metals (total and dissolved), GRO, DRO/ORO, PCDDs/PCDFs, Acid Volatile Sulfide/Simultaneously Extracted Metals (AVS/SEM), and Grain Size in sediments.
- PCB-congeners (all 209) and an extended list of parent and alkyl PAHs may be performed on selected soil and sediment samples for forensic purposes.

2 Project Organization and Responsibilities

2.1 Project Schedule

A tentative project schedule is provided in the RI/FS Work Plan. According to the Consent Decree deadlines, field work must begin within 30 days of the approval of the Final RI/FS Work Plan, Health and Safety Plan (HASP), FSP and QAPP.

2.2 Project Organization

The responsibilities of key personnel are described below.

2.2.1 Management Responsibilities

Pepco Project Manager

As Pepco Project Manager, Ms. Mahvi's responsibilities include:

- Representing Pepco management,
- Primary interface with DDOE,
- Securing project funding,
- Working with Pepco Community Involvement Coordinator (Donna Cooper) to implement the Community Involvement Plan (CIP), and
- Reviewing all project documents before submission to DDOE.

AECOM Project Manager

The AECOM Project Manager, Mr. Ravi Damera, has responsibility for day-to-day management of technical and scheduling matters related to the project. Other duties, as necessary, of the AECOM Project Manager include:

- Subcontractor procurement,
- Assignment of duties to project staff and orientation of the staff to the specific needs and requirements of the project,
- Ensuring that data assessment activities are conducted in accordance with the QAPP,

- Approval of project-specific procedures and internally prepared plans, drawings, and reports,
- Serving as the focus for coordination of all field and laboratory task activities, communications, reports, and technical reviews, and other support functions, and facilitating site activities with the technical requirements of the project, and
- Maintenance of the project files.

2.2.2 Quality Assurance Responsibilities

AECOM Project Quality Assurance (QA) Officer

The AECOM Project QA Officer, Mr. Gary Grinstead, has overall responsibility for quality assurance oversight. The AECOM Project QA Officer communicates directly to the AECOM Project Manager. Specific responsibilities include:

- Preparing the QAPP,
- Reviewing and approving QA procedures, including any modifications to existing approved procedures,
- Ensuring that QA audits of the various phases of the project are conducted as required,
- Providing QA technical assistance to project staff,
- Ensuring that data validation/data assessment is conducted in accordance with the QAPP, and
- Reporting on the adequacy, status, and effectiveness of the QA program to the AECOM Project Manager.

AECOM Analytical Task Manager

The AECOM Project Chemist/Laboratory Coordinator, Mr. Robert Kennedy, will be responsible for managing the subcontractor laboratories, serving as the liaison between field, laboratory personnel, data validation and database teams and assessing the quality of the analytical data.

2.2.3 Laboratory Responsibilities

Pending final procurement, TestAmerica is proposed to perform the chemical analyses of all samples as detailed in **Section 7.0**.

Laboratory Manager

The Laboratory Manager is ultimately responsible for the data produced by the laboratory. Specific responsibilities include:

- Implementing and adhering to the laboratory QA manual and all corporate policies and procedures within the laboratory,
- Approving the standard operating procedures (SOPs),
- Maintaining adequate staffing, and
- Implementing internal/external audit findings corrective actions.

Laboratory QA Coordinator

The Laboratory QA Coordinator reports to the Laboratory Manager. Specific responsibilities include:

- Approving SOPs,
- Assessing and maintaining the laboratory QA manual implementation within the facility operations,
- Recommending resolutions for ongoing or recurrent nonconformances within the laboratory,
- Performing QA assessments, and
- Reviewing and approving corrective action plans for nonconformances, tracking trends of nonconformances to detect systematic problems, and initiating additional corrective actions as needed.

Laboratory Project Manager

The TestAmerica Laboratory Project Manager is anticipated to be Ms. Carrie Gamber at TestAmerica-Pittsburgh. She will be the primary point of contact between the TestAmerica network laboratories and AECOM. The ECCS on-site mobile lab Project Manager will be Nick Nigro. Specific responsibilities of the Laboratory Project Manager include:

- Monitoring analytical and QA project requirements for a specified project,
- Acting as a liaison between the client and the laboratory staff,
- Reviewing project data packages for completeness and compliance to client needs, and
- Monitoring, reviewing, and evaluating the progress and performance of projects.

2.2.4 Field Responsibilities

AECOM Field Team Leader

The AECOM Field Team Leader, Mr. Scott Beatson, has overall responsibility for completion of all field activities in accordance with the QAPP and is the communication link between AECOM project management and the field team. Specific responsibilities of the AECOM Field Team Leader include:

- Coordinating activities at the site,
- Assigning specific duties to field team members,
- Mobilizing and demobilizing of the field team and subcontractors to and from the site,
- Directing the activities of subcontractors on site,
- Resolving any logistical problems that could potentially hinder field activities, such as equipment malfunctions or availability, personnel conflicts, or weather dependent working conditions,
- Implementing field quality control (QC) including issuance and tracking of measurement and test equipment; the proper labeling, handling, storage, shipping, and chain-of-custody (COC) procedures used at the time of sampling; and control and collection of all field documentation, and
- Communicating any non-conformances or potential data quality issues to AECOM project management.

AECOM Field Staff

The field staff reports directly to the AECOM Field Team Leader, although the Field Team Leader in some cases will be conducting the duties of the field staff listed below. The responsibilities of the field team include:

- Collecting samples, conducting field measurements, and decontaminating equipment according to documented procedures stated in the QAPP,
- Ensuring that field instruments are properly operated, calibrated, and maintained, and that adequate documentation is kept for all instruments,
- Collecting the required QC samples and thoroughly documenting QC sample collection,
- Ensuring that field documentation and data are complete and accurate, and
- Documenting and communicating any nonconformance or potential data quality issues to the AECOM Field Team Leader.

3 Quality Assurance Objectives for Measurement

3.1 Data Quality Objectives

The field investigation activities are designed to characterize conditions in soil, groundwater, surface water and sediment, further refine the CSM, and collect data to support risk assessment and Natural Resource Damage Assessment (NRDA). Data gaps identified during the review of existing data were used to guide the scope of this investigation. Field investigation activities are divided into Landside and Waterside activities and are noted in **Section 1**. All field investigation activities will be conducted in accordance with the RI/FS Work Plan, the FSP, and the HASP, submitted under separate covers.

The data quality objectives (DQOs) for this investigation are:

- To characterize environmental conditions within the Study Area and refine the CSM
- To collect data to update existing Landside and Waterside datasets so the nature and extent of impacts can be better defined
- To collect data to determine whether and to what extent past or current conditions at the Site have caused or contributed to contamination of the Anacostia River
- To collect data within the Anacostia River to identify potential Site-related, near-Site and far-Site sources of contaminants of potential concern (COPCs) in sediment and surface water
- To collect hydraulic data to better understand the site-specific hydrogeology and evaluate the volumetric flux of groundwater to the Anacostia River
- To collect data to better understand sedimentation in the portion of the Anacostia River in Study Area
- To collect data to support performance of Human Health and Ecological Risk Assessments
- To collect data to support development and evaluation of remedial alternatives
- To collect data for NRDA evaluation

The Landside and Waterside DQO development process is presented in **Tables 2** and **3** of the FSP, respectively.

3.2 Data Quality Objectives for Measurement Data

3.2.1 Precision

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is assessed through the collection and measurement of field duplicates at a rate of one duplicate per twenty analytical samples, per matrix, per sampling technique.

Precision will be measured through the calculation of relative percent difference (RPD). The objective for field precision RPDs is < 30% RPD for aqueous samples, and < 50% RPD for solid samples, where results reported at greater than five times the reporting limit.

Precision in the laboratory is assessed through the calculation of RPD for duplicate samples, either as matrix spike/matrix spike duplicates (MS/MSDs) or as laboratory duplicates. The control limits provided in **Table 1** for each parameter will be utilized.

3.2.2 Accuracy

Accuracy is the degree of agreement between the observed value and an accepted reference or true value. Accuracy in the field is assessed through the use of trip blanks and equipment blanks and through the adherence to all sample handling, preservation, and holding time requirements. The objective for trip blanks and equipment blanks is that no target compounds are present above the reporting limit. Sampling preservation and holding time requirements are provided in **Table 4**.

Laboratory accuracy is assessed through the analysis of laboratory method blanks, and spiked samples such as MS/MSDs, laboratory control samples (LCSs), and surrogate compounds. Method blanks should not contain any target compounds above the reporting limits (RLs) which are quantitation limits based on the low point of calibration, or Estimated Minimum Level (EML) for all isotope dilution analytes. For spiked samples, the accuracy objectives, as measured by percent recoveries (%Rs), will be the control limits provided in **Table 1**.

3.2.3 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. "Normal conditions" are defined as the conditions expected if the sampling plan was implemented as planned.

Field completeness is a measure of the amount of valid samples obtained during all sampling for the project. The field completeness objective is greater than 90 percent.

Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The laboratory completeness objective is greater than 95 percent.

3.2.4 Sensitivity

Sensitivity of analytical data is demonstrated by laboratory RLs and Method Detection Limits (MDLs). The target RLs for the analytes to be analyzed are presented in **Tables 2** and **3**. The RLs for the actual samples may differ due to analytical dilutions, sample volume, or sample matrix.

Reporting limits were selected in part by consideration of the applicable screening levels which are risk based and used as Project Screening Limits (PSLs), and in part by consideration of the actual ability of the laboratory to attain reporting limits at the screening levels. Selected Ion Monitoring (SIM) will be performed for selected gas chromatography/mass spectrometry (GC/MS) analysis targets to obtain lower reporting and detection limits. Not all risk based target analyte PSLs are obtainable using the RLs of conventional USEPA methods.

To maximize the usability of the data, any analytes detected below the RLs and above the MDL will be reported by the laboratory as estimated ("J") values for the following parameters: VOCs, SVOCs, OCPs, PCBs as Aroclors, GRO, DRO, ORO, and metals. For PCB congener and PCDD/PCDF analyses by high resolution mass spectrometry (HRMS), detected concentrations below the EML and above the Estimated Detection Limit (EDL) will be reported by the laboratory as estimated ("J") values. EDLs are sample specific limits based on signal-noise ratio and will be used as the reporting detection limit for nondetect results.

3.2.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the protocols described in this QAPP are followed and that proper sampling techniques are used. Planned analytical data will be comparable when similar sampling and analytical methods are used as documented in the QAPP.

3.2.6 Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary.

Representativeness is ensured through the design of the sampling program and will be satisfied by ensuring that the Work Plan and QAPP are followed and that proper sampling techniques are used. Within the laboratory, representativeness will be ensured by the use of appropriate methods, conformance to the approved analytical procedures, and adherence to sample holding times.

3.3 Special Training/ Certifications

3.3.1 Training

This investigation includes routine field sampling techniques, field measurements, and laboratory analyses. No specialized training is therefore necessary. Prior to starting work, personnel will be given instruction specific to the project, covering the following areas:

- Organization and lines of communication and authority,
- Overview of the scope of work,
- QA/QC requirements,
- Documentation requirements, and
- Health and safety requirements.

Instructions will be provided by the AECOM Project Manager, AECOM Field Team Leader, and AECOM Project QA Officer.

3.3.2 Certifications

The chemical analysis laboratories hold National Environmental Laboratory Accreditation Program (NELAP) accreditation.

3.4 Documents and Records

3.4.1 Project Files

The project files will be the central repository for all documents which constitute evidence relevant to sampling and analysis activities as described in this QAPP. AECOM is the custodian of the project files and will maintain the contents of the project files for the investigation, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, and data reviews in a secured, limited access area and under custody of the AECOM Project Manager.

The project files will include at a minimum:

- Field logbooks,
- Field data and data deliverables,
- Photographs,
- Drawings,
- Sample collection logs,
- Laboratory data deliverables,
- Data validation reports,
- Data assessment reports,
- Access/Legal agreements with property owners,
- A copy of final plans and other documents,
- Progress reports, QA reports, interim project reports, etc.,
- All custody documentation (tags, forms, airbills, etc.)

Records will be retained for a minimum of 6 years or the duration requested by USEPA.

3.4.2 Field Records

Field logbooks will provide the means of recording the data collection activities and will be maintained in accordance with Project Operating Procedure (POP) 101 – Field Records located in **Appendix A** of the FSP. As such, entries will be described in as much detail as possible so that persons going to the facility could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in the project files when not in use. Each logbook will be identified by the project-specific document number.

The title page of each logbook will contain the following:

- Person to whom the logbook is assigned,
- The logbook number,
- Project name and number,
- Project start date, and
- End date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigation team personnel, and the purpose of their visit, will also be recorded in the field logbook.

Field logbooks will be supplemented by standardized field measurement and sample collection forms. All measurements made and samples collected will be recorded. All entries will be made in permanent ink, signed, and dated and no erasures or obliterations will be made. If conditions are such that only a pencil can be used (e.g., extreme cold), the procedures for using a pencil in **Section 6.1** of POP 101 – Field Records must be followed. If an incorrect entry is made, the information will be crossed out with a single strike mark, which is initialed and dated by the sampler. Whenever a sample is collected, or a measurement is made, a detailed description of the sampling location, which includes compass and distance measurements, or, latitude and longitude information (e.g., obtained by using a global positioning system) will be recorded. The number of photographs taken of the sampling location, if any, will be noted. Equipment used to make measurements will be identified, along with the date of calibration.

3.4.3 Laboratory Records and Deliverables

Laboratory data reduction procedures will be performed according to the following protocol.

- All information related to analysis will be documented in controlled laboratory logbooks, instrument printouts, or other approved forms.
- All entries that are not generated by an automated data system will be made neatly and legibly in permanent, waterproof ink.
- Information will not be erased or obliterated. Corrections will be made by drawing a single line through the error and entering the correct information adjacent to the cross-out. All changes will be initialed, dated, and, if appropriate, accompanied by a brief explanation.
- Unused pages or portions of pages will be crossed out to prevent future data entry.
- Analytical laboratory records will be reviewed by the supervisory personnel on a regular basis and by the Laboratory QA Coordinator periodically, to verify adherence to documentation requirements.

On-site mobile laboratory turnaround time will be 24 hours. The standard fixed laboratory turnaround time will be 15 business days for all parameters except PCB congeners and PCDD/PCDFs. The turnaround time for PCB congener and PCDD/PCDF analysis is four weeks. The laboratory will provide a complete report in portable document format (PDF) format, and an electronic data deliverables (EDDs). The EDD will be provided as text files in AECOM-specific EQuIS® 4-file format. The PDF format data packages will be contract laboratory program (CLP)-

like reports containing QC summary forms and all raw data and will be completely paginated and bookmarked. All text in the reports should be electronically searchable.

4 Sampling Procedures

4.1 Sampling Design

A summary of the sample locations, types of samples collected, analyses to be performed, monitoring wells to be installed, and rationale for sample collection is presented in **Tables 4** and **5** of the FSP.

4.2 Sampling Methods

The reader is referred to FSP Section 5 and FSP Appendix A for details on field sampling methods and AECOM POPs, respectively.

4.3 QC sample collection

QC samples for laboratory analyses will include field duplicates, MS/MSDs, equipment blanks, trip blanks, and temperature blanks. These samples will be collected as described below:

Field duplicates

Field duplicates will be collected at a frequency of one field duplicate per 20 field samples, per matrix, per sampling technique. Field duplicates for solid samples will be collected by alternately filling two sets of identical sample containers from the interim container used to homogenize the sample. For soil VOC samples, the field duplicate will be collected using the collection device (e.g., sample coring device) from the same areas as the parent sample (i.e., soil VOC samples are not homogenized). For aqueous samples, the parent sample and field duplicate sample containers will be filled in an alternating fashion (i.e., one parent sample container filled, one field duplicate container filled. All field duplicates will be analyzed for the same parameters as their associated samples.

MS/MSDs

MS/MSD samples will be collected at a frequency of one for every 20 field samples, per matrix for all parameters except PCB congeners and PCDD/PCDFs. The HRMS isotope dilution methods for PCB congeners and PCDD/PCDFs include labeled analog spikes in every sample. For those samples designated as MS/MSDs, sufficient additional volume or mass (based on the laboratory's requirements) will be collected.

Equipment blanks

Equipment blanks will be collected at a rate of one for every 20 field samples, per matrix, per sampling technique. Equipment blanks will be collected by pouring laboratory volatile organic analysis (VOA)-free water over the decontaminated sampling equipment, and collecting the rinsate into the appropriate sample containers. Equipment blanks will not be collected when dedicated sampling equipment is used (e.g., peristaltic pump with dedicated tubing).

Trip blanks

Trip blanks will be included with each shipment of groundwater and soil samples collected for VOC and GRO analyses. Trip blanks associated with groundwater samples will originate in the laboratory and will be prepared by filling two 40-mL VOA vials with laboratory VOA-free water and the chemical preservative, and sealing the vials with septum-lined caps (allowing no headspace). Trip blanks associated with soil VOC samples will consist of one set of the soil VOA vials (i.e., two low level VOA vials and one high level VOA vial). Trip blanks associated with soil GRO samples will consist of one soil GRO vial (i.e., one VOA vial containing methanol). Trip blanks will accompany the sample bottles to the site and will remain (unopened) in the shipping container until the sample bottles are received back at the laboratory.

Temperature blanks

Temperature blanks will be included in each cooler, allowing the laboratory to determine the temperature of the shipment without disturbing the field samples. Temperature blanks will be prepared by filling a plastic or glass vial with water.

5 Sample Custody

5.1 Sample Containers, Preservation, and Holding Times

Sample bottles and chemical preservatives will be provided by the laboratories. The containers will be cleaned by the manufacturer to meet or exceed all analyte specifications established in the latest USEPA's Specifications and Guidance for Contaminant-Free Sample Containers. Certificates of analysis will be provided with each lot of containers and maintained on file to document conformance to USEPA specifications. A summary of sample container, preservation, and holding time requirements is presented in **Table 4**.

5.2 Sample Labeling

Immediately upon collection, each sample will be labeled with an adhesive label. Samples will be assigned unique sample identifications. Each sample label will include the sample number, location, date/time of collection, and analysis. Each sample number will consist of a four part identification system that describes the sampling method, location ID, depth, and sample type, as described below:

- Sampling Method: This part is represented by a three letter code as follows:

Monitoring Well Soil	MWS
Monitoring Well Water	MWW
Soil Boring Soil	SBS
Soil Boring Water	SBW
Direct Push Soil	DPS

Direct Push Water	DPW
Surface Soil Sample	SUS
Sediment	SED
Surface Water	SUW

- Location: This will be a two digit code consisting of numbers, letters or a combination (e.g., 01, 15, C2).
- Sample Depth: Sample depth will be identified using a two digit number (e.g., 05 representing 5 feet below grade). Where sample depth involves an interval, this identifier identifies the starting depth of the interval only. The number "00" will represent surface samples.
- Sample Type: The last character of the sample ID will represent the sample type:

  N – Field sample

  R – Field duplicate

  Q – Quality control (QC) sample (e.g., equipment blank, trip blank)

- Equipment Blank – "EB" followed by date (e.g., EB-070110). If multiple EBs are collected on the same day for differing types of sampling equipment, numerical designations will be used to differentiate the type of equipment blank (e.g., EB01-070110, EB02-070110), with the type of sampling equipment associated with each type of equipment blank documented in the field log book (e.g., EB01-070110 collected from split spoon sampler, EB02-070110 collected from Geoprobe® cutting shoe)
- Trip Blank – "TB" followed by date (e.g., TB-070110). If multiple TBs are collected on the same day for multiple coolers of VOC samples, numerical designations will be used to differentiate the different trip blanks (e.g., TB01-070110, TB02-070110). The cooler specific chain-of-custody forms will document which VOC samples are associated with the trip blanks.

An example of a complete sample ID would be MWW0515N for the groundwater sample collected from monitoring well MW-5 at15 feet below grade. Another example would be SEDC200R representing duplicate of a surface sediment sample collected at grid node C2.

Samples being designated for matrix spike and matrix spike duplicate (MS/MSD) analysis will *not* include an identifier as part of the sample code, but will be identified as such on the chain-of-custody in the comments section on the same row as the parent sample.

5.3 Custody Procedures

Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in two parts: field sample collection and laboratory analysis.
A sample is considered to be under a person's custody if

- the item is in the actual possession of a person;
- the item is in the view of the person after being in actual possession of the person;
- the item was in the actual physical possession of the person but is locked up to prevent tampering; and
- the item is in a designated and identified secure area.

5.3.1 Field Custody Procedures

The field sampler is personally responsible for the care and custody of the samples until they are transferred or dispatched properly. Field procedures have been designed such that as few people as possible will handle the samples. Field custody procedures will be performed according to POP 102 - Chain of Custody Procedures located in **Appendix A** of the FSP.

All sample containers will be identified by the use of sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample tag because the pen would not function in freezing weather.

Samples will be accompanied by a properly completed COC form. The sample numbers and locations will be listed on the COC form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the sampler to another person, to the permanent laboratory, or to/from a secure storage location. An example COC form is presented as **Figure 1**. All sample shipments will be accompanied by the COC record identifying the contents. The original record will accompany the shipment, and the back copy will be retained by the sampler and placed in the project files.

Field samples will be packed and shipped to the laboratory according to POP 103 – Packaging and Shipment of Samples, located in **Appendix A** of the FSP. Samples will be properly packaged on ice at 4°C for shipment and dispatched to the laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be sealed and secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the front right and back left of the cooler and covered with clear plastic tape after being signed by field personnel. The cooler will be strapped shut with strapping tape in at least two locations.

If the samples are sent by common carrier, the waybill will be used. Waybills will be retained as part of the permanent documentation. Commercial carriers are not required to sign off on the custody forms since the custody forms will be sealed inside the sample cooler and the custody seals will remain intact.

5.3.2 Laboratory Custody Procedures

Samples will be received and logged in at the laboratory by a designated sample custodian or his/her designee. Upon sample receipt, the sample custodian will

- Examine the shipping containers to verify that the custody tape is intact,
- Examine all sample containers for damage,
- Determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the COC form or in sample log-in records,
- Compare samples received against those listed on the COC,

- Verify that sample holding times have not been exceeded,
- Examine all shipping records for accuracy and completeness,
- Determine if sample pH is adequate and whether any adjustments were required (if applicable) and record sample receipt form,
- Sign and date the COC immediately (if shipment is accepted) and attach the waybill,
- Note any problems associated with the coolers and/or samples on the cooler receipt form and notify the Laboratory Project Manager, who will be responsible for contacting the client,
- Attach laboratory sample container labels with unique laboratory identification and analyses required, and
- Place the samples in the proper laboratory storage.

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory information management system (LIMS). At a minimum, the following information will be entered: project name or identification, unique sample identification numbers (both client and internal laboratory), type of sample, required analyses, and date and time of laboratory receipt of samples.
- The appropriate laboratory personnel will be notified of sample arrival.
- The completed COC, waybills, and any additional documentation will be placed in the project file.

Specific details of laboratory custody procedures for sample receiving, sample identification, sample control, and record retention are described in the Laboratory QA Manual and laboratory SOPs.

6 Calibration Procedures

6.1 Instrument/Equipment Testing, Inspection, and Maintenance

The field equipment for this project will include a photoionization detector (PID), an electronic water level indicator, and water quality instrumentation. AECOM field personnel will be responsible for ensuring that the instruments are properly functioning. At a minimum, this will entail checking the instrument prior to shipment to the field and performing daily operational checks and calibration as described in **Section 6.2**. Routine maintenance and trouble-shooting procedures will be performed as described in the manufacturer's instructions. Spare parts will be readily available on site or from the vendor.

Routine testing and preventive maintenance is performed by the laboratory as part of their QA program. Details on the type of checks, frequencies, and corrective actions are included in the Laboratory QA Manual.

6.2 Instrument/Equipment Calibration and Frequency

The field instrumentation requiring field calibration will include a PID, YSI water quality meter, and LaMotte turbidity meter. Calibration will be performed daily or anytime that the operator suspects that the instrument is not reading accurately according to POP 502 – Water Quality Instrumentation located in **Appendix A** of the FSP:

All calibrations and calibration checks will be documented in the field records. Calibration records will include the date/time of calibration/calibration check, name of the person performing the calibration, reference standard used, and the results of the calibration or check.

Calibration procedures for laboratory instruments will consist of initial calibrations, initial calibration verifications, and continuing calibration verification. The SOP for each analysis performed in the laboratory describes the calibration procedures, their frequency, acceptance criteria, and the conditions that will require recalibration. This information is summarized in **Table 7**.

The laboratory maintains documentation for each instrument, which includes the following information: instrument identification, serial number, date of calibration, analyst, calibration solutions, and the samples associated with these calibrations.

6.3 Inspection/ Acceptance of Supplies and Consumables

For this project, critical supplies for field activities will be tracked through AECOM's system in the following manner.

Critical Supplies and Consumables	Inspection Requirements and Acceptance Criteria	Responsible Individual
Sample bottles	Visually inspected upon receipt for cracks, breakage, and cleanliness. Must be accompanied by certificate of analysis.	Field Team
Chemicals and reagents	Visually inspected for proper labeling, expiration dates, appropriate grade	Field Team
Field measurement equipment	Functional checks to ensure proper calibration and operating capacity	Field Team
Sampling equipment	Visually inspected for obvious defects, damage, and contamination	Field Team

Supplies and consumables not meeting acceptance criteria will initiate the appropriate corrective action. Corrective measures may include repair or replacement of measurement equipment, and/or notification of vendor and subsequent replacement of defective or inappropriate materials. All actions will be documented in the project files.

The laboratory system of inspection and acceptance of supplies and consumable is documented in the Laboratory QA Manual.

7 Analytical Procedures

Soil, sediment, groundwater, and surface water samples will be analyzed by the NELAP-certified fixed and mobile laboratories listed below.

Groundwater, surface water, soil, and sediment samples collected for VOCs, SVOCs, OCPs, and metals will be analyzed by:

TestAmerica
301 Alpha Drive
Pittsburgh, PA 15238
412-963-7058

Groundwater and surface water samples collected for GRO, DRO/ORO will be analyzed by:

TestAmerica
3355 McLemore Drive
Pensacola, FL
850-474-1001

Soil and sediment samples collected for PCB-Aroclors and DRO/ORO will be analyzed at the on-site mobile laboratory by:

ECCS
2525 Advanced Road
Madison, WI 534718
608-221-8700

All PCB congener, alkylated PAH, and PCDD/PCDF analyses will be performed by:

TestAmerica
5815 Middlebrook Pike
Knoxville, TN 37921
865-291-3000

A summary of the sample locations, types of samples collected, and analyses to be performed is presented in **Tables 4** and **5** of the FSP. Details for conditional sample analyses are provided in the Work Plan.
EPA Method 1668A and EPA Method 8290A are ultratrace isotope dilution based HRMS analytical techniques. When concentrations exceed the calibration range in soil or sediment then results may be flagged E if they exceed

the upper confidence limit (UCL) but are within linear range of instrument response. If the labeled internal standard spike is diluted out during reanalysis then quantitation of target congeners may be performed by the internal standard method rather than true isotope dilution. These results will be appropriately qualified in the laboratory narrative and data validation reports.

Samples will be analyzed for the analytes listed in **Tables 2** and **3**. The laboratory analytical methods to be used are summarized in **Table 5**. Laboratory SOPs that will be utilized for the analyses are listed in **Table 6** and are included in **Appendix A** on CD-ROM. Note the laboratory SOPs are proprietary business information to be shared only with Pepco, AECOM, and DDOE.

8 Data Reduction, Validation and Reporting

8.1 Data Review, Verification, and Validation

All data generated through field activities, or through the analytical program, will be reduced, verified and/or validated prior to reporting. No data will be disseminated by AECOM or its subcontractors until it has been subjected to the procedures summarized below.

8.1.1 Field Data

Field data will be reviewed daily by the AECOM Field Team Leader to ensure that the records are complete, accurate, and legible and to verify that the sampling procedures are in accordance with the protocols specified in the Work Plan and QAPP.

8.1.2 Internal Laboratory Review

Prior to the release of any data from the laboratory, the data will be reviewed and approved by laboratory personnel. The review will consist of a tiered approach that will include reviews by the person performing the work, by a qualified peer, and by supervisory and/or QA personnel.

8.1.3 Validation of Analytical Data

AECOM's validation staff will perform validation on the data for all parameters as described in **Section 8.2.3** of this QAPP. The validation will primarily be based on information provided by the laboratory on QC summary forms, and will include minimal or no raw data review. At a minimum, the validation will include the following data elements:

- Agreement of analyses conducted with COC requests
- Holding times and sample preservation
- Initial and continuing calibrations and analytical sequence
- Mass spectrometer tuning (GC/MS only)
- Internal standard performance (GC/MS only)
- Laboratory blanks/equipment blanks/trip blanks
- Surrogate recoveries
- Laboratory control sample/laboratory control sample (LCS/LCSD) results
- Matrix spike/matrix spike duplicate (MS/MSD) results

- Laboratory duplicate results
- Field duplicate results
- Interference check sample results
- Inductively Coupled Plasma (ICP) serial dilution results
- Endrin/dichlorodiphenyltrichloroethane (DDT) breakdown check standard results (pesticides only)
- Labeled toxics/level of chlorination/window defining/labeled clean-up recoveries (PCB congeners only)
- Percent solids
- Quantitation limits and sample results (limited to evaluating dilutions and reanalyses)

8.1.4 Data Management

Data management operations include data recording, validation, transformation, transmittal, reduction, analysis, tracking, storage and retrieval.

Upon receipt from the laboratory, PDF format reports and EDDs will be checked for completeness. During the data analysis process, a variety of quality checks are performed to ensure data integrity. These checks include:

- Audits to ensure that laboratories reported all requested analyses;
- Checks that all analytes are consistently and correctly identified;
- Reviews to ensure that units of measurement are provided and are consistent;
- Reports to review sample definitions (depths, dates, locations); and
- Proofing manually entered data against the PDF format original.

Records of the checks are maintained on file.

Once all data quality checks are performed, the data will be exported to a variety of formats to meet project needs. Cross-tab tables showing concentrations by sample location will be prepared.

The project data will be maintained on a secure network drive, which is backed up regularly. Access to the data will be limited to authorized users and will be controlled by password access. Data will be retained in accordance with the requirements stated in **Section 3.4.1** of this QAPP.

8.2 Verification and Validation methods

8.2.1 Field Data Verification

Field records will be reviewed by the AECOM Field Team Leader to ensure that:

- Logbooks and standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.
- Records are legible and in accordance with good recordkeeping practices, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.
- Sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in the QAPP, and that any deviations were documented and approved by the appropriate personnel.
- Field calibration, replicate and duplicate sample results are within acceptable ranges and any deviations were properly documented and approved by the appropriate personnel.

8.2.2 Laboratory Data Verification

Prior to being released as final, laboratory data will proceed through a tiered review process. Data verification starts with the analyst who performs a 100 percent review of the data to ensure the work was done correctly the first time. The data reduction and initial verification process must ensure that:

- Sample preparation and analysis information is correct and complete,
- Analytical results are correct and complete,
- The appropriate SOPs have been followed and are identified in the project records,
- Proper documentation procedures have been followed, and
- All nonconformances have been documented.

Following the completion of the initial verification by the analyst performing the data reduction, a systematic check of the data will be performed by an experienced peer or supervisor. This check will be performed to ensure that initial review has been completed correctly and thoroughly and will include a review of

- Adherence to the requested analytical method SOP,
- Correct interpretation of chromatograms, mass spectra, etc.,
- Correctness of numerical input when computer programs are used (checked randomly),
- Correct identification and quantification of constituents with appropriate qualifiers,
- Numerical correctness of calculations and formulas (checked randomly),

- Acceptability of QC data,
- Documentation that instruments were operating according to method specifications (calibrations, performance checks, etc.),
- Documentation of dilution factors, standard concentrations, etc.,
- Sample holding time assessment.

A third-level review will be performed by the Laboratory Project Manager before results are submitted to clients. This review serves to verify the completeness of the data report and to ensure that project requirements are met for the analyses performed. A narrative to accompany the final report will be prepared by the Laboratory Project Manager.

8.2.3 Validation of Analytical Deliverables

Validation of the data described in **Section 8.1.3** of this QAPP will be performed using EPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2010) and EPA National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2008), modified as appropriate for non-CLP methods.

Upon completion of the validation, a report will be prepared. This report will summarize the samples reviewed, elements reviewed, any non-conformances with the established criteria, and validation actions (including application of data qualifiers). Data qualifiers will be consistent with the USEPA guidelines.

8.2.4 Verification during Data Management

All manually entered data (e.g., field data) will be proofed 100 percent against the original. Electronic data will be checked after loading against laboratory data sheets for completeness and spot checked for accuracy.

8.3 Reconciliation with User Requirements

8.3.1 Comparison to Measurement Objectives

The field and laboratory data collected during this investigation will be used to achieve the objectives identified in **Section 3.3** of this QAPP. The QC results associated with each analytical parameter for each matrix will be compared to the measurement objectives presented in **Section 3.3.2** of this QAPP. Only data generated in association with QC results meeting the stated acceptance criteria (i.e., data determined to be valid) will be considered usable for decision making purposes. Rejected data will be clearly indicated during validation and made unavailable for use.

Accuracy Assessment

One measure of accuracy will be %Rs, which is calculated for matrix spikes, surrogates, and LCSs. Percent recoveries for MS/MSD results will be determined according to the following equation:

$$\%R = \frac{(Amount\ in\ Spiked\ Sample - Amount\ in\ Sample)}{Known\ \text{Amount}\ \text{Added}} x100$$

Percent recoveries for surrogates and LCS results will be determined according to the following equation:

$$\%R = \frac{Experimental\ Concentration}{Known\ Amount\ \text{Added}} x100$$

An additional measure of accuracy is blank contamination. The blanks associated with this project include laboratory method blanks and field blanks (e.g., trip blanks). The results of the laboratory and field blanks will be compared to the objectives in stated **Table 1** of the QAPP. Failure to meet these objectives may indicate a systematic laboratory or field problem that should be investigated and resolved immediately. Associated data may be qualified and limitations placed on its use, depending on the magnitude of the problem.

Precision Assessment

The RPD between the matrix spike and matrix spike duplicate and field duplicate pair is calculated to compare to precision objectives (**Table 1** of this QAPP). The RPD will be calculated according to the following formula.

$$RPD = \frac{(Amount\ in\ Sample\,1 - Amount\ in\ Sample\ 2)}{0.5\,(Amount\ in\ Sample\,1 + Amount\ in\ Sample\ 2)} x100$$

Failure to achieve precision objectives may result in the associated data being qualified (**Section 8.2.3**) and limitations placed upon its use.

Completeness Assessment

Completeness is the ratio of the number of valid sample results to the total number of samples analyzed with a specific matrix and/or analysis. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$Completeness = \frac{(number\ of\ valid\ measurements)}{(number\ of\ measurements\ planned)} x100$$

Failure to meet the completeness objective will require an assessment to determine if the missing or invalid data are critical to achieving the project objectives. Corrective actions may include resampling or re-analysis, depending on the type of problem, logistical constraints, etc.

8.3.2 Comparison to Project Objectives

In addition to the comparison described in **Section 8.3.1**, the data obtained will be both qualitatively and quantitatively assessed on a project-wide, matrix-specific, and parameter-specific basis. Factors to be considered in this assessment of field and laboratory data will include, but not necessarily be limited to, the following.

- Conformance to the field methodologies and SOPs proposed in the Work Plan and QAPP,
- Conformance to the analytical methodologies provided in the QAPP,
- Adherence to proposed sampling strategy,
- Presence of elevated detection limits due to matrix interferences or contaminants present at high concentrations,
- Unusable data sets (qualified as “R”) based on data validation,
- Data sets identified as usable for limited purposes (qualified as “J”) based on data validation,
- Effect of qualifiers applied as a result of data review on the ability to implement the project decision rules, and
- Status of all issues requiring corrective action, as presented in the QA reports to management.

The effect of nonconformance (procedures or requirements) or noncompliant data on project objectives will be evaluated. Minor deviations from approved field and laboratory procedures and sampling approach will likely not affect the adequacy of the data as a whole in meeting the project objectives. The assessment will also entail the identification of any remaining data gaps and need to reevaluate project decision rules.

This assessment will be performed by the AECOM technical team, in conjunction with the AECOM Project QA Officer, and the results presented and discussed in detail in the final report.

9 Laboratory Quality Control

9.1 Laboratory QC samples

The analytical laboratories have a QC program in place to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as SOPs and each SOP includes the minimum requirements for the procedure. The internal QC checks differ slightly for each individual procedure and are outlined in the SOPs included in **Appendix A**. In general they include:

- Blanks (method, reagent/preparation, instrument)
- MS/MSDs
- Surrogate spikes (organic analyses)
- Laboratory duplicates
- LCSs
- Internal standard area counts (GC/MS analyses and ICP/mass spectrometry analysis)
- Endrin/DDT breakdown check standard results (OCP only)
- Calibration check compounds
- Interference checks (ICP analysis)
- Serial dilutions (ICP analysis)
- Labeled analog spike recovery (PCB congeners, PAHs by ID0016, and PCDD/PCDFs only)

The control limits for precision and accuracy will be those listed in **Table 1**.

9.2 Assessment/oversight

9.2.1 Assessment

The types of planned assessments pertinent to this program include technical surveillance audits (TSAs) of field and laboratory activities, data package audits, and data validation audits.

<u>Field Activity TSA</u>

If requested by the AECOM Project Manager, a TSA of field activities may be conducted by the AECOM Project QA Officer or his/her designate. The TSA includes an examination of field sampling records, field measurement results, field instrument operating and calibration records, sample collection, handling, and packaging procedures, QA

procedures, COC, sample documentation, etc. If significant deficiencies are noted, follow-up audits will be conducted.

During the audit, the auditor will keep detailed notes of audit findings. Preliminary results of the audit will be reviewed with the AECOM Field Team Leader while on site to ensure that deficiencies adversely affecting data quality are immediately identified and corrective measures initiated. Upon completion of the audit, the AECOM Project QA Officer will prepare a written audit report, which summarizes the audit findings, identifies deficiencies and recommends corrective actions. This report will be submitted to the AECOM Project Manager, who will be responsible for ensuring that corrective measures are implemented and documented. The results of the audit process will be included in the QA reports to management.

Laboratory TSA

Laboratory TSAs are conducted periodically by AECOM's QA staff as part of their analytical subcontractor monitoring program. The laboratory TSA includes a review of the following areas:

- QA organization and procedures,
- Personnel training and qualifications,
- Sample log-in procedures,
- Sample storage facilities,
- Analyst technique,
- Adherence to laboratory SOPs and project QAPP,
- Compliance with QA/QC objectives,
- Instrument calibration and maintenance,
- Data recording, reduction, review, and reporting, and
- Cleanliness and housekeeping.

Preliminary results of the systems audit will be discussed with the Laboratory Manager, Laboratory Project Manager, and Laboratory QA Coordinator. A written report that summarizes audit findings and recommends corrective actions will be prepared and submitted to the Laboratory Manager for response, and to the AECOM Project Manager. The results of the audit, including resolution of any deficiencies, will be included in the QA reports to management.

9.2.2 Response Actions

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or out-of-limit QC performance that can affect data quality. Corrective action can occur

during field activities, laboratory analyses, and data assessment. All corrective action proposed and implemented should be documented in the QA reports to management. Corrective action should only be implemented after approval by the AECOM Project Manager, or his designate.

The DDOE Project Manager will be notified of significant issues that potentially impact the achievement of the project objectives.

Field Corrective Action

Corrective action in the field may be needed when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the QAPP, etc.), or when sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. The field team may identify the need for corrective action. The AECOM Field Team Leader will approve the corrective action and notify the AECOM Project Manager. The AECOM Project Manager, in consultation with the AECOM Project QA Officer, will approve the corrective measure. The AECOM Field Team Leader will ensure that the corrective measure is implemented by the field team.

Corrective action resulting from internal field audits will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. The AECOM Project QA Officer will identify deficiencies and recommend corrective action to the AECOM Project Manager. Implementation of corrective actions will be performed by the AECOM Field Team Leader and field team. Corrective action will be documented in QA reports to the project management team.

Corrective actions will be implemented and documented in the field record book. Documentation will include:

- A description of the circumstances that initiated the corrective action,
- The action taken in response,
- The final resolution, and
- Any necessary approvals.

No staff member will initiate corrective action without prior communication of findings through the proper channels.

Laboratory Corrective Action

Corrective action in the laboratory may occur prior to, during, and after initial analyses. A number of conditions such as broken sample containers, multiple phases, low/high pH readings, and potentially high concentration samples

may be identified during sample log-in or analysis. Following consultation with laboratory analysts and supervisory personnel, it may be necessary for the Laboratory QA Coordinator to approve the implementation of corrective action. If the nonconformance causes project objectives not to be achieved, the AECOM Project Manager will be notified.

These corrective actions are performed prior to release of the data from the laboratory. The corrective action will be documented in both the laboratory's corrective action files, and in the narrative data report sent from the laboratory to the AECOM Project Manager. If the corrective action does not rectify the situation, the laboratory will contact the AECOM Project Manager, who will determine the action to be taken and inform the appropriate personnel.

Corrective Action during Data Review and Data Assessment

The need for corrective action may be identified during either data review or data assessment. Potential types of corrective action may include resampling by the field team or reinjection/reanalysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team and whether the data to be collected is necessary to meet the required QA objectives. If the AECOM data reviewer or data assessor identifies a corrective action situation, the AECOM Project Manager will be responsible for informing the appropriate personnel.

9.2.3 Reports to Management

QA reports will be submitted to the AECOM Project Manager to ensure that any problems identified during the sampling and analysis programs are investigated and the proper corrective measures taken in response. The QA reports will include (where applicable):

- All results of field and laboratory audits,
- A summary of revisions to the QAPP,
- Results of any performance evaluation (PE) or split samples,
- Problems noted during data validation and assessment, and
- Significant QA/QC problems, recommended corrective actions, and the outcome of corrective actions.

QA reports will be prepared by the AECOM Project QA Officer and submitted on an as-needed basis.

10 References

United States Environmental Protection Agency, 2010. *National Functional Guidelines for Inorganic Superfund Data Review*. Contract Laboratory Program. January.

United States Environmental Protection Agency, 2008. *National Functional Guidelines for Superfund Organic Methods Data Review*. Contract Laboratory Program. June.

United States Environmental Protection Agency, 2001. *Quality Staff. EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5. EPA/240/B-01/003. March.

United States Environmental Protection Agency, 2006. *Quality Staff. Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4. EPA/240/B-06/001. February.

United States Environmental Protection Agency, 2002. *Quality Staff. EPA Guidance for Quality Assurance Project Plans*, EPA QA/G-5. EPA/240/R-02/009. December.

United States Environmental Protection Agency, 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, Interim Final, EPA-540-G-89-004. October.

Figures

Figure 1. Example of AECOM Chain of Custody Form

AECOM

CHAIN OF CUSTODY RECORD

Page ____ of ____

Client/Project Name:	Project Location:	Analysis Requested
Project Number:	Field Logbook No.:	
Sampler (Print Name)/(Affiliation):	Chain of Custody Tape Nos.:	
Signature:	Send Results/Report to:	TAT:

Container Type
P – Plastic
A – Amber Glass
G – Clear Glass
V – VOA Vial
O – Other
E – Encore

Preservation
1 – HCl, 4°
2 – H2SO4, 4°
3 – HNO3, 4°
4 – NaOH, 4°
5 – NaOH/ZnAc, 4°
6 – Na2S2O3, 4°
7 – 4°

Matrix Codes:
DW – Drinking Water
WW – Wastewater
GW – Groundwater
SW – Surface Water
ST – Storm Water
W – Water
S – Soil
SL – Sludge
SD – Sediment
SO – Solid
A – Air
L – Liquid
P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered											Lab I.D.	Remarks

Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:	Analytical Laboratory (Destination):
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:	
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:	Sample Shipped Via: UPS FedEx Courier Other / Temp blank Yes No

Serial No. _____

Tables

Table 1. Field and Laboratory QC

QC Sample→	Field Duplicate	MS/MSD	LCS/LCSD	MS/MSD	LCS/LCSD	Surrogate Spikes	Laboratory Method Blanks	Equipment Rinsate Blanks and/or Trip Blanks	Cooler Temperature Blanks
DQI	**Precision**			**Accuracy - Bias**			**Accuracy-Bias/ Contamination**		**Accuracy-Bias/Preservation**
VOCs	Soil RPD ≤ 50%; Aqueous RPD ≤ 30%	See laboratory % recovery limits in Appendix B					Target analytes < RL*	Target analytes < RL	4°C ± 2°C
SVOCs							Target analytes < RL*	Target analytes < RL	
OCPs							Target analytes < RL	Target analytes < RL	
PCBs - Aroclors							Target analytes < RL	Target analytes < RL	
PCBs - Congeners							Target analytes < EML	Target analytes < EML	
PCDD/PCDFs							Target analytes < EML	Target analytes < EML	
Metals		Matrix Duplicate Soil RPD ≤ 35%;aqueous RPD ≤ 20%	NA	75-125%	Soil- vendor control limits; aqueous 80-120%	NA	Target analytes < RL	Target analytes < RL	
GRO		RPD ≤ 50%	RPD ≤ 25%	40 – 140%; nonane 30 – 140%	40 – 140%; nonane 30 – 140%	40 -140%	Target analytes < RL	Target analytes and ranges < RL	
DRO/ORO		RPD ≤ 50%	RPD ≤ 25%	60 – 140%	70 – 130%	60-140%	Target analytes < RL	Target analytes and ranges < RL	

*VOCs and SVOCs: Common laboratory contaminants should be <5x RL
DQI – Data Quality Indicator
NA Not applicable
MS/MSDs not applicable PCB – congener analyses
Note all limits are subject to change based on final laboratory selection and required annual laboratory QC limit updates.

Table 2. Analyte lists and reporting limits for soil and groundwater (all parameters except PCB – congeners and PCDDs/PCDFs).

	Project Screening Limits[1]				Laboratory Limits[2]			
	Water (ug/L)		Solids (mg/Kg)		Water (ug/L)		Solids (mg/Kg)	
Parameter	**GW**	**SW**	**SO**	**SE**	**RL**	**MDL**	**RL**	**MDL**
VOCs by SW-846 8260B								
1,1,1-Trichloroethane	NV	1.10E+01	3.80E+03	7.00E-02	1.00E+00	2.86E-01	5.00E-03	4.86E-04
1,1,2,2-Tetrachloroethane	4.00E+01	4.00E+00	2.80E+00	1.36E+00	1.00E+00	2.00E-01	5.00E-03	7.18E-04
1,1,2-Trichloro-1,2,2-trifluoroethane	NV	NV	1.80E+04	NA	1.00E+00	3.20E-01	5.00E-03	1.07E-03
1,1,2-Trichloroethane	1.60E+02	1.60E+01	6.80E-01	4.00E-01	1.00E+00	2.01E-01	5.00E-03	8.31E-04
1,1-Dichloroethane	nv	4.70E+01	1.70E+01	2.00E-02	1.00E+00	1.16E-01	5.00E-03	5.75E-04
1,1-Dichloroethene	7.10E+04	2.50E+01	1.10E+02	1.00E-01	1.00E+00	2.96E-01	5.00E-03	8.48E-04
1,2,3-Trichlorobenzene	7.00E+02	8.00E+00	4.90E+01	1.10E-02	1.00E+00	1.54E-01	5.00E-03	8.45E-04
1,2,4-Trichlorobenzene	7.00E+02	7.00E+01	2.70E+01	1.10E-02	1.00E+00	2.71E-01	5.00E-03	8.82E-04
1,2-Dibromo-3-chloropropane	NV	NV	6.90E-02	NA	1.00E+00	1.41E-01	5.00E-03	7.49E-04
1,2-Dibromoethane	NV	NV	1.70E-01	NA	1.00E+00	1.80E-01	5.00E-03	8.63E-04
1,2-Dichlorobenzene	1.30E+04	2.00E+02	9.80E+02	3.00E-02	1.00E+00	1.52E-01	5.00E-03	7.98E-04
1,2-Dichloroethane	3.70E+02	3.70E+01	2.20E+00	2.00E-02	1.00E+00	2.12E-01	5.00E-03	6.13E-04
1,2-Dichloropropane	1.50E+02	1.50E+01	4.70E+00	2.00E-03	1.00E+00	9.48E-02	5.00E-03	5.43E-04
1,3-Dichlorobenzene	1.90E+03	2.00E+02	1.20E+01	3.00E-02	1.00E+00	1.05E-01	5.00E-03	6.56E-04
1,4-Dichlorobenzene	1.90E+03	1.90E+02	1.20E+01	3.00E-02	1.00E+00	2.06E-01	5.00E-03	6.37E-04
1,4-Dioxane	NV	NV	1.70E+01	1.19E-01	2.00E+02	3.43E+01	1.00E+00	2.76E+02
2-Butanone	NV	1.40E+04	2.00E+04	3.50E+01	5.00E+00	5.48E-01	5.00E-03	8.82E-04
2-Hexanone	NV	9.90E+01	1.40E+02	5.82E-02	5.00E+00	1.59E-01	5.00E-03	6.90E-04
4-Methyl-2-pentanone	NV	1.70E+02	5.30E+03	2.51E-02	5.00E+00	5.28E-01	5.00E-03	6.53E-04
Acetone	NV	1.50E+03	6.30E+04	9.90E-03	5.00E+00	2.50E+00	2.00E-02	5.00E-03
Benzene	5.10E+02	5.10E+01	5.40E+00	1.00E-02	1.00E+00	1.05E-01	5.00E-03	6.75E-04
Bromochloromethane	NV	NV	6.80E+01	NA	1.00E+00	1.80E-01	5.00E-03	6.88E-04
Bromodichloromethane	1.70E+02	1.70E+01	1.40E+00	NA	1.00E+00	1.30E-01	5.00E-03	5.61E-04
Bromoform	1.40E+03	1.40E+02	2.20E+02	7.50E+01	1.00E+00	1.91E-01	5.00E-03	4.42E-04
Bromomethane	1.50E+04	1.50E+03	3.20E+00	1.37E-03	1.00E+00	3.13E-01	5.00E-03	7.39E-04
Carbon disulfide	NV	9.20E-01	3.70E+02	8.51E-04	1.00E+00	2.12E-01	5.00E-03	5.12E-04
Carbon tetrachloride	1.60E+01	1.60E+00	3.00E+00	1.70E-01	1.00E+00	1.37E-01	5.00E-03	4.46E-04
Chlorobenzene	1.60E+04	1.60E+03	1.40E+02	3.00E-02	1.00E+00	1.35E-01	5.00E-03	7.57E-04
Chloroethane	NV	NV	6.10E+03	NA	1.00E+00	2.15E-01	5.00E-03	1.55E-03
Chloroform	4.70E+03	4.70E+02	1.50E+00	2.00E-02	1.00E+00	1.71E-01	5.00E-03	5.85E-04
Chloromethane	NV	NV	5.00E+01	NA	1.00E+00	2.83E-01	5.00E-03	8.52E-04
cis-1,2-Dichloroethene	NV	NV	2.00E+02	2.00E-01	1.00E+00	2.37E-01	5.00E-03	7.03E-04
cis-1,3-Dichloropropene	NV	NV	8.30E+00	NA	1.00E+00	1.87E-01	5.00E-03	6.78E-04
Cyclohexane	NV	NV	2.90E+03	NA	1.00E+00	2.54E-01	5.00E-03	3.71E-04
Dibromochloromethane	1.30E+02	1.30E+01	3.30E+00	NA	1.00E+00	1.37E-01	5.00E-03	7.10E-04
Dichlorodifluoromethane	NV	NV	4.00E+01	NA	1.00E+00	1.93E-01	5.00E-03	6.66E-04

Table 2. Analyte lists and reporting limits for soil and groundwater (all parameters except PCB – congeners and PCDDs/PCDFs).

	Project Screening Limits[1]				Laboratory Limits[2]			
	Water (ug/L)		Solids (mg/Kg)		Water (ug/L)		Solids (mg/Kg)	
Parameter	**GW**	**SW**	**SO**	**SE**	**RL**	**MDL**	**RL**	**MDL**
Ethylbenzene	2.10E+04	4.00E+01	2.70E+01	3.00E-02	1.00E+00	2.27E-01	5.00E-03	6.43E-04
Isopropylbenzene	NV	2.60E+00	1.10E+03	8.60E-02	1.00E+00	1.64E-01	5.00E-03	6.79E-04
Methyl acetate	NV	NV	1.00E+05	NA	1.00E+00	1.38E-01	5.00E-03	9.01E-04
Methylcyclohexane	NV	NV	2.90E+03	NA	1.00E+00	2.61E-01	5.00E-03	7.25E-04
Methylene chloride	NV	5.90E+02	3.10E+02	1.80E-02	1.00E+00	1.49E-01	5.00E-03	6.72E-04
Methyl-tert-butyl ether	NV	1.11E+04	2.20E+02	1.00E+02	1.00E+00	1.83E-01	5.00E-03	7.48E-04
o-Xylene	NV	3.50E+02	3.00E+02	8.90E-02	1.00E+00	1.09E-01	5.00E-03	7.79E-04
p+m-Xylene	NV	NV	2.60E+02	NA	2.00E+00	4.06E-01	1.00E-02	1.47E-03
Styrene	NV	7.20E+01	3.60E+03	2.00E-01	1.00E+00	9.66E-02	5.00E-03	7.05E-04
Tetrachloroethene	3.30E+01	3.30E+00	4.10E+01	2.00E-03	1.00E+00	1.49E-01	5.00E-03	6.80E-04
Toluene	1.50E+05	6.00E+02	4.50E+03	1.00E-02	1.00E+00	1.50E-01	5.00E-03	7.30E-04
trans-1,2-Dichloroethene	1.00E+05	1.00E+04	6.90E+01	2.00E-01	1.00E+00	1.70E-01	5.00E-03	5.96E-04
trans-1,3-Dichloropropene	NV	5.50E-02	8.30E+00	NA	1.00E+00	1.48E-01	5.00E-03	5.98E-04
Trichloroethene	3.00E+02	NV	2.00E+00	NA	1.00E+00	1.43E-01	5.00E-03	6.58E-04
Trichlorofluoromethane	NV	1.10E+04	3.40E+02	NA	1.00E+00	1.99E-01	5.00E-03	9.19E-04
Vinyl chloride	2.40E+01	2.40E+00	1.70E+00	1.00E-02	1.00E+00	2.27E-01	5.00E-03	4.69E-04
SVOCs by SW-846 8270C (with low level PAHs)								
1,1-Biphenyl	NV	1.40E+01	2.10E+01	1.22E+00	1.00E+00	4.15E-02	3.30E-02	2.98E-03
1,2,4,5-Tetrachlorobenzene	NV	1.10E+00	1.80E+01	1.00E-02	1.00E+00	6.51E-02	3.30E-02	2.53E-02
2,2'-Oxybis(1-chloropropane)	6.50E+06	6.50E+04	2.20E+01	NA	2.00E-01	1.97E-02	6.70E-03	7.20E-04
2,3,4,6-Tetrachlorophenol	NV	1.20E+00	1.80E+03	1.00E-02	1.00E+00	1.35E-01	3.30E-02	2.14E-02
2,4,5-Trichlorophenol	NV	3.60E+03	6.20E+03	1.00E-02	1.00E+00	1.53E-01	3.30E-02	3.56E-03
2,4,6-Trichlorophenol	2.40E+01	2.40E+00	6.20E+01	1.00E-02	1.00E+00	1.75E-01	3.30E-02	4.99E-03
2,4-Dichlorophenol	2.90E+03	1.10E+01	1.80E+02	1.00E-02	2.00E-01	3.34E-02	6.70E-03	6.69E-04
2,4-Dimethylphenol	8.50E+03	2.00E+02	1.20E+03	2.90E-02	1.00E+00	8.52E-02	3.30E-02	5.22E-03
2,4-Dinitrophenol	5.30E+04	5.30E+03	1.20E+02	6.21E-03	5.00E+00	6.13E-01	1.70E-01	3.97E-02
2,4-Dinitrotoluene	3.40E+01	3.40E+00	5.50E+00	4.16E-02	1.00E+00	5.36E-02	3.30E-02	2.69E-03
2,6-Dinitrotoluene	5.30E+04	3.40E+00	6.20E+01	4.16E-02	1.00E+00	7.97E-02	3.30E-02	3.44E-03
2-Chloronaphthalene	1.60E+04	2.00E+02	8.20E+03	2.50E-01	2.00E-01	1.51E-02	6.70E-03	6.96E-04
2-Chlorophenol	1.50E+03	1.00E+02	5.10E+02	5.50E-02	1.00E+00	1.65E-01	3.30E-02	2.73E-03
2-Methylnaphthalene	NV	4.70E+00	2.20E+02	2.02E-02	2.00E-01	1.22E-02	6.70E-03	6.00E-04
2-Methylphenol	NV	1.30E+01	3.10E+03	5.10E-03	1.00E+00	8.62E-02	3.30E-02	2.33E-03
2-Nitroaniline	NV	NV	6.00E+02	NV	5.00E+00	3.52E-01	1.70E-01	1.49E-02
2-Nitrophenol	8.60E+06	1.92E+03	1.80E+04	1.33E-02	1.00E+00	1.71E-01	3.30E-02	3.68E-03
3& 4-Methylphenol	NV	2.80E-02	3.80E+00	1.27E-01	1.00E+00	9.02E-02	3.30E-02	3.27E-03
3,3'-Dichlorobenzidine	2.80E-01	NV	8.60E+01	NV	1.00E+00	1.12E-01	3.30E-02	3.53E-03
3-Nitroaniline	NV	2.80E+02	4.90E+00	1.04E-01	5.00E+00	3.21E-01	1.70E-01	1.37E-02
4,6-Dinitro-2-methylphenol	2.80E+03	1.50E+00	NV	1.23E+00	5.00E+00	2.20E-01	1.70E-01	1.34E-02

Table 2. Analyte lists and reporting limits for soil and groundwater (all parameters except PCB – congeners and PCDDs/PCDFs).

	Project Screening Limits[1]				Laboratory Limits[2]			
	Water (ug/L)		Solids (mg/Kg)		Water (ug/L)		Solids (mg/Kg)	
Parameter	**GW**	**SW**	**SO**	**SE**	**RL**	**MDL**	**RL**	**MDL**
4-Bromophenyl phenyl ether	NV	NV	6.20E+03	1.50E+01	1.00E+00	6.35E-02	3.30E-02	2.90E-03
4-Chloro-3-methyl phenol	1.50E+03	2.32E+02	8.60E+00	1.46E-01	1.00E+00	7.54E-02	3.30E-02	3.07E-03
4-Chloroaniline	NV	NV	NV	NV	1.00E+00	8.85E-02	3.30E-02	2.67E-03
4-Chlorophenyl phenyl ether	NV	5.43E+02	6.20E+03	5.10E-03	1.00E+00	5.03E-02	3.30E-02	3.71E-03
4-Nitroaniline	NV	NV	8.60E+01	NV	5.00E+00	1.72E-01	1.70E-01	1.35E-02
4-Nitrophenol	8.60E+06	6.00E+01	1.80E+04	1.33E-02	5.00E+00	6.47E-01	1.70E-01	1.22E-02
Acenaphthene	9.90E+03	5.00E+01	3.30E+03	6.71E-03	2.00E-01	1.44E-02	6.70E-03	6.41E-04
Acenaphthylene	9.90E+03	4.84E+03	3.30E+03	5.87E-03	2.00E-01	1.52E-02	6.70E-03	7.64E-04
Acetophenone	NV	NV	1.00E+04	NV	1.00E+00	8.00E-02	3.30E-02	2.74E-03
Anthracene	4.00E+05	4.00E+04	1.70E+04	1.00E-02	2.00E-01	1.51E-01	6.70E-03	6.53E-04
Atrazine	NV	1.80E+00	7.50E+00	2.00E-04	1.00E+00	8.92E-02	3.30E-02	3.25E-03
Benzaldehyde	NV	NV	1.00E+04	NV	1.00E+00	1.50E-01	3.30E-02	5.00E-03
Benzo(a)anthracene	1.80E-01	1.80E-02	2.10E-01	3.19E-02	2.00E-01	1.47E-02	6.70E-03	8.36E-04
Benzo(a)pyrene	1.80E-01	1.80E-02	2.10E+00	1.57E-02	2.00E-01	1.34E-02	6.70E-03	6.68E-04
Benzo(b)fluoranthene	1.80E-01	1.80E-02	2.10E+00	1.04E+01	2.00E-01	1.57E-02	6.70E-03	1.05E-03
Benzo(g,h,i)perylene	4.00E+04	7.64E+00	1.70E+03	1.70E-01	2.00E-01	1.51E-02	6.70E-03	6.64E-04
Benzo(k)fluoranthene	1.80E-01	NV	2.10E+01	2.72E-02	2.00E-01	5.47E-02	6.70E-03	1.35E-03
bis(2-Chloroethoxy)methane	NV	1.10E+04	1.80E+02	NV	1.00E+00	5.81E-02	3.30E-02	2.20E-03
bis(2-Chloroethyl)ether	5.30E+00	NV	1.00E+00	3.52E+00	2.00E-01	2.51E-02	6.70E-03	8.95E-04
bis(2-Ethylhexyl)phthalate	2.20E+01	1.60E+01	1.20E+02	1.00E-01	2.00E+00	1.25E+00	6.67E-02	5.39E-03
Butyl benzyl phthalate	1.90E+04	1.90E+01	9.10E+02	1.00E-01	1.00E+00	1.42E-01	3.30E-02	4.56E-03
Caprolactam	NV	NV	3.10E+04	NV	5.00E+00	1.19E+00	1.70E-01	2.52E-02
Carbazole	NV	NV	2.20E+03	NV	2.00E-01	1.58E-02	6.70E-03	6.15E-04
Chrysene	1.80E-01	1.80E-02	2.10E+02	2.68E-02	2.00E-01	1.40E-02	6.70E-03	7.94E-04
Dibenzo(a,h)anthracene	1.80E-01	1.80E-02	2.10E-01	6.22E-03	2.00E-01	1.55E-02	6.70E-03	7.42E-04
Dibenzofuran	NV	3.70E+00	1.00E+02	5.10E+00	1.00E+00	6.17E-02	3.30E-02	3.28E-03
Diethyl phthalate	4.40E+05	2.10E+02	4.90E+04	5.30E-01	1.00E+00	1.46E-01	3.30E-02	3.64E-03
Dimethyl phthalate	1.10E+07	3.00E+00	4.90E+04	1.00E+00	1.00E+00	7.65E-02	3.30E-02	3.63E-03
Di-n-butyl phthalate	4.50E+04	1.90E+01	6.20E+03	1.10E-01	1.00E+00	1.25E-01	3.30E-02	4.18E-03
Di-n-octyl phthalate	NV	2.20E+01	6.20E+03	1.00E-01	1.00E+00	2.07E-01	3.30E-02	3.52E-03
Fluoranthene	1.40E+03	1.40E+02	2.20E+03	3.15E-02	2.00E-01	1.62E-02	6.70E-03	7.13E-04
Fluorene	5.30E+04	5.30E+03	2.20E+03	1.00E-02	2.00E-01	2.16E-02	6.70E-03	8.79E-04
Hexachlorobenzene	2.90E-03	2.90E-04	1.10E+00	1.40E-03	2.00E-01	1.83E-02	6.70E-03	7.11E-04
Hexachlorobutadiene	1.80E+02	1.00E+01	2.20E+01	2.65E-02	2.00E-01	1.66E-02	6.70E-03	7.47E-04
Hexachlorocyclopentadiene	1.10E+04	5.00E-01	3.70E+02	9.01E-01	1.00E+00	5.18E-02	3.30E-02	3.60E-03
Hexachloroethane	3.30E+01	3.30E+00	4.30E+01	1.03E+00	1.00E+00	6.28E-02	3.30E-02	2.40E-03
Indeno(1,2,3-cd)pyrene	1.80E-01	4.31E+00	2.10E+00	1.73E-02	2.00E-01	1.99E-02	6.70E-03	6.87E-04
Isophorone	9.60E+03	9.60E+02	1.80E+03	4.32E-01	1.00E+00	6.44E-02	3.30E-02	2.51E-03

Table 2. Analyte lists and reporting limits for soil and groundwater (all parameters except PCB – congeners and PCDDs/PCDFs).

	Project Screening Limits[1]				Laboratory Limits[2]			
	Water (ug/L)		Solids (mg/Kg)		Water (ug/L)		Solids (mg/Kg)	
Parameter	**GW**	**SW**	**SO**	**SE**	**RL**	**MDL**	**RL**	**MDL**
Naphthalene	NV	6.00E+02	1.80E+01	1.47E-02	2.00E-01	1.40E-02	6.70E-03	5.75E-04
Nitrobenzene	6.90E+03	6.90E+02	2.40E+01	1.45E-01	2.00E+00	8.43E-02	6.67E-02	2.78E-03
N-Nitroso-di-n-propylamine	5.10E+00	NV	2.50E-01	NV	2.00E-01	3.08E-02	6.70E-03	7.82E-04
N-Nitrosodiphenylamine	6.00E+01	2.10E+02	3.50E+02	2.68E+00	1.00E+00	8.53E-02	3.30E-02	3.09E-03
Pentachlorophenol	3.00E+01	3.00E+00	2.70E+00	1.00E-02	1.00E+00	6.63E-02	3.30E-02	2.98E-03
Phenanthrene	4.00E+05	4.00E-01	1.70E+04	1.87E-02	2.00E-01	4.27E-02	6.70E-03	1.06E-03
Phenol	8.60E+06	4.00E+00	1.80E+04	4.80E-02	2.00E-01	5.81E-02	6.70E-03	7.88E-04
Pyrene	4.00E+04	2.50E-02	1.70E+03	4.43E-02	2.00E-01	1.57E-02	6.70E-03	6.75E-04
Pesticides by SW-846 8081B (low level)								
4,4'-DDD	3.10E-03	3.10E-04	7.20E+00	3.54E-03	1.30E-03	6.70E-04	8.33E-05	1.09E-05
4,4'-DDE	2.20E-03	2.20E-04	5.10E+00	3.16E-03	1.30E-03	7.90E-04	8.33E-05	1.26E-05
4,4'-DDT	2.20E-03	2.20E-04	7.00E+00	1.19E-03	1.30E-03	7.40E-04	8.33E-05	1.25E-05
Aldrin	5.00E-04	3.00E+00	1.00E-01	2.00E-03	1.30E-03	8.30E-04	8.33E-05	1.49E-05
alpha-BHC	4.90E-02	1.00E-02	2.70E-01	6.00E-03	1.30E-03	6.60E-04	8.33E-05	1.36E-05
alpha-Chlordane	8.10E-04	2.20E-03	6.50E+00	<0.00003	1.30E-03	9.80E-04	8.33E-05	1.65E-05
beta-BHC	1.70E-01	1.00E-02	9.60E-01	5.00E-03	1.30E-03	1.00E-03	8.33E-05	2.16E-05
delta-BHC	4.90E-02	1.41E+02	2.70E-01	1.00E-02	1.30E-03	3.80E-04	8.33E-05	1.28E-05
Dieldrin	5.40E-04	5.60E-02	1.10E-01	1.90E-03	1.30E-03	8.20E-04	8.33E-05	1.39E-05
Endosulfan I	8.90E+02	5.60E-02	3.70E+02	2.90E-03	1.30E-03	9.40E-04	8.33E-05	1.57E-05
Endosulfan II	8.90E+02	5.60E-02	3.70E+02	1.40E-02	1.30E-03	9.80E-04	8.33E-05	1.47E-05
Endosulfan Sulfate	8.90E+02	5.60E-02	3.70E+02	5.40E-03	1.30E-03	5.70E-04	8.33E-05	8.70E-06
Endrin	6.00E-01	3.60E-02	1.80E+01	2.22E-03	1.30E-03	9.60E-04	8.33E-05	1.62E-05
Endrin Aldehyde	3.00E+00	3.00E-01	1.80E+01	2.22E-03	1.30E-03	9.00E-04	8.33E-05	1.62E-05
Endrin Ketone	6.00E-01	3.60E-02	1.80E+01	2.22E-03	1.30E-03	9.20E-04	8.33E-05	1.30E-05
gamma-BHC (Lindane)	1.80E+01	1.00E-02	2.10E+00	2.37E-03	1.30E-03	8.00E-04	8.33E-05	1.46E-05
gamma-Chlordane	8.10E-03	2.20E-03	6.50E+00	<0.00003	1.30E-03	9.60E-04	8.33E-05	1.64E-05
Heptachlor	7.90E-04	7.90E-05	3.80E-01	1.00E-02	1.30E-03	9.90E-04	8.33E-05	1.85E-05
Heptachlor Epoxide	3.90E-04	3.90E-05	1.90E-01	6.00E-04	1.30E-03	9.70E-04	8.33E-05	1.62E-05
Methoxychlor	NV	3.00E-02	3.10E+02	1.87E-02	2.50E-03	9.10E-04	1.67E-04	1.74E-05
Toxaphene	2.80E-03	2.80E-04	1.60E+00	1.00E-04	1.00E-01	1.86E-02	3.33E-03	5.56E-04
PCB – Aroclors by SW-846 8082A								
Aroclor -1016	6.40E-04	6.40E-05	3.70E+00	2.60E-02	1.00E-02	2.52E-03	8.33E-01	1.24E-01
Aroclor -1221	6.40E-04	6.40E-05	5.40E-01	2.60E-02	1.00E-02	2.49E-03	8.33E-01	1.59E-01
Aroclor -1232	6.40E-04	6.40E-05	5.40E-01	2.60E-02	1.00E-02	2.93E-03	8.33E-01	1.43E-01
Aroclor -1242	6.40E-04	6.40E-05	7.40E-01	2.60E-02	1.00E-02	1.86E-03	8.33E-01	1.36E-01
Aroclor -1248	6.40E-04	6.40E-05	7.40E-01	2.60E-02	1.00E-02	2.27E-03	8.33E-01	7.88E-02
Aroclor -1254	6.40E-04	6.40E-05	7.40E-01	6.00E-02	1.00E-02	2.29E-03	8.33E-01	1.19E-01
Aroclor -1260	6.40E-04	6.40E-05	7.40E-01	2.60E-02	1.00E-02	1.36E-03	8.33E-01	1.18E-01

Table 2. Analyte lists and reporting limits for soil and groundwater (all parameters except PCB – congeners and PCDDs/PCDFs).

	Project Screening Limits[1]				Laboratory Limits[2]			
	Water (ug/L)		Solids (mg/Kg)		Water (ug/L)		Solids (mg/Kg)	
Parameter	**GW**	**SW**	**SO**	**SE**	**RL**	**MDL**	**RL**	**MDL**
Aroclor -1262	6.40E-04	6.40E-05	7.40E-01	2.60E-02	1.00E-02	1.36E-03	8.33E-01	1.18E-01
Aroclor -1268	6.40E-04	6.40E-05	7.40E-01	2.60E-02	1.00E-02	1.36E-03	8.33E-01	1.18E-01
GRO by SW-846 8015B								
Gasoline Range Organics (C6-C10)	NV	NV	NV	NV	100	TBD	0.05	TBD
DRO and ORO by SW-846 8015B								
Diesel Range Organics (C10-C28)	NV	NV	NV	NV	100	TBD	40	TBD
Oil Range Organics (C28-C36)	NV	NV	NV	NV	100	TBD	40	TBD
Metals by SW-846 6020A, 6010C, 7471B , and 7470A								
Aluminum	NV	8.70E+01	9.90E+04	NV	2.00E+02	9.68E+00	2.00E+01	1.08E+00
Antimony	6.40E+03	6.40E+02	4.10E+01	2.00E+00	2.00E+00	1.87E-02	2.00E-01	2.60E-03
Arsenic	1.40E+00	1.40E-01	1.60E+00	5.90E+00	1.00E+00	2.91E-01	1.00E-01	1.81E-02
Barium	NV	4.00E+00	1.90E+04	7.00E-01	1.00E+01	9.80E-02	1.00E+00	1.07E-02
Beryllium	NV	6.60E-01	2.00E+02	NV	1.00E+00	3.67E-02	1.00E-01	7.50E-03
Cadmium	NV	8.35E-01	8.00E+01	5.83E-01	1.00E+00	1.14E-01	1.00E-01	7.00E-03
Calcium	NV	1.16E+05	NV	NV	5.00E+03	9.68E+00	5.00E+02	9.82E-01
Chromium	NV	8.50E+01	5.60E+00	2.60E+01	2.00E+00	5.43E-01	2.00E-01	6.10E-03
Cobalt	NV	2.30E+01	3.00E+01	5.00E+01	5.00E-01	2.63E-02	5.00E-02	1.50E-03
Copper	NV	2.03E+01	4.10E+03	3.16E+01	2.50E+01	2.71E+00	2.50E+00	3.42E-01
Iron	NV	1.00E+03	7.20E+04	2.00E+04	1.00E+02	1.19E+01	1.00E+01	2.98E+00
Lead	NV	3.60E+00	8.00E+01	3.10E+01	1.00E+00	1.92E-02	1.00E-01	3.80E-03
Magnesium	NV	8.20E+04	NV	NV	5.00E+03	2.07E+01	5.00E+02	2.21E+00
Manganese	1.00E+03	1.20E+02	2.30E+03	4.60E+02	1.50E+01	6.80E-01	1.50E+00	4.80E-02
Mercury	NV	7.70E-01	4.30E+00	1.74E-01	2.00E-01	3.84E-02	3.30E-02	1.09E-02
Nickel	4.60E+04	7.28E+01	2.00E+03	1.60E+01	1.00E+00	1.75E-01	1.00E-01	1.13E-02
Potassium	NV	5.30E+04	NV	NV	5.00E+03	7.50E+02	5.00E+02	7.50E+01
Selenium	4.20E+04	5.00E+00	5.10E+02	NV	5.00E+00	4.22E-01	5.00E-01	5.02E-02
Silver	NV	3.20E+00	5.10E+02	5.00E-01	1.00E+00	3.62E-02	1.00E-01	3.90E-03
Sodium	NV	6.80E+05	NV	NV	5.00E+03	2.15E+02	5.00E+02	8.21E+00
Thallium	4.70E+00	4.70E-01	1.00E+00	NV	1.00E+00	1.52E-02	1.00E-01	2.00E-03
Vanadium	NV	2.00E+01	5.20E+02	NV	1.00E+00	8.24E-02	1.00E-01	7.90E-03
Zinc	2.60E+05	1.67E+02	3.10E+04	9.80E+01	2.00E+01	2.46E+00	2.00E+00	2.23E-01

Notes:

1. Project Screening Limits derived the following sources by matrix:

Groundwater (GW) = USEPA National Recommended Water Quality Criteria 2009 for human health (organisms only), default DAF of 10 applied.
Surface Water (SW) = lowest of DDOE WQS Criteria, USEPA Region 3 Surface Water Criteria, and literature based benchmarks (Suter & Tsao 1996 and Buchman 2008)
Soils (SO) = USEPA Regional Screening Levels (RSLs). Industrial Soil. May 2010
Sediment (SE) = lowest of the NOAA SQuiRTS, USEPA Region 3 BTAG Freshwater Sediment Screening Benchmarks, USEPA Region 5 Ecological Screening Levels, or Ontario Ministry of the Environment Provincial Sediment Quality Guidelines

NOTE: Project Screening Limits are risk based and may not be achievable using EPA method laboratory techniques.

2 Adjustments for sample moisture and dilutions may elevate sample specific limits. Note all limits are subject to change based on final laboratory selection and required annual laboratory detection limit updates

NV No value available NA Not applicable

Table 3. Analyte lists and detection limits for HRMS and isotope dilution methods.

Parameter		Project Screening Limit[1]				Estimated Minimum Level/ Estimated Detection Limit*			
		Water (pg/L)		Solids (pg/g)		Water (pg/L)		Solids (pg/g)	
		GW	SW	SO	SE	EML	EDL	EML	EDL
CB Name	IUPAC Number								
PCB – Congeners by EPA Method 1668C									
2-MoCB	1	640	NV	740000	2.5	40	0.6	5	0.2
3-MoCB	2	640	NV	740000	2.5	40	0.64	5	0.23
4-MoCB	3	640	NV	740000	2.5	40	0.7	5	0.27
2,2'-DiCB	4	640	NV	740000	2.5	40	3.8	5	1.54
2,3-DiCB	5	640	NV	740000	2.5	40	2.9	5	1.26
2,3'-DiCB	6	640	NV	740000	2.5	40	2.68	5	1.19
2,4-DiCB	7	640	NV	740000	2.5	40	2.76	5	1.22
2,4'-DiCB3	8	640	NV	740000	2.5	40	2.6	5	1.16
2,5-DiCB	9	640	NV	740000	2.5	40	2.76	5	1.23
2,6-DiCB	10	640	NV	740000	2.5	40	2.98	5	1.32
3,3'-DiCB	11	640	NV	740000	2.5	40	2.64	5	1.17
3,4-DiCB	12	640	NV	740000	2.5	40	2.7	5	1.2
3,4'-DiCB	13	640	NV	740000	2.5	40	2.7	5	1.2
3,5-DiCB	14	640	NV	740000	2.5	40	2.34	5	1.03
4,4'-DiCB	15	640	NV	740000	2.5	40	2.76	5	1.31
2,2',3-TrCB	16	640	NV	740000	2.5	40	2.58	5	1.03
2,2',4-TrCB	17	640	NV	740000	2.5	40	2.16	5	0.86
2,2',5-TrCB3	18	640	NV	740000	2.5	40	1.88	5	0.75
2,2',6-TrCB	19	640	NV	740000	2.5	40	2.64	5	1.06
2,3,3'-TrCB	20	640	NV	740000	2.5	40	0.9	5	0.47
2,3,4-TrCB	21	640	NV	740000	2.5	40	0.9	5	0.47
2,3,4'-TrCB	22	640	NV	740000	2.5	40	0.92	5	0.48
2,3,5-TrCB	23	640	NV	740000	2.5	40	0.94	5	TBD
2,3,6-TrCB	24	640	NV	740000	2.5	40	1.8	5	0.72
2,3',4-TrCB	25	640	NV	740000	2.5	40	0.84	10	0.43
2,3',5-TrCB	26	640	NV	740000	2.5	40	0.88	10	0.46
2,3',6-TrCB	27	640	NV	740000	2.5	40	1.56	10	0.62
2,4,4'-TrCB3	28	640	NV	740000	2.5	40	0.9	10	0.47
2,4,5-TrCB	29	640	NV	740000	2.5	40	0.88	10	0.46
2,4,6-TrCB	30	640	NV	740000	2.5	40	1.92	10	0.76
2,4',5-TrCB	31	640	NV	740000	2.5	40	0.88	10	0.46
2,4',6-TrCB	32	640	NV	740000	2.5	40	1.52	10	0.61
2',3,4-TrCB	33	640	NV	740000	2.5	40	0.9	10	0.47
2',3,5-TrCB	34	640	NV	740000	2.5	40	0.92	10	0.48
3,3',4-TrCB	35	640	NV	740000	2.5	40	0.94	10	0.49

Table 3. Analyte lists and detection limits for HRMS and isotope dilution methods.

Parameter		Project Screening Limit[1]				Estimated Minimum Level/ Estimated Detection Limit*			
		Water (pg/L)		Solids (pg/g)		Water (pg/L)		Solids (pg/g)	
		GW	SW	SO	SE	EML	EDL	EML	EDL
3,3',5-TrCB	36	640	NV	740000	2.5	40	0.92	10	0.48
3,4,4'-TrCB	37	640	NV	740000	2.5	40	0.94	10	0.49
3,4,5-TrCB	38	640	NV	740000	2.5	40	0.96	10	0.5
3,4',5-TrCB	39	640	NV	740000	2.5	40	0.86	10	0.45
2,2',3,3'-TeCB	40	640	NV	740000	2.5	40	1.42	10	0.73
2,2',3,4-TeCB	41	640	NV	740000	2.5	40	1.42	10	0.73
2,2',3,4'-TeCB	42	640	NV	740000	2.5	40	1.44	10	0.74
2,2',3,5-TeCB	43	640	NV	740000	2.5	40	1.32	10	0.68
2,2',3,5'-TeCB3	44	640	NV	740000	2.5	40	1.26	10	0.64
2,2',3,6-TeCB	45	640	NV	740000	2.5	40	1.48	10	0.75
2,2',3,6'-TeCB	46	640	NV	740000	2.5	40	1.74	10	0.89
2,2',4,4'-TeCB	47	640	NV	740000	2.5	40	1.28	10	0.65
2,2',4,5-TeCB	48	640	NV	740000	2.5	40	1.4	10	0.72
2,2',4,5'-TeCB	49	640	NV	740000	2.5	40	1.18	10	0.6
2,2',4,6-TeCB	50	640	NV	740000	2.5	40	1.36	10	0.7
2,2',4,6'-TeCB	51	640	NV	740000	2.5	40	1.48	10	0.75
2,2',5,5'-TeCB3	52	640	NV	740000	2.5	40	1.36	10	0.69
2,2',5,6'-TeCB	53	640	NV	740000	2.5	40	1.36	10	0.7
2,2',6,6'-TeCB	54	640	NV	740000	2.5	40	2.06	10	0.85
2,3,3',4'-TeCB	55	640	NV	740000	2.5	40	1.1	10	0.56
2,3,3',4'-TeCB	56	640	NV	740000	2.5	40	1.04	10	0.53
2,3,3',5-TeCB	57	640	NV	740000	2.5	40	1.04	10	0.54
2,3,3',5'-TeCB	58	640	NV	740000	2.5	40	1.04	10	0.53
2,3,3',6-TeCB	59	640	NV	740000	2.5	40	1.02	10	0.52
2,3,4,4'-TeCB	60	640	NV	740000	2.5	40	1.06	10	0.55
2,3,4,5-TeCB	61	640	NV	740000	2.5	40	1.02	10	0.52
2,3,4,6-TeCB	62	640	NV	740000	2.5	40	1.02	10	0.52
2,3,4',5-TeCB	63	640	NV	740000	2.5	10	0.98	10	0.5
2,3,4',6-TeCB	64	640	NV	740000	2.5	40	0.96	10	0.49
2,3,5,6-TeCB	65	640	NV	740000	2.5	40	1.28	10	0.65
2,3',4,4'-TeCB3	66	640	NV	740000	2.5	40	1.0	10	0.51
2,3',4,5-TeCB	67	640	NV	740000	2.5	40	0.94	10	0.48
2,3',4,5'-TeCB	68	640	NV	740000	2.5	40	0.94	10	0.49
2,3',4,6-TeCB	69	640	NV	740000	2.5	40	1.18	10	0.6
2,3',4',5-TeCB	70	640	NV	740000	2.5	40	1.02	10	0.52
2,3',4',6-TeCB	71	640	NV	740000	2.5	40	1.42	10	0.73
2,3',5,5'-TeCB	72	640	NV	740000	2.5	40	1.02	10	0.52
2,3',5',6-TeCB	73	640	NV	740000	2.5	40	1.32	10	0.68

Table 3. Analyte lists and detection limits for HRMS and isotope dilution methods.

Parameter		Project Screening Limit[1]				Estimated Minimum Level/ Estimated Detection Limit*			
		Water (pg/L)		Solids (pg/g)		Water (pg/L)		Solids (pg/g)	
		GW	SW	SO	SE	EML	EDL	EML	EDL
2,4,4',5-TeCB	74	640	NV	740000	2.5	40	1.02	10	0.52
2,4,4',6-TeCB	75	640	NV	740000	2.5	40	1.02	10	0.52
2',3,4,5-TeCB	76	640	NV	740000	2.5	40	1.02	10	0.52
3,3',4,4'-TeCB3,6 DL	77	640	NV	110000	2.5	40	0.96	10	0.5
3,3',4,5-TeCB	78	640	NV	740000	2.5	40	1.08	10	0.55
3,3',4,5'-TeCB	79	640	NV	740000	2.5	40	0.96	10	0.49
3,3',5,5'-TeCB	80	640	NV	740000	2.5	40	0.92	10	0.47
3,4,4',5-TeCB6 DL	81	640	NV	38000	2.5	40	0.98	10	0.49
2,2',3,3',4-PeCB	82	640	NV	740000	2.5	40	2.12	10	0.89
2,2',3,3',5-PeCB	83	640	NV	740000	2.5	40	1.78	10	0.75
2,2',3,3',6-PeCB	84	640	NV	740000	2.5	40	2.04	10	0.85
2,2',3,4,4'-PeCB	85	640	NV	740000	2.5	40	1.48	10	0.61
2,2',3,4,5-PeCB	86	640	NV	740000	2.5	40	1.5	10	0.63
2,2',3,4,5'-PeCB	87	640	NV	740000	2.5	40	1.5	10	0.63
2,2',3,4,6-PeCB	88	640	NV	740000	2.5	40	1.82	10	0.76
2,2',3,4,6'-PeCB	89	640	NV	740000	2.5	40	1.96	10	0.82
2,2',3,4',5-PeCB	90	640	NV	740000	2.5	40	1.54	10	0.63
2,2',3,4',6-PeCB	91	640	NV	740000	2.5	40	1.82	10	0.76
2,2',3,5,5'-PeCB	92	640	NV	740000	2.5	40	1.74	10	0.73
2,2',3,5,6-PeCB	93	640	NV	740000	2.5	40	1.74	10	0.73
2,2',3,5,6'-PeCB	94	640	NV	740000	2.5	40	1.96	10	0.82
2,2',3,5',6-PeCB	95	640	NV	740000	2.5	40	1.86	10	0.77
2,2',3,6,6'-PeCB	96	640	NV	740000	2.5	40	1.48	10	0.61
2,2',3',4,5-PeCB	97	640	NV	740000	2.5	40	1.5	10	0.63
2,2',3',4,6-PeCB	98	640	NV	740000	2.5	40	1.7	10	0.71
2,2',4,4',5-PeCB	99	640	NV	740000	2.5	40	1.78	10	0.75
2,2',4,4',6-PeCB	100	640	NV	740000	2.5	40	1.74	10	0.73
2,2',4,5,5'-PeCB3	101	640	NV	740000	2.5	40	1.52	10	0.63
2,2',4,5,6'-PeCB	102	640	NV	740000	2.5	10	1.7	10	0.71
2,2',4,5,'6-PeCB	103	640	NV	740000	2.5	40	1.72	10	0.72
2,2',4,6,6'-PeCB	104	640	NV	740000	2.5	40	1.32	10	0.55
2,3,3',4,4'-PeCB3,6 DL	105	640	NV	380000	1500	40	0.88	10	0.42
2,3,3',4,5-PeCB	106	640	NV	740000	2.5	40	0.94	10	0.46
2,3,3',4',5-PeCB	107	640	NV	740000	2.5	40	0.92	10	0.45
2,3,3',4,5'-PeCB	108	640	NV	740000	2.5	40	0.96	10	0.47
5/2,3,3',4,6-PeCB	109	640	NV	740000	2.5	40	1.5	10	0.63
2,3,3',4',6-PeCB	110	640	NV	740000	2.5	40	1.3	10	0.54
2,3,3',5,5'-PeCB	111	640	NV	740000	2.5	40	1.24	10	0.51

Table 3. Analyte lists and detection limits for HRMS and isotope dilution methods.

Parameter		Project Screening Limit[1]				Estimated Minimum Level/ Estimated Detection Limit*			
		Water (pg/L)		Solids (pg/g)		Water (pg/L)		Solids (pg/g)	
		GW	SW	SO	SE	EML	EDL	EML	EDL
2,3,3',5,6-PeCB	112	640	NV	740000	2.5	40	1.34	10	0.56
2,3,3',5',6-PeCB	113	640	NV	740000	2.5	40	1.54	10	0.63
2,3,4,4',5-PeCB6 DL	114	640	NV	380000	2.5	40	0.88	10	0.41
2,3,4,4',6-PeCB	115	640	NV	740000	2.5	40	1.3	10	0.54
2,3,4,5,6-PeCB	116	640	NV	740000	2.5	40	1.48	10	0.61
2,3,4',5,6-PeCB	117	640	NV	740000	2.5	40	1.48	10	0.61
2,3',4,4',5-PeCB3,6 DL	118	640	NV	380000	2.5	40	0.88	10	0.42
2,3',4,4',6-PeCB	119	640	NV	740000	2.5	40	1.5	10	0.63
2,3',4,5,5'-PeCB	120	640	NV	740000	2.5	40	1.26	10	0.53
2,3',4,5,'6-PeCB	121	640	NV	740000	2.5	40	1.28	10	0.53
2',3,3',4,5-PeCB	122	640	NV	740000	2.5	40	1.04	10	0.5
2',3,4,4',5-PeCB6 DL	123	640	NV	380000	2.5	40	1.02	10	0.45
2',3,4,5,5'-PeCB	124	640	NV	740000	2.5	40	0.96	10	0.47
2',3,4,5,6'-PeCB	125	640	NV	740000	2.5	40	1.5	10	0.63
3,3',4,4',5-PeCB3,6 DL	126	640	NV	110	2.5	40	0.92	10	/0.47
3,3',4,5,5'-PeCB	127	640	NV	740000	2.5	40	0.94	10	0.45
2,2',3,3',4,4'-HxCB3	128	640	NV	740000	2.5	40	1.4	10	0.69
2,2',3,3',4,5-HxCB	129	640	NV	740000	2.5	40	1.46	10	0.72
2,2',3,3',4,5'-HxCB	130	640	NV	740000	2.5	40	1.88	10	0.93
2,2',3,3',4,6-HxCB	131	640	NV	740000	2.5	40	1.92	10	0.96
2,2',3,3',4,6'-HxCB	132	640	NV	740000	2.5	40	1.38	10	0.91
2,2',3,3',5,5'-HxCB	133	640	NV	740000	2.5	40	1.76	10	0.88
2,2',3,3',5,6-HxCB	134	640	NV	740000	2.5	40	1.88	10	0.94
2,2',3,3',5,6'-HxCB	135	640	NV	740000	2.5	40	2.44	10	1.02
2,2',3,3',6,6'-HxCB	136	640	NV	740000	2.5	40	1.8	10	0.75
2,2',3,4,4',5-HxCB	137	640	NV	740000	2.5	40	1.62	10	0.81
2,2',3,4,4',5'-HxCB3	138	640	NV	740000	2.5	40	1.44	10	0.71
2,2',3,4,4',6-HxCB	139	640	NV	740000	2.5	40	1.6	10	0.8
2,2',3,4,4',6'-HxCB	140	640	NV	740000	2.5	40	1.6	10	0.8
2,2',3,4,5,5'-HxCB	141	640	NV	740000	2.5	40	1.68	10	0.83
2,2',3,4,5,6-HxCB	142	640	NV	740000	2.5	40	1.84	10	0.92
2,2',3,4,5,6'-HxCB	143	640	NV	740000	2.5	40	1.88	10	0.94
2,2',3,4,5',6-HxCB	144	640	NV	740000	2.5	40	2.26	10	0.95
2,2',3,4,6,6'-HxCB	145	640	NV	740000	2.5	40	1.72	10	0.72
2,2',3,4',5,5'-HxCB	146	640	NV	740000	2.5	40	1.52	10	0.76
2,2',3,4',5,6-HxCB	147	640	NV	740000	2.5	40	1.56	10	0.78
2,2',3,4',5,6'-HxCB	148	640	NV	740000	2.5	40	2.4	10	1.01
2,2',3,4',5',6-HxCB	149	640	NV	740000	2.5	40	1.56	10	0.78

Table 3. Analyte lists and detection limits for HRMS and isotope dilution methods.

Parameter		Project Screening Limit[1]				Estimated Minimum Level/ Estimated Detection Limit*			
		Water (pg/L)		Solids (pg/g)		Water (pg/L)		Solids (pg/g)	
		GW	SW	SO	SE	EML	EDL	EML	EDL
2,2',3,4',6,6'-HxCB	150	640	NV	740000	2.5	40	1.68	10	0.7
2,2',3,5,5',6-HxCB	151	640	NV	740000	2.5	40	2.44	10	1.02
2,2',3,5,6,6'-HxCB	152	640	NV	740000	2.5	40	1.7	10	0.71
2,2',4,4',5,5'-HxCB3	153	640	NV	740000	2.5	40	1.24	10	0.62
2,2',4,4',5',6-HxCB	154	640	NV	740000	2.5	40	1.98	10	0.83
2,2',4,4',6,6'-HxCB	155	640	NV	740000	2.5	40	1.62	10	0.68
2,3,3',4,4',5-HxCB6 DL	156	640	NV	380000	2.5	40	1.38	10	0.69
2,3,3',4,4',5'-HxCB6 DL	157	640	NV	380000	2.5	40	1.38	10	0.69
2,3,3',4,4',6-HxCB	158	640	NV	740000	2.5	40	1.14	10	0.57
2,3,3',4,5,5'-HxCB	159	640	NV	740000	2.5	40	1.22	10	0.61
2,3,3',4,5,6-HxCB	160	640	NV	740000	2.5	40	1.46	10	0.72
2,3,3',4,5',6-HxCB	161	640	NV	740000	2.5	40	1.22	10	0.61
2,3,3',4',5,5'-HxCB	162	640	NV	740000	2.5	40	1.22	10	0.6
2,3,3',4',5,6-HxCB	163	640	NV	740000	2.5	40	1.46	10	0.72
2,3,3',4',5',6-HxCB	164	640	NV	740000	2.5	40	1.28	10	0.64
2,3,3',5,5',6-HxCB	165	640	NV	740000	2.5	40	1.34	10	0.67
2,3,4,4',5,6-HxCB	166	640	NV	740000	2.5	40	1.4	10	0.7
2,3',4,4',5,5'-HxCB6 DL	167	640	NV	380000	2.5	40	0.92	10	0.45
2,3',4,4',5',6-HxCB	168	640	NV	740000	2.5	40	1.26	10	0.62
3,3',4,4',5,5'-HxCB3,6 DL	169	640	NV	380	2.5	40	1.1	10	0.55
2,2',3,3',4,4',5-HpCB3	170	640	NV	740000	2.5	40	1.54	10	0.77
2,2'3,3',4,4',6-HpCB	171	640	NV	740000	2.5	40	1.68	10	0.78
2,2',3,3',4,5,5'-HpCB	172	640	NV	740000	2.5	40	1.66	10	0.77
2,2',3,3',4,5,6-HpCB	173	640	NV	740000	2.5	40	1.68	10	0.78
2,2',3,3',4,5,6'-HpCB	174	640	NV	740000	2.5	40	1.56	10	0.72
2,2',3,3',4,5',6-HpCB	175	640	NV	740000	2.5	40	1.5	10	0.69
2,2',3,3',4,6,6'-HpCB	176	640	NV	740000	2.5	40	1.14	10	0.69
2,2',3,3',4',5,6-HpCB	177	640	NV	740000	2.5	40	1.6	10	0.74
2,2',3,3',5,5',6-HpCB	178	640	NV	740000	2.5	40	1.62	10	0.75
2,2',3,3',5,6,6'-HpCB	179	640	NV	740000	2.5	40	1.2	10	0.56
2,2',3,4,4',5,5'-HpCB3	180	640	NV	740000	2.5	40	1.62	10	0.57
2,2',3,4,4',5,6-HpCB	181	640	NV	740000	2.5	40	1.5	10	0.69
2,2',3,4,4',5,6'-HpCB	182	640	NV	740000	2.5	40	1.46	10	0.67
2,2',3,4,4',5',6-HpCB	183	640	NV	740000	2.5	40	1.48	10	0.69
2,2',3,4,4',6,6'-HpCB	184	640	NV	740000	2.5	40	1.24	10	0.57
2,2',3,4,5,5',6-HpCB	185	640	NV	740000	2.5	40	1.48	10	0.69
2,2',3,4,5,6,6'-HpCB	186	640	NV	740000	2.5	40	1.2	10	0.55
2,2',3,4',5,5',6-HpCB3	187	640	NV	740000	2.5	40	1.38	10	0.63

Table 3. Analyte lists and detection limits for HRMS and isotope dilution methods.

Parameter		Project Screening Limit[1]				Estimated Minimum Level/ Estimated Detection Limit*			
		Water (pg/L)		Solids (pg/g)		Water (pg/L)		Solids (pg/g)	
		GW	SW	SO	SE	EML	EDL	EML	EDL
2,2',3,4',5,6,6'-HpCB	188	640	NV	740000	2.5	40	1.16	10	0.51
2,3,3',4,4',5,5'-HpCB6 DL	189	640	NV	380000	2.5	40	0.84	10	0.43
2,3,3',4,4',5,6-HpCB	190	640	NV	740000	2.5	40	1.16	10	0.54
2,3,3',4,4',5',6-HpCB	191	640	NV	740000	2.5	40	1.14	10	0.53
2,3,3',4,5,5',6-HpCB	192	640	NV	740000	2.5	40	1.28	10	0.59
2,3,3',4',5,5',6-HpCB	193	640	NV	740000	2.5	40	1.26	10	0.58
2,2',3,3',4,4',5,5'-OcCB	194	640	NV	740000	2.5	40	1.14	10	0.62
2,2',3,3',4,4',5,6-OcCB3	195	640	NV	740000	2.5	40	1.22	10	0.66
2,2',3,3',4,4',5,6'-OcCB	196	640	NV	740000	2.5	40	1.22	10	0.82
2,2',3,3',4,4',6,6'-OcCB	197	640	NV	740000	2.5	40	1.24	10	0.61
2,2',3,3',4,5,5',6-OcCB	198	640	NV	740000	2.5	40	1.72	10	0.85
2,2',3,3',4,5,5',6'-OcCB	199	640	NV	740000	2.5	40	1.22	10	0.6
2,2',3,3',4,5,6,6'-OcCB	200	640	NV	740000	2.5	40	1.18	10	0.58
2,2',3,3',4,5',6,6'-OcCB	201	640	NV	740000	2.5	40	1.72	10	0.85
2,2',3,3',5,5',6,6'-OcCB	202	640	NV	740000	2.5	40	1.32	10	0.66
2,2',3,4,4',5,5',6-OcCB	203	640	NV	740000	2.5	40	1.54	10	0.76
2,2',3,4,4',5,6,6'-OcCB	204	640	NV	740000	2.5	40	1.3	10	0.64
2,3,3',4,4',5,5',6-OcCB	205	640	NV	740000	2.5	40	0.96	10	0.53
2,2',3,3',4,4',5,5',6-NoCB3	206	640	NV	740000	2.5	40	1.7	10	0.91
2,2',3,3',4,4',5,6,6'-NoCB	207	640	NV	740000	2.5	40	1.2	10	0.64
2,2',3,3',4,5,5',6,6'-NoCB	208	640	NV	740000	2.5	40	1.24	10	0.66
DeCB3	209	640	NV	740000	2.5	40	1.64	10	0.66

Table 4. Analyte lists and detection limits for HRMS and isotope dilution methods.

Parameter	CAS Number	Project Screening Limit[1]				Lower Calibration Level/ Estimated Detection Limit*			
		Water (pg/L)		Solids (pg/g)		Water (pg/L)		Solids (pg/g)	
		GW	SW	SO	SE	EML	EDL	EML	EDL
PCDD/PCDFs –by EPA Method 8290A									
1,2,3,4,6,7,8-HPCDD	35822-46-9	NV	NV	NV	NA	50	1.6	5	0.18
1,2,3,4,6,7,8-HPCDF	67562-39-4	NV	NV	NV	NA	50	1.1	5	0.11
1,2,3,4,7,8-HxCDD	39227-28-6	NV	NV	NV	NA	50	1.6	5	0.17
1,2,3,4,7,8-HXCDF	70648-26-9	NV	NV	NV	NA	50	1.4	5	0.13
1,2,3,4,7,8,9-HPCDF	55673-89-7	NV	NV	NV	NA	50	0.82	5	0.078
1,2,3,6,7,8-HxCDD	57653-85-7	NV	NV	NV	NA	50	1.5	5	0.16
1,2,3,6,7,8-HXCDF	57117-44-9	NV	NV	NV	NA	50	0.83	5	0.077
1,2,3,7,8,9-HxCDD	19408-74-3	NV	NV	NV	NA	50	1.3	5	0.12
1,2,3,7,8,9-HXCDF	72918-21-9	NV	NV	NV	NA	50	1.1	5	0.12
1,2,3,7,8-PeCDD	40321-76-4	NV	NV	NV	NA	50	1.8	5	0.17
1,2,3,7,8-PECDF	57117-41-6	NV	NV	NV	NA	50	1.4	5	0.12
2,3,4,6,7,8-HXCDF	60851-34-5	NV	NV	NV	NA	50	0.86	5	0.084
2,3,4,7,8-PECDF	57117-31-4	NV	NV	NV	NA	50	1.2	5	0.11
2,3,7,8-TCDD	1746-01-6	5.10E-08	0.00001	18	0.85	10	3.5	1	0.31
2,3,7,8-TCDF	51207-31-9	NV	NV	NV	NA	10	2.3	1	0.20
OCDD	3268-87-9	NV	NV	NV	NA	100	1.7	10	0.20
OCDF	39001-02-0	NV	NV	NV	NA	100	1.9	10	0.21
Total HpCDF	3898-75-3	NV	NV	NV	NA	NA	NA	NA	NA
Total HpCDD	37871-00-4	NV	NV	NV	NA	NA	NA	NA	NA
Total HxCDF	55684-94-1	NV	NV	NV	NA	NA	NA	NA	NA
Total HxCDD	34465-46-8	NV	NV	NV	NA	NA	NA	NA	NA
Total PeCDF	60402-15-4	NV	NV	NV	NA	NA	NA	NA	NA
Total PeCDD	36088-22-9	NV	NV	NV	NA	NA	NA	NA	NA
Total TCDF	55722-27-5	NV	NV	NV	NA	NA	NA	NA	NA

Table 5. Analyte lists and detection limits for HRMS and isotope dilution methods.

Parameter	CAS Number	Project Screening Limit[1]				Lower Calibration Level/ Method Detection Limit*			
		Water (ug/L)		Solids (mg/kg)		Water (ng/L)		Solids (ng/g)	
		GW	SW	SO	SE	QL	MDL	QL	MDL
PAHs and alkylated PAH homologs –by Method ID0016									
Acenaphthene	83-32-9	9.90E+03	5.00E+01	3.30E+03	6.71E-03	10	2.4	1	0.21
Acenaphthylene	208-96-8	9.90E+03	4.84E+03	3.30E+03	5.87E-03	10	0.15	1	0.063
Anthracene	120-12-7	4.00E+05	4.00E+04	1.70E+04	1.00E-02	10	0.71	1	0.19
Benzo(a)anthracene	56-55-3	1.80E-01	1.80E-02	2.10E-01	3.19E-02	10	1.5	1	0.29
Benzo(b)fluoranthene	205-99-2	1.80E-01	1.80E-02	2.10E+00	1.04E+01	10	1.5	1	0.25
Benzo(k)fluoranthene	207-08-9	1.80E-01	NV	2.10E+01	2.72E-02	10	1	1	0.22
Benzo(ghi)perylene	191-24-2	4.00E+04	7.64E+00	1.70E+03	1.70E-01	10	0.51	1	0.15
Benzo(a)pyrene	50-32-8	1.80E-01	2.10E+00	1.57E-02	2.00E-01	10	0.4	1	0.19
Benzo(e)pyrene	192-97-2	NV	NV	NV	NV	10	1.4	1	0.17
Chrysene	218-01-9	1.80E-01	1.80E-02	2.10E+02	2.68E-02	10	0.22	1	0.2
C1-Chrysenes/benz(a)anthracenes	NV	NV	NV	NV	NV	10	10	1	1
C2-Chrysenes/benz(a)anthracenes	NV	NV	NV	NV	NV	10	10	1	1
C3-Chrysenes/benz(a)anthracenes	NV	NV	NV	NV	NV	10	10	1	1
C4-Chrysenes/benz(a)anthracenes	NV	NV	NV	NV	NV	10	10	1	1
Dibenz(a,h)anthracene	53-70-3	1.80E-01	1.80E-02	2.10E-01	6.22E-03	10	0.78	1	0.07
Dibenzothiophene	132-65-0	NV	NV	NV	NV	10	0.69	1	0.14
C1-Dibenzothiophenes	NA	NV	NV	NV	NV	10	10	1	1
C2-Dibenzothiophenes	NA	NV	NV	NV	NV	10	10	1	1
C3-Dibenzothiophenes	NA	NV	NV	NV	NV	10	10	1	1
C4-Dibenzothiophenes	NA	NV	NV	NV	NV	10	10	1	1
2,6-Dimethylnaphthalene	581-42-0	NV	NV	NV	NV	10	2.2	2	0.44
Fluoranthene	206-44-0	1.40E+03	1.40E+02	2.20E+03	3.15E-02	10	2.4	1	0.36
C1-Fluoranthenes/pyrenes	NA	NV	NV	NV	NV	10	10	1	1
Fluorene	86-73-7	5.30E+04	5.30E+03	2.20E+03	1.00E-02	10	1.5	1	0.47
C1-Fluorenes	NA	NV	NV	NV	NV	10	10	1	1
C2-Fluorenes	NA	NV	NV	NV	NV	10	10	1	1
C3-Fluorenes	NA	NV	NV	NV	NV	10	10	1	1
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-01	4.31E+00	2.10E+00	1.73E-02	10	1	1	0.17
2-Methylnaphthalene	91-57-6	NA	4.70E+00	2.20E+02	2.02E-02	20	8.3	10	2.9
1-Methylnaphthalene	90-12-0	NA	NV	NV	NV	10	4.1	5	1.3
Naphthalene	91-20-3	NV	6.00E+02	1.80E+01	1.47E-02	50	16	20	5.3
C2-Naphthalenes	NA	NV	NV	NV	NV	10	10	2	2
C3-Naphthalenes	NA	NV	NV	NV	NV	10	10	2	2
C4-Naphthalenes	NA	NV	NV	NV	NV	10	10	1	1
Perylene	198-55-0	NV	NV	NV	NV	10	0.81	1	0.12
Phenanthrene	85-01-8	4.00E+05	4.00E-01	1.70E+04	1.87E-02	20	11	2	1.6

Table 5. Analyte lists and detection limits for HRMS and isotope dilution methods.

Parameter	CAS Number	Project Screening Limit[1]				Lower Calibration Level/ Method Detection Limit*			
		Water (ug/L)		Solids (mg/kg)		Water (ng/L)		Solids (ng/g)	
		GW	SW	SO	SE	QL	MDL	QL	MDL
C1-Phenanthrenes/anthracenes	NA	NV	NV	NV	NV		10	1	1
C2-Phenanthrenes/anthracenes	NA	NV	NV	NV	NV	10	10	1	1
C3-Phenanthrenes/anthracenes	NA	NV	NV	NV	NV	10	10	1	1
C4-Phenanthrenes/anthracenes	NA	NV	NV	NV	NV	10	10	1	1
Pyrene	129-00-0	4.00E+04	2.50E-02	1.70E+03	4.43E-02	10	1.7	2	1.1
2,3,5-Trimethylnaphthalene	2245-38-7	NV	NV	NV	NV	10	1.6	2	0.46

Notes:

1. Project Screening Limits derived the following sources by matrix:
   Groundwater (GW) = USEPA National Recommended Water Quality Criteria 2009 for human health (organisms only), default DAF of 10 applied.
   Surface Water (SW) = lowest of DDOE WQS Criteria, USEPA Region 3 Surface Water Criteria, and literature based benchmarks (Suter & Tsao 1996 and Buchman 2008)
   Soils (SO) = USEPA Regional Screening Levels (RSLs). Industrial Soil. May 2010
   Sediment (SE) = lowest of the NOAA SQuiRTS, USEPA Region 3 BTAG Freshwater Sediment Screening Benchmarks, USEPA Region 5 Ecological Screening Levels, or Ontario Ministry of the Environment Provincial Sediment Quality Guidelines

NOTE: Project Screening Limits are risk based and may not be achievable using EPA method laboratory techniques.

*Average estimated detection limits for soil and water method blanks. Note all PCDD/PCDF and PCB congener results above the sample specific EDL will be reported and reporting detection limits will be based on the EDL, not the EML or QL. Adjustments for sample moisture and dilutions may elevate sample specific limits. Note all limits are subject to change based on final laboratory selection and required annual laboratory detection limit updates

NR Not reported

NV No Value

DL Dioxin-like

Table 6. Sample container, preservation, and holding time requirement.

Parameter	Container [1]	Preservation	Holding Time [2]
Solid Samples			
VOCs	High level analysis: 1- 40 mL vial filled with 5 mL methanol (5 g soil to 5 mL methanol) Low level analysis: 2-40 mL vials with teflon stir bar and filled with 5 mL deionized water (5 g soil to 5 mL deionized water) % solids: 1 - 60 mL plastic	Ice, 4°C, in field	48 hours to freezing for water preserved samples; 14 days from collection to analysis for methanol and water preserved samples
SVOCs	1-8 oz amber glass with Teflon-lined cap	Ice, 4°C.	14 days to extraction; 40 days from extraction to analysis
PAHs	1-8 oz amber glass with Teflon-lined cap	Ice, 4°C. Maintain in dark; lab storage at <-10°C.	100 days to extraction; 40 days from extraction to analysis
Metals	1-8 oz amber glass with Teflon-lined cap	Ice, 4°C.	28 days to analysis (mercury); 180 days to analysis (other metals).
AVS/SEM	1-4 oz. amber glass with Teflon-lined cap	Ice, 4°C, no headspace	14 days to analysis
DRO/ORO	1-8 oz amber glass with Teflon-lined cap	Ice, 4°C.	14 days to extraction; 40 days from extraction to analysis
GRO	1-40 mL vial filled with 5 mL methanol (5 g soil in 5 mL methanol)	Ice, 4°C.	28 days
OCPs	1-8 oz amber glass with Teflon-lined cap	Ice, 4°C.	14 days to extraction; 40 days from extraction to analysis
PCBs as Aroclors	1-8 oz amber glass with Teflon-lined cap	Ice, 4°C.	14 days to extraction; 40 days from extraction to analysis
PCBs as Congeners	1-8 oz amber glass with Teflon-lined cap	Ice, 4°C. Maintain in dark; lab storage at <-10°C.	365 calendar days for preparation and analysis
PCDDs/PCDFs	1-8 oz amber glass with Teflon-lined cap	Ice, 4°C. Maintain in dark; ; lab storage at <-10°C.	365 calendar days for preparation and analysis

Table 6. Sample container, preservation, and holding time requirement.

Parameter	Container [1]	Preservation	Holding Time [2]
Aqueous Samples			
VOCs	3 x 40 mL vials	HCl to pH <2; Ice, 4°C.	14 days
SVOCs (incl. PAHs only)	2 x 1 L, amber glass	Ice, 4°C	7 days to extraction; 40 days from extraction to analysis
Metals, total	500 mL, plastic	HNO_3 to pH <2 Ice, 4°C.	28 days to analysis (mercury); 180 days to analysis (other metals).
DRO	1 x 2 L, amber glass	HCl to pH <2; Ice, 4°C	14 days to extraction; 40 days from extraction to analysis
GRO	2 x 40 mL vials	HCl to pH <2; Ice, 4°C.	14 days
PCBs -Aroclors	2 x 1 L, amber glass	Ice, 4°C	7 days to extraction; 40 days from extraction to analysis
OCP	2 x 1 L, amber glass	Ice, 4°C	7 days to extraction; 40 days from extraction to analysis
PCB - congeners	2 x 1 L, amber glass	Ice, 4°C	365 calendar days for preparation and analysis
PCDDs/PCDFs	1-8 oz amber glass with Teflon-lined cap	Ice, 4°C. Maintain in dark	365 calendar days for preparation and analysis

[1] Laboratory may provide alternate containers as long as the containers meet the requirements of the method and allow the collection of sufficient volume to perform the analyses and any reanalyses required by the method.
[2] Holding time begins from date of sample collection.

Table 7. Preparation and Analytical methodologies

Parameter	Methodology
TCL VOCs	SW-846 5030B/5035A/8260B
TCL SVOCs	SW-846 8270C
TAL Metals	SW-846 6010C/6020A/7470A/7471B
TCL Pesticides (low level for aqueous samples)	SW-846 8081B
TCL PCBs - Aroclors	SW-846 8082A
PCB – Homologs (optional)	EPA 680 modified
DRO and ORO	SW-846 8015B
GRO	SW-846 8015B
AVS/SEM	EPA-821-R-91-100
PCB - congeners	EPA 1668
PCDD/PCDFs	SW-846 8290

Table 8. Laboratory Preparation and Analytical SOPs

Reference Number	Fixed or Mobile Laboratory Performing Analysis	Title	Analytical Parameter
PT-MS-002, Rev.17	TestAmerica - Pittsburgh	Volatile Compounds by GC/MS	VOCs
PT-MS-001, Rev.11	TestAmerica - Pittsburgh	Semivolatile Organic Analysis by GC/MS	SVOCs
PT-GC-006, Rev.3	TestAmerica - Pittsburgh	Chlorinated Pesticides	OCPs
LAM-005, Rev 3	ECCS Mobile Lab	Polychlorinated Biphenyl (PCB) as Arolcors by Gas Chromatography	PCB Aroclors
KNOX-ID-0013, Rev 11	TestAmerica – Knoxville	Analysis of Polychlorinated Biphenyl (PCB) Isomers by Isotope Dilution HRGC/HRMS	PCB Congeners
PT-MT-002, Rev. 8	TestAmerica - Pittsburgh	Analysis of Metals by Inductively Coupled Plasma/Mass Spectrometry (ICPMS)	Metals (aqueous, excl. mercury)
PT-MT-001, Rev.11	TestAmerica - Pittsburgh	Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP)	Metals (soils, excl. mercury)
PT-MT-007, Rev.9	TestAmerica - Pittsburgh	Preparation and Analysis of Mercury in Solid Samples by Cold Vapor Atomic Absorption	Mercury (soil)
PT-MT-005, Rev. 9	TestAmerica - Pittsburgh	Preparation and Analysis of Mercury in Aqueous Samples by Cold Vapor Atomic Absorption	Mercury (aqueous)
PT-WC-008 R4_AVS_SEM_F, Rev. 4	TestAmerica - Pittsburgh	Acid Volatile Sulfides (AVS) and Simultaneously Extracted Metals (SEM) in Sediment	AVS/SEM
LAM-023, Rev 2.0	ECCS Mobile Lab	Diesel Range Organics	DRO/ORO
KNOX-ID-0016, Rev 8	TestAmerica – Knoxville	Isotope Dilution Analysis of Selected Semivolatile Organic Compounds and Alkylated PAHs by Gas Chromatography/Mass Spectrometry - Selected Ion Monitoring	Parent and alkylated PAHs by isotope dilution and selected ion monitoring
PS-GCV-001, Rev.6	TestAmerica - Pensacola	Gasoline Range Organics (GRO)	GRO

Table 9. Fixed and Mobile Laboratory Instrument Maintenance and Calibration.

Instrument	Maintenance Activity	Testing/ Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)
GC/MS (VOC soil)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning/ instrument performance and sensitivity	IC: Initial setup; after major maintenance; or after CCV failure. ICV: after each IC CCV: Every 12 hours	IC: Minimum of 5 point curve with %RSD ≤30 for CCCs; if %RSD >15%, use curve fit r^2>0.990;no single analyte %RSD >45% ICV: <20% RSD; no single analyte >60% RSD CCV : <20% difference for CCCs; non-CCC and non-SPCC average %D <20% and no single analyte %D >60% See SOP for details	Perform maintenance and recalibrate See SOP for details
GC/MS (VOC water)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning/ instrument performance and sensitivity	IC: Initial setup; after major maintenance; or after CCV failure. ICV: after each IC CCV: Every 12 hours	IC: Minimum of 5 point curve with %RSD ≤30 for CCCs; if mean %RSD <15% and each analyte <30% use avg RRF all, if any analyte >30% use curve fit r^2>0.990 ICV: <20% RSD for CCCs; no single analyte >30% RSD with 6 exceptions per SOP. ICV: <20% RSD for CCCs; no single analyte >30% RSD with 6 exceptions per SOP. See SOP for details	Perform maintenance and recalibrate See SOP for details
GC/MS (SVOC,PAHs)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning/ instrument performance and sensitivity	IC: Initial setup; after major maintenance; or after CCV failure. ICV: after each IC. CCV: Every 12 hours	IC: Minimum of 5 point curve with %RSD ≤30% for CCCs; if %RSD >15%, use curve fit r^2>0.990; no single analyte %RSD >60% ICV: <20% difference; no single analyte >60% difference CCV : <20% difference for CCCs; no single analyte %D >60% See SOP for details	Perform maintenance and recalibrate See SOP for details

Table 9. Fixed and Mobile Laboratory Instrument Maintenance and Calibration.

Instrument	Maintenance Activity	Testing/ Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)
HRGC/HRMS (PCB – Congeners)	Clean sources; maintain vacuum pumps	Tuning/ instrument performance and sensitivity	IC: Initial setup; after major maintenance; or after CCV failure. CCV: Every 12 hours	IC: %RSD ≤20% for target analytes calculated by isotope dilution; %RSD ≤35% for target analytes calculated by internal standard CCV: ≤30% drift for Toxics and LOC congeners; 40-160% for non-toxic congeners See SOP for details	Perform maintenance and recalibrate See SOP for details
HRGC/HRMS (PCDD/PCDFs)	Clean sources; maintain vacuum pumps	Tuning/ instrument performance and sensitivity	IC: Initial setup; after major maintenance; or after CCV failure. CCV: Every 12 hours	IC: %RSD ≤20% for target analytes calculated by isotope dilution; %RSD ≤30% for target analytes calculated by internal standard CCV: ≤20% drift for native congeners; ≤30% for lableled congeners See SOP for details	Perform maintenance and recalibrate See SOP for details
GC/ECD (Pesticides)	Change septa, clean injectors, change or trim columns, install new liners	Detector signals and chromatogram review/instrument performance and sensitivity	IC: Initial setup; after major maintenance; or after CCV failure. ICV: prior to samples CCV:Every 12 hours or 20 samples (whichever is more frequent), beginning and end of run	IC: Five point curve;RSD <20%; r^2>0.990 ICV: <20% difference CCV: <20%D; no single analyte >60% See SOPs for details	Perform maintenance and recalibrate See SOP for details
GC/ECD (PCB – Aroclors)	Change septa, clean injectors, change or trim columns, install new liners	Detector signals and chromatogram review/instrument performance and sensitivity	IC: Initial setup; after major maintenance; or after CCV failure. ICV: prior to samples CCV: Every 12 hours or 20 samples (whichever is more frequent), beginning and end of run	IC: Five point curve;RSD <20%; r^2>0.990 ICV: <20% difference CCV: <15%D; no single analyte >60% See SOP for details	Perform maintenance and recalibrate See SOP for details
GC/PID/FID (GRO)	Change septa, clean injectors, change or trim columns, install new liners	Detector signals and chromatogram review/instrument performance and sensitivity	IC: Initial setup; after major maintenance; or after ICV or CCV failure. ICV: after each IC CCV: Prior to samples, every 24 hours or every 20 samples, whichever is more frequent and at end of run	IC: Minimum of five standards, %RSD ≤25, r ≥0.99 ICV: 80-120% recovery CCV: %D or %drift ≤25, except nonane (≤30). See SOP for details	Perform maintenance and recalibrate See SOP for details

Table 9. Fixed and Mobile Laboratory Instrument Maintenance and Calibration.

Instrument	Maintenance Activity	Testing/ Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)
GC/FID (DRO)	Change septa, clean injectors, change or trim columns, install new liners	Detector signals and chromatogram review/instrument performance and sensitivity	IC: Initial setup; after major maintenance; or after ICV or CCV failure ICV: after each IC CCV: Every 12 hours and at end of run	IC: Minimum of five standards, %RSD ≤20 ICV: 70-130% recovery CCV: %D or %drift ≤20 See SOP for details	Perform maintenance and recalibrate See SOP for details
ICP/MS (Metals Analysis [excl. mercury])	Replace disposables, flush lines	Tuning/ instrument performance and sensitivity	IC: Daily, prior to analysis of samples ICV: Immediately following calibration CCV: After every 10 samples; beginning and end of run	IC: Minimum of one standard and one blank with correlation coefficient ≥0.998 for multi-point curves ICV: 90-110% recovery CCV: 90-110% recovery See SOP for details	Perform maintenance and recalibrate See SOP for details
ICP/AES (Metals Analysis [excl. mercury])	Replace disposables, flush lines	Verify intensity counts/ instrument performance and sensitivity	IC: Daily, prior to analysis of samples ICV: Immediately following calibration CCV: After every 10 samples; beginning and end of run	IC: Minimum of one standard and one blank with correlation coefficient ≥0.998 for multi-point curves ICV: 90-110% recovery CCV: 90-110% recovery See SOP for details	Perform maintenance and recalibrate See SOP for details
CVAA (Mercury Analysis)	Replace disposables, flush lines	Sensitivity check/ check connections	IC: Daily, prior to analysis of samples ICV: Immediately following calibration CCV: After every 10 samples; beginning and end of run	IC: Five standards and one blank with correlation coefficient ≥0.995. ICV: 90-110% recovery CCV: 80-120% recovery	Perform maintenance and recalibrate See SOP for details

ICV – Initial calibration verification
CCV – Continuing calibration verification
RSD – Relative standard deviation
SPCC – System performance check compounds
RF – Response factor
CCC – Calibration check compound
LCS – Laboratory control sample
LOC – Level of chlorination
D – Difference