QUALITY ASSURANCE PROJECT PLAN

Focused Community Strategies - Brownsville Pointe
105 McDonough Boulevard SE
Atlanta, Georgia 30315

Conducted Under EPA Brownfields Cooperative Agreement BF 02D34622

Acres ID #238666
Georgia USTMP Facility ID #9060480
CHA Project Number: 081554.000

October 2024

Prepared for:

City of Atlanta
Department of City Planning
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United States Environmental Protection Agency, Region 4
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A2. APPROVAL PAGE

Quality Assurance Project Plan

105 McDonough Boulevard SE
Atlanta, Georgia 30315

Approvals Signature

DocuSigned by: Jessica Lavandier D94544FFEA13482...	Jessica Lavandier	10/2/2024
Signature	**Printed Name**	**Date**
Title: Project Manager Organization: City of Atlanta		
	Keith Ziobron, PE	10/2/2024
Signature	**Printed Name**	**Date**
Title: Qualified Environmental Professional Project Manager Organization: CHA Consulting, Inc.		
	Sam Urban	10/2/2024
Signature	**Printed Name**	**Date**
Title: Qualified Environmental Professional QA/QC Officer Organization: CHA Consulting, Inc.		
	Derek Street	
Signature	**Printed Name**	**Date**
Title: Brownfields Project Officer/Manager Organization: EPA		
Signature	**Printed Name**	**Date**
Title: Brownfields Designated Approving Official Organization: EPA		

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A3. DISTRIBUTION LIST

The following individuals will/may receive copies of the approved Quality Assurance Project Plan (SSQAPP) and any subsequent revisions:

- Derek Street, Brownfields Project Officer & EPA Designated Approving Official (DAO), EPA Region 4, Sam Nunn Federal Center, 61 Forsyth Street SW, Atlanta, Georgia 30303, Phone: (404) 562-8574, Email: street.derek@epa.gov
- Adam Otis Hanley, PE, Environmental Engineer, Georgia EPD, Response and Remediation Program – Brownfield, 2 Martin Luther King Drive, Suite 1054 East, Atlanta, Georgia 30334-9000, Phone: (470) 251-8102, Email: adam.hanley1@dnr.ga.gov
- Keith Ziobron, PE, CHA Project Manager, 270 Peachtree Street, NW, Suite 1500, Atlanta, GA 30303, Phone: (678) 787-9576, Email: kziobron@chasolutions.com
- Sam Urban, CHA QA/QC Reviewer, 270 Peachtree Street, NW, Suite 1500, Atlanta, GA 30303, Phone:(678) 301-5127, Email: surban@chasolutions.com
- Jessica Lavandier, Brownfields Program Director, City of Atlanta, 55 Trinity Avenue SW Suite 3350, Atlanta, Georgia 30303, Phone: (404) 865-8522, Email: jlavandier@atlantaga.gov
- Marvin Nesbitt, Owner, Focused Community Strategies (FCS), Phone: (404) 627-4323, Email: marvin@fcsministries.org
- Ioana Pacurar, Project Manager, Eurofins Inc., 3080 Presidential Drive, Atlanta, GA 30340, Phone: (770) 457-8177, Email: ioana.pacurar@et.eurofinsus.com
- Robert Brawner, Environmental Consultant, One Consulting Group, Inc. (One Group), 590 Bonaventure Ave NE Atlanta, Georgia 30306 Phone: (404) 815-8005, Email: robert@onecginc.com

A4. INTRODUCTION AND PROJECT/TASK ORGANIZATION

CHA Consulting, Inc. (CHA) was selected by the City of Atlanta (City) as their Qualified Environmental Professional (QEP) and is responsible for preparing this Quality Assurance Plan (SSQAPP) for the management of contaminated soil at 105 McDonough Boulevard SE, in Atlanta, Fulton County, Georgia (herein referred to as the Subject Property). This report serves as the SSQAPP for the Subject Property and will describe the soil investigation activities to follow the removal of contaminated soil at the Subject Property.

More specifically, the types of sampling anticipated to ensure proper soil management, include:

1. Collecting soil clearance samples from excavation limits during contaminated soil removal;
2. Based on Georgia EPD's Brownfield Program requirements, an additional six soil borings will be advanced across the Subject Property to facilitate site-wide soil characterization sampling;
3. Measuring fluid (groundwater and free product) levels in five existing monitoring wells.

The SSQAPP Organizational Chart is provided as **Appendix A**. The individuals participating in the project and their specific roles and responsibilities are provided below:

Derek Street, EPA Region 4 Brownfields Project Officer/DAO - The EPA Project Officer is responsible for overseeing and monitoring the grant. This individual ensures that the processes described in the Workplan are followed and the terms and conditions of the grant are met. The Brownfields Region 4 Quality Assurance Manager's DAO provides technical assistance to the Region 4 Project Officer working on Brownfields sites. The DAO's role is to provide technical reviews of the Generic QAPP, SSQAPP, Addendums, and any revisions that are generated.

Adam Hanley, PE, Georgia Environmental Protection Division (GAEPD) Brownfields Program, Environmental Engineer – This individual will review and approve the final site assessment plan(s), SSQAPP Addenda, and report(s), as necessary. This individual also ensures that plans comply with the current GAEPD rules and regulations. If a prospective purchaser is pursuing a Brownfields Agreement with GAEPD, this individual would be involved in scoping the necessary assessment and cleanup requirements to achieve the agreement.

Jessica Lavandier, City of Atlanta Brownfields Program Manager – She is responsible for the overall strategic direction of the project and ensures project activities are executed in accordance with the approved Work Plan and the Terms and Conditions of the Cooperative Agreement. Ms. Lavandier, along with Keith Ziobron, will be responsible for RLF loan management.

Keith Ziobron, Project Manager, CHA – The Project Manager will be the primary decision maker for the cleanup activities and the primary user of the data to determine whether or not further action is required at the project site. He will also coordinate the activities for the cleanup project and specific responsibilities may include the following:

1. Approving the SSQAPP and subsequent revisions in terms of Brownfields specific requirements; distribution of the SSQAPP document to the Field Team Leader and members of the project team.
2. Overall responsibility for the investigation.
3. Coordinating field and laboratory activities.
4. Conducting project activities in accordance with the SSQAPP and work order.
5. Validating field data.
6. Reporting to Owner's Project Director and Technical Director regarding the project status per the work order and preparing interim and final reports.
7. Making final project decisions, subject to the approval of Owner's Project Director and Technical Director, to commit the necessary resources to conduct the project.
8. Instituting corrective actions for problems encountered in the field sampling activities.
9. Communicating corrective actions to the Field Team Leader to remedy problems encountered in the field and coordinate with the Lab Director to correct any corresponding problems encountered in the chemical analyses.
10. Compiling documentation detailing any corrective actions and providing them to the QA/QC Officer, Owner's Project and Technical Directors.

Field Team Leader, TBD, One Group Consulting, Inc.

As the Field Team Leader, this individual will perform the following duties:

1) Select the field sampling team and discuss project details with the Project Manager.
2) Conduct field activities per the approved QAPP documents and supervise the field sampling team.
3) Upon receipt from the Project Manager, make available the approved QAPP documents and subsequent revisions to the members of the field sampling team.
4) Report problems in the field to the Project Manager.

5) Implement corrective actions in the field as directed by the Project Manager. Corrective actions will be documented in the field logs and provided to the Project Manager.

Sam Urban, QA/QC Officer, CHA – The QA/QC Officer will remain independent of the activities included in data generation and will provide QA/QC technical assistance to the Project Manager. She will also be responsible for the final internal review and approval of the SSQAPP documents, internal QA audits, and QC implementation of the Brownfields project. The QA/QC Officer will report audit results to the Project Manager and review all implemented corrective actions.

Marvin Nesbitt, Senior Director of Community Development, Focused Communities Strategies: FCS Urban Ministries, Inc., Property Owner and Loan Recipient Representative – FCS Urban Ministries, Inc. is the owner of the Subject Property and manages the overall redevelopment of the property. Mr. Nesbitt will be the main point of contact between the City of Atlanta, CHA, and the contractors performing on-site activities. As the recipient of the revolving loan fund (RLF) loan, FCS Urban Ministries is responsible to ensure the processes described in the QAPP are followed and the terms and conditions of the loan and grant are met.

Ioana Pacurar, Laboratory Project Manager, Eurofins Inc. – This individual will be responsible for coordinating the analysis of the samples and laboratory validation of the data. She will coordinate the receipt of the samples at the laboratory, select the analytical team, ensure internal laboratory audits are conducted per the Laboratory's Quality Assurance Manual (Laboratory's QAM), and distribute the applicable sections of the SSQAPP and subsequent revisions to members of the analytical team. She is responsible for instituting corrective actions for problems encountered in the chemical analyses and will also report laboratory problems affecting the project data to the Project Manager and QA/QC officer. Corrective actions for chemical analyses will be detailed in a QA report that will be provided to the Project Manager via electronic and/or conventional mail.

A5. PROBLEM DEFINITION/BACKGROUND

The Subject Property is located at 105 McDonough Boulevard Southeast in the City of Atlanta, Fulton County, Georgia. It is identified by Fulton County Tax Assessor records as tax identification number 14 005600050611, owned by FCS Urban Ministries, Inc. (FCS). The Subject Property is bordered to the west by Jonesboro Road SE and to the north and east by McDonough Boulevard SE. The former Martin Street right of way, now part of the development, bisects the Subject Property. A site map of the Subject Property is included as **Figure 1.**

This QAPP and associated sampling activities will be funded under the City's Brownfields RLF Cooperative Agreement grant (02D34622).

As of August 2024, FCS was in the process of demolishing the sole existing structure located on the northern portion of the Subject Property. Historically this structure served as a former service station that was abandoned and left in disrepair by the former owner. Based on a previous Environmental Site Assessment (ESA) dated April 20, 2018, the Subject Property was developed into a service station in 1950s and operated under several facility names from at least 1958 to 2008. The former service station operated an underground storage tank (UST) system comprised of three USTs and one dispenser island located north of the structure.

Numerous environmental investigations and reports have been conducted and prepared for the Subject Property from 2017 to 2024 including a Phase II Soil and Groundwater Assessment,

Modified Phase II Subsurface Investigation Report, Perspective Purchase Corrective Action Plan, Underground Storage Tank Closure Report, Corrective Action Plan Part A, Site Investigation Summary Report #1 & #2, UST Groundwater Monitoring, and UST Soil Sampling. These investigations are summarized chronologically below and document petroleum constituents at concentrations above EPD residential Type 1 RRS standards in the soil around the historical UST system on the Subject Property.

Phase II ESA – Logic Environmental, Inc. – June 2017
Logic Environmental, Inc. (Logic) completed a Phase II ESA for the Subject Property in June 2017. Laboratory analysis of soil samples collected from borings advanced near the location of the USTs and dispenser island reported concentrations for gasoline constituents above laboratory detection limits. Gasoline constituents were reported above laboratory detection limits in all groundwater samples, with gasoline constituent concentrations exceeding respective maximum contaminant levels (MCLs) in one groundwater sample collected near the USTs.

Modified Phase II Subsurface Investigation Report – One Consulting Group, Inc. – June 2018
One Consulting Group, Inc. (One Group) completed a modified Phase II Subsurface Investigation for the Subject Property in June 2018 to assess the Subject Property for impacts from the UST system and historical dry cleaner facilities identified on nearby off-site properties. The following constituents were detected in the groundwater samples:

- Petroleum constituents were detected in all four samples;
- Benzene concentrations over the MCL were detected in two of the groundwater samples;
- Chlorinated solvent tetrachloroethene (PCE) was detected in two of the groundwater samples, one of which exceeded the applicable MCL;
- 1,2, -dichloroethane (1,2-DCA) was detected in a groundwater sample.

One Group performed a potential receptors survey which did not identify any active drinking water wells within one mile of the Subject Property.

Perspective Purchase Correction Action Plan – One Consulting Group, Inc. – June 2018
One Group prepared a Perspective Purchase Corrective Action Plan (PPCAP) in June 2018 to enroll the Subject Property in the Georgia Environmental Protection Division (EPD) Brownfield Program. The PPCAP proposed the removal of soil that exceeded the non-residential Type 3 or 4 soil risk reduction standards (RRS), removal of the three USTs and dispenser island from the former service station, evaluation of vapor intrusion, asbestos-containing material (ACM) and lead-based paint (LBP) surveys, and removal and disposal of identified ACMs and LBP.

It should be noted that the PPCAP was amended in September 2023 after the redevelopment plans for the Subject Property were changed from non-residential use to include residential use.

UST Closure Report – Cardno, Inc. – April 2019
Cardno, Inc. (Cardno) submitted a UST Closure Report to the GA EPD's UST Management Program (USTMP) in April 2019 following the removal of the three USTs (two 4,000-gallon gasoline USTs and one 2,000-gallon diesel UST) from the Subject Property in February 2019. This work was performed under the City of Atlanta's EPA Brownfield Assessment Grant (BF 00D59517-0). Following the removal of the USTs, confirmation soil samples collected from UST excavation reported petroleum constituents above the applicable UST Soil Threshold Levels (xylene, ethylbenzene, total petroleum hydrocarbons (TPH) gasoline range organics (GRO), TPH diesel range organics (DRO)). Based on the soil confirmation sample analytical results, 70 cubic

yards of petroleum-contaminated soil was removed from the Subject Property and property disposed of off-site. Following the submission of the UST Closure Report, the EPD USTMP requested a Corrective Action Plan (CAP) Part A be prepared.

Corrective Action Plan – One Consulting Group, Inc. – March 2021
One Group submitted a CAP Part A to the GA EPD USTMP. Based on the previous detections at the Subject Property, the CAP Part A recommended the installation of two additional monitoring wells and that a high-vacuum recovery event be conducted.

Site Investigation Summary Report #1 – One Consulting Group, Inc. – July 2021
One Group submitted a Site Investigation Summary Report (SISR) to EPD USTMP in July 2021 following the installation of the two additional groundwater monitoring wells recommended in the CAP Part A. Groundwater samples collected from the new monitoring wells reported detections of BTEX (benzene, toluene, ethylbenzene, xylenes) constituents exceeding the Georgia In-stream Water Quality Standards (ISWQS), the guidance criteria utilized by the EPD USTMP. In October 2021, the GA EPD USTMP approved the scheduling of a high-vacuum recovery event to be conducted at the Subject Property

Site Investigation Summary Report #2 – One Consulting Group, Inc. – March 2022
One Group submitted a second SISR to GA EPD USTMP in March 222 following the high-vacuum recovery event that was conducted on February 24, 2022. A total of 1,100 gallons of petroleum impacted groundwater and approximately 6.5 equivalent gallons of vapor recovery was removed from the Subject Property. Groundwater samples collected in March following the recovery event continued to exhibit concentrations of BTEX in every monitoring well. Based on the results of the March 2022 monitoring, One Group recommended performing quarterly monitoring for two years.

Asbestos Containing Materials Survey – One Consulting Group, Inc. – March 2022
One Group conducted an ACM survey in March 2022 for the Subject Property. Of the 23 samples collected during the survey, only one sample from the roofing tar taken from the Subject Property's roof penetrations and parapet walls reported asbestos at concentrations greater than 1%. This material is considered a non-friable ACM.

UST Groundwater Monitoring – Wood Environment & Infrastructure Solutions, Inc. & WSP – July 2022 to December 2023
In July 2022 Wood Environmental & Infrastructure Solution, Inc. (Wood) performed a Georgia Risk Based Correction Action (GRBCA) workbook analysis under the Georgia UST State Contractor Program to calculate the site-specific alternate cleanup levels (ACLs) for groundwater.

In August 2022 WSP (formerly Wood) conducted the first quarterly groundwater monitoring event. Based on the GRBCA analysis, there were two detections of benzene above ACLs.

In February 2023 groundwater sampling analytical results showed a decrease in benzene detections in one of the monitoring wells (MW-1), but detections in MW-2 remained above the ACL. Based on these analytical results, WSP conducted a high-vacuum recovery event in April 2023 to remove impacted groundwater from MW-2.

Groundwater monitoring performed in May 2023 detected benzene concentrations above the ACL in MW-2 consistent with previous monitoring events.

In December 2023, WSP conducted a groundwater monitoring event at the Subject Property. Two groundwater monitoring wells located east and west of the former USTs (MW-1 and MW-2) reported BTEX concentrations above the EPD In-Stream Water Quality Standards for benzene, toluene, ethylbenzene, and xylenes but below the applicable ACLs. Free product with a thickness of approximately 0.9 feet was measured in MW-2. The two groundwater monitoring wells located north and south of the former USTs (MW-3 and MW-5) reported concentrations of benzene above the EPD ISWQS. The groundwater sample collected from MW-5 also reported concentrations of ethylbenzene and xylenes above the EPD ISWQS.

Phase II ESA – WSP – August 2023
WSP conducted a Phase II ESA in August 2023 at the Subject Property to investigate portions of the Subject Property not previously assessed and fill in data gaps. Low concentrations of only two volatile organic compounds (VOCs) were detected in one of the soil samples taken at the Subject Property. 2-butanone and acetone were detected in one soil boring below their respective Type 1 RRS. Barium, chromium, and lead were detected in all of the soil samples taken at concentrations below their respective Type 1 RRS.

UST Soil Sampling – WSP – August 2023 – December 2023
WSP collected soil samples around the former UST excavation pit in lieu of the scheduled groundwater monitoring event in August 2023 to determine the extent of petroleum impacts. The soil boring located southeast of the former USTs and north of the former service station reported concentrations of VOCs and RCRA metals below their respective Type 1 RRS.

WSP collected additional soil samples from around the former UST excavation pit in December 2023. Four soil borings had detections of benzene, toluene, ethylbenzene, and xylenes above the applicable Type 1 RRS and USTMP standards. These detections were all at 15-19 feet bgs.

A6. PROJECT TASK DESCRIPTION AND SCHEDULE

Based on the previous environmental investigations conducted at the Subject Property, soil and groundwater impacts above residential RRS are present. The sampling described in this QAPP will be performed to document post-remedial site conditions in compliance with soil residential Type 1 RRS.

Task: Prepare Health and Safety Plan

Prior to beginning any sampling or corrective action work, site-specific Health and Safety Plans (HASPs) will be developed by the owner's consultant, One Group. These documents will outline potential hazards, the level of personal protection to be used, and the procedures to be followed for monitoring and emergency situations at the subject site. It is assumed that the fieldwork will be performed in Level D personal protection (i.e. steel-toed boots and hard hats). The consultant's personnel and subcontractors shall meet the requirements of the Occupational Safety and Health Administration (OSHA) Standard 1910.120.

Task: Excavation Clearance Soil Samples

Soil will be excavated from the location of the former UST system. In accordance with the EPD guidance document "Guidance for Demonstrating Completion of Soil Removal Actions at Corrective Action Sites in Georgia," One Group will collect soil samples from excavation sidewalls not intervened by property boundaries at a frequency of one sample every 25 feet of horizontal sidewall per five feet of vertical depth. The excavation is anticipated to extend to groundwater and

no excavation floor samples are planned. A photoionization detector (PID) will be used to screen soils for organic vapors during the excavation process and during sample collection.

Soil samples will be collected for laboratory analysis based on:

- Their position in relation to potential source areas;
- A depth determined to be above the seasonal high groundwater level;
- Relative levels of volatile organics based on PID measurements (>2 ppm)
- Discretion of field personnel

Soil samples will be collected following EPA's Region 4 Soil Sampling standard (LSASDPROC-300-R5) using laboratory-provided containers and analyzed for the following:

- VOCs via EPA Method SW8260B;
- Semi-volatile organic compounds (SVOCs) using EPA Method 8270D;
- Resource Conservation and Recovery Act (RCRA) 8 metals.

Additionally, the following information will be recorded in field books by the field sampling team as soil samples are collected from the excavation:

- Sample PID reading(s)
- Sample depth and location
- Sample date and time

Task: Measure fluid (groundwater and free product) levels in existing groundwater monitoring wells

One Group will measure the fluid level in all five groundwater monitoring wells using a water level meter. Measurements will take into account both groundwater level and free product level if present in the well. All groundwater level measurements will be compared to the same reference point and taken within 24 hours in order to minimize fluctuations in hydraulic conditions. The water level meter will be decontaminated between wells to avoid cross-contamination.

Task: Waste Characterization Analysis

Excess soil from soil borings and the excavation will be removed for proper off-site for disposal as non-hazardous special waste. Previous site characterization will serve as the waste profile required by the final disposal location. While not anticipated, if the final disposal location requires additional waste characterization, investigation derived waste will be collected following EPA's Region 4 Soil Sampling standard (LSASDPROC-300-R5) and sampled for the following analysis:

- Toxicity Characteristic Leaching Procedure (TCLP) via EPA Method

<u>Contaminated Soil Disposal Records</u>

Remediation and transport of excavated soil shall be completed in accordance with federal, state, and local rules and regulations, specifically, regulations 49 CFR, Subtitle B, OCGA 391-3-19, 46-11 and City of Atlanta Code of Ordinance Chapter 74 and 150. Approval from the disposal facility for acceptance of waste materials shall be obtained in writing before transporting excavated soil from the Subject Property. The Field Team Leader or field sampling team will record the following to document proper disposal of contaminated soil leaving the Subject Property:

- Waste Profile(s) and associated profile number(s) from the receiving landfill(s)
- Waste manifest numbers
- Disposal ticket numbers and associated tonnage
- Transporter company and truck number

Schedule

A proposed project schedule is provided below.

Table #1 Project Schedule

Task	Anticipated Start Date	Anticipated End Date	Actual End Date/Progress Notes
SSQAPP	Q4 2024	Q4 2024	-
Site HASP	Q4 2024	Q4 2024	-
Environmental Sampling	Q4 2024	Q1 2025	-
Laboratory Analysis	Q4 2024	Q1 2025	-
Reporting	Q1 2025	Q2 2025	-

A7. QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The following seven steps are used to determine the criteria for project-specific data quality objectives (DQO) when performing assessment projects funded by EPA:

State the Problem:

- Petroleum-impacted soil at concentrations above residential RRS is present at the Subject Property. This presence of contamination has the potential to harm human health and the environment, as well as prevent the Subject Property from being redeveloped for mixed-use.

Identify the Decision

- Remove contaminated soil from the Subject Property and assess post-remedial soil conditions to document Subject Property's compliance with residential Type 1 RRS.

Inputs to the Decision

- The inputs to the decision have been based on historical records, previous environmental investigations, the CAP Part A, and the scope of work for the Site.

Define the Study Area Boundaries

- A site boundary map is included in Figure 2.

Develop a Decision Rule

- Authorized by the City of Atlanta to proceed with the sampling activities outlined herein, the owner’s consultant will evaluate the analytical data against state regulatory standards (soil RRS) and federal standards for solid waste toxicity characteristics.

Specify Limits on Data Gaps/Errors

- Soil samples will be collected to characterize waste for disposal, and to confirm and document that adequate quantities of impacted soil have been removed.

Optimized Design

- The optimized design consists of the execution of sampling activities discussed herein to confirm appropriate waste disposal methods and to demonstrate that appropriate quantities of soil have been removed. Finally, sampling will verify that fill material imported to the Subject Property complies with residential Type 1 RRS standards.

Measurement Quality Objectives (MQOs) are designed to evaluate and control various phases (sampling, preparation, and analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed. MQOs are defined in terms of the following data quality indicators:

- Detectability (the ability of the method to reliably detect and measure a pollutant concentration above background). The sample collection and analysis to be completed will identify petroleum constituents in the soil.
- Precision (the degree of agreement among repeated measurements of the same parameter and provides information about the consistency of methods). Quality assurance sampling will confirm the analytical precision.
- Bias/Accuracy (a measure of confidence that describes how close a measurement is to its “true” value). Methods to determine and assess the accuracy of field and laboratory measurements include instrument calibrations and various types of QC checks.
- Completeness (a measure of the percentage of valid samples collected and analyzed to yield sufficient information to make informed decisions with statistical confidence). Samples will be collected in accordance with EPA, and EPD protocols for completeness.
- Comparability (a measure that shows how data can be compared to other data collected by using standardized methods of sampling and analysis). Samples will be compared to applicable residential RRS.

A8. SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

This section outlines the minimum training requirements for personnel conducing project activities. Current training records and certificates are kept in personnel files located at the respective headquarters of the project personnel. Specifically, these training documents will be kept on-site by the following key personnel:

- The City of Atlanta and their representatives, if applicable, will keep records of their employees and contractor certifications at their office located at 55 Trinity Avenue SW, Suite 3350 Atlanta, Georgia.

All training records will be made available upon request. Deficiencies and the need for new training are identified during annual personnel evaluations. Personnel deficient in any of the following requirements will not be allowed to conduct project activities.

Hazardous Waste Operations and Emergency Response
All field sampling project personnel must have current certificates of training for the 40-hour OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER)/Safety Training Class with annual 8-hour refresher courses completed per 40 CFR Part 311 and 29 CFR 19110.120.

The City of Atlanta will be responsible for ensuring that their personnel have valid and current specialized training required by the OSHA regulations (as applicable) for site visits during active assessment and/or remediation activities. Any other personnel (EPA, contractors, etc.) visiting the Subject Property during cleanup activities, must ensure their personnel have at a minimum an OSHA 40-Hr HAZWOPER training certification. If they are to enter any regulated contained areas, then additional training certifications may be required. All training certifications will need to be verified as a pre-requisite for site visit(s).

A9. DOCUMENTS AND RECORDS

The principles provided in this section of the SSQAPP for project records, sample collection and submission, chain of custody, investigation-derived waste disposal, and laboratory results apply to this project.

Specific field sampling forms that will be used with all field activities and collected samples include chain of custody records and field sampling equipment & calibration logs. Copies of typical field forms are included in **Appendix B**. These documents and records will be maintained in accordance with the requirements set forth in the EPA Region 4, Science and Ecosystem Support Division (SESD), "Field Branches Quality System and Technical Procedures", http://www.epa.gov/region4/sesd/fbqstp/index.html.

The requested lab turnaround time for this project will range from next-day to five business days depending on project requirements.

B1. SAMPLING DESIGN PROCESS

The following environmental media will be sampled following the excavation of contaminated soil from the Subject Property as identified during previous environmental assessments as described in Section A5.

Soil Excavation Samples: Soil samples will be collected from the excavation following the removal of contaminated soil to demonstrate compliance with EPD sampling protocols for clearance sampling following the excavation of contaminated soil. Soil samples will be collected from each sidewall of the excavation. In order to redevelop the Subject Property for mixed-use commercial and residential, the confirmation soil samples must be below applicable Type 1 RRS.

Soil Borings: Based on the analytical data of the soil excavation samples and in consultation with the EPD's Georgia Brownfield Program, soil borings may be taken across the Subject Property to assess the subsurface conditions following the excavation of the contaminated soil.

Waste Characterization: Representative soil from the proposed excavation and excess soil from soil excavation and borings will be sampled in order to characterize it for proper disposal off-site.

Soil sampling will be completed in accordance with EPA and Georgia EPD Standard Operating Procedures (SOPs) as outlined in Section A and submitted to the laboratory for analysis per the following table.

Table #2 Sample Matrix – Closure Performance Sampling

Sample Identification	Purpose	Media	Number of Samples	Selected Analysis
S1-SX	Determine if additional contaminated soil remains in the excavated area.	Soil	Up to 15	VOCs: Method SW8260B SVOCs: Method 8270D RCRA 8 Metals: Method 6010
WC1-WCX	While not anticipated, additional waste characterization of excavated and excess soil will be performed at the request of the final disposal facility.	Soil	Up to 10	TCLP via EPA Method 1311

The laboratory will provide containers for the samples. The Field Team Leader is responsible for ensuring the laboratory provides the appropriate sampling containers, including a preservative. Additionally, the Field Team Leader is responsible for overseeing sample collection activities.

Precautions will be taken to prevent cross-contamination. If the field team encounters any problems or unexpected situations while in the field (e.g., access problems, safety issues, inadequate supplies, equipment failure, etc.), the Corrective Action Process will be followed as provided in **Appendix C**.

Any materials generated as a result of cleanup activities may require characterization for waste profiling. Materials, such as disposable personal protection equipment, will be containerized and properly labeled until appropriate analytical tests are conducted to determine its waste characterization. Materials generated on site that are characterized as non-hazardous will be disposed of as non-hazardous waste. Any identified containerized hazardous waste that is stored on-site will be manifested and shipped to a permitted treatment and/or disposal facility. All management of waste materials will be conducted in accordance with EPA Region 4 LSASDPROC-202-R4 SOP, included in **Appendix D.**

B2. SAMPLING AND ANALYTICAL METHODS REQUIREMENTS

Field and laboratory personnel will be aware, at all times, of the need to properly maintain all samples, whether in the field or in the laboratory, under strict Chain of Custody protocols and in a manner to retain physical sample properties and chemical composition. The handling and transportation of samples will be accomplished in a manner that not only protects the integrity of the sample, but also documents sample custody. In general, packing, marking, labeling, and shipping of samples will be conducted in accordance with EPA's Standard Operating Procedures (SOPs). Samples will be packed and shipped in accordance with applicable and current US Department of Transportation regulations and/or International Air Transport Association standards. The following sections detail sample handling and custody requirements from sample collection to final disposal.

Field Procedures

The following procedures should be followed in the field to ensure data quality objectives for the project are met.

Sampling Equipment Procedures

Sampling equipment may consist of:

- PID
- Appropriate health and safety equipment as specified in the site-specific health and safety plan
- Plastic sheeting
- Water-level probe
- Six-foot rule with gradation in hundredths of a foot
- Appropriate transport containers (coolers) with ice and appropriate labeling, packing,
- and shipping materials
- COC forms
- Indelible ink pens
- Site map with well locations and groundwater contours maps
- Keys to wells (if applicable)

Sampling Collection Procedures

Soil samples will be collected in accordance with the procedures described in Section A6, EPA Region 4's Soil Sampling Standards (LSASDPROC-300-R5), and ASTM Standard Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D1586-84).

B3. SAMPLE HANDLING AND CUSTODY REQUIREMENTS

Samples will be collected using laboratory-provided containers. Containers will be filled in accordance with laboratory guidance based on the intended analysis as specified in Section A.

Upon collection, samples will be transferred immediately from the sampling device into the appropriate laboratory-supplied container. All samples collected will have discrete unique sample identification numbers. The unique sample identifications are necessary to identify and track each of the many samples collected for analysis during the duration of the project. Whenever possible, sample labeling procedures from previous investigations will be followed or continued.

The following sample packaging guidelines will be followed:

- Sample containers will be placed in the cooler in a manner to minimize the potential for cross contamination.
- Sample containers obtained from specific sampling locations will be placed in the same container when possible.
- Containers used for shipping will be filled with proper packing material to prevent containers from shifting and minimize the potential for rupture during shipping.

A Chain of Custody record will be completed for each set of collected samples. The Chain of Custody form will be provided by the analytical laboratory. The purpose of the Chain of Custody procedure is to prevent misidentification of samples, prevent tampering of the samples during shipment and storage, allow easy identification of tampering, and allow for easy tracking of possession. If the Chain of Custody is broken at any time from sample collection through sample analysis, the Project Manager and QA/QC Officer will be notified.

When samples leave the sampler's immediate control (such as, shipment to laboratory), the

sampler will sign and date the Chain of Custody record(s) to relinquish the samples. The Chain of Custody record will be placed into a sealable plastic bag and placed into the Container. A custody seal will be placed on the shipping container. The custody seal will bear the collector's name, signature, and the date collected. The custody seal is used to ensure that the samples in the shipping container have not been tampered with.

B4. ANALYTICAL METHODS AND REQUIREMENTS

Samples collected under the scope of this project will be submitted for laboratory analysis of constituents as specified in Section B2. Once the samples are received and logged in at the laboratory, the samples will be analyzed as requested on the chain of custody.

Available laboratory information and extraction and digestion criteria are included in Laboratory QAM documents, included in **Appendix E.** The Laboratory Director is responsible for overseeing the success of the analysis and for implementing corrective actions if deemed necessary as outlined in Section C1 of this document.

Constituents of concern, analytical/extraction methods, sample container, preservation, and holding time requirements, are provided in the referenced EPA guidance documents and discussed in **Table 2.**

The detection limit requirements for each analyte are typically below regulatory limits for the parameters of interest. The Project Manager has reviewed the laboratory QC samples and control limits identified in the laboratory documentation. The quality of the data generated using the laboratory QAM will provide analytical data of a known quality and precision for projects under this City of Atlanta Brownfield RLF grant.

Non-standard or unpublished methodologies for analysis are not anticipated. Samples collected will likely be subject to a standard laboratory turnaround time of ten business days, unless expedited turnaround time is needed to safely secure the site or facilitate construction.

B5. FIELD QUALITY CONTROL REQUIREMENTS

The following QA/QC samples will be collected during this project:

- Field Duplicate Samples
- MS/MSD Samples

Field Duplicate Samples: duplicate samples will be collected to evaluate the reproducibility of sampling and analysis. Duplicate samples will be collected, stored and transported in the same manner as the actual samples. A unique sample identification will be assigned to each duplicate, and all duplicates will be submitted blind to the laboratory. At least one duplicate sample will be collected per sample media or one duplicate per day.

MS/MSD Samples: Laboratory accuracy will be assessed in accordance with the laboratory's QAQC procedures such as percent recovery from laboratory control samples (LCSs), and matrix spike/matrix spike duplicate (MS/MSD) samples. MS/MSD samples will be collected at a frequency of no less than 5% (or one duplicate per 20 samples).

B6. LABORATORY QUALITY CONTROL REQUIREMENTS

The selected laboratory, Eurofins, Inc. (Eurofins), will follow quality control procedures at all times

for soil samples to be analyzed. Laboratory quality documentation is provided in **Appendix E**. The following parameters and laboratory quality control requirements based on laboratory QC data for this project are included in the following tables:

Table #3 Soil Laboratory Quality Control Requirements

Parameter	Method	Laboratory Control Spike Range	Relative Percent Difference	Matrix Spike Range
RCRA metals	EPA 6010 EPA 7470/7473	80-120%	20%	75-125%
VOCs	EPA 8260	65-140%	20-30%	60-140%
SVOCs	EPA 8270	40-130%	20-40%	30-140%
TCLP	EPA 1311	65-132%	20-56%	66-150%

B7. FIELD EQUIPMENT AND CORRECTIVE ACTION

At a minimum, all field-screening equipment will be calibrated immediately prior to each day's use. Additional calibration may be required if measurements appear erroneous. The calibration procedures will conform to the manufacturer's standard instructions. Records of all instrument calibration will be maintained by the Field Team Leader. Copies of all of the instrument manuals will be maintained on site by the field personnel.

PID
The photoionization analyzer will be a Photovac MicroTip (or equivalent), equipped with a 10.6 eV lamp or 11.7 eV lamp. The Photovac is capable of ionizing and detecting compounds with an ionization potential of less than 10.6 eV. Calibration and maintenance will be performed according to manufacturer’s specifications. Calibration and maintenance information will be recorded in the field logs.

Dust Monitor
The dust monitor will be a Sensidyne NEPHELOMETER (or equivalent) and will be calibrated at the start of each day of use. Calibration and maintenance of the dust monitor will be conducted in accordance with the manufacturer’s specifications. The calibration data will be recorded in field logs.

Water Level Meter or Oil/Water Interface Probe
The water-level cable will be checked once to a standard to assess if the meter has been correctly calibrated by the manufacturer or vendor. If the markers are incorrect, the meter will be sent back to the manufacturer or vendor.

B8. LAB EQUIPMENT AND CORRECTIVE ACTION

The selected laboratory’s QAM addresses the testing, inspection, and maintenance of the analytical instruments and is provided in **Appendix E.** The laboratory director will be responsible for laboratory equipment, calibration, and for instituting corrective actions for problems encountered during the analysis of samples. Any problems affecting the project data will be reported to the Project Manager and QA/QC officer.

B9. ANALYTICAL SENSITIVITY AND PROJECT CRITERIA

Analytical method sensitivity and project criteria for the analytical methods within the scope of this project will be determined by the selected laboratory. Their Quality Assurance Manual specifying the analytical method sensitivity and project criteria for analytical methods is included in **Appendix E.** In addition, minimum detection limits for soil samples will comply with Georgia Rule 391-3-19.07, Comparison of Existing Contamination to Risk Reduction Standards, and Rule 391-3-19 Appendix I, Notification Concentrations for soil. Solid waste disposal limits will be compared to Toxicity Characteristic limits, 40 CFR § 261.24.

B10. DATA MANAGEMENT AND DOCUMENTS

Data for this project will be produced in two locations: onsite and at the selected laboratory. Data collected onsite will be recorded on field data worksheets (provided in **Appendix B**) and in field logbooks. Copies of the field log pages will become part of the project file. These documents and records are also maintained in general accordance with the requirements set forth in the SESD's "Field Branches Quality System and Technical Procedures." Some of the required documentation includes:

- Field crew signatures or initials all records/notes with an appropriate pen.
- Use of field sampling and decontamination supplies and equipment are tracked with an in-house system.
- Sampling containers are prepared by the laboratory and shipped with a packing list documenting content.
- Preservatives used by the laboratory are traceable by preparation date, vendor, and lot number.
- Sampling containers are pre-cleaned at the laboratory.
- All equipment is maintained and calibrated per manufacturers' specifications.

Field logs will include weather observations at the site when field activities were conducted. All relevant observations or digressions from the procedures in this QAPP, deemed notable by any field team member, will also be recorded in the field logbook. The Project Manager will submit copies of the field data worksheets and logbooks with the field activity report when field activities are complete as a deliverable or as part of the final report.

The laboratory provides electronic copies of the analytical results generally within 10 days of sample receipt. Paper copies will be supplied by the laboratory upon request or will be printed from the electronic copy by the Project Manager. The Project Manager and QA/QC Officer will be responsible for reviewing the data to verify its usability, ensuring the analytical report meets requirements, and forwarding it to the Owner, when applicable.

After the laboratory report is reviewed by the Project Manager, QA/QC Officer, data is then formatted into tables and compared to regulatory limits to determine if contamination is present at the subject property. Upon completion of formatting of the Analytical Data Table, data is reviewed for accuracy by the QA/QC Officer. Site figures and maps including analytical results and sample locations will be prepared for submittal with final reports. These figures will also be reviewed for accuracy by the QA/QC Officer. The schedule for the respective project managers

to review the data for accuracy and usability will be within 14 days after receipt of data.

The selected laboratory will manage the original raw data and data validation report for projects in both hard copy and electronic format. This information will be made available to the Project Manager or QA/QC Officer upon request. The Laboratory Director and/or QA/QC Officer will maintain information on where the records are stored, will identify who will be responsible for records management, and how long specific types of records or documents will be maintained.

The owner's consultant's project records will include correspondence, field logs and data sheets, laboratory analytical reports, audit findings, progress reports, and a closeout report.

A closeout report will be submitted to the City by the owner's consultant summarizing cleanup and sampling activities. The closeout report will also include copies of field notes and logs, analytical laboratory results, a summary of activities completed with any deviations from the approved QAPP, conclusions, and recommendations and will be submitted to the Project Manager, the Owner, and EPA Region 4 Brownfields Project Officer.

All records, reports, and checklists from the EPA Region 4 Designated Approving Official will be stored in the physical project file located at the City's main office 55 Trinity Avenue SW, Suite 3350 Atlanta, GA 30303 . Additional copies will be stored with CHA's Atlanta office. All records will be made available upon request during the life of the project and for a minimum of three years after the project. The project file will be eventually archived for a minimum period of ten (10) years.

C1. ASSESSMENT AND RESPONSE ACTIONS

Types of assessments generally include soil assessments. These assessments may be performed to determine the general subsurface conditions of the site, delineation of horizontal and/or vertical extent of migration, monitoring, risk assessment, and corrective action.

The validation of all reported data may be performed by the QA/QC Officer or an independent third party and reviewed by the QA/QC Officer. A QA review of all reports will be conducted by the Project Manager or similar senior technical staff (as appropriate). The QA/QC Officer may conduct an on-site field audit at the time(s) when samples are being collected for both field and laboratory analysis. The QA/QC Officer will have the authority to halt the on-site work if he/she believes the findings from the audit justify such action. In the event discrepancies are identified during an audit, the QA/QC Officer will discuss findings with the Project Manager and Field Team Leader. The Field Team Leader, in consultation with the Project Manager, will be responsible for corrective actions related to field activities. Audit findings would be included in the final reports along with descriptions as warranted; this information is provided to project staff, state, and EPA project personnel, as applicable. In the event the County and its assigns hire a subcontractor to perform a specialized task, the Project Manager will provide oversight of the work by an experienced Field Team Technician or Field Team Leader.

The laboratory will provide a narrative report with the analytical results referencing the project, associated chain of custody, QC issues, and the validity and integrity of the results. Section D2 of this QAPP discusses the verification and validation process in detail.

The Corrective Action Process Flowchart provided in **Appendix C** outlines the standard process for communicating and resolving problems that arise in the field, via corrective actions implementation.

C2. PROJECT REPORTS

Execution of proposed field activities will not commence until this QAPP is approved by EPA.

All reports will be reviewed for technical accuracy and data quality by the project QA/QC officer or similar senior technical staff (as appropriate). The Project Manager will oversee the preparation of the prepare the final report, which will be reviewed for technical accuracy and data quality by the project QA/QC Officer or similar senior technical staff (as appropriate).

The final closeout report will include a summary description of project activities, a summary of all data, the field activity report, a discussion on any problems encountered during the project and the corrective actions taken, a discussion of the conclusions drawn from the results and the rationale for those conclusions, and the results of the data quality assessment. The final report will be distributed to the project team. The report will then be reviewed for conformance with internal document standards. Final reports will be forwarded to the EPA Project Manager and City Brownfield Project Director, as applicable.

D1. FIELD DATA EVALUATION

The Project Manager will validate the field data and discuss any problems identified during the project with the Field Team Leader. Data will be reviewed for integrity by checking all field entries for errors and consistency. Data validation will be accomplished through a series of checks and reviews intended to assure that the reported results are of a verifiable, reproducible, and acceptable quality. The validation process will include:

- Quality control samples meet criteria
- Quality control data (RPDs) are acceptable

A data usability review that includes an assessment of field procedures (including field notes, field screening results, and field analytical data) completeness, comparability, representativeness, precision, and bias (accuracy) of the data will be performed by the Project Manager. The findings of this review will be documented and presented in the final report.

If verification or validation indicates that samples have been collected and/or analyzed out of compliance with the QAPP (for instance deviations from the acceptance criteria for quality control defined in this QAPP and its addendums), resampling may be required. The Project Manager must contact the EPA Project Manager in the event that there are any deviations from the QAPP, and they will determine if the data is acceptable or if resampling is required. If data is accepted that deviates from the QAPP, the data will be used for screening purposes only and annotated as such.

D2. LABORATORY DATA EVALUATION

The Laboratory Director will review and verify the laboratory data generated under their corrective action system for accuracy according to the laboratory's QAM, as detailed in Section B8 of this document. Quality control checks are performed on field data by reviewing the chain of custody forms and results from the lab for each sampling event. All sample results will be reviewed and correlated to field measurements and observations. The validation process will include:

- Narrative review;
- Quality control blanks meet criteria;
- Appropriate preservatives were used and hold times were met;
- Determination if quality control checks meet criteria; and
- Determination if unacceptable data are identified and corrective actions are initiated;

In addition to evaluating data qualifiers associated with laboratory analyses, a comparison of the sample duplicate(s) and the corresponding sample result(s) will be made to evaluate the reproducibility of the sample results based on the laboratory analysis and sample collection and transportation procedures.

Based on the data qualifiers provided by the laboratory, and on the sample/sample duplicate comparison described above; data will be categorized as fully quantified, qualified, or unusable. Unusable data will not be utilized in the project decision process. Raw data will be included in all submitted project reports.

An evaluation of laboratory analysis procedures and review of the chain-of-custody, holding times, blanks, control samples, duplicate analysis, detection limits, holding times, laboratory controls, and overall assessment of data will be conducted by the Laboratory Director.

The Project Manager and/or QA/QC Officer will perform verification and validation of laboratory data for conformance with the data objectives stated in the QAPP. Data verification will include completeness, correctness, and conformance evaluations. Data validation will be performed to assess the quality and usability of the data generated. Data verification and validation will be performed in accordance with EPAs "*Guidance on Environmental Data Verification and Validation*." Results of the data verification and validation, including potential influence on the data quality, will be summarized in the final report.

Table #4 Typical Validation Activities

Item	Activity
Data Deliverables and QAPP	Ensure that all required information on sampling and analysis was provided (including planning documents).
Analytes	Ensure that required lists of analytes were reported as specified.
Chain-of-Custody	Examine the traceability of the data from time of sample collection until reporting of data. Examine chain-of-custody records against contract, method, or procedural requirement.
Holding Time	Identify holding time criteria, and either confirm that they were met or document any deviations. Ensure that samples were analyzed within holding times specified in method, procedure, or contract requirements. If holding times were not met, confirm that deviations were documented, that appropriate notifications were made (consistent with procedural requirements), and that approval to proceed was received prior to analysis.
Sample Handling	Ensure that required sample handling, receipt, and storage procedures were followed, and that any deviations were documented.
Sampling Methods and Procedures	Establish that required sampling methods were used and that any deviations were noted. Ensure that the sampling procedures and field measurements met performance criteria and that any deviations were documented.

Item	Activity
Analytical Methods and Procedures	Establish that required analytical methods were used and that any deviations were noted. Ensure that the QC samples met performance criteria and that any deviations were documented.
Data Qualifiers	Determine that the laboratory data qualifiers were defined and applied as specified in methods, procedures, or contracts.
Deviations	Determine the impacts of any deviations from sampling or analytical methods and SOPs. Consider the effectiveness and appropriateness of any corrective action.
Sampling Plan	Determine whether the sampling plan was executed as specified (i.e., the number, location, and type of field samples were collected and analyzed as specified in the QAPP).
Sampling Procedures	Evaluate whether sampling procedures were followed with respect to equipment and proper sampling support (e.g., techniques, equipment, decontamination, volume, temperature, preservatives, etc.).
Co-located Field Duplicates	Compare results of co-located field duplicates with criteria established in the QAPP.
Project Quantitation Limits	Determine that quantitation limits were achieved, as outlined in the QAPP and that the laboratory successfully analyzed a standard at the QL.
Confirmatory Analyses	Evaluate agreement of laboratory results.
Performance Criteria	Evaluate QC data against project-specific performance criteria in the QAPP (i.e., evaluate quality parameters beyond those outlined in the methods.).
Data Qualifiers	Determine that the data qualifiers applied were those specified in the QAPP and that any deviations from specifications were justified.
Validation Report	Summarize deviations from methods, procedures, or contracts. Include qualified data and explanation of all data qualifiers.

D3. EVALUATING DATA IN TERMS OF USERS NEEDS

The object of the cleanup is to remediate the identified environmental impacts. Analytical data generated in accordance with approved methodologies will be considered definitive and quantitative based on the results and findings of the validation process.

The Project Manager will validate the field data and discuss any problems identified during the project with the Field Team Leader. Any problems and associated corrective actions will be documented in the field logs and the final report. The Project Manager will discuss any problems along with proposed corrective actions with the QA/QC Officer.

Because data generated with significant deviations from the requirements of the QAPP will be rejected and because of the nature of the work (biased sampling), all data will have the same expected uncertainties and there will be no limitations on data use. The following is a list of considerations for data usability assessment:

Table #5 Data Usability Considerations

Item	Cleanup Activity
Deviations	Determine the impact of deviations on the usability of data.
Sampling Locations, Deviations	Determine if alterations to sample locations continue to satisfy the project objectives.
Chain-of-Custody, Deviation	Establish that any problems with documentation of custody procedures do not prevent the data from being used for the intended purpose.

Item	Cleanup Activity
Holding Times, Deviation	Determine the acceptability of data where holding times were exceeded.
Damaged Samples, Deviation	Determine whether the data from damaged samples are useable. If the data cannot be used, determine whether resampling is necessary.
Proficiency Testing (PT) Sample Results, Deviation	Determine if the implications of any unacceptable analytes (as identified by the PT sample results) on the usability of the analytical results. Describe any limitations on the data.
SOPs and Methods, Deviation	Evaluate the impact of deviations from SOPs and specified methods on data quality.
QC Samples	Evaluate the implications of unacceptable QC sample results on the data usability for the associated samples. For example, consider the effects of blank contamination.
Matrix	Evaluate matrix effects (interference or bias).
Meteorological Data and Site Conditions	Evaluate the possible effects of meteorological (e.g., wind, rain, temperature) and site conditions on sample results. Review field reports to identify whether any unusual conditions were presented and how the sampling plan was executed.
Comparability	Ensure that results from different data collection activities achieve an acceptable level of agreement.
Completeness	Evaluate the impact of missing information. Ensure that enough information was obtained for the data to be useable (completeness as defined in the QAPP.
Background	Determine if background levels have been adequately established (if appropriate).
Critical Samples	Establish that critical samples and critical target analytes/COCs, as defined in the QAPP, were collected and analyzed. Determine if the results meet criteria specified in the QAPP.
Data Restrictions	Describe the exact process for handling data that do not meet quality standards (i.e., when measurement performance criteria are not met). Depending on how those data will be used, specify the restrictions on the use of those data for environmental decision-making.
Usability Decision	Determine if the data can be used to make a specific decision considering the implications of all deviations and corrective action.
Usability Report	Discuss and compare overall precision, accuracy, representativeness, comparability, completeness, and sensitivity for each matrix, analytical group, and concentration level. Describe limitations on the use of the project if criteria for data quality indicators are not met.

Field modifications regarding sampling analysis may be necessary for circumstances such as auger refusal, limited access areas, or when enough sample volume could not be collected for various reasons. Resampling may be necessary if results are deemed unacceptable for various reasons such as exceeding laboratory holding times or to confirm previous sampling and/or excavation activities, etc. These variables will be further defined throughout this QAPP based on the specific contaminants of concern. Upon receipt of the laboratory data, the data will be reviewed to verify its usability. Upon determination, data is then formatted into tables and compared to regulatory limits to determine if concentrations at the Subject Property exceed applicable action levels. Upon completion of formatting the Analytical Data Table; data will be reviewed for accuracy by the QA/QC Officer.

The owner's consultant will evaluate the usability of individual sample results at the parameter level. Analytical results will be evaluated based on sensitivity criteria described through this

QAPP. Data limitations will be documented along with how the data should be used. Conclusions and recommendations drawn from all assessment information will be documented in the final report. Site figures and maps including analytical results and sample locations are frequently prepared for submittal with final reports. These figures and maps are also reviewed for accuracy by the QA/QC Officer.

Usable data will be tabulated and compared to applicable target concentrations. The QA/QC Officer will compare and review the laboratory data to the table for completeness, correctness, and accuracy. Usable data will be provided on-site figures and other graphical representations and will also be reviewed for completeness, correctness, and accuracy.

REFERENCES

1) U.S. Environmental Protection Agency. February 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process. EPA/240/B-06/001.

2) U.S. Environmental Protection Agency. December 2002. Guidance for Quality Assurance Project Plans. EPA QA/G-5. EPA 240/R-02/009.

3) U.S. Environmental Protection Agency. March 2001. EPA Requirements for Quality Assurance Project Plans. EPA QA/R-5. EPA 240/B/01/003.

4) U.S. Environmental Protection Agency. February 2006. Data Quality Assessment: Statistical Methods for Practitioners. EPA QA/G-9S. EPA 240-B-06-003.

5) U.S. Environmental Protection Agency Region 4, Science and Ecosystem Support Division (SESD), Field Branches Quality System and Technical Procedures, Quality System and Technical Procedures for LSASD Field Branches | US EPA

Recorded Information Sources:

6) One Consulting Group. April 20, 2018. Phase I Environmental Site Assessment, 0 and 105 McDonough Blvd. SE and 1326 Jonesboro Rd. SE, Atlanta, Georgia

7) One Consulting Group. June 14, 2018. Modified Phase II Subsurface Investigation, 0 and 105 McDonough Blvd. SE and 1326 Jonesboro Rd. SE, Atlanta, Georgia

8) One Consulting Group. June 27, 2018. Prospective Purchaser Corrective Action Plan, 105 McDonough Blvd. SE and 1326 Jonesboro Rd. SE, Atlanta, Georgia.

9) Cardno. March 25, 2019. Submission of UST Closure Report, 105 McDonough Blvd SE, Atlanta, Georgia, Facility ID 906480.

10) One Consulting Group. March 3, 2021. Corrective Action Plan Part A, 105 McDonough Blvd SE.

11) One Consulting Group. March 31, 2022. GA UST Site Investigation Summary Report, 105 McDonough Blvd. SE, Atlanta, Georgia.

12) WSP USA Environment & Infrastructure Inc. December 7, 2022. GA UST Management Program Monitoring Only Report. 105 McDonough Blvd. SE, Atlanta, Georgia.

13) WSP USA Environment & Infrastructure Inc. September 26, 2023. Phase II Environmental Site Assessment, City of Atlanta Brownfields Program, USEPA Cooperative Agreement #01D11420. 105 McDonough Blvd. SE, Atlanta, Georgia.

14) WSP USA Environment & Infrastructure Inc. September 29, 2023. Prospective Purchaser Corrective Action Plan Amendment No. 1, Parcel Boundaries and Risk Reduction Standards, 105 McDonough Blvd. SE, Atlanta, Georgia.

15) WSP USA Environment & Infrastructure Inc. March 7, 2024. Prospective Purchaser Corrective Action Plan Amendment No. 2, 105 McDonough Blvd. SE, Atlanta, Georgia.

FIGURES

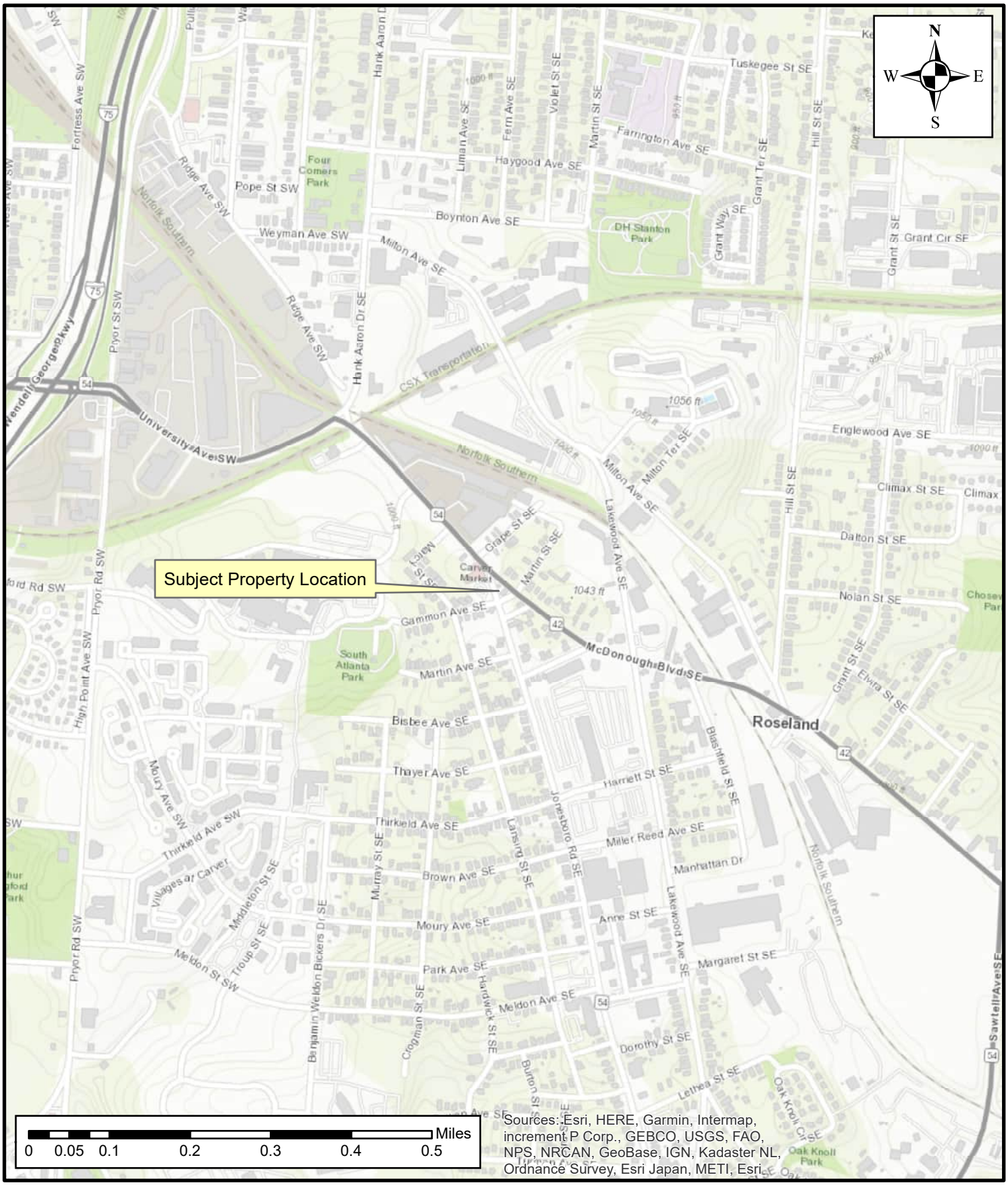


Figure 1	**Subject Property Location Map**	CHA
Project No: 081554	105 McDonough Blvd SE Atlanta, GA	270 Peachtree St. NW Suite 1500 Atlanta, GA 3030-1283 678.954.500 www.chacompanies.com
Date: 09/2024		

PROPOSED EXCAVATION AREA

MW-1 EXISTING MONITORING WELL

SITE BOUNDARY

CHA
270 Peachtree Street NW, Suite 1500
Atlanta, GA 30303-1283
678.954.5000 . www.chasolutions.com

SITE LAYOUT MAP

105 McDONOUGH BLVD SE
ATLANTA, GEORGIA

PROJECT NO. 081554.000

DATE: 09/2024

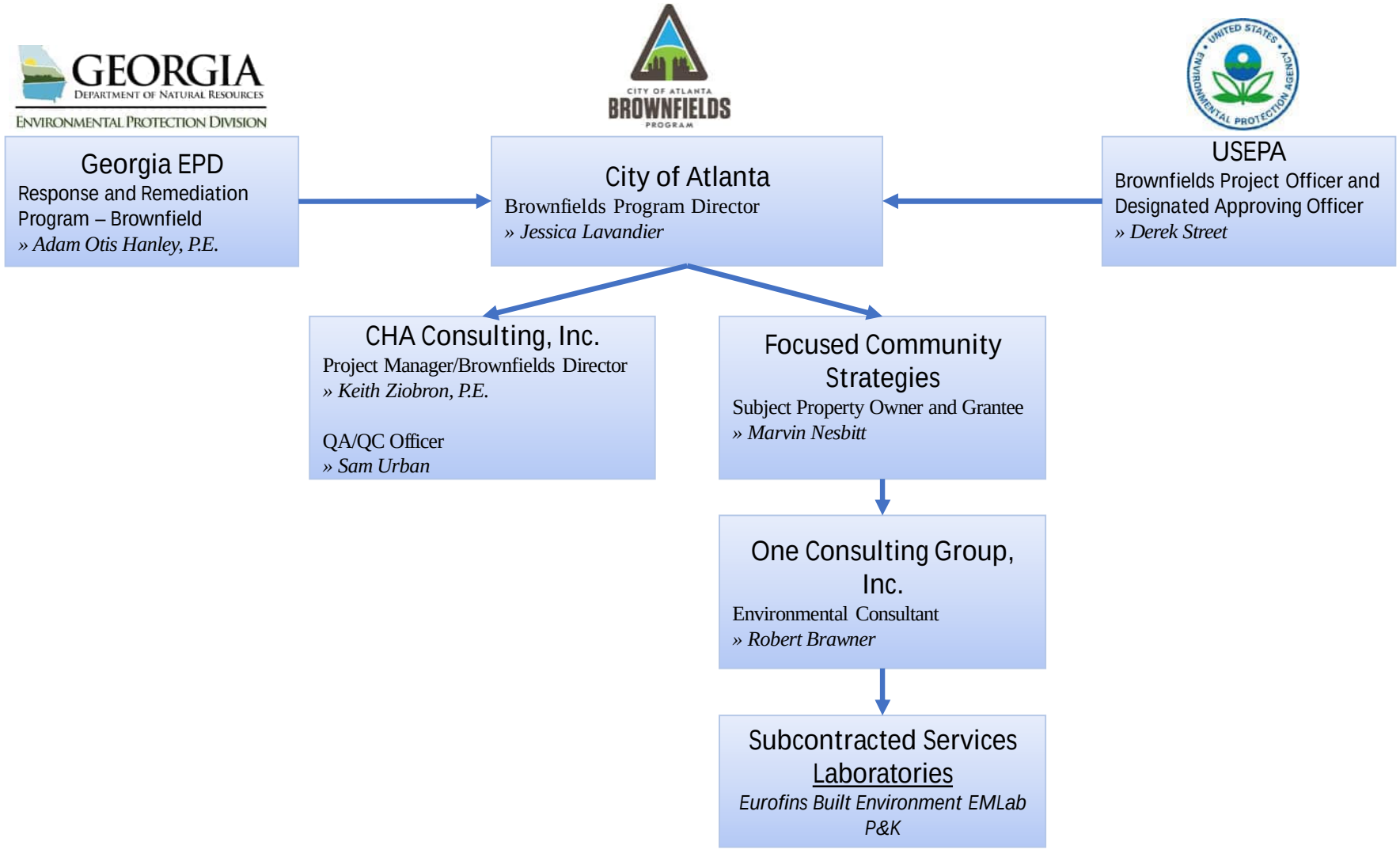
FIGURE 2

File: V:\PROJECTS\ANY\K6\081554.000\09_DESIGN\DRAWINGS\ENV\105 MCDONOUGH.DWG Saved: 9/25/2024 8:13:28 AM Plotted: 9/25/2024 8:14:57 AM Current User: Ehmann, Karyn LastSavedBy: 5768

APPENDIX A

Quality Assurance Project Organizational Chart

Quality Assurance Project Organizational Chart



APPENDIX B

Field Forms

TEST BORING LOG

CHA

BORING NO.

PROJECT & LOCATION:

CLIENT:

PROJECT NO.:

CONTRACTOR:

SHEET NO.: 1 OF

GROUNDWATER MEASUREMENT						CASING	SAMPLER	CORE BARREL	ELEVATION:
DATE	TIME	DEPTH TO (FT.): WATER	BOTTOM OF CASING	BOTTOM OF BORING	TYPE:				
					SIZE I.D.:				START DATE: TIME:
					HAMMER WT.:				
					HAMMER FALL:				FINISH DATE: TIME:
					DRILL FLUID:	DEPTH INTRODUCED:			RIG TYPE:
					CHECKED BY:				DRILLER:
IF BORING IS DRY, CHECK HERE: ☐					DATE:				INSPECTOR:

DEPTH IN FEET	SAMPLE NO.	RECOVERY LENGTH	SPT BLOWS PER 6"	N/RQD	PID (ppm)	NOTES	FIELD CLASSIFICATION
5							
10							
15							
20							

BLOWS/FT.	DENSITY
0-4	- VERY LOOSE
5-10	- LOOSE
11-30	- MEDIUM COMPACT
31-50	- COMPACT
51+	- VERY COMPACT

BLOWS/FT.	CONSISTENCY
0-2	- VERY SOFT
3-4	- SOFT
5-8	- MEDIUM STIFF
9-15	- STIFF
16-30	- VERY STIFF
31+	- HARD

SAMPLE IDENTIFICATION
S – SPLIT SPOON
T – THIN WALL TUBE
A – AUGER CUTTINGS
W – WASH SAMPLE

BORING NO.

TEST BORING LOG

BORING NO.

PROJECT & LOCATION:

CLIENT:

PROJECT NO.:

CONTRACTOR:

SHEET NO.: OF

DEPTH IN FEET	SAMPLE NO.	RECOVERY LENGTH	SPT BLOWS PER 6"	N/RQD	PID (ppm)	NOTES	FIELD CLASSIFICATION

BLOWS/FT.	DENSITY
0-4	- VERY LOOSE
5-10	- LOOSE
11-30	- MEDIUM COMPACT
31-50	- COMPACT
50+	- VERY COMPACT

BLOWS/FT.	CONSISTENCY
0-2	- VERY SOFT
3-4	- SOFT
5-8	- MEDIUM STIFF
9-15	- STIFF
16-30	- VERY STIFF
31+	- HARD

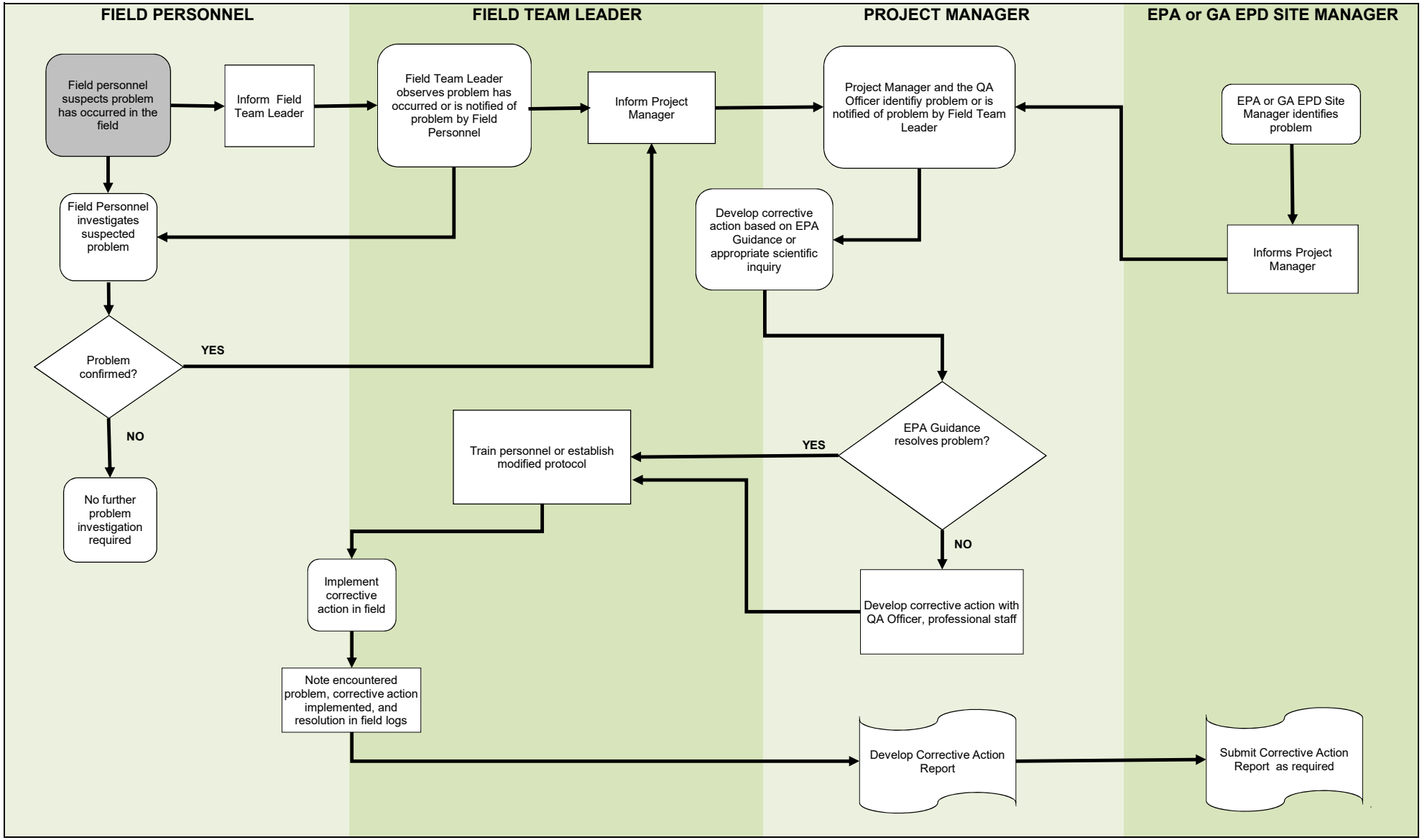
SAMPLE IDENTIFICATION
S – SPLIT SPOON
T – THIN WALL TUBE
A – AUGER CUTTINGS
W – WASH SAMPLE

BORING NO.

APPENDIX C

Corrective Action Flow Chart

CORRECTIVE ACTION PROCESS



APPENDIX D

Standard Operating Procedures

Region 4 **U.S. Environmental Protection Agency** **Laboratory Services and Applied Science Division** **Athens, Georgia**	
Operating Procedure	
Title: Field Equipment Cleaning and Decontamination	ID: LSASDPROC-205-R4
Issuing Authority: LSASD Field Branch Chief	
Effective Date: June 22, 2020	Review Due Date: June 22, 2023

Purpose

This procedure is to be used by Region 4 Laboratory Services and Applied Science Division staff . This document describes general and specific procedures, methods and considerations to be used and observed when cleaning and decontaminating sampling equipment during the course of field investigations. This procedure is to be used by all Region 4 Laboratory Services and Applied Science Division (LSASD) staff.

Scope/Application

The procedures contained in this document are to be followed when field cleaning sampling equipment, for both re-use in the field, as well as used equipment being returned to the Field Equipment Center (FEC). On the occasion that LSASD field investigators determine that any of the procedures described in this section are either inappropriate, inadequate or impractical and that other procedures must be used to clean or decontaminate sampling equipment at a particular site, the variant procedure will be documented in the field logbook, along with a description of the circumstances requiring its use. Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use.

TABLE OF CONTENTS

1 General Information

1.1 Documentation/Verification

This procedure was prepared by persons deemed technically competent by LSASD management, based on their knowledge, skills and abilities and have been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the LSASD Local Area Network (LAN). The Document Control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on LAN and for maintaining records of review conducted prior to its issuance.

1.2 Definitions

- Decontamination: The process of cleaning dirty sampling equipment to the degree to which it can be re-used, with appropriate QA/QC, in the field.

- Deionized water: Tap water that has been treated by passing through a standard deionizing resin column. At a minimum, the finished water should contain no detectable heavy metals or other inorganic compounds (i.e., at or above analytical detection limits) as defined by a standard inductively coupled Argon Plasma Spectrophotometer (ICP) (or equivalent) scan. Deionized water obtained by other methods is acceptable, as long as it meets the above analytical criteria. Organic-free water may be substituted for deionized water.

- Detergent shall be a standard brand of phosphate-free laboratory detergent such as Liquinox® or Luminox®. Liquinox® is a traditional anionic laboratory detergent and is used for general cleaning and where there is concern for the stability of the cleaned items in harsher cleaners. Luminox® is a specialized detergent with the capability of removing oils and organic contamination. It is used in lieu of a solvent rinse step in cleaning of equipment for trace contaminant sampling. Where not specified in these procedures, either detergent is acceptable.

- Drilling Equipment: All power equipment used to collect surface and sub-surface soil samples or install wells. For purposes of this procedure, direct push is also included in this definition.

- Field Cleaning: The process of cleaning dirty sampling equipment such that it can be returned to the FEC in a condition that will minimize the risk of transfer of contaminants from a site.

- Organic-free water: Tap water that has been treated with activated carbon and deionizing units. At a minimum, the finished water must meet the analytical criteria of deionized water and it should contain no detectable pesticides, herbicides, or extractable organic compounds, and no volatile organic compounds above minimum detectable levels as determined by the Region 4 laboratory for a given set of analyses. Organic-free water obtained by other methods is acceptable, as long as it meets the above analytical criteria.

- Tap water: Water from any potable water supply. Deionized water or organic-free water may be substituted for tap water.

1.3 General Precautions

1.3.1 Safety

Proper safety precautions must be observed when field cleaning or decontaminating dirty sampling equipment. Refer to the LSASD Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASPs) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate. At a minimum, the following precautions should be taken in the field during these cleaning operations:

- When conducting field cleaning or decontamination using laboratory detergent, safety glasses with splash shields or goggles, and latex gloves will be worn.

- No eating, smoking, drinking, chewing, or any hand to mouth contact should be permitted during cleaning operations.

1.3.2 Procedural Precaution

Prior to mobilization to a site, the expected types of contamination should be evaluated to determine if the field cleaning and decontamination activities will generate rinses and other waste waters that might be considered RCRA hazardous waste or may require special handling.

2 Introduction to Field Equipment Cleaning and Decontamination

2.1 General

The procedures outlined in this document are intended for use by field investigators for cleaning and decontaminating sampling and other equipment in the field. These procedures should be followed in order that equipment is returned to the FEC in a condition that will minimize the risk of transfer of contaminants from a site.

Sampling and field equipment cleaned in accordance with these procedures must meet the minimum requirements for the Data Quality Objectives (DQOs) of the study or investigation. If deviations from these procedures need to be made during the course of the field investigation, they will be documented in the field logbook along with a description of the circumstances requiring the use of the variant procedure.

Cleaning procedures for use at the Field Equipment Center (FEC) are found in LSASD Operating Procedure for Equipment Cleaning and Decontamination at the FEC (LSASDPROC-206).

2.2 Handling Practices and Containers for Cleaning Solutions

Improperly handled cleaning solutions may easily become contaminated. Storage and application containers must be constructed of the proper materials to ensure their integrity. Following are acceptable materials used for containing the specified cleaning solutions:

- Detergent must be kept in clean plastic, metal, or glass containers until used. It should be poured directly from the container during use.

- Tap water may be kept in tanks, hand pressure sprayers, squeeze bottles, or applied directly from a hose.

- Deionized water must be stored in clean, glass or plastic containers that can be closed for transport. It can be applied from plastic squeeze bottles.

- Organic-free water must be stored in clean glass or Teflon® containers prior to use. It may be applied using Teflon® squeeze bottles, or with the portable system.

2.3 Disposal of Cleaning Solutions

Procedures for the safe handling and disposition of investigation derived waste (IDW); including used wash water and rinse water are in LSASD Operating Procedure for Management of Investigation Derived Waste (LSASDPROC-202).

2.4 Sample Collection Equipment Contaminated with Concentrated Materials

Equipment used to collect samples of concentrated materials from investigation sites must be field cleaned before returning from the study. At a minimum, this should consist of washing with detergent and rinsing with tap water. When the above procedure cannot be followed, the following options are acceptable:

- Leave with facility for proper disposal;

- If possible, containerize, seal, and secure the equipment and leave on-site for later disposal;

- Containerize, bag, or seal the equipment so that no odor is detected and return to the Field Equipment Center.

It is the project leader's responsibility to evaluate the nature of the sampled material and determine the most appropriate cleaning procedures for the equipment used to sample that material.

2.5 Sample Collection Equipment Contaminated with Environmental Media

Equipment used to collect samples of environmental media from investigation sites should be field cleaned before returning from the study. Based on the condition of the sampling equipment, one or more of the following options must be used for field cleaning:

- Wipe the equipment clean;

- Water-rinse the equipment;

- Wash the equipment in detergent and water followed by a tap water rinse.

- For grossly contaminated equipment, the procedures set forth in Section 2.4 must be followed.

Under extenuating circumstances such as facility limitations, regulatory limitations, or during residential sampling investigations where field cleaning operations are not feasible, equipment can be containerized, bagged or sealed so that no odor is detected and returned to the FEC without being field cleaned. If possible, FEC personnel should be notified that equipment will be returned without being field cleaned. It is the project leader's responsibility to evaluate the nature of the sampled material and determine the most appropriate cleaning procedures for the equipment used to sample that material.

2.6 Handling of Decontaminated Equipment

After decontamination, equipment should be handled only by personnel wearing clean gloves to prevent re-contamination. In addition, the equipment should be moved away (preferably upwind) from the decontamination area to prevent re-contamination. If the equipment is not to be immediately re-used, it should be covered with plastic sheeting or wrapped in aluminum foil to prevent re-contamination. The area where the equipment is kept prior to re-use must be free of contaminants.

3 Field Equipment Decontamination Procedures

3.1 General

Sufficient equipment should be transported to the field so that an entire study can be conducted without the need for decontamination. When equipment must be decontaminated in the field, the following procedures are to be utilized.

Note: Equipment utilized for PFAS sampling will not cleaned in the field.

3.2 Specifications for Decontamination Pads

Decontamination pads constructed for field cleaning of sampling and drilling equipment should meet the following minimum specifications:

- The pad should be constructed in an area known or believed to be free of surface contamination.
- The pad should not leak.
- If possible, the pad should be constructed on a level, paved surface and should facilitate the removal of wastewater. This may be accomplished by either constructing the pad with one corner lower than the rest, or by creating a sump or pit in one corner or along one side. Any sump or pit should also be lined.
- Sawhorses or racks constructed to hold equipment while being cleaned should be high enough above ground to prevent equipment from being splashed.
- Water should be removed from the decontamination pad frequently.
- A temporary pad should be lined with a water impermeable material with no seams within the pad. This material should be either easily replaced (disposable) or repairable.

At the completion of site activities, the decontamination pad should be deactivated. The pit or sump should be backfilled with the appropriate material designated by the site project leader, but only after all waste/rinse water has been pumped into containers for disposal. See LSASD Operating Procedure for Management of Investigation Derived Waste (LSASDPROC-202) for proper handling and disposal of these materials. If the decontamination pad has leaked excessively, soil sampling may be required.

3.3 "Classical Parameter" Sampling Equipment

"Classical Parameters" are analyses such as oxygen demand, nutrients, certain inorganic compounds, sulfide, flow measurements, etc. For routine operations involving classical parameter analyses, water quality sampling equipment such as Kemmerers, buckets, dissolved oxygen dunkers, dredges, etc., may be cleaned with the sample water or tap water between sampling locations as appropriate.

Flow measuring equipment such as weirs, staff gages, velocity meters, and other stream gauging equipment may be cleaned with tap water between measuring locations, if necessary.

Note: The procedures described in Section 3.3 are not to be used for cleaning field equipment to be used for the collection of samples undergoing trace organic or inorganic constituent analyses.

3.4 Sampling Equipment used for the Collection of Trace Organic and Inorganic Compounds

For samples undergoing trace organic or inorganic constituent analyses, the following procedures are to be used for all sampling equipment or components of equipment that come in contact with the sample:

3.4.1 Standard LSASD Method

- An optional Liquinox® detergent wash step may be useful to remove gross dirt and soil.
- Clean with tap water and Luminox® detergent using a brush, if necessary, to remove particulate matter and surface films.
- Rinse thoroughly with tap water.
- Rinse thoroughly with organic-free water and place on a clean foil-wrapped surface to **a**ir-dry.
- Wrap the dry equipment with aluminum foil or bag in clean plastic. If the equipment is to be stored overnight before it is wrapped in foil, it should be covered and secured with clean, unused plastic sheeting.

3.4.2 Alternative Solvent Rinse Method

The historical solvent rinse method of cleaning equipment for trace contaminant sampling remains an acceptable method.

- Clean with tap water and Liquinox® detergent using a brush, if necessary, to remove particulate matter and surface films. Equipment may be steam cleaned (Liquinox® detergent and high-pressure hot water) as an alternative to brushing. Sampling equipment that is steam cleaned should be placed on racks or saw horses at least two feet above the floor of the decontamination pad. PVC or plastic items should not be steam cleaned.

- Rinse thoroughly with tap water.

- Rinse thoroughly with deionized water.
- Rinse with an appropriate solvent (generally isopropanol).
- Rinse with organic-free water and place on a clean foil-wrapped surface to **a**ir-dry.
- Wrap the dry equipment with aluminum foil or plastic. If the equipment is to be stored overnight before it is wrapped, it should be covered and secured with clean, unused plastic sheeting.

3.5 Well Sounders or Tapes

The following procedures are recommended for decontaminating well sounders (water level indicators) and tapes. Unless conditions warrant, it is only necessary to decontaminate the wetted portion of the sounder or tape.

- Wash with Liquinox® detergent and tap water.
- Rinse with tap water.
- Rinse with deionized water.

3.6 Redi-Flo2® Pump

CAUTION – Do not wet the controller. Always disconnect power from the pump when handling the pump body.

The Redi-Flo2® pump and any associated connected hardware (e.g., check valve) should be decontaminated between each monitoring well. The following procedures are required, depending on whether the pump is used solely for purging or used for purging and sampling.

3.6.1 Purge Only (Pump and Wetted Portion of Tubing or Hose)

- Disconnect power and wash exterior of pump and wetted portion of the power lead and tubing or hose with Liquinox® detergent and water solution.
- Rinse with tap water.
- Final rinse with deionized water.
- Place pump and reel in a clean plastic bag and keep tubing or hose contained in clean plastic or galvanized tub between uses.

3.6.2 Purge And Sample

Grundfos Redi-Flo2® pumps are extensively decontaminated and tested at the FEC to prevent contamination from being transmitted between sites. The relevant sections of LSASDPROC-206, *Field Equipment Cleaning and Decontamination at the FEC,* should be implemented in the field where a high risk of cross-contamination exists, such as where NAPL or high-concentration contaminants occur. In most cases, the abbreviated cleaning procedure described below will suffice, provided that sampling proceeds from least to most contaminated areas.

- Disconnect and discard the previously used sample tubing from the pump. Remove the check valve and tubing adapters and clean separately (See Section 3.6.3 for check valve). Wash the pump exterior with detergent and water.

- Prepare and fill three containers with decontamination solutions, consisting of Container #1, a tap water/detergent washing solution. Luminox® is commonly used. An additional pre-wash container of Liquinox® may be used; Container #2, a tap water rinsing solution; and Container #3, a deionized or organic-free water final rinsing solution. Choice of detergent and final rinsing solution for all steps in this procedure is dependent upon project objectives (analytes and compounds of interest). The containers should be large enough to hold the pump and one to two liters of solution. An array of 2' long 2" PVC pipes with bottom caps is a common arrangement. The solutions should be changed at least daily.

- Place the pump in Container #1. Turn the pump on and circulate the detergent and water solution through the pump and then turn the pump off.

- Place the pump in Container #2. Turn the pump on and circulate the tap water through the pump and then turn the pump off.

- Place the pump in Container #3. Turn the pump on and circulate deionized or organic-free water through the pump and then turn the pump off.

- Disconnect power and remove pump from Container #3. Rinse exterior and interior of pump with fresh deionized or organic-free water.

- Decontaminate the power lead by washing with detergent and water, followed by tap water and deionized water rinses. This step may be performed before washing the pump if desired.

- Reassemble check valve and tubing adapters to pump. ALWAYS use Teflon® tape to prevent galling of threads. Firm hand-tightening of fittings or light wrench torque is generally adequate.

- Place the pump and reel in a clean plastic bag.

3.6.3 Redi-Flo2® Ball Check Valve

- Remove the ball check valve from the pump head. Check for wear and/or corrosion, and replace as needed. During decontamination check for free-flow in forward direction and blocking of flow in reverse direction.

- Using a brush, scrub all components with detergent and tap water.

- Rinse with deionized water.
- Rethread the ball check valve to the Redi-Flo2® pump head.

3.7 Mega-Monsoon® and GeoSub® Electric Submersible Pump

As these pumps have lower velocities in the turbine section and are easier to disassemble in the field than Grundfos pumps, the outer pump housing should be removed to expose the impeller for cleaning prior to use and between each use when used as a sampling pump for trace contaminant sampling.

- Remove check valves and adapter fittings and clean separately.
- Remove the outer motor housing by holding the top of the pump head and unscrewing the outer housing from its O-ring sealed seat.
- Clean all pump components per the provisions of section 3.4. Use a small bottle brush for the pump head passages
- Wet the O-ring(s) on the pump head with organic-free water. Reassemble the outer pump housing to the pump head.
- Clean cable and reel per Section 3.4.
- Conduct final rinse of pump with organic-free water over pump and through pump turbine.

3.8 Bladder Pumps

Bladder pumps are presumed to be intended for use as low flow purge-and-sample pumps. The Geotech® bladder pump and Geoprobe Systems® mechanical bladder pump can be cleaned similarly.

- Discard any tubing returned with the pump.
- Completely disassemble the pump, being careful to note the initial position of and retain any springs and loose ball checks.
- Discard pump bladder.
- Clean all parts as per the standard cleaning procedure in Section 3.4.
- Install a new Teflon® bladder and reassemble pump.

3.9 Downhole Drilling Equipment

While LSASD does not currently operate drilling equipment, LSASD personnel do oversee and specify drilling operations. The following procedures are to be used for drilling activities involving the collection of soil samples for trace organic and inorganic constituent analyses and for the construction of monitoring wells to be used for the collection of groundwater samples for trace organic and inorganic constituent analyses.

3.9.1 Introduction

Cleaning and decontamination of all equipment should occur at a designated area (decontamination pad) on the site. The decontamination pad should meet the specifications of Section 3.2 of this procedure.

Tap water brought on the site for drilling and cleaning purposes should be contained in a pre-cleaned tank.

A steam cleaner and/or high pressure hot water washer capable of generating a pressure of at least 2500 PSI and producing hot water and/or steam, with a detergent compartment, should be obtained.

3.9.2 Preliminary Cleaning and Inspection

Drilling equipment should be clean of any contaminants that may have been transported from off-site to minimize the potential for cross-contamination. The drilling equipment should not serve as a source of contaminants. Associated drilling and decontamination equipment, well construction materials, and equipment handling procedures should meet these minimum specified criteria:

- All downhole augering, drilling, and sampling equipment should be sandblasted before use if painted, and/or there is a buildup of rust, hard or caked matter, etc., that cannot be removed by steam cleaning (detergent and high pressure hot water), or wire brushing. Sandblasting should be performed prior to arrival on site, or well away from the decontamination pad and areas to be sampled.

- Any portion of the drilling equipment that is over the borehole (kelly bar or mast, backhoe buckets, drilling platform, hoist or chain pulldowns, spindles, cathead, etc.) should be steam cleaned (detergent and high pressure hot water) and wire brushed (as needed) to remove all rust, soil, and other material which may have come from other sites before being brought on site.

- Printing and/or writing on well casing, tremie tubing, etc., should be removed before use. Emery cloth or sand paper can be used to remove the printing and/or writing. Most well material suppliers can provide materials without the printing and/or writing if specified when ordered. Items that cannot be cleaned are not acceptable and should be discarded.

- Equipment associated with the drilling and sampling activities should be inspected to insure that all oils, greases, hydraulic fluids, etc., have been removed, and all seals and gaskets are intact with no fluid leaks.

3.9.3 Drill Rig Field Cleaning Procedure

Any portion of the drill rig, backhoe, etc., that is over the borehole (kelly bar or mast, backhoe buckets, drilling platform, hoist or chain pulldowns, spindles, cathead, etc.) should be steam cleaned (detergent and high pressure hot water) between boreholes.

3.9.4 Field Decontamination Procedure for Drilling Equipment

The following is the standard procedure for field cleaning augers, drill stems, rods, tools, and associated equipment. This procedure does not apply to well casings, well screens, or split-spoon samplers used to obtain samples for chemical analyses, which should be decontaminated as outlined in Section 3.4 of this procedure.

- Wash with tap water and detergent, using a brush if necessary, to remove particulate matter and surface films. Steam cleaning (high pressure hot water with detergent) may be necessary to remove matter that is difficult to remove with the brush. Drilling equipment that is steam cleaned should be placed on racks or saw horses at least two feet above the floor of the decontamination pad. Hollow-stem augers, drill rods, etc., that are hollow or have holes that transmit water or drilling fluids, should be cleaned on the inside with vigorous brushing.

- Rinse thoroughly with tap water.

- Remove from the decontamination pad and cover with clean, unused plastic if not used immediately. If stored overnight, the plastic should be secured to ensure that it stays in place.

3.9.5 Field Decontamination Procedure for Direct Push Technology (DPT) Equipment

- Certain specific procedures for the decontamination of DPT tools are described in the various sampling procedures, but the following general guidelines apply:

- Prior to return to the Field Equipment Center, all threaded tool joints should be broken apart and the equipment cleaned per the provisions of *Section 2.5, Sample Collection Equipment Contaminated with Environmental Media* of this procedure.

- Equipment that contacts the sample media and is cleaned in the field for reuse should be cleaned per the provisions of *Section 3.4, Sampling Equipment used for the Collection of Trace Organic and Inorganic Compounds* of this procedure. This would include piston sampler points and shoes, screen point sampler screens and sheaths, and the drive rods when used for groundwater sampling.

- Equipment that does not directly contact the sample media and is cleaned in the field for reuse can generally be cleaned per the provisions of Section *3.7.4, Field Decontamination Procedure for Drilling Equipment* of this procedure.

- Stainless steel SP15/16 well screens require special care as the narrow slots are difficult to clean under even controlled circumstances and galvanic corrosion can release chrome from the screen surface. As soon as possible after retrieval, the screen slots should be sprayed from the outside to break loose as much material as possible before it can dry in place. To prevent galvanic corrosion, the screens must be segregated from the sampler sheaths, drive rods, and other carbon steel during return transport from the field.

3.10 Rental Pumps

Completing a groundwater sampling project may require the use of rental pumps. Rental pumps are acceptable where they are of suitable stainless steel and Teflon® construction. These pumps should be cleaned prior to use using the procedures specified herein and a rinse-blank collected prior to use.

4 References

LSASD Operating Procedure for Management of Investigation Derived Waste, LSASDPROC-202, Most Recent Version

LSASD Operating Procedure for Equipment Cleaning and Decontamination at the FEC, LSASDPROC-206, Most Recent Version

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 LSASD, Athens, GA, Most Recent Version

Revision History

The top row of this table shows the most recent changes to this controlled document. For previous revision history information, archived versions of this document are maintained by the LSASD Document Control Coordinator on the LSASD local area network (LAN).

History	Effective Date
LSASDPROC-205-R4, *Field Equipment Cleaning and Decontamination,* replaces SESDPROC-205-R3 **General:** Updated format, Division and Branch names and naming conventions post agency re-alignment. Section 3.1: Added note that PFAS sampling equipment will not be cleaned in the field. Clarified in Section 3.9 that LSASD does not performing drilling activities.	June 22, 2020
SESDPROC-205-R3, *Field Equipment Cleaning and Decontamination*, replaces SESDPROC-205-R2. **Cover Page:** The author was changed to Brian Striggow. LSASD's reorganization was reflected in the authorization section by making John Deatrick the Chief of the Field Services Branch. The FQM was changed from Bobby Lewis to Hunter Johnson. **Revision History:** Changes were made to reflect the current practice of only including the most recent changes in the revision history. **General:** Corrected any typographical, grammatical and/or editorial errors. **Section 1.4:** Differentiate between Liquinox® and Luminox® detergents. **Section 3.4:** Restore solvent rinse as alternative cleaning method. **Section 3.7:** Added section on cleaning of 12 Volt electric submersible pumps. **Section 3.8:** Added section on cleaning of bladder pumps. **Section 3.9:** Added language on cleaning and transport of SP15/16 screens **Section 3.10:** Added section on cleaning of rental pumps	December 18, 2015
SESDPROC-205-R2, *Field Equipment Cleaning and Decontamination*, replaces SESDPROC-205-R1.	December 20, 2011
SESDPROC-205-R1, *Field Equipment Cleaning and Decontamination*, replaces SESDPROC-205-R0.	November 1, 2007

SESDPROC-205-R0, *Field Equipment Cleaning and Decontamination*, Original Issue	February 05, 2007

Region 4 U.S. Environmental Protection Agency Laboratory Services & Applied Science Division Athens, Georgia	
Operating Procedure	
Title: Groundwater level and well depth measurement	ID: LSASDPROC-105-R5
Issuing Authority: Field Services Branch Supervisor	
Effective Date: April 22, 2023	Review Due Date: May 14, 2024
Method Reference: N/A	SOP Author: Michael Roberts

Purpose

This document describes general and specific procedures, methods and considerations to be used and observed when determining water levels and depths of wells.

Scope/Application

The procedures contained in this document are to be used by field investigators to measure water levels and depths of wells. On the occasion that LSASD field investigators determine that any of the procedures described in this section are either inappropriate, inadequate or impractical and that another procedure must be used for water level or depth determination, the variant procedure(s) will be documented in the field logbook and the subsequent investigation report, along with a description of the circumstances requiring its use

TABLE OF CONTENTS

1 General Information

1.1 Documentation/Verification

This procedure was prepared by persons deemed technically competent by LSASD management, based on their knowledge, skills and abilities and has been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the LSASD Local Area Network. The Document Control Coordinator is responsible for ensuring the most recent version of the procedure is placed on the LAN and for maintaining records of review conducted prior to its issuance.

1.2 General Precautions

1.2.1 Safety

Proper safety precautions must be observed when measuring water levels in wells and determining their depths. Refer to the LSASD Safety, Health and Environmental Management Program Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASPs) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.2.2 Procedural Precautions

The following precautions should be considered when measuring water levels and depths of wells:

- Special care must be taken to minimize the risk of cross-contamination between wells when conducting water level and depth measurements. This is accomplished primarily by decontaminating the sounders or other measuring devices between wells, according to LSASD Operating Procedure for Field Equipment Cleaning and Decontamination, (LSASDPROC-205) and maintaining the sounders in clean environment while in transit between wells.
- Water levels and well depths measured according to these procedures should be recorded in a bound logbook dedicated to the project as per LSASD Operating Procedure for Logbooks (LSASDPROC-010). Serial numbers, property numbers or other unique identification for the water level indicator or sounder must also be recorded.

2 Quality Control Issues

There are several specific quality control issues pertinent to conducting water level and depth measurements at wells. These are:

- Devices used to measure groundwater levels should be verified annually against a National Institute of Standards and Technology (NIST) traceable measuring tape. These devices should check to within 0.01 feet per 10 feet of length with an allowable error of 0.03 feet in the first 30 feet. Before each use, these devices should be prepared according to the manufacturer's instructions (if appropriate) and checked for obvious damage. All verification and maintenance data should be documented electronically or recorded in a logbook maintained at the Field Equipment Center (FEC) as per the LSASD Operating Procedure for Equipment Inventory and Management (LSASDPROC-108). The functional check and tape length verification should be performed according to the instructions included in LSASDFORM-043, *Well Sounder Function Check and Verification,* which also includes the form for recording the required information.

- These devices should be decontaminated according to the procedures specified in LSASD Operating Procedure for Field Equipment Cleaning and Decontamination (LSASDPROC-205) prior to use at the next well.

3 Water Level and Depth Measurement Procedures

3.1 General

The measurement of the groundwater level in a well is frequently conducted in conjunction with ground water sampling to determine the phreatic water surface. This potentiometric surface measurement can be used to establish ground water direction and gradients. Groundwater level and well depth measurements are needed to determine the volume of water or drawdown in the well casing for proper purging.

All groundwater level and well depth measurements should be made relative to an established reference point on the well casing and should be documented in the field records. This reference point is usually identified by the well installer using a permanent marker for PVC wells, or by notching the top of casing with a chisel for stainless steel wells. By convention, this marking is usually placed on the north side of the top of casing. If no mark is apparent, the person performing the measurements should take both water level and depth measurements from the north side of the top of casing and note this procedure in the field log book.

To be useful for establishing groundwater gradient, the reference point should be tied in with the NAVD88 (North American Vertical Datum of 1988) or a local datum. For an isolated group of wells, it is acceptable to use an arbitrary datum common to all wells in that group.

Water levels should be allowed to equilibrate prior to measurement after removing sealing caps. There are no set guidelines and appropriate equilibration times can range from minutes to hours depending on well recharge, local geology and topography, and project objectives.

3.2 Specific Groundwater Level Measurement Techniques

Measuring the depth to the phreatic ground water surface can be accomplished by the following methods. Method accuracies are noted for each of the specific methods described below.

- Electronic Water Level Indicators – These types of instruments consist of a spool of dual conductor wire, a probe attached to the end and an indicator. When the probe comes in contact with the water, the circuit is closed and a meter light and/or audible buzzer attached to the spool will signal contact. Penlight or 9-volt batteries are normally used as a power source. Measurements should be made and recorded to the nearest 0.01 foot.

- Other Methods – There are other types of water level indicators and recorders available on the market, such as weighted steel tape, chalked tape, sliding float method, air line pressure method and automatic recording methods. These methods are primarily used for closed systems or permanent monitoring wells. Acoustic water level indicators are also available which measure water levels based on the measured return of an emitted acoustical impulse. Accuracies for these methods vary and should be evaluated before selection. Any method not capable of providing measurements to within 0.1 foot should not be used.

3.3 Special Considerations for Water Level Measurements at Sites with Shallow Groundwater Gradient

Groundwater gradients at some sites can be very shallow and if gradient and groundwater flow pattern (gradient direction) determination are part of the project objectives, it is critical that groundwater level measurements obtained from wells are as accurate as possible. Special care should be taken to allow the water level to equilibrate after removing sealing caps and the same sounder should be used for all measurements, if possible. The sounding activity should be coordinated to allow all wells to be sounded within the minimum possible time. This is particularly important in areas with potential tidal influences.

3.4 Total Well Depth Measurement Techniques

The well sounder, weighted tape or electronic water level indicators can be used to determine the total well depth. This is accomplished by lowering the tape or cable until the weighted end is felt resting on the bottom of the well. Because of tape buoyancy and weight effects encountered in deep wells with long water columns, it may be difficult to determine when the tape end is touching the bottom of the well and sediment in the bottom of the well can also make it difficult to determine total depth. Care must be taken in these situations to ensure accurate measurements. The operator may find it easier to allow the weight to touch bottom and then detect the ‘tug’ on the tape while lifting the weight off the well bottom. All total depth measurements must be made and recorded to the nearest 0.1 foot. As a cautionary note, when measuring well depths with the electronic water level indicators, the person performing the measurement must measure and add the length of the probe beneath the circuit closing electrodes to the depth measured to obtain the true depth. This is necessary because the tape distance markings are referenced to the electrodes, rather than the end

of the probe. For electronic sounders maintained at the LSASD FEC, the sounder reel will be marked with the appropriate additional length identified as the 'TD adder'.

3.5 Equipment Available

The following equipment is available for ground water level and total depth measurements:

- Weighted steel measuring tapes
- Electronic water level indicators

4 Establishment of Top of Casing Elevations

To establish groundwater surface elevations, the measured distance from the top of casing to the water surface is subtracted from the well top of casing (TOC) elevation. Obtaining accurate TOC elevations is crucial to developing an accurate groundwater surface elevation map and determination of groundwater flow direction.

The only acceptable means of surveying well TOC elevations is differential leveling conducted to third order standards. Third order differential leveling has allowable error defined by the following formula:

$$AAAAAAoowwwwwwAAww\ EEEEEEooEE\ (ffff) = 0.05 \times \sqrt{SSSSEESSwwSS\ Lloooolll\ Lhwlllffh\ (mmmmmAAwwmm)}$$

This work must be conducted with an auto level as the leveling instrument. Surveying TOC elevations with a total station or survey-grade GPS will not provide the requisite accuracy.

When adding wells to a monitoring network, it is permissible to tie the new well elevations to the known TOC elevations of existing wells in the network. The elevations of several wells in the existing network should be checked to assure that the relative differences in elevation match the recorded elevation data.

Generally, the ground surface elevations at each well should be surveyed at the same time.

5 References

LSASD Operating Procedure for Equipment Inventory and Management, LSASDPROC-108, Most Recent Version

LSASD Operating Procedure for Field Equipment Cleaning and Decontamination, LSASDPROC-205, Most Recent Version

LSASD Operating Procedure for Logbooks, LSASDPROC-010, Most Recent Version

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region LSASD, Athens, GA, Most Recent Version

6 Revision History

The top row of this table shows the most recent changes to this controlled document. For previous revision history information, archived versions of this document are maintained by the LSASD Document Control Coordinator on the LSASD local area network (LAN).

History	Effective Date
Replaced Chief with Supervisor	April 22, 2023
LSASDPROC-105-R4, *Groundwater Level and Well Depth Measurement*, replaces SESDPROC-105-R3 **General:** Corrected any typographical, grammatical, and/or editorial errors. Updated document template and naming convention. Changed references to SESD to LSASD and FSB to ASB due to organizational name changes from Agency re-alignment. Reformatted and updated naming convention.	May 15, 2020
SESDPROC-105-R3, *Groundwater Level and Well Depth Measurement*, replaces SESDPROC-105-R2 **General:** Corrected any typographical, grammatical, and/or editorial errors. **Title Page:** Author changed from Tim Simpson to Brian Striggow. Changed the Field Quality Manager from Bobby Lewis to Hunter Johnson. Updated cover page to represent LSASD reorganization. John Deatrick was not listed as the Supervisor of the Applied Services Branch **Section 4:** Added section on the Establishment of Well Top of Casing Elevations.	November 3, 2016
SESDPROC-105-R2, *Groundwater Level and Well Depth Measurement*, replaces SESDPROC-105-R1	January 29, 2013
SESDPROC-105-R1, *Groundwater Level and Well Depth Measurement*, replaces SESDPROC-105-R0	November 1, 2007
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Region 4 U.S. Environmental Protection Agency Laboratory Services & Applied Science Division Athens, Georgia	
Operating Procedure	
Title: Soil Sampling	ID: LSASDPROC-300-R5
Issuing Authority: Field Services Branch Supervisor	
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Purpose

This document describes general and specific procedures, methods and considerations to be used and observed when collecting soil samples for field screening or laboratory analysis.

Scope/Application

The procedures contained in this document are to be used by field personnel when collecting and handling soil samples in the field. On the occasion that LSASD field personnel determine that any of the procedures described in this section are inappropriate, inadequate or impractical and that another procedure must be used to obtain a soil sample, the variant procedure will be documented in the field logbook and subsequent investigation report, along with a description of the circumstances requiring its use. Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use.

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1 General Information

1.1 Documentation/Verification

This procedure was prepared by persons deemed technically competent by LSASD management, based on their knowledge, skills and abilities and have been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the LSASD local area network (LAN). The QAC is responsible for ensuring the most recent version of the procedure is placed on the LAN, and for maintaining records of review conducted prior to its issuance.

1.2 General Precautions

1.2.1 Safety

Proper safety precautions must be observed when collecting soil samples. Refer to the LSASD Safety and Occupational Health Manual and any pertinent site-specific Health and Safety Plans (HASP) and Job Hazard Assessments for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. The reader should address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.2.2 Procedural Precautions

The following precautions should be considered when collecting soil samples:

- Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.
- Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.
- If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.
- Shipped samples shall conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179), and/or International Air Transportation Association (IATA) hazardous materials shipping requirements found in the current edition of IATA's Dangerous Goods Regulations.
- Documentation of field sampling is done in a bound logbook.

- Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.
- All shipping documents, such as air bills, bills of lading, etc., shall be retained by the project leader in the project files. (Air bills are generated online via UPS Campusship program and package tracking is done online). Receipts are not always received at time of shipping.
- Sampling in landscaped areas: Cuttings should be placed on plastic sheeting and returned to the borehole upon completion of the sample collection. Any 'turf plug' generated during the sampling process should be returned to the borehole.
- Sampling in non-landscaped areas: Return any unused sample material back to the auger, drill or push hole from which the sample was collected.

2 Special Sampling Considerations

2.1 Special Precautions for Trace Contaminant Soil Sampling

- A clean pair of new, non-powdered, disposable gloves will be worn each time a different sample is collected and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised.
- Sample containers with samples suspected of containing high concentrations of contaminants shall be handled and stored separately.
- All background samples shall be segregated from obvious high-concentration or waste samples. Sample collection activities shall proceed progressively from the least suspected contaminated area to the most suspected contaminated area. Samples of waste or highly-contaminated media must not be placed in the same ice chest as environmental (i.e., containing low contaminant levels) or background samples.
- If possible, one member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other member(s) collect the samples.
- Samplers must use new, verified/certified-clean disposable or non-disposable equipment cleaned according to procedures contained in the LSASD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205), for collection of samples for trace metals or organic compound analyses.

2.2 Sample Homogenization

1. If sub-sampling of the primary sample is to be performed in the laboratory, transfer the entire primary sample directly into an appropriate, labeled sample container(s). Proceed to step 4.

2. If sub-sampling the primary sample in the field or compositing multiple primary samples in the field, place the sample into a glass or stainless steel homogenization container and mix thoroughly. Each aliquot of a composite sample should be of the same approximate volume.

3. All soil samples must be thoroughly mixed to ensure that the sample is as representative as possible of the sample media. ***Samples for VOC analysis are not homogenized.*** The most common method of mixing is referred to as quartering. The quartering procedure should be performed as follows:

   - The material in the sample pan should be divided into quarters and each quarter should be mixed individually.
   - Two quarters should then be mixed to form halves.
   - The two halves should be mixed to form a homogenous matrix.

   This procedure should be repeated several times until the sample is adequately mixed. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the material in a circular fashion, reversing direction, and occasionally turning the material over.

4. Place the sample into an appropriate, labeled container(s) by using the alternate shoveling method and secure the cap(s) tightly. The alternate shoveling method involves placing a spoonful of soil in each container in sequence and repeating until the containers are full or the sample volume has been exhausted. Threads on the container and lid should be cleaned to ensure a tight seal when closed.

2.3 Dressing Soil Surfaces

Any time a vertical or near vertical surface is sampled, such as achieved when shovels or similar devices are used for subsurface sampling, the surface should be dressed (scraped) to remove smeared soil. This is necessary to minimize the effects of contaminant migration interferences due to smearing of material from other levels.

2.4 Quality Control

If possible, a control sample should be collected from an area not affected by the possible contaminants of concern and submitted with the other samples. This control sample should be collected as close to the sampled area as possible and from the same soil type. Equipment blanks should be collected if equipment is field cleaned and re-used on-site or if necessary to document that low-level contaminants were not introduced by sampling tools. LSASD Operating Procedure for Field Sampling Quality Control (SESDPROC-011) contains other procedures that may be applicable to soil sampling investigations.

2.5 Records

Field notes, recorded in a bound field logbook, as well as chain-of-custody documentation will be generated as described in the LSASD Operating Procedure for Logbooks (SESDPROC-010) and the LSASD Operating Procedure for Sample and Evidence Management (SESDPROC-005).

3 Samples Collected for Volatile Organic Compounds (VOC) or for Per- and Polyfluoroalkyl Substances (PFAS) Analyses

3.1 Soil Samples Collected for Volatile Organic Compounds (VOC) Analysis

The procedures outlined here are summarized from *Test Methods for Evaluating SolidWaste, Physical/Chemical Methods SW-846, Method 5035.*If samples are to be analyzed for VOCs, they should be collected in a manner that minimizes disturbance of the sample. For example, when sampling with an auger bucket, the sample for VOC analysis should be collected directly from the auger bucket (preferred) or from minimally disturbed material immediately after an auger bucket is emptied into the pan. The sample shall be containerized by filling an En Core® Sampler or other Method 5035 compatible container. ***Samples for VOC analysis are not homogenized.*** Preservatives may be required for some samples with certain variations of Method 5035. Consult the method or the principal analytical chemist to determine if preservatives are necessary.

3.2 Soil Sampling for VOCs (Method 5035)

The following sampling protocol is recommended for site investigators assessing the extent of VOCs in soils at a project site. Because of the large number of options

available, careful coordination between field and laboratory personnel is needed. The specific sampling containers and sampling tools required will depend upon the detection levels and intended data use. Once this information has been established, selection of the appropriate sampling procedure and preservation method best applicable to the investigation can be made.

3.2.1 Equipment

Soil for VOC analyses may be retrieved using any of the LSASD soil sampling methods described in Sections 4 through 8 of this procedure. Once the soil has been obtained, the En Core® Sampler, syringes, stainless steel spatula, standard 2- oz. soil VOC container, or pre-prepared 40 mL vials may be used/required for sub-sampling. The specific sample containers and the sampling tools required will depend upon the data quality objectives established for the site or sampling investigation. The various sub-sampling methods are described below.

3.2.2 Sampling Methodology - Low Concentrations (<200 µg/kg)

When the total VOC concentration in the soil is expected to be less than 200 µg/kg, the samples may be collected directly with the En Core® Sampler or syringe. If using the syringes, the sample must be placed in the sample container (40 mL pre-prepared vial) immediately to reduce volatilization losses. The 40 mL vials should contain 10 mL of organic-free water for an un-preserved sample or approximately 10 mL of organic-free water and a preservative. It is recommended that the 40 mL vials be prepared and weighed by the laboratory (commercial sources are available which supply preserved and tared vials). When sampling directly with the En Core® Sampler, the vial must be immediately capped and locked.

A soil sample for VOC analysis may also be collected with conventional sampling equipment. A sample collected in this fashion must either be placed in the final sample container (En Core® Sampler or 40 mL pre-prepared vial) immediately or the sample may be immediately placed into an intermediate sample container with no head space. If an intermediate container (usually 2-oz. soil jar) is used, the sample must be transferred to the final sample container (En Core® Sampler or 40 mL pre-prepared vial) as soon as possible, not to exceed 30 minutes.

NOTE:After collection of the sample into either the En Core® Sampler or other container, the sample must immediately be stored in an ice chest and cooled.

Soil samples may be prepared for shipping and analysis as follows:

En Core® Sampler - the sample shall be capped, locked, and secured in the original foil bag. All foil bags containing En Core® samplers are then placed in a plastic bag and sealed with custody tape, if required.

Syringe - Add about 3.7 cc (approximately 5 grams) of sample material to 40-mL pre-prepared containers. Secure the containers in a plastic bag. Do not use a custody seal on the container; place the custody seal on the plastic bag. Note: When using the syringes, it is important that no air is allowed to become trapped behind the sample prior to extrusion, as this will adversely affect the sample.

Stainless Steel Laboratory Spatulas - Add between 4.5 and 5.5 grams (approximate) of sample material to 40 mL containers. Secure the containers in a plastic bag. Do not use a custody seal on the container; place the custody seal on the plastic bag.

3.2.3 Sampling Methodology - High Concentrations (>200 µg/kg)

Based upon the data quality objectives and the detection level requirements, this high-level method may also be used. Specifically, the sample may be packed into a single 2-oz. glass container with a screw cap and septum seal. The sample container must be filled quickly and completely to eliminate head space. Soils\sediments containing high total VOC concentrations may also be collected as described in Section 3.2.2, Sampling Methodology - Low Concentrations, and preserved using 10 mL methanol.

3.2.4 Special Techniques and Considerations for Method 5035

Effervescence

If low concentration samples effervesce (rapidly form bubbles) from contact with the acid preservative, then either a test for effervescence must be performed prior to sampling, or the investigators must be prepared to collect each sample both preserved or un-preserved, as needed, or all samples must be collected unpreserved.

To check for effervescence, collect a test sample and add to a pre-preserved vial. If preservation (acidification) of the sample results in effervescence then preservation by acidification is not acceptable, and the sample must be collected un-preserved.

If effervescence occurs and only pre-preserved sample vials are available, the preservative solution may be placed into an appropriate hazardous waste container and the vials triple rinsed with organic free water. An appropriate amount of organic free water, equal to the amount of preservative solution, should be placed

into the vial. The sample may then be collected as an un-preserved sample. Note: the amount of organic free water placed into the vials will have to be accurately measured.

Sample Size

While this method is an improvement over earlier ones, field investigators must be aware of an inherent limitation. Because of the extremely small sample size and the lack of sample mixing, sample representativeness for VOCs may be reduced compared to samples with larger volumes collected for other constituents. The sampling design and objectives of the investigation should take this into consideration.

Holding Times

Sample holding times are specified in the Laboratory Services Branch *Laboratory Operations and Quality Assurance Manual* (ASBLOQAM), Most Recent Version. Field investigators should note that the holding time for an un-preserved VOC soil/sediment sample on ice is 48 hours. Arrangements should be made to ship the soil/sediment VOC samples to the laboratory by overnight delivery the day they are collected so the laboratory may preserve and/or analyze the sample within 48 hours of collection.

Percent Solids

Samplers must ensure that the laboratory has sufficient material to determine percent solids in the VOC soil/sediment sample to correct the analytical results to dry weight. If other analyses requiring percent solids determination are being performed upon the sample, these results may be used. If not, a separate sample (minimum of 2 oz.) for percent solids determination will be required. The sample collected for percent solids may also be used by the laboratory to check for preservative compatibility.

Safety

Methanol is a toxic and flammable liquid. Therefore, methanol must be handled with all required safety precautions related to toxic and flammable liquids. Inhalation of methanol vapors must be avoided. Vials should be opened and closed quickly during the sample preservation procedure. Methanol must be handled in a ventilated area. Use protective gloves when handling the methanol vials. Store methanol away from sources of ignition such as extreme heat or open flames. The vials of methanol should be stored in a cooler with ice at all times.

Shipping

Methanol and sodium bisulfate are considered dangerous goods, therefore shipment of samples preserved with these materials by common carrier is regulated by the U.S. Department of Transportation and the International Air Transport Association (IATA). The rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179) and the current edition of the IATA Dangerous Goods Regulations must be followed when shipping methanol and sodium bisulfate. Consult the above documents or the carrier for additional information. Shipment of the quantities of methanol and sodium bisulfate used for sample preservation falls under the exemption for small quantities.

The summary table on the following page lists the options available for compliance with SW846 Method 5035. The advantages and disadvantages are noted for each option. LASSD's goal is to minimize the use of hazardous material (methanol and sodium bisulfate) and minimize the generation of hazardous waste during sample collection.

Table 1: Method 5035 Summary

OPTION	PROCEDURE	ADVANTAGES	DISADVANTAGES
1	Collect two 40 mL vials with ≈ 5 grams of sample, and one 2 oz. glass jar w/septum lid for screening, % moisture and preservative compatibility.	Screening conducted by lab.	Presently a 48-hour holding time for unpreserved samples. Sample containers must be tared.
2	Collect three En Core® samplers, and one 2 oz. glass jar w/septum lid for screening, % solids.	Lab conducts all preservation/preparation procedures.	Presently a 48- hour holding time for preparation of samples.
3	Collect two 40 mL vials with 5 grams of sample and preserve w/methanol or sodium bisulfate, and one 2-oz. glass jar w/septum lid for screening, % solids .	High level VOC samples may be composited. Longer holding time.	Hazardous materials used in the field. Sample containers must be tared.
4	Collect one 2-oz. glass jar w/septum lid for analysis, % solids (high level VOC only).	Lab conducts all preservation/preparation procedures.	May have significant VOC loss.

3.3 Soil Samples for Per- and Polyfluoroalkyl Substances (PFAS) Analysis

Sources of PFAS contamination in soils can include direct discharges, direct applications of some PFAS products such as aqueous film-forming foams (AFFF), air deposition from manufacturing stack emissions, landfill leachate, and land applications of biosolids or effluents. The distribution of PFAS in soils is multifaceted and will be dependent on site-specific conditions and soils as well as the individual properties of the PFAS such as chain length and functional group. Heavy PFAS contamination of subsurface soils can serve as long-term sources for both groundwater and surface water contamination. For more information about conducting site investigations for PFAS, please see the Interstate Technology and Regulatory Council's (ITRC's) April 2020 Fact Sheets: *Site Characterization Considerations, Sampling Precautions, and Laboratory Analytical Methods for Per- and Polyfluoroalkyl Substances (PFAS)*, and *Environmental Fate and Transport for Per- and Polyfluoroalkyl Substances*.

3.3.1 Sampling Equipment

Guidance documents recommend sampling equipment be made of stainless-steel, high-density polyethylene (HDPE), polypropylene, and/or silicone. Standard soil sampling equipment such as stainless-steel spoons, hand augers, and direct push samplers with liners that are PFAS-free can be used to collect samples for PFAS analyses. Direct contact sampling equipment that will be used to collect samples for PFAS analyses should be decontaminated following the procedures in the *Field Equipment Cleaning and Decontamination at the FEC*, LSASDPROC-206.

3.3.2 PFAS Soil Sample Mixing and Homogenization Considerations

Because studies have shown the loss of PFAS due to adsorption to surfaces, samples should be minimally handled and directly placed into the sample container when possible. Sample preparation procedures should be specified in the Sampling and Analysis Plan (SAP). If compositing, mixing or homogenization of the sample is desired, it should preferably be done at the laboratory so that a representative subsample will be analyzed. In cases where the homogenization is conducted in the field, extra grab samples should accompany the mixed or composited samples to determine the variability and impacts on PFAS concentrations of the mixed samples.

3.3.3 Trace Level Sampling Technique for PFAS

To prevent PFAS contamination, **extreme care** is required when handling containers, samples and equipment that will be used to collect samples for PFAS analyses. **New gloves** need to be worn when decontaminating and handling sample containers and equipment. When worn gloves become compromised by potential PFAS containing materials, they need to be changed for new gloves. Nitrile gloves are recommended for PFAS sampling investigations. Also, sample containers should be kept covered in original packaging or in Whirl-Paks® until ready for use due to potential PFAS

contamination from air deposition of vapors, aerosols, and particulates.

This trace level sampling technique is used to minimize PFAS contamination of the samples. This process will require two field personnel for PFAS sample collection. When the field investigators are prepared to fill the sample container(s), a designated sampler will don new gloves while a second designee, also with new gloves, will assist by opening sample container packaging/Whirl-Pak®. The designated sampler removes the sample container(s) from the packaging but keeps them closed. Only after the second designee is ready to fill the sample container does the designated sampler remove the cap and hold it in their hand until the appropriate sample volume is obtained. After capping the sample container(s), return them to their Whirl-Pak®. The designated sampler who holds the sample container(s) should not touch anything else during the sample collection process. This is important because of the wide use of PFAS in commercial products such as clothing, field gear, personnel protective equipment, sunscreen, insect repellants, and personal hygiene products. Additionally, the designated sampler should avoid touching the sample media and the inside of the sample container. The second designee will operate sampling equipment and assist with sample container packaging and labeling. Sampling equipment known or suspected to contain PFAS should be avoided during sampling activities.

3.3.4 Quality Control Samples and Standard Operating Procedures

For soil samples undergoing PFAS analyses, it extremely important that quality control samples be collected as part of the investigation to account for the PFAS contribution of the sample containers, decontamination solutions, gloves, decontaminated equipment and plastic used to store equipment. Equipment rinse and material blanks are needed for PFAS sampling investigations to assess the direct contact sampling equipment impact on the sampling results. It is also helpful to take field quality control samples such as field blanks, duplicates, and trip blanks to evaluate the soil sampling and sample handling activities of the investigation. Laboratory sources of water used for equipment decontamination and blank sample collection should be produced as PFAS-free or assessed for background concentrations of PFAS.

Along with a good quality assurance program, standard operating procedures (SOPs) and detailed SAPs are required for PFAS investigations to provide consistency between samplers and investigations.

4 Manual Soil Sampling Methods

4.1 General

These methods are used primarily to collect surface and shallow subsurface soil samples. Surface soils are generally classified as soils between the ground surface and 6 to 12 inches below ground surface. The most common interval is 0 to 6 inches; however, the data quality objectives of the investigation may dictate another interval, such as 0 to 3 inches for risk assessment purposes. The shallow subsurface interval may be considered to extend from approximately 12 inches below ground surface to a site-specific depth at which sample collection using manual collection methods becomes impractical.

If a thick, matted root zone, gravel, concrete, etc. is present at or near the surface, it should be removed before the sample is collected. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials.

When compositing, make sure that each composite location (aliquot) consist of equal volumes, i.e., same number of equal spoonfuls.

4.2 Spoons

Stainless steel spoons may be used for surface soil sampling to depths of approximately 6 inches below ground surface where conditions are generally soft and non-indurated, and there is no problematic vegetative layer to penetrate.

4.2.1 Special Considerations When Using Spoons

When using stainless steel spoons, consideration must be given to the procedure used to collect the volatile organic compound sample. If the soil being sampled is cohesive and holds its in situ texture in the spoon, the En Core® Sampler or syringe used to collect the sub-sample for Method 5035 should be plugged directly from the spoon. If, however, the soil is not cohesive and crumbles when removed from the ground surface for sampling, consideration should be given to plugging the sample for Method 5035 directly from the ground surface at a depth appropriate for the investigation Data Quality Objectives.

4.3 Hand Augers

Hand augers may be used to advance boreholes and collect soil samples in the surface and shallow subsurface intervals. Typically, 3-inch stainless steel auger buckets with cutting

heads are used. The bucket is advanced by simultaneously pushing and turning using an attached handle with extensions (if needed).

4.3.1 Surface Soil Sampling

When conducting surface soil sampling with hand augers, the auger buckets may be used with a handle alone or with a handle and extensions. The bucket is advanced to the appropriate depth and the contents are transferred to the homogenization container for processing. Observe precautions for volatile organic compound and PFAS sample collection found in Section 3.

4.3.2 Subsurface Soil Sampling

Hand augers are the most common equipment used to collect shallow subsurface soil samples. Auger holes are advanced one bucket at a time until the sample depth is achieved. When the sample depth is reached, the bucket used to advance the hole is removed and a clean bucket is attached. The clean auger bucket is then placed in the hole and filled with soil to make up the sample and removed.

The practical depth of investigation using a hand auger depends upon the soil properties and depth of investigation. In sand, augering is usually easily performed, but the depth of collection is limited to the depth at which the sand begins to flow or collapse. Hand augers may also be of limited use in tight clays or cemented sands. In these soil types, the greater the depth attempted, the more difficult it is to recover a sample due to increased friction and torqueing of the hand auger extensions. At some point these problems become so severe that power equipment must be used.

4.3.3 Special Considerations for Soil Sampling with the Hand Auger

- Because of the tendency for the auger bucket to scrape material from the sides of the auger hole while being extracted, the top several inches of soil in the auger bucket should be discarded prior to placing the bucket contents in the homogenization container for processing.
- Observe precautions for volatile organic compound (VOC) and PFAS sample collection found in Section 3. Collect the VOC sample directly from the auger bucket, if possible.
- Power augers, such as the Little Beaver® and drill rigs may be used to advance boreholes to depths for subsurface soil sampling with the hand auger. They may not be used for sample collection. When power augers are used to advance a borehole to depth for sampling, care must be taken that exhaust fumes, gasoline and/or oil do not contaminate the borehole or area in the immediate vicinity of sampling.
- When moving to a new sampling location, the entire hand auger assembly must be replaced with a properly decontaminated hand auger assembly.

5 Direct Push Soil Sampling Methods

5.1 General

These methods are used primarily to collect shallow and deep subsurface soil samples. Three samplers are available for use within the Division's direct push tooling inventory. All of the sampling tools involve the collection and retrieval of the soil sample within a thin-walled liner. The following sections describe each of the specific sampling methods that can be accomplished using direct push techniques, along with details specific to each method. While LSASD currently uses the sample tooling described, tooling of similar design and materials is acceptable.

If gravel, concrete, etc. is present at or near the surface, it should be removed before the sample is collected. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials. Turf grass is not typically removed prior to sampling with these devices.

5.2 Large Bore® Soil Sampler

The Large Bore® (LB) sampler is a solid barrel direct push sampler equipped with a piston-rod point assembly used primarily for collection of depth-discrete subsurface soil samples. The sample barrel is approximately 30-inches (762 mm) long and has a 1.5-inch (38 mm) outside diameter. The LB® sampler is capable of recovering a discrete sample core 22 inches x 1.0 inch (559 mm x 25 mm) contained inside a removable liner. The resultant sample volume is a maximum of 283 mL.

After the LB® sample barrel is equipped with the cutting shoe and liner, the piston-rod point assembly is inserted, along with the drive head and piston stop assembly. The assembled sampler is driven to the desired sampling depth, at which time the piston stop pin is removed, freeing the push point. The LB® sampler is then pushed into the soil a distance equal to the length of the LB® sample barrel. The probe rod string, with the LB® sampler attached, is then removed from the subsurface. After retrieval, the LB® sampler is then removed from the probe rod string. The drive head is then removed to allow removal of the liner and soil sample.

5.3 Macro-Core® Soil Sampler

The Macro-Core® (MC) sampler is a solid barrel direct push sampler equipped with a piston-rod point assembly used primarily for collection of either continuous or depth-discrete subsurface soil samples. Although other lengths are available, the standard MC® sampler has an assembled length of approximately 52 inches (1321 mm) with an outside

diameter of 2.2 inches (56 mm). The MC® sampler is capable of recovering a discrete sample core 45 inches x 1.5 inches (1143 mm x 38 mm) contained inside a removable liner. The resultant sample volume is a maximum of 1300 mL. The MC® sampler may be used in either an open-tube or closed-point configuration. Although the MC® sampler can be used as an open-barrel sampler, in LSASD usage, the piston point is always used to prevent the collection of slough from the borehole sides.

5.4 Dual Tube Soil Sampling System

The Dual Tube 21 soil sampling system is a direct push system for collecting continuous core samples of unconsolidated materials from within a sealed outer casing of 2.125-inch (54 mm) OD probe rod. The samples are collected within a liner that is threaded onto the leading end of a string of 1.0-inch diameter probe rod. Collected samples have a volume of up to 800 mL in the form of a 1.125-inch x 48-inch (29 mm x 1219 mm) core. Use of this method allows for collection of continuous core inside a cased hole, minimizing or preventing cross-contamination between different intervals during sample collection. The outer casing is advanced, one core length at a time, with only the inner probe rod and core being removed and replaced between samples. If the sampling zone of interest begins at some depth below ground surface, a solid drive tip must be used to drive the dual tube assembly and core to its initial sample depth.

5.5 Special Considerations When Using Direct Push Sampling Methods

- *Liner Use and Material Selection* – Direct Push Soil Samples are collected within a liner to facilitate removal of sample material from the sample barrel. The liners may only be available in a limited number of materials for a given sample tool, although overall, liners are available in brass, stainless steel, cellulose acetate butyrate (CAB), polyethylene terepthalate glycol (PETG), polyvinyl chloride (PVC) and Teflon®. For most LSASD investigations, the standard polymer liner material for a sampling tool will be acceptable. When the study objectives require very low reporting levels or unusual contaminants of concern, the use of more inert liner materials such as Teflon® or stainless steel may be necessary.

- *Sample Orientation* – When the liners and associated sample are removed from the sample tubes, it is important to maintain the proper orientation of the sample. This is particularly important when multiple sample depths are collected from the same push. It is also important to maintain proper orientation to define precisely the depth at which an aliquot was collected. Maintaining proper orientation is typically accomplished using vinyl end caps. Convention is to place red caps on the top of the liner and black caps on the bottom to maintain proper sample orientation. Orientation can also be indicated by marking on the exterior of the liner with a permanent marker.

- *Core Catchers* – Occasionally the material being sampled lacks cohesiveness and is subject to crumbling and falling out of the sample liner. In cases such as these, the use of core catchers on the leading end of the sampler may help retain the sample until it is retrieved to the surface. Core catchers may only be available in specific materials and should be evaluated for suitability. However, given the limited sample contact that core-catchers have with the sample material, most standard core-catchers available for a tool system will be acceptable.

- *Decontamination* – The cutting shoe and piston rod point are to be decontaminated between each sample, using the procedures specified for the collection of trace organic and inorganic compounds found in Field Equipment and Decontamination – SESDPROC-205, most recent version. Within a borehole, the sample barrel, rods, and drive head may be subjected to an abbreviated cleaning to remove obvious and loose material, but must be cleaned between boreholes using the procedures specified for downhole drilling equipment in Field Equipment and Decontamination – SESDPROC-205, most recent version.

- *Decommissioning* – Boreholes must be decommissioned after the completion of sampling. Boreholes less than 10 feet deep that remain open and do not approach the water table may be decommissioned by pouring 30% solids bentonite grout from the surface or pouring bentonite pellets from the surface, hydrating the pellets in lifts. Boreholes deeper than 10 feet, or any borehole that intercepts groundwater, must be decommissioned by pressure grouting with 30% solids bentonite grout, either through a re-entry tool string or through tremie pipe introduced to within several feet of the borehole bottom.

- *VOC and PFAS Sample Collection* – Observe precautions for volatile organic compounds and Per- and Polyfluoroalkyl Substances sample collection found in Section 3 of this procedure.

6 Split Spoon/Drill Rig Methods

6.1 General

Split spoon sampling methods are used primarily to collect shallow and deep subsurface soil samples. All split spoon samplers, regardless of size, are basically split cylindrical barrels that are threaded on each end. The leading end is held together with a beveled threaded collar that functions as a cutting shoe. The other end is held together with a threaded collar that serves as the sub used to attach the spoon to the string of drill rod. Two basic methods are available for use, including the smaller diameter standard split spoon, driven with the drill rig safety hammer, and the larger diameter continuous split spoon,

advanced inside and slightly ahead of the lead auger during hollow stem auger drilling. The following sections describe each of the specific sampling methods, along with details specific to each method.

If gravel, concrete, etc. is present at or near the surface, it should be removed before the sample is collected. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials. Turf grass is not typically removed prior to sampling with these devices.

6.2 Standard Split Spoon

A drill rig is used to advance a borehole to the target depth. The drill string is then removed and a standard split spoon is attached to a string of drill rod. Split spoons used for soil sampling must be constructed of stainless steel and are typically 2.0-inches OD (1.5-inches ID) and 18-inches to 24-inches in length. Other diameters and lengths are common and may be used if constructed of the proper material. After the spoon is attached to the string of drill rod, it is lowered into the borehole. The safety hammer is then used to drive the split spoon into the soil at the bottom of the borehole. After the split spoon has been driven into the soil, filling the spoon, it is retrieved to the surface, where it is removed from the drill rod string and opened for sample acquisition.

6.3 Continuous Split Spoon

The continuous split spoon is a large diameter split spoon that is advanced into the soil column inside a hollow stem auger. Continuous split spoons are typically 3 to 5 inches in diameter and either 5 feet or 10 feet in length, although the 5-foot long samplers are most common. After the auger string has been advanced into the soil column a distance equal to the length of the sampler being used it is returned to the surface. The sampler is removed from inside the hollow stem auger and the threaded collars are removed. The split spoon is then opened for sampling.

6.4 Special Considerations When Using Split Spoon Sampling Methods

- Always discard the top several inches of material in the spoon before removing any portion for sampling. This material normally consists of borehole wall material that has sloughed off of the borehole wall after removal of the drill string prior to and during inserting the split spoon.
- Observe precautions for volatile organic compounds and Per- and Polyfluoroalkyl Substances sample collection found in Section 3.

7 Shelby Tube/Thin-Walled Sampling Methods

7.1 General

Shelby tubes, also referred to generically as thin-walled push tubes or Acker thin-walled samplers, are used to collect subsurface soil samples in cohesive soils and clays during drilling activities. In addition to samples for chemical analyses, Shelby tubes are also used to collect relatively undisturbed soil samples for geotechnical analyses, such as hydraulic conductivity and permeability, to support hydrogeologic characterizations at hazardous waste and other sites.

If gravel, concrete, etc. is present at or near the surface, it should be removed before the sample is collected. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials. Turf grass is not typically removed prior to sampling with this device.

7.2 Shelby Tube Sampling Method

A typical Shelby tube is 30 inches in length and has a 3.0-inch OD (2.875-inch ID) and may be constructed of steel, stainless steel, galvanized steel, or brass. They also typically are attached to push heads that are constructed with a ball-check to aid in holding the contained sample during retrieval. If used for collecting samples for chemical analyses, it must be constructed of stainless steel. If used for collecting samples for standard geotechnical parameters, any material is acceptable.

To collect a sample, the tube is attached to a string of drill rod and is lowered into the borehole, where the sampler is then pressed into the undisturbed material by hydraulic force. After retrieval to the surface, the tube containing the sample is then removed from the sampler head. If samples for chemical analyses are needed, the soil contained inside the tube is then removed for sample acquisition. If the sample is collected for geotechnical parameters, the tube is typically capped, maintaining the sample in its relatively undisturbed state, and shipped to the appropriate geotechnical laboratory.

7.3 Special Considerations When Using Split Spoon Sampling Methods

Observe precautions for volatile organic compounds and Per- and Polyfluoroalkyl Substances sample collection found in Section 3.

8 Backhoe Sampling Method

8.1 General

Backhoes may be used in the collection of surface and shallow subsurface soil samples. The trenches created by excavation with a backhoe offer the capability of collecting samples from very specific intervals and allow visual correlation with vertically and horizontally adjacent material. If possible, the sample should be collected without entering the trench. Samples may be obtained from the trench wall or they may be obtained directly from the bucket at the surface. The following sections describe various techniques for safely collecting representative soil samples with the aid of a backhoe.

The depth measurement for the sample begins at the top of the soil horizon.

8.2 Scoop-and-Bracket Method

If a sample interval is targeted from the surface, it can be sampled using a stainless steel scoop and bracket. First a scoop and bracket are affixed to a length of conduit and is lowered into the backhoe pit. The first step is to take the scoop and scrape away the soil comprising the surface of the excavated wall. This material likely represents soil that has been smeared by the backhoe bucket from adjacent material. After the smeared material has been scraped off, the original stainless steel scoop is removed and a clean stainless steel scoop is placed on the bracket. The clean scoop can then be used to remove sufficient volume of soil from the excavation wall to make up the required sample volume.

8.3 Direct-from-Bucket Method

It is also possible to collect soil samples directly from the backhoe bucket at the surface. Some precision with respect to actual depth or location may be lost with this method but if the soil to be sampled is uniquely distinguishable from the adjacent or nearby soils, it may be possible to characterize the material as to location and depth. In order to ensure representativeness, it is also advisable to dress the surface to be sampled by scraping off any smeared material that may cross-contaminate the sample.

8.4 Special Considerations When Sampling with a Backhoe

- Do not physically enter backhoe excavations to collect a sample. Use either procedure 8.2, Scoop-and-Bracket Method, or procedure 8.3, Direct-from-Bucket Method to obtain soil for sampling.

- Smearing is an important issue when sampling with a backhoe. Measures must be taken, such as dressing the surfaces to be sampled (see Section 2.3), to mitigate problems with smearing.
- Paint, grease and rust must be removed and the bucket decontaminated prior to sample collection.
- Observe precautions for volatile organic compound and PFAS sample collection found in Section 3.

9 Incremental Sampling Method

9.1 General

ISM is a structured composite sampling and processing protocol that reduces data variability and provides an unbiased estimate of mean contaminant concentrations in the area targeted for sampling. ISM provides representative samples of specific soil volumes defined as decision units (DUs) by collecting numerous increments of soil (typically 30–100) that are combined, processed, and subsampled according to specific protocols. Triplicate samples are collected to measure and evaluate the reproducibility of the sample data.

Like all sampling approaches, ISM should be applied within a systematic planning framework. The size, orientation, and location of a DU is site-specific and represents the smallest volume of soil about which a decision is to be made (USEPA 1999, Ramsey and Hewitt 2005, HDOH 2008a, ADEC 2009). DUs are based on project-specific needs and site-specific DQOs. More detailed information on conducting sampling using ISM can be found in the Interstate Technology and Regulatory Council's *Incremental Sampling Methodology* (ISM-1).

9.2 Field Implementation, Sample Collection, and Processing

9.2.1 Introduction

The goal of most sampling efforts is to collect a sample that is representative of the target area (or DU). ISM is designed to collect representative and reproducible soil data. To help ensure data quality, all field sampling and field processing activities should be performed and supervised by personnel trained in ISM implementation

9.2.2 Sampling Tools

The selection of the appropriate sampling tool for collecting an ISM sample depends on the cohesiveness and composition of the soil substrate. The sampling tool should obtain cylindrical or core-shaped increments of a constant depth from the presented surface so that each increment collected is the same approximate volume and mass.

See Figures 1 and 2 for examples of sampling tools for nonvolatile ISM sample collection. Various other hand augers, core sampling tools, step probes, etc., are available from environmental or agricultural suppliers and are applicable to ISM if the specifications meet project DQOs. It is highly recommended that the proposed sampling tool is tested at the sample location prior to full mobilization to ensure that the sampling tool is appropriate for site conditions. If a pilot sampling effort is not possible, a variety of tools to address different soil types or site conditions should be taken into the field.

Note: Volatile ISM sample collection should follow Method 5035 recommendations. See Section 3 of this SOP.

9.2.3 Field Collection

Incremental soil samples are prepared by collecting multiple increments of soil (typically 30 or more) from a specified DU and physically combining these increments into a single sample, referred to as the "incremental sample." Samples are collected in triplicate from different locations within the same DU. Sample increments locations can be selected by a random number generator or evenly spaced across the DU to ensure that the incremental sample is representative of the DU. Survey flags or other markers can be helpful in identifying increment collection locations prior to beginning sample location.

The number of increments to be collected from each DU of a site investigation should be evaluated during systematic planning as part of the DQO process and documented in the sampling and analysis plan (SAP).See section 5.3.2 of ISM-1 for subsurface ISM sample collection.

9.2.4 Field Handling of ISM Samples

ISM samples collect a larger volume of soil than discrete samples and will require a larger collection container than may be specified by the laboratory or that is typically used. For example, a gallon-sized sealable plastic bag or a liter glass jar may be used depending upon the suspect analytes. When building the incremental sample by collecting increments, it may be more practical to collect the sample in an aluminum pan, plastic bucket, stainless-steel bowl, or other easily transported

container until the entire sample has been collected. The final sample can then be processed in the field or transferred to a container for shipment to a laboratory for sample processing and analysis.

Processing of ISM samples is ideally performed in a laboratory. However, subsampling, disaggregation, drying, and sieving are some processing steps that may be required to be performed in the field. Field processing may be necessary if field analysis will be performed on the samples of if the laboratory is unable to perform the sample processing steps required. Any field processing steps should be rigorously performed to ensure that the sample representativeness is maintained through analysis. To ensure proper sample size reduction and representative subsampling, they should be performed using a 2-D Japanese slab cake and specialized subsampling tool, a riffle splitter, rotary cone sample splitter, or similar. Sample volume reduction of ISM samples should not be conducted with a stainless-steel spoon and a stainless-steel bowl. All sample processing equipment should be appropriately decontaminated between sample stations.

9.3 Special Considerations When Using Incremental Sampling Methods

- Selection of an appropriately sized and positioned Decision Unit is important to ensuring quality data and useful results
- Steps should be taken throughout the sampling effort to ensure that the representativeness of the sample is maintained from collection through analysis
- Advance coordination with the laboratory is necessary to ensure that the laboratory has the capability and capacity to conduct any sample processing that may be necessary. If the lab cannot complete the required processing steps, the sampling team may need to perform the sample processing steps in the field.

Figure 1

Figure 2

10 References

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version

LSASD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, Most Recent Version

LSASD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC, SESDPROC-206, Most Recent Version

LSASD Operating Procedure for Field Sampling Quality Control, SESDPROC-011, Most Recent Version

LSASD Operating Procedure for Field X-Ray Fluorescence (XRF) Measurement, SESDPROC-107, Most Recent Version

LSASD Operating Procedure for Logbooks, SESDPROC-010, Most Recent Version

LSASD Operating Procedure for Sample and Evidence Management, SESDPROC-005, Most Recent Version

Title 49 Code of Federal Regulations, Pts. 171 to 179, Most Recent Version

US EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, Most Recent Version (Method 5035)

US EPA Region 4 Safety and Occupational Health Manual. Region 4 LSASD, Athens, GA, Most Recent Version

ITRC (Interstate Technology & Regulatory Council). 2012. Incremental Sampling Methodology. ISM-1. Washington, D.C.: Interstate Technology & Regulatory Council, Incremental Sampling Methodology Team. www.itrcweb.org.

ITRC (Interstate Technology and Regulatory Council) April 2020 Fact Sheets: *Site Characterization Considerations, Sampling Precautions,* and *Laboratory Analytical Methods for Per- and Polyfluoroalkyl Substances (PFAS)*, and *Environmental Fate and Transport for Per- and Polyfluoroalkyl Substances*

11 Revision History

The top row of this table shows the most recent changes to this controlled document. For previous revision history information, archived versions of this document are maintained by the LSASD Quality Assurance Coordinator (QAC) on the LSASD local area network (LAN).

History	Effective Date
Replaced Chief with Supervisor; General formatting changes.	April 22, 2023
LSASDPROC-300-R4, *Soil Sampling,* replaces SESDPROC-300-R3Added Section 3.3. Soil Samples Collected for PFAS Analysis. Added Section 9, Incremental Sampling Method including Figures 1 and 2. **General:** Throughout the document, mention of SESD was replaced with LSASD as appropriate. Mention of Document Control Coordinator changed to Quality Assurance Coordinator. **Cover Page:** Changed Kevin Simmons, Environmental Scientist to Life Scientist. Changed Acting Supervisor, John Deatrick of the Enforcement and Investigations Branch to Supervisor, Applied Science Branch. Changed Acting Supervisor, Laura Ackerman, Ecological Assessment Branch to Supervisor, Hunter Johnson, Superfund Section. Changed Bobby Lewis, Field Quality Manager, Science and Ecosystem Support Division to Stacie Masters, Quality Assurance Coordinator, Laboratory Services and Applied Science Division.	June 11, 2020
SESDPROC-300-R3, *Soil Sampling*, replaces SESDPROC-300-R2. **General:** Corrected any typographical, grammatical and/or editorial errors. **Title Page:** Updated the author from Fred Sloan to Kevin Simmons. Updated the Enforcement and Investigations Branch Supervisor from Archie Lee to Acting Supervisor, John Deatrick. Section 1.5.1: Added “The reader should” to last sentence of the paragraph. Section 1.5.2: Omitted “When sampling in landscaped areas,” from first sentence of eighth bullet. Section 3.2.4: In the first paragraph, first sentence, added “(rapidly form bubbles).” Omitted “(rapidly form bubbles)” from second paragraph, second sentence. Any reference to “Percent Moisture and Preservation Compatibility (MOICA)” or “Percent Moisture” was changed to “Percent Solids”, both in the text and in Table 1.	August 21, 2014

SESDPROC-300-R2, *Soil Sampling*, replaces SESDPROC-300-R1.	December 20, 2011

SESDPROC-300-R1, *Soil Sampling*, replaces SESDPROC-300-R0.	November 1, 2007
SESDPROC-300-R0, Soil Sampling, Original Issue	February 05, 2007

Region 4 U.S. Environmental Protection Agency Laboratory Services and Applied Science Division Athens, Georgia	
Operating Procedure	
Title: Packing, Marking, Labeling and Shipping of Environmental and Waste Samples	**ID: FSBPROC-209-R6**
Issuing Authority: Field Services Branch Chief	
Effective Date: May 31, 2024	**Next Review Date: May 31, 2028**
Method Reference: N/A	**SOP Author: Paula Whiting**

Purpose

Regulations for packing, marking, labeling, and shipping of dangerous goods by air transport are promulgated by Department of Transportation under 49 CFR, Subchapter C, Hazardous Materials Regulations, and the International Air Transport Authority (IATA), which is equivalent to United Nations International Civil Aviation Organization (UN/ICAO). Transportation of hazardous materials (dangerous goods) by EPA personnel is covered by EPA Order 1000. This document describes general and specific procedures, methods, and considerations to be used and observed by LSASD field investigators when packing, marking, labeling, and shipping environmental and waste samples to ensure that all shipments are in compliance with the above regulations and guidance.

Scope/Application

The procedures contained in this document are to be used by field personnel when packing, marking, labeling, and shipping environmental samples and dangerous goods by air transport. Samples collected during field investigations or in response to a hazardous materials incident must be classified prior to shipment, as either environmental or hazardous materials (dangerous goods) samples.

In general, environmental samples include drinking water, most groundwater and ambient surface water, soil, sediment, treated municipal and industrial wastewater effluent, biological specimens, or any samples not expected to be contaminated with high levels of hazardous materials. Samples collected from process wastewater streams, drums, bulk storage tanks, soil, sediment, or water samples from areas suspected of being highly contaminated may require shipment as dangerous goods.

Government employees transporting samples or hazardous materials (i.e., preservatives or waste samples) in government vehicles are not subject to the requirements of this section in accordance with 49 CFR 171.1(d)(5). EPA contractors, however, are not covered by this exemption and may not transport these materials without full compliance with 49 CFR. Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use.

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1 General Information

1.1 Documentation/Verification

This procedure was prepared by persons deemed technically competent by LSASD management, based on their knowledge, skills and abilities and have been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the LSASD local area network (LAN). The Document Control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on the LAN and for maintaining records of review conducted prior to its issuance.

1.2 General Precautions

1.2.1 Safety

Proper safety precautions must be observed when packing, marking, labeling, and shipping environmental or waste samples. Refer to the LSASD Safety, Health, and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASPs) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. Minimally, gloves and safety glasses should be utilized when completing work covered in this operating procedure.

1.2.2 Training

Employees required to handle samples to be shipped as dangerous goods shall be trained in DOT hazardous materials regulations for bulk or non-bulk ground shipments and IATA Dangerous Goods Regulations (DGR) to ship hazmat/dangerous goods by passenger and/or cargo aircraft as required in the 49 CFR Hazardous Materials Regulations (HMR). The employees shall receive certifications in Hazmat Ground Shipper Certification (DOT) and Hazmat Air Shipper Certification (IATA). Under DOT rules, all hazmat employee training must be repeated at least every three years. For IATA, training shall be repeated every two years.

2 Shipment of Dangerous Goods

2.1 The project leader is responsible for determining if samples collected during a specific field investigation meet the definitions for dangerous goods. If a sample is collected of a material that is listed in the Dangerous Goods List, Section 4.2, IATA, then that sample must be identified, packaged, marked, labeled, and shipped according to the instructions given for that material. If the composition of the collected sample(s) is unknown, and the project leader knows or suspects that it is a regulated material (dangerous goods), the sample may not be offered for air transport. If the composition and properties of the waste sample or highly

contaminated soil, sediment, or water sample are unknown, or only partially known, the sample may not be offered for air transport.

In addition, the shipment of pre-preserved sample containers or bottles of preservatives (e.g., NaOH pellets, HCL, etc.) which are designated as dangerous goods by IATA is regulated. Shipment of nitric acid (HNO_3) is strictly regulated. Consult the IATA Dangerous Goods Regulations for guidance. ***Dangerous goods must not be offered for air transport by any personnel except LSASD's dangerous goods shipment designee or other personnel trained and certified by IATA in dangerous goods shipment.***

3 Shipment of Environmental Samples

3.1 Guidance for the shipment of environmental laboratory samples by personnel is provided in a memorandum dated March 6, 1981, subject "Final National Guidance Package for Compliance with Department of Transportation Regulations in the Shipment of Laboratory Samples". By this memorandum, the shipment of the following unpreserved samples is not regulated:

3.1.1 Drinking water
3.1.2 Treated effluent
3.1.3 Biological specimens
3.1.4 Sediment
3.1.5 Water treatment plant sludge
3.1.6 POTW sludge

3.2 In addition, the shipment of the following preserved samples is not regulated, provided the amount of preservative used does not exceed the amounts found in 40 CFR 136.3 or the USEPA Region 4 Laboratory Services Branch Laboratory Operations and Quality Assurance Manual (LOQAM), Most Recent Version. This provision is also discussed in correspondence between DOT and EPA (Department of Transportation, Letter from Edward T. Mazzullo, Director, Office of Hazardous Materials Standards, to Henry L. Longest II, Acting Assistant Administrator, USEPA, Ref No.: 02-0093, February 13, 2003). It is the shipper's (individual signing the air waybill) responsibility to ensure that proper amounts of preservative are used:

3.2.1 Drinking water
3.2.2 Ambient water
3.2.3 Treated effluent
3.2.4 Biological specimens
3.2.5 Sediment
3.2.6 Wastewater treatment plant sludge
3.2.7 Water treatment plant sludge

3.3 Samples determined by the project leader to be in these categories are to be shipped using the following protocol, developed jointly between USEPA, OSHA, and DOT. This procedure is documented in the "Final National Guidance Package for Compliance with Department of Transportation Regulations in the Shipment of Environmental Laboratory Samples."

3.4 Untreated wastewater and sludge from Publicly Owned Treatment Works (POTWs) are considered to be "diagnostic specimens" (not environmental laboratory samples). However, because they are not considered to be etiologic agents (infectious) they are not restricted and may be shipped using the procedures outlined below.

3.5 Environmental samples should be packed prior to shipment by air using the following procedures:

3.5.1 Allow sufficient headspace (ullage) in all bottles (except VOA containers with a septum seal) to compensate for any pressure and temperature changes (approximately 10 percent of the volume of the container).

3.5.2 Ensure that the lids on all bottles are tight (will not leak).

3.5.3 Place bottles in separate and appropriately sized polyethylene bags and seal the bags. If available, the use of Whirl-Pak bags is preferable; if unavailable, seal regular bags with tape (plastic electrical tape).

3.5.4 Select a sturdy cooler in good repair. Secure and tape the drain plug with fiber or duct tape inside and outside. Line the cooler with a large heavy duty plastic bag.

3.5.5 Place cushioning/absorbent material in the bottom of the cooler and then place the containers in the cooler with sufficient space to allow for the addition of cushioning between the containers.

3.5.6 If required by the method for preservation, put "blue ice" (or ice that has been "double bagged" in heavy duty polyethylene bags and properly sealed) on top of and/or between the containers. Fill all remaining space between the containers with absorbent material.

3.5.7. If the samples are preserved with ice, include a temperature blank for the laboratory to verify that the samples are received at the appropriate temperature.

3.5.8 Securely fasten the top of the large garbage bag with tape (preferably plastic electrical tape).

3.5.9 Place the Chain-of-Custody Record or the CLP Traffic Report Form (if applicable) into a plastic bag and tape the bag to the inner side of the cooler lid.

3.5.10 Close the cooler and securely tape (preferably with fiber tape) the top of the cooler shut. Chain-of-custody seals should be affixed to the top and sides of the cooler within the securing tape so that the cooler cannot be opened without breaking the seal.

4 References

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version.

Title 40 Code of Federal Regulations (CFR), Pt. 136.3, Identification of Test Procedures, July 1, 2001. See Table II, Footnote 3.

Title 49 CFR, Pt. 171.1(d)(5), Applicability of Hazardous Materials Regulations (HMR) to Persons and Functions.

United States Department of Transportation (US DOT). 2003. Letter from Edward T. Mazzullo, Director, Office of Hazardous Materials Standards, to Henry L. Longest II, Acting Assistant Administrator, USEPA, Ref No. 02-0093, February 13, 2003.

US Environmental Protection Agency (US EPA) Order 1000.18, February 16, 1979.

US EPA. 1981. "Final Regulation Package for Compliance with DOT Regulations in the Shipment of Environmental Laboratory Samples," Memo from David Weitzman, Work Group Chairman, Office of Occupational Health and Safety (PM-273), April 13, 1981.

US EPA. 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. Region 4 Science and Ecosystem Support Division (LSASD), Athens, GA.

US EPA. Laboratory Services Branch Laboratory Operations and Quality Assurance Manual (LOQAM). Region 4 LSASD, Athens, GA (LSBPROC-120, Most Recent Version).

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 LSASD Athens, GA, Most Recent Version.

5 Revision History

This table shows the most recent changes to this controlled document. For previous revision history information, archived versions of this document are maintained by the LSASD Quality Assurance Coordinator on the LSASD local area network (LAN).

History	Effective Date
FSBPROC-209-R6, *Packing, Marking, Labeling and Shipping of Environmental and Waste Samples*, replaces LSASDPROC-209-R5 **General**: Corrected any typographical, grammatical, and/or editorial errors. **Section 1.2.1**: Included recommended PPE. **Section 1.2.2**: New section added to include relevant training requirements.	May 31, 2024
Replaced Chief with Supervisor; General formatting revisions.	April 22, 2023
LSASDPROC-209-R4 *Packing, Marking, Labeling and Shipping of Environmental and Waste Samples*, replaces LSASDPROC-209-R3 Reformatted document to Divisional Format	February 23, 2020
LSASDPROC-209-R3, *Packing, Marking, Labeling and Shipping of Environmental and Waste Samples*, replaces LSASDPROC-209-R2. **Cover Page:** Changes made to reflect reorganization of LSASD from two field branches to one: John Deatrick listed as the Chief, Field Services Branch. The FQM was changed from Liza Montalvo to Hunter Johnson. **Revision History:** Changes were made to reflect the current practice of only including the most recent changes in the revision history.	February 4, 2015
LSASDPROC-209-R2, *Packing, Marking, Labeling and Shipping of Environmental and Waste Samples*, replaces LSASDPROC-209-R1.	April 20, 2011
LSASDPROC-209-R1, *Packing, Marking, Labeling and Shipping of Environmental and Waste Samples*, replaces LSASDPROC-209-R0.	November 1, 2007
LSASDPROC-209-R0, Packing, Marking, Labeling and Shipping of Environmental and Waste Samples, Original Issue	February 05, 2007

APPENDIX E

Laboratory Quality Manual

Standard Operating Procedure for the

Quality Assurance Manual

Eurofins Atlanta
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Garrett Ervin — 3/27/2024
Garrett Ervin, Business Unit Manager — **Date**

Ryan Sullivan — 3/27/24
Ryan Sullivan, Laboratory Director — **Date**

Dana B. Till — 3/27/24
Dana Till, Technical Director / Acting QA Manager — **Date**

Miriam Pacurar — 3/27/2024
Miriam Pacurar, Deputy Quality Assurance Manager — **Date**

STANDARD OPERATING PROCEDURES FOR THE
QUALITY ASSURANCE PROGRAM

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3.0 STATEMENT OF POLICY

3.1 Quality Policy: The objective of Eurofins Environment Testing Southeast, LLC., Atlanta (EETSE Atlanta) is to generate high quality data in a cost effective manner, which is accurate, impartial, reliable, and adequate for its intended use. Management of EETSE Atlanta is committed to following accepted laboratory practices to achieve high quality of testing services, and strives to ensure both the analytical validity and legal defensibility of all reported data managed so to safeguard impartiality.

EETSE Atlanta management is committed to compliance with The NELAC Institute (TNI) Standards, AIHA LAP International Standard, Georgia EPD as well as North Carolina and South Carolina rules to establish, implement, and maintain a quality system appropriate to the scope of all laboratory activities, including the type, range, and volume of testing. ISO/IEC 17025:2017 is the basis of laboratory accreditations. Management is committed to the accepted professional laboratory practices and shall document the policies, systems, programs, procedures, and instructions to the extent necessary to enable EETSE Atlanta to assure the quality of the test results generated. Management is committed to good professional laboratory practice to meet customer requirements with quality service.

Laboratory management has established, documented, and maintained policies for the fulfilment of the purposes of this document and shall ensure that the policies and objectives are acknowledged and implemented at all levels of the laboratory organization. These policies address the competence, impartiality, and consistency of the laboratory operations. All documentation, processes, systems, records, related to the fulfilment of the requirements of this document shall be included in, referenced from, or linked to the management system.

Quality system documentation is communicated to, understood by, and made available to personnel through EETSE Atlanta management by means of training and educational instruction. All laboratory staff concerned with analytical testing activities must familiarize themselves with the quality documentation and implement the policies and principles in their work. Management communicates to personnel their duties, responsibilities, and authorities. It is the policy of EETSE Atlanta to continually improve quality systems and provide support to improvement efforts.

3.2 Purpose: The Quality Assurance Program (QAP) sets forth the management policy, organizational structure, and procedures for chemical analyses performed by EETSE Atlanta. Management encourages the development and use of the best testing practices as dictated by each measurement situation. However, the procedures set forth herein must be followed to the greatest extent possible. All deviations must be documented in each individual case and maintained with the sample data. The QA Manual (QAM) and all Standard Operating Procedures will be reviewed no less than annually.

Appropriate use of data generated under the varying conditions encountered in environmental analyses requires reliance on the quality control practices incorporated into the procedures. Although the EPA, state environmental protection departments, The NELAC Institute (TNI), AIHA LAP, other regulatory agencies, and clients require the use of approved methods for sampling and analysis, the mere approval of these procedures does not guarantee adequate results. Inaccuracies can result from many causes, including matrix effect, equipment malfunction, and operator error. Therefore, the quality control component of each method is indispensable and cannot be compromised.

This manual delineates the elements of the QA Program that must be implemented by all sections of the lab. These requirements outlined are the minimum requirements. Method-specific procedures and project-specific Quality Assurance Project Plans (QAPP) may require more stringent QA requirements.

3.3 Definitions

3.3.1 Quality Assurance (QA) is the total program for assuring reliability of the monitoring and measurement of data. It comprises all those planned and systematic actions necessary to provide adequate confidence that all aspects of laboratory service programs are performed in a manner satisfactory to EETSE Atlanta management and to the needs of its customers.

3.3.2 Quality Control (QC) is the routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process. It covers the operational procedures, techniques, and activities that provide the means to measure, evaluate and document the quality of data obtained in the laboratory. The QC Program specifies the minimum practices, which shall be used to assure that data is produced of a known and defensible quality and within acceptable limits.

3.4 Fields of Testing

This manual covers methods for the analysis of aqueous, solid, waste, and air matrices currently on EETSE Atlanta scopes of accredited testing for AIHA LAP, Florida DOH, The NELAC Institute (TNI), North Carolina DENR and South Carolina DHEC. A detailed list of test methods and analytes may be found in Section 5.0, which defines the minimum level of quality assurance/quality control needed to meet required specifications. All methods carried out by EETSE Atlanta shall meet these stipulations as appropriate. In some instances, quality assurance project plans (QAPPs), project specific data quality objectives (DQOs), or local regulations may require criteria other than those stated. In these cases, the laboratory will abide by the more stringent criteria, following a review and acceptance of the requirements by the Laboratory Manager and the Quality Assurance Manager.

3.5 Management of the Quality Assurance Manual

This manual was prepared in accordance with the current The NELAC Institute (TNI) standards and AIHA LAP requirements. It also follows guidelines set by the U.S. Environmental Protection Agency, Florida DOH and ISO/IEC 17025. Tests are always carried out in accordance with stated methods and customers' requirements. Further, the laboratory can be legally responsible as it carries out testing in such a way to meet the requirements of this International Standard and to satisfy the needs of the customer, the regulatory authorities or organizations providing recognition. The management system shall cover work carried out in the laboratory's permanent facilities.

3.5.1 The QA manual is reviewed annually by the Quality Assurance Manager and laboratory personnel to confirm that it reflects current in-house practices and meets all the requirements of both EETSE Atlanta's clients and accrediting agencies. Modifications may be made in order to correct inconsistencies, implement improvements, encompass new concepts or procedures, adapt to new regulations, or update any changes in state or national policies or standards. The Quality Assurance Manager, Laboratory Manager, Technical Director, and relevant operational staff review the changes before they are integrated into the QA manual.

3.5.2 Policies or procedures in the manual which demand immediate attention are addressed through the use of temporary and permanent Interim Change Notices as described in Section 8.

3.6 Control of the Quality Assurance Manual

The Quality Assurance Manual is considered confidential within Eurofins Environment Testing Southeast, LLC., Atlanta. It may not be altered in any manner by anyone other than the Quality Assurance Manager, the Laboratory Manager, or an employee duly appointed by either of the aforementioned. The manual shall be marked as an "Uncontrolled Copy" if provided to external users or regulators. It is intended for the exclusive purpose of the review of EETSE Atlanta's quality systems and shall not be used in any other way without written permission of the Business Unit Manager, Laboratory Manager, or Quality Assurance Manager.

3.7 Order of Precedence

In the event of a conflict or discrepancy between policies, the order of precedence shall be as follows:

1. Eurofins Atlanta Interim Change Notice
2. Quality Assurance Manual
3. Standard Operating Procedures
4. Other (memos, charts, published methods, etc.)

4.0 ORGANIZATION AND RESPONSIBILITY

4.1 Organization: Eurofins Environment Testing Southeast, LLC. Atlanta (EETSE Atlanta) was established in 1992 in Atlanta, Georgia, an environmental testing laboratory dedicated to providing superior quality data. The laboratory is one of the largest independent environmental laboratories in the Southeast comprised of highly skilled scientists and experts in the field of environmental testing who are dedicated to providing superior quality analytical data.

The professionals at the laboratory perform chemical and biological testing on a variety of environmental samples. These include solid waste matrices, soils, sediments, fibrous wastes, polymeric emulsions, filter cakes, spent carbons, spent catalysts, air sampling media, ground, surface and waste waters, aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, and tars.

4.2 Organizational Structure: The relationship between management, technical operations, support services and quality system is as follows: Laboratory Operations, Quality Assurance Department, Technical Director, and Customer Service Department report to the Business Unit Manager, who in turn reports to the company President. The organizational structure of EETSE Atlanta provides for an independent Quality Assurance Department with the overall responsibility of developing and auditing for compliance to a comprehensive Quality Assurance Program. The QA Department has the authority and organizational freedom to ensure that QA activities are implemented and accomplished. The Quality Assurance Manager reports directly to the Business Unit Manager of EETSE Atlanta.

4.2.1 Because of the breadth of knowledge required to produce quality data, the cooperation of numerous individuals is required. All assigned personnel shall remain diligent to identify, report, and promptly rectify issues or events affecting data quality as they occur. To encourage the identification of these situations, management at all levels shall promote continuous quality improvement throughout the entire company. These events and their resolutions must be verified and substantiated as required by this document and any other applicable QA guidelines.

Laboratory personnel have the authority and resources to carry out their duties, which include

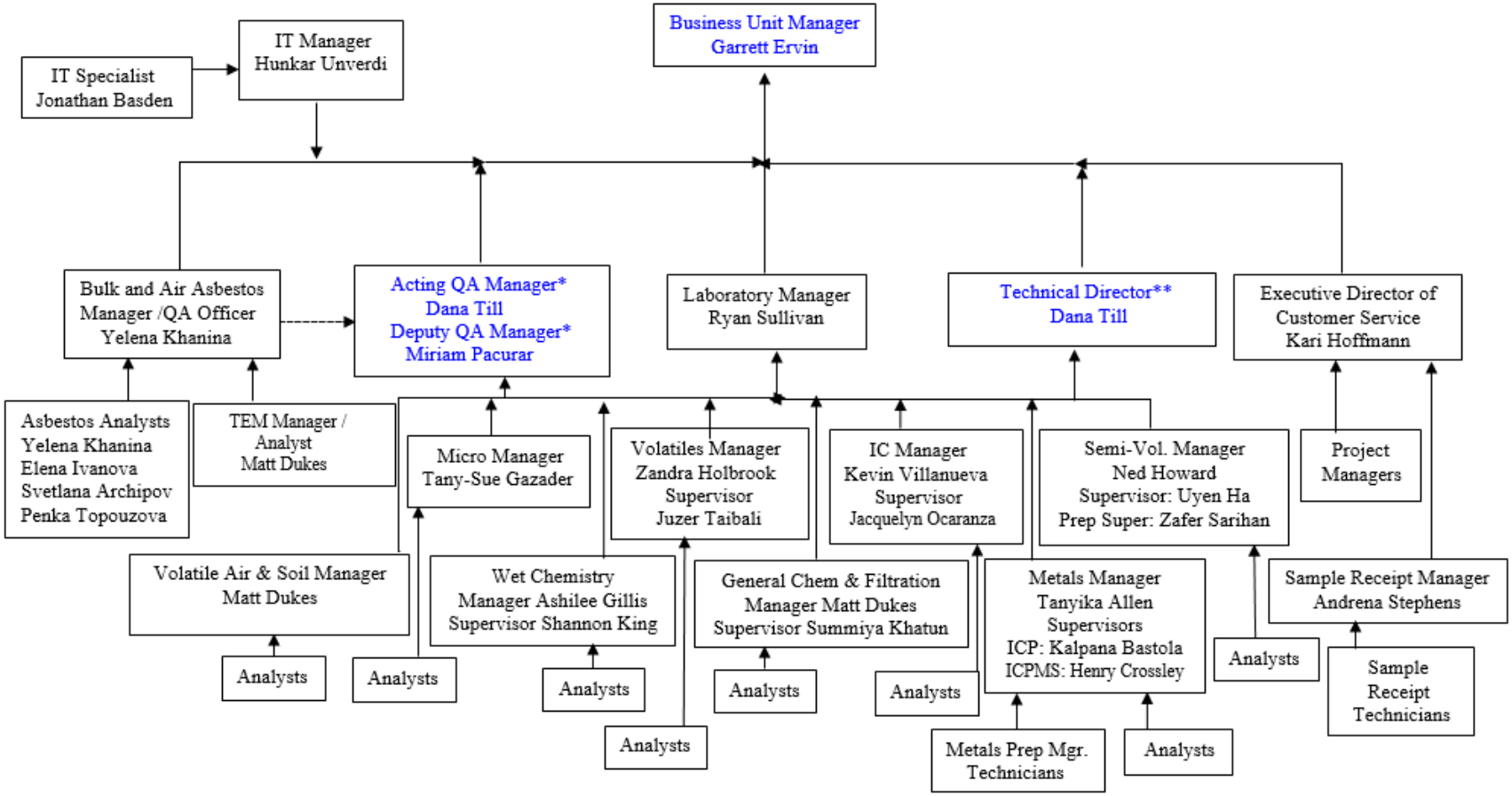
- implementation, maintenance and improvement of the management system
- identification of deviations from the management system or from laboratory procedures
- initiation of actions to prevent or minimize such deviations
- reporting the effectiveness of the management system and laboratory activities
- Identifying needs for improvement

4.2.2 The establishment of a Quality Assurance Program requires the services of all the employees of EETSE Atlanta in order to carry out the monitoring, record keeping, statistical techniques, and other functions required by the system. This total commitment of all personnel to the production and reporting of reliable data is dependent upon the conscientious effort of everyone involved. It is important, therefore, that each member of the organization have a clear understanding of his duties, responsibilities, and relationship to the total effort.

4.3 Organizational Chart

The organizational structure at EETSE Atlanta is documented in the form of an Organizational Chart, Figure 4-1, which identifies personnel involved in the production of quality data. Lines of communication and responsibility exist throughout the entire company. Employees are provided routine communication in the form of training, lectures, meetings, and emails to focus on customer needs, regulatory requirements and to maintain an effective management system. This communication and internal monitoring allows for the integrity of the management system to be maintained when changes are implemented.

FIGURE 4-1
ORGANIZATIONAL CHART



*TNI: The QA Managers will serve as deputy in the event of the Technical Director's absence.
**TNI: The Technical Director will serve as deputy in the event of the QA Managers' absence.

For AIHA-LAP LLC accreditation: The Laboratory Technical Director will serve as deputy for the IHLAP and ELLAP Technical Manager. The Laboratory Technical Director will also serve as deputy for the IHLAP and ELLAP Quality Assurance Manager. The Laboratory Quality Assurance Manager will serve as deputy for the EMLAP Microbiology Technical Manager and the Microbiology Quality Assurance Coordinator.

4.4 Responsibilities and Position Requirements

It is the responsibility of all EETSE Atlanta employees to implement the Quality Assurance Program effectively. The roles and responsibilities of the technical management and the Quality Assurance Manager to ensure compliance with the regulatory standards (including AIHA LAP and NELAC) are outlined in the position descriptions below. All chemists and technicians are responsible for understanding and following the measures of the QA program, and for reporting any quality failures to a Manager or Supervisor in a timely manner. Supervisors and Managers are responsible for ensuring that all laboratory personnel are familiar with the requirements of the Quality Assurance Program and that these requirements are implemented and maintained. It is the responsibility of the Supervisor to ensure that all laboratory personnel are trained to perform their assigned tasks. It is the responsibility of each Supervisor to ensure that any quality failures are reported to the Quality Assurance Department immediately.

The essential personnel involved in the implementation of and/or monitoring of the Quality Assurance Program are identified in the following sections.

4.4.1 Business Unit Manager

The Business Unit Manager is responsible for the overall operation of the laboratory and reports directly to the company President. The Business Unit Manager ensures that all of the resources are available to implement and follow the procedures and policies as written in the EETSE Atlanta QA Manual for compliance with The NELAC Institute (TNI) Standards, National Voluntary Laboratory Approval Program (NVLAP), AIHA LAP International Standard, Georgia EPD, North Carolina, and South Carolina rules and regulations. The Business Unit Managers reviews, approves the EETSE Atlanta Quality Assurance Manual, and authorizes the Quality Assurance Manager to perform internal audits on behalf of the company.

The Business Unit Manager will conduct the annual management review of laboratory operations to assess the effectiveness of policies and procedures in order to implement changes where deemed necessary. The agenda of the annual meeting will include reports from all department supervisors and cover such topics as quality assurance, accreditations, documentation, changes in the laboratory, equipment and maintenance needs, results of audits etc. The topics to be discussed will be determined by the Business Unit Manager, Laboratory Manager, and Quality Assurance Manager. A current list of topics is presented in Attachment 4.

4.4.2 Laboratory Manager

The Laboratory Manager is responsible for the daily operations within the analytical sections of the laboratory. If the Laboratory Manager is absent for a period of time exceeding 15 consecutive calendar days, the Business Unit Manager must designate another full-time staff member meeting the qualifications of the Laboratory Manager to temporarily perform this function. In case of a change of Laboratory Manager, all necessary, accrediting authorities must be notified in writing within thirty days. The following is the position description for Laboratory Manager:

Position Description and Requirements

Position Title: Laboratory Manager

Position Description: This position is responsible for the following:

- Oversees the daily operations of the laboratory.
- Ensures that client specific reporting & quality control requirements are met.
- Works with the Project Managers and Department Managers to ensure project objectives are met in a timely manner.

- Sets goals and objectives for both the business and the laboratory employees.
- Provides direction to departmental managers to steer all departmental efforts toward the overall corporate production goals.
- Discusses and resolves disagreements, as necessary, with laboratory personnel.
- Coordinates any unresolved concerns between the project managers and the departmental supervisors.
- Ensures that all analysts and supervisors have the appropriate education & training to properly carry out the duties assigned to them, and ensures that this training has been documented.
- Ensures that a sufficient number of qualified personnel are employed to supervise and perform the work of the laboratory.
- Ensures that HR policies are adhered to and maintained.
- Ensures management's commitment to compliance with The NELAC Institute (TNI) Standards
- Ensures compliance with International Standard ISO/IEC 17025
- Hires key personnel and recruits professional talent.
- Reviews and approves all SOPs prior to their implementation and ensures all approved SOPs are implemented and adhered to.
- Schedules analytical operations.
- Supervises the maintenance of instruments and the scheduling of repairs.
- Ensures that appropriate corrective actions are taken to address analyses as requiring such actions by internal & external performance or procedural audits.
- Ensures that personnel are free from any commercial, financial or other undue pressures that which adversely affect the quality of their work.
- Supervises the preparation & maintenance of laboratory records.
- Responsible for holding documented meetings as needed with the departmental supervisors.

Position Requirements: BA or BS in Chemistry, Microbiology, Biology, Environmental Science or other related degree. Must have 2-5 years of experience of as duties described above.

4.4.3 Quality Assurance Manager Positions

4.4.3.1 Acting Quality Assurance Manager

The QA Manager is responsible for establishing a Quality Assurance Program that meets the quality assurance objectives of the company, and its clients. If the QA Manager is absent for a period of time exceeding 15 consecutive calendar days, the Business Unit Manager must designate another full-time staff member meeting the qualifications of the QA Manager to temporarily perform this function. In case of a change of QA Manager, all necessary accrediting authorities must be notified in writing within thirty days. The following is the position description for Quality Assurance Manager:

Position Description and Requirements

Position Title: Quality Assurance Manager

Position Description: This position is responsible for the following:

- Directs all corporate quality assurance (QA).
- Responsible for developing and maintaining all QA systems and documentation.
- Responsible for all aspects of the State and Federal Certification processes.
- Maintains records of acceptable performance of MDLs.
- Directs management to compliance to the AIHA LAP Accreditation Policies
- Directs management to compliance with The NELAC Institute (TNI) Standards

- Ensures compliance with International Standard ISO/IEC 17025
- Has authorization from company Business Unit Manager to conduct internal audits
- Maintains all quality control charts.
- Has direct access to the Technical Director and to the highest level of management where decisions are made on laboratory policy and resources.
- Serves as focal point for QA/QC; has responsibility for the oversight and review of QC data.
- Functions independently from laboratory operations for which QA oversight is held.
- Evaluates data objectively and performs assessments without outside influence.
- Performs periodic reviews of test reports under AIHA LAP according to the LQSR.
- Conducts internal audits on the entire laboratory technical operation annually.
- Notifies laboratory management of deficiencies in the quality system and monitors corrective action.
- Maintains currency of the QA manual.
- Responsible for preparing/submitting a quarterly report to upper management.
- Serves as deputy in the event of the Technical Director's absence.

Position Requirements: Must have a BA or BS in Chemistry, Microbiology, Biology, Environmental Science or any other related degree. Must have 2-5 years of experience carrying out the duties described above.

4.4.3.2 Deputy Quality Assurance Manager

Acting and Deputy Quality Assurance Managers for EETSE Atlanta are responsible for establishing a Quality Assurance Program that meets the quality assurance objectives of the company and its clients. They direct all corporate quality assurance, develop and maintain all QA systems and documentation, and are responsible for all aspects of the State and Federal Certification process. They function independently from laboratory operations for which QA oversight is held to objectively evaluate data and perform assessments without outside influence. Additionally, they maintain currency of the QA Manual, conduct internal audits on the entire laboratory technical operation and maintains all quality control charts.

Also, Deputy Quality Assurance Manager takes on many of the duties of the Quality Assurance Department. This includes administration of accreditations, management of the proficiency testing programs, oversight of routine laboratory controls (such as thermometer, pipettor, and balance calibrations), monitoring of in-house QA Department projects and studies, tracking and posting of various QA correspondence and documentation, performance of internal audits, addressing Risk Management and QA Department Corrective Action Reports, Quality Assurance training, and the administration of annual MDL studies.

4.4.4 Department Director (If Applicable)

The Department Director reports to the Business Unit Manager / Laboratory Manager and is responsible for the administrative functions within the assigned department(s). This includes but is not limited to non-production activities such as monitoring Demonstrations of Capabilities, oversight of Standard Operating Procedure updates, Method Detection Limits Studies, as well as departmental instrument maintenance and quality assurance assignments. In addition, the Department Director is responsible for assuring adequate staffing and training. The following is the position description for Department Director:

Position Description and Requirements

Position Title: Department Director (When Applicable)
Position Description: This position is responsible for the following:

- Oversees the daily operations of the laboratory.
- Ensures that client specific reporting & quality control requirements are met.
- Works with Project Managers/Group Leaders to ensure project objectives are met in a timely manner.
- Sets goals and objectives for both the business and the laboratory employees.
- Provides direction to departmental managers to steer all departmental efforts toward the overall corporate production goals.
- Discusses and resolves disagreements, as necessary, with laboratory personnel.
- Coordinates any unresolved concerns between the project managers & the departmental supervisors.
- Ensures that all analysts and supervisors have the appropriate education & training to properly carry out the duties assigned to them, and ensures that this training has been documented.
- Ensures that a sufficient number of qualified personnel are employed to supervise and perform the work of the laboratory.
- Ensures that HR policies are adhered to and maintained.
- Ensures management's commitment to compliance with The NELAC Institute (TNI) Standards
- Hires key personnel and recruits professional talent.
- Reviews and approves all SOPs prior to their implementation and ensures all approved SOPs are implemented and adhered to.
- Schedules analytical operations.
- Supervises the maintenance of instruments and the scheduling of repairs.
- Ensures that appropriate corrective actions are taken to address analyses as requiring such actions by internal & external performance or procedural audits.
- Ensures that personnel are free from any commercial, financial or other undue pressures that which adversely affect the quality of their work.
- Supervises the preparation & maintenance of laboratory records.
- Responsible for holding documented meetings as needed with the departmental supervisors.

Position Requirements: A Degree or the necessary experience to achieve the requirements outlined in the position description. Must have 2-5 years of experience carrying out the duties described above.

4.4.5 Technical Director

The Technical Director exercises daily supervision of laboratory procedures and the reporting of results. If the Technical Director is absent for a period of time exceeding 15 consecutive calendar days, the Business Unit Manager must designate another full-time staff member meeting the qualifications of the Technical Director to temporarily perform this function. In case of a change of Technical Director, all necessary accrediting authorities must be notified in writing within thirty days. The following is the position description for Technical Director:

Position Description and Requirements

Position Title: Technical Director
Position Description: This position is responsible for the following:

- Updates SOPs as required.
- Maintains Test Codes
- Ensures that all employees are properly trained

- Reviews and approves revisions to the Quality Assurance Manual.
- Maintains records of employee training including acceptable performance of IDOCs.
- Provides technical assistance in the development of new methods.
- Responsible for following direction given by the Business Unit Manager.
- Ensures management's commitment to compliance with The NELAC Institute (TNI) Standards
- Ensures compliance with International Standard ISO/IEC 17025
- Provides technical guidance to analytical staff.
- Assists with internal and external audits.
- Ensures that appropriate corrective actions are taken to address analyses identified as requiring such actions by internal and external performance or procedural audits.
- Oversees equipment maintenance and repair.
- Assists the Laboratory Manager in the investigation of new technologies and proposed equipment acquisitions by the laboratory.
- Serves as deputy in the Quality Manager's absence.

Position Requirements: A Bachelor's Degree in chemical, environmental, biological, or physical sciences or engineering, with at least 24 college semester credit hours in chemistry and at least two years of experience in the environmental analysis of representative inorganic and organic analytes for which the laboratory seeks or maintains accreditation. A Masters or Doctoral Degree may be substituted for one year of experience.

4.4.6 Microbiology Lab Manager

Microbiology Lab Manager reports to the Lab Manager on all aspects of sample processing. The Microbiology Lab Manager is responsible for managing Microbiology Analysts.

Position Description and Requirements

Position Title: Microbiology Lab Manager

Position Description: This position is responsible for the following:

- Training and qualification of personnel (under their supervision) on procedures.
- Monitors necessary protocols and standard operating procedures, including control charts.
- Maintains QC within their area of responsibility.
- Ensures that personnel (under their supervision) use approved procedures, and maintain all QC.
- Recommends and implements new or revised QC policies as approved by the QA Manager.
- Assists in reviewing departmental requirements and monitoring maintenance requirements.
- Reviews data and QC results, and reports non-conformances to the appropriate QA Manager, Technical Manager, and/or Business Unit Manager.
- Provides guidance to analysts in resolving problems encountered daily during sample preparation and analysis, in conjunction with the Technical Director or Quality Assurance Manager.
- Ensures all logbooks are maintained and current.
- Maintains adequate and valid inventory of reagents, standards, spare parts, and other relevant resources required to perform daily analysis.
- Assists Technical Director with Demonstrations of Capability.

Position Requirements: A Degree (typically Microbiology, Biology or equivalent) or the necessary experience to achieve the requirements outlined in the position description.

4.4.7 Microbiology Analyst

The Microbiology Analyst training required is described in detail in the Employee Training Files maintained by the Technical Director.

Position Description and Requirements

Position Title: Microbiology Analyst

Position Description: This position is responsible for the following:

- Performs analyses by adhering to analytical and quality control protocols prescribed by SOPs, the QA manual, and project specific requirements (e.g. data packages).
- Documents standard and sample preparation, instrument maintenance, calculations, and any observed non-conformances on work lists, bench sheets, or laboratory logbooks.
- Reports all out-of-control situations, instrument problems, matrix problems, and QC failures, which might affect the reliability of the data, to their respective supervisors or the QA Manager.
- Reviews data generated and submits it to the departmental supervisor prior to entering and submitting the data to the next level of review.

Position Requirements: At a minimum, analysts must have a high school diploma or equivalent or the necessary experience to meet the requirements of the position description.

4.4.8 Technical Assistant

The Technical Assistant reports directly to the Technical Director and assists with the implementation and maintenance of all programs assigned to the Technical Director.

Position Description and Requirements

Position Title: Technical Assistant

Position Description: This position is responsible for the following:

- Schedules, tracks and provides preliminary document review for DOC studies.
- Performs SOP updates as instructed from Tech. Director.
- Maintains SOP document control system.
- Scans and publishes completed documents to Portal Server for archiving.
- Schedules and documents training sessions and staff meetings held by Tech. Director.
- Assists Tech. Director with development of training program content and media.
- Assists Tech. Director with day-to-day functions of the Tech. Direction Dept. as needed.

Position Requirements: A Bachelors Degree in a science or engineering based major.

4.4.9 Director of Project Management

The Director of Project Management serves as a liaison between the laboratory and its clients ensuring the delivery of reports and data packages. The following is the position description:

Position Description and Requirements

Position Title: Director of Project Management

Position Description: The Director of Project Management serves as a liaison between the laboratory and its clients, and ensures delivery of data packages. Responsibilities include:

- Meets client specifications by communicating project and QA requirements to the laboratory.
- Assigns project managers.
- Notifies laboratory personnel of incoming projects and sample delivery schedules and requirements.

- Monitors status of data package projects in-house to ensure timely and accurate delivery of reports.
- Informs clients of data package related problems and resolves service issues.
- Coordinates requests for sample containers and other services such as data packages.
- Reviews and approves, with input from the Business Unit Manager, proposals for marketing.
- Reviews laboratory data reports and quotes.

Position Requirements: A Degree or the necessary experience, 2 years management or supervisory experience, strong computer and personnel skills, knowledge of the environmental and chemical sciences, and previous project management experience.

4.4.10 Project Manager

The Project Manager is responsible for directly ensuring that the individual client's needs are met on a project-by-project basis with respect to the laboratory's QA program and any project-specific QA programs. The Project Manager is responsible for disseminating any project-specific information to the Laboratory Manager and/or Laboratory Director. Non-routine QA requirements must be approved by the Laboratory Director and Laboratory Manager. The following is the position description for Project Manager:

Position Description and Requirements

Position Title: Project Manager
Position Description: This position is responsible for the following:

- Ensures effective and accurate communication between the client and the laboratory.
- Handles all client requests and needs.
- Utilizes any corporate documents to consult with clients about client questions or concerns.
- Responsible for notifying the Director of Project Management of any client activities that entail services that are not currently performed by EETSE Atlanta.
- Assesses client requests with consultation with the Director of Project Management.
- Develops and maintains client records and requirements.
- Ensures that the laboratory is aware of, and completes, all client requests and requirements.
- Responsible for meeting with the Marketing Manager, Director of Project Management, and Business Unit Manager on a periodic basis for marketing purposes.
- Communicates proper sampling, shipping, and receiving procedures to clients.
- Documents client interaction and maintains client information in the Project Management System.
- Reviews and approves data reports prior to their release to the clients.
- Ensures client specific reporting and quality control requirements are met.

Position Requirements: A Degree or the necessary experience to achieve the position requirements outlined in the Position Description.

4.4.11 Department Manager

Oversees operation of departments, supervises employees, & addresses issues in the departments

Position Description and Requirements

Position Title: Department Manager
Position Description: This position is responsible for the following:

- Supervise employees to ensure they are working to full potential and being productive at all times.

- Handle all personnel issues, i.e. conflict between workers, inappropriate behavior, schedule changes, time-off requests, etc…
- Write warnings if needed.
- Ensure employee's time sheets reflect actual work schedule.
- Make sure clock in-out times are accurate.
- Make sure employees are coming to work at the designated time.
- Monitor employee breaks.
- Assign tasks to personnel using the Task Management software.
- Grade task upon completion, this is to be included in the employee's Performance Evaluation.
- The use of this software will also be used in performing supervisor's Performance Evaluation.
- Perform Employee Performance Evaluations on all employees in department.

Production responsibilities:

- Maintain backlog to ensure all samples are completed within holding time, due date, and that all special requirements are met.
- Keep track of inventory and order supplies as needed.
- Sufficient amounts of reagents, solvents, standards, etc… must be kept at all times so production is not affected because of a shortage of supplies.
- Identify and solve problems within the department including, but not limited to equipment, tests performed, and any other issues resulting from the preparation/analysis of samples.
- A supervisor is required to stay until problems are solved or rush work is completed to within a reasonable amount of time or hour (this includes staying late and working weekends.)
- Delegate work to employees.
- Assign batches and/or tests.
- Assign new tests to employees so workload can be spread evenly among staff.
- Assign duties to employees, i.e. ordering of supplies, logging in new supplies, etc…

QA Responsibilities:

- Ensure all employees are properly trained and DOC's performed.
- Ensure all CDOC's are performed on a yearly basis for all employees and for all tests.
- Ensure MDL's are completed/prepped yearly, more often where applicable, or as needed due to instrument changes/maintenance.
- Complete PT samples in a timely manner and identify any issues with test as soon as possible.
- If necessary, coordinate preparing/running of Proficiency samples with associated departments to ensure their timely completion and enough samples remain for all tests.
- QA review any data generated within department.
- Assists in reviewing departmental requirements and monitoring maintenance requirements.
- Review and revise SOP's when necessary.
- Ensure batches, logbook pages, raw data, & paperwork are scanned & posted to the Portal Server.

Position Requirements: A Bachelor's Degree preferably in chemical, environmental, biological, physical sciences, engineering, or other scientific discipline and at least two years of experience in the environmental analysis similar to that which will be overseen.

4.4.12 Supervisors

Assists with operation of departments and supervision of employees and report to the managers.

Position Description and Requirements

Position Title: Supervisors

Position Description: Supervisors report to their respective Manager on all aspects of sample processing. If a section does not have a supervisor, the Manager of that section functions as the supervisor. The Supervisor's responsibilities include, when applicable:

- Training and qualification of personnel (under their supervision) on procedures.
- Monitors necessary protocols and standard operating procedures, including control charts.
- Maintains QC within their area of responsibility.
- Ensures that personnel (under their supervision) use approved procedures, maintain all instrument QC.
- Recommends and implements new or revised QC policies as approved by the QA Manager.
- Assists in reviewing departmental requirements and monitoring maintenance requirements.
- Reviews all data and QC results, and reports non-conformances to the appropriate QA Manager,
- Technical Manager, and/or Business Unit Manager.
- Provides guidance to analysts in resolving problems encountered daily during sample preparation and analysis, in conjunction with the Technical Director or Quality Assurance Manager.
- Ensures all logbooks are maintained and current.
- Maintains adequate and valid inventory of reagents, standards, spare parts, and other relevant resources required to perform daily analysis.
- Assists Technical Director with MDLs and IDOCs.

Position Requirements: Degree or the necessary experience to achieve the requirements outlined in the position description. Two plus years of experience considered in lieu of a degree.

4.4.13 Analysts

Analysts are responsible for performing the various testing, digestive, and extractive procedures required in the laboratory.

Position Description and Requirements

Position Title: Analysts

Position Description: Each type of analyst position and the specific training required is described in detail in the Employee Training Files maintained by the Technical Director. In general, analysts are responsible for the following duties:

- Performs analyses by adhering to analytical and quality control protocols prescribed by SOPs, the QA manual, turnaround times, rush analyses and short hold analyses, and project specific requirements (e.g. data packages).
- Documents standard and sample preparation, instrument calibration and maintenance, calculations, and any observed non-conformances on work lists, bench sheets, or laboratory notebooks.
- Reports all out-of-control situations, instrument problems, matrix problems, and QC failures, which might affect the reliability of the data, to their respective supervisors or the QA Manager.
- Reviews all data generated prior to entering and submitting the data to the next level of review.
- Suggests method improvements to their supervisor, Technical Director, or the QA Manager for potential incorporation into SOPs.

Position Requirements: At a minimum, analysts must possess a high school diploma or equivalent. If the analyst operates equipment, the analyst must satisfactorily complete a short course

offered by an equipment manufacturer, professional organization, university, or other qualified training facility (in-house training is acceptable).

4.4.14 Project Manager Assistant

Project Manager Assistants are responsible for providing assistance to project managers with the production and completion of data packages.

Position Description and Requirements

Position Title: Project Manager Assistant

Position Description: Project manager assistants report to the project managers. This position is primarily responsible for assisting project managers with on time completion of all data packages and to ensure effective and accurate communication between lab and project managers with respect to data package status. In general project manager assistants are responsible for the following duties:

- Assigns data packages and completion deadlines to appropriate lab departments.
- Responsible for initial data package review after data package was completed by lab departments
- Responsible of notifying project managers or Director of Project Management of any internal problems or discrepancies that may affect data package on time completion.
- Responsible for formatting data package (inserting dividers, making table of contents, copying reports, COC and checklist, putting all data in appropriate order, etc);
- Responsible for setting bookmarks and creating CD ROM's, completing and updating data package status document (located on the EETSE Atlanta Server) on the daily basis, and ensures that data package was scanned or copied after approved by the project manager

Position Requirements: A Degree or the necessary experience to achieve the requirements outlined in the position description.

4.5 Improper, Unethical, or Illegal Actions; Data Integrity System; and Confidentiality of Client Information and Proprietary Rights

4.5.1 It is recognized that the quality assurance program is an inherent function involving all of the organizational components and personnel. The achievement of quality objectives is attained by each individual performing assigned work in strict compliance with approved and applicable requirements and procedures.

4.5.2 For a quality assurance program to succeed, it is imperative that all employees adhere to procedures which detect and prevent improper, unethical, or illegal actions which could in any way compromise the reliability and data integrity. Training in legal, ethical, data integrity, and confidentiality of client information and proprietary rights responsibilities is mandatory. Records are maintained that document, through individual signatures, that every employee understands the consequences of improper, unethical, or illegal actions related to data integrity. Potential instances of improper, unethical, illegal actions or Data Integrity issues will be discussed and addressed in senior management meetings.

The laboratory will inform the clients, of the information it intends to place in the public domain. Except for information that the customer makes publicly available, or when agreed between the laboratory and the customer (e.g. for the purpose of responding to complaints), all other information is considered proprietary information and shall be regarded as confidential. Personnel acting on the laboratory's behalf, shall also keep confidential all information obtained or created during the

performance of laboratory activities, except as require by law. The laboratory is responsible for management of all information obtained or created during the performance of laboratory activities. Information about the customer obtained from sources other than the customer (e.g. complainant, regulators) shall be confidential between the customer and the laboratory. The provider (source) of this information shall be confidential to the laboratory and shall not be shared with the customer, unless agreed by the source.

4.5.3 Improper actions are defined as deviations from method-specified or client-specified analytical or quality assurance practices. These events may be intentional or unintentional. Disciplinary measures may include verbal warnings, written warnings, and/or dismissal.

4.5.4 Unethical or illegal actions are defined as the deliberate falsification or alteration of analytical or quality assurance results where failed method, quality control, or client specifications are made to appear acceptable. These actions affect the integrity of the data. Also included as unethical or illegal actions is the falsification and reporting of data where analyses were never performed. Disciplinary measures may include verbal warnings, written warnings, and/or dismissal. Findings of fraud may be prosecuted to the fullest extent of the law.

4.5.5 Employee training of legal, ethical, and data integrity responsibilities establishes the program and procedures that prevent and detect improper, unethical, or illegal actions by employees. Deterrence begins with a position of zero tolerance established by management. Employee training supports and sustains the policy.

4.5.5.1 Training of laboratory employees with respect to their legal and ethical responsibilities is comprised of three basic components:

4.5.5.1.1 The definition of improper, unethical, or illegal actions.

4.5.5.1.2 The elements of the laboratory's prevention and detection program.

4.5.5.1.3 Some examples of inappropriate laboratory practices that affect data integrity.

4.5.5.2 Training courses in legal and ethical responsibilities also include the potential punishments and penalties for fraudulent conduct.

4.5.6 Laboratory management implements a variety of proactive measures to promote the prevention and detection of improper, unethical, or illegal activities. Minimum requirements are included in the quality program by means of the following:

4.5.6.1 An ethics and data integrity policy that is read and signed by all personnel.

4.5.6.2 Initial and annual ethics and data integrity training.

4.5.6.3 Internal audits.

4.5.6.4 Anti-fraud language in client contracts and project agreements, where applicable.

4.5.6.5 Analyst notation and signature on manual integration changes to data and/or calculations.

4.5.6.6 Mandatory use of electronic and computer software audit functions wherever possible.

4.5.6.7 A no-fault policy encourages employees to come forward and report fraudulent activities.

4.5.7 Employees are provided routine communications in the form of training, lectures, and updates in policy that are intended to reduce illicit behavior.

4.5.8 Any of the following means may be used to monitor the quality and validity of test results:

4.5.8.1 Internal quality control samples.

4.5.8.2 Interlaboratory comparisons or proficiency test studies.

4.5.8.3 Certified reference materials or internal quality control using secondary reference materials.

4.5.8.4 Replicate tests using the same or different methods.

4.5.8.5 Re-testing of retained samples.

4.5.8.6 Correlation of results for different characteristics of a sample.

4.5.9 Examples of inappropriate practices include the following:

4.5.9.1 Failure to properly record and preserve data: Analysts must be able to clearly demonstrate how analytical values were obtained from the associated raw data. Such documentation shall be maintained by the laboratory and be available to data users or auditors at any time. This includes failure to document data in the original logbook or on the original company form. Transferring data from a scratch paper or note paper to the logbook or company form is never allowed. The data must be recorded in the appropriate document at the time the test or preparation is being performed by the person performing the test. Failure to comply with this will result in disciplinary measures up to and including dismissal.

4.5.9.2 Failure to properly document errors: All errors, mistakes, and justifications for manual integrations must be fully explained within the case narrative of the final report.

4.5.9.3 Failure to initiate corrective actions: Analysts having knowledge of any part of an analysis or procedure that requires corrective action must immediately notify management.

4.5.9.4 Failure to report a missed holding time: Samples analyzed outside of allowed holding times must not be reported without qualifying the data, and some results may be unusable due to lack of validity. Backdating an analysis to save a missed hold time is forbidden.

4.5.9.5 Failure to follow methods or SOPs as written: Methods and standard operating procedures must be followed without deviation. Analysts must immediately submit any changes to the Technical Director for revisions.

4.5.9.6 Signing another person's signature to documentation.

4.5.10 Improper, unethical, and illegal actions are considered fraudulent because they affect the integrity of the data. Gross deviations from specified procedures will be investigated for potential improper, unethical, illegal actions and data integrity issues. Findings of fraud may be prosecuted to the fullest extent of the law. The following are examples of improper, unethical, and illegal conduct that affect data integrity:

4.5.10.1 Improper use of manual integrations to meet calibration or method Quality Control criteria, such as peak shaving or peak enhancement, if performed solely to meet QC requirements.

4.5.10.2 Falsification of results to meet method requirements.

4.5.10.3 Reporting of results without analyses to support the data or reporting results from the analysis of one sample for those of another.

4.5.10.4 Selective exclusion of data to meet QC criteria, such as dropping calibration points without technical or statistical justification.

4.5.10.5 Misrepresentation of laboratory performance by falsifying calibration data or QC.

4.5.10.6 Citing matrix interference as a basis for exceeding acceptance limits, especially without initiating corrective actions, in interference-free matrices.

4.5.10.7 Unwarranted manipulation of computer software such as subtracting or not subtracting a blank or background, altering chromatographic baselines, or improper background subtraction (GC/MS) to comply with ion abundance criteria in to meet QC requirements.

4.5.10.8 Improper alteration of analytical conditions, such as modifying an EM voltage or changing a GC temperature program to induce a shorter analytical run time, which makes the standard analysis different from the sample analysis.

4.5.10.9 Misrepresentation of QC samples, such as adding surrogates after sample extraction, omitting sample preparation steps for QC samples, over-spiking, or under-spiking.

4.5.11 The Data Integrity System (a.k.a. Legal & Ethical Training SOP) is reviewed annually as part of the annual management review.

4.5.12 To ensure confidentiality of data integrity issues, a chain of command policy has been adopted. Employees are encouraged to bring data integrity issues to their immediate supervisor. If the supervisor is a part of the data integrity issue, then the employee brings the issue to the Laboratory Manager, who is part of upper management. In the absence of the Laboratory Manager, the issue is brought to either the Quality Assurance Manager or the Technical Director. A confidential meeting with the Human Resources Manager may take place to resolve the issue. Discussions will take place outside the laboratory and in upper management's office(s) to again help ensure confidentiality.

4.5.13 Employees are also trained the importance of Confidentiality of Client Information and Proprietary Rights. Employees are taught as part of their Legal & Ethical Training that they should not discuss client information, events, knowledge of investigations, information about the client obtained from sources other than the client or results outside the work place. This information is considered confidential. Further, they are informed that failure to comply is a violation of their Data Integrity training and is considered grounds for termination of employment.

4.6 Undue Internal and External Pressures and Impartiality

4.6.1 EETSE Atlanta, Inc. strives for the highest caliber of laboratory performance in conjunction with accomplishing quality objectives. One component of realizing this goal is to protect laboratory personnel from undue internal and external pressures.

4.6.2 The laboratory shall be responsible for the impartiality of its laboratory activities and shall not allow commercial, financial or other pressures to compromise impartiality. If a risk to impartiality is identified, the laboratory shall be able to demonstrate how it eliminates or minimizes such a risk.

4.6.3 At EETSE Atlanta, Inc. analysts and technicians are insulated from work-related undue pressures that would compromise the quality of their work. Management is aware and considerate of these internal pressures such as management burdens and project deadlines, and of external stresses such as customer complaints and priority requests for analysis.

4.6.3 Management policy is to remain supportive of laboratory personnel and aware of their workloads and the demands placed upon them. Precautions are taken to ensure that there are no conflicts of interest

between staff and clients. For example, priority requests, complaints, or status of work inquiries are directed through supervisors, managers, or administrative personnel.

4.6.4 Internal complaints and concerns expressed by employees are handled by EETSE Atlanta' policy of encouraging free communication with all levels of management. An "open door" approach promotes avenues of communication that could prevent improper conduct or data integrity issues resulting from undue external and internal pressures. Reducing workload for individual employees may include assigning additional personnel to assist in heavily backlogged areas, providing supplies, or equipment, or affording technical assistance and resources.

4.7 Responsibility for QA Program Adherence

4.7.1 It is the responsibility of all EETSE Atlanta employees to implement the Quality Assurance Program effectively. All chemists and technicians are responsible for understanding and following the measures of the QA program, and for reporting any quality failures to a Manager or Supervisor in a timely manner.

4.7.2 Supervisors and Managers are responsible for ensuring that all laboratory personnel are familiar with the requirements of the Quality Assurance Program and that these requirements are implemented and maintained. It is the responsibility of each Supervisor to ensure that any quality failures are reported to the Project Manager and the Quality Assurance Department immediately.

4.7.3 It is the responsibility of the Technical Director to ensure that all laboratory personnel are trained to perform their assigned analyses.

4.7.4 The laboratory's approved signatories (designees of the Technical Manager) are identified as follows:

Laboratory Manager
Director of Project Management
Project Managers

Individuals are authorized as project manager report signatories based on meeting the qualifications of project manager job description in the QA Manual as well as completion of the following training:

Quality Assurance Manual
Data Integrity Training
PCM Asbestos Reports Training

Individuals are authorized to act as project manager report signatories when these documents have been completed and signed by the individual(s) and referenced managers.

5.0 QUALITY ASSURANCE PROGRAM

5.1 The Quality Assurance Program (QAP) has been developed to provide a high-quality document that complies with the intent of testing regulations, standards, and established guidelines. The QAP takes into account requirements for special controls, processes, test equipment and skills to attain the required quality and the need for verification of quality by inspection and test. It also provides for the training of personnel to attain required proficiency levels and for regular assessments of the QAP to assure the adequacy of resources and the effectiveness of management controls established to achieve quality. The Quality Manual is maintained in a current condition.

5.2 Revisions to this QAP are made and controlled by the QA Manager, Technical Director, and Business Unit Manager in accordance with EETSE Atlanta' quality assurance practices. Such revisions and updates shall be performed as needed to improve the effectiveness of this program. Control of this QA manual is accomplished following the requirements of Section 8.2, "Document Control".

5.3 Definitions (Not Alphabetical)

5.3.1 Batch - A group of samples and QC samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents.

5.3.1.1 Preparation Batch - is composed of between 1 and 20 samples of the same matrix and meets the criteria for a batch as described in Section 5.3.1. Preparation batches consist of extractions, digestions, or concentrations. The maximum time between the start of processing of the first and last sample in a preparation batch is 24 hours. A preparation batch must have a spiked sample and a duplicate sample (or matrix spike duplicate).

5.3.1.2 Analytical Batch - is composed of prepared environmental samples (extracts, digestates, or concentrates) or non-prepared environmental samples which are analyzed together as a group. When the batch contains non-prepared samples as a group, the rules for preparation batches must be followed.

5.3.1.2.1 Test categories where samples do not have to be prepared prior to analysis include GRO, VOC, Ion Chromatography, direct injection SVOC, orthophosphorus, turbidity, pH, and Conductivity.

5.3.1.2.2 When soil VOC or GRO samples arrive in ENCORES or in jars, they considered prepared when placed into water or methanol. Rules for preparation batches apply.

5.3.1.2.3 The maximum length of time that an analytical batch can be left open is 24 hours. An analytical batch may have no more than 20 samples of similar matrix.

5.3.1.2.4 Test procedures take precedence over analytical batch considerations. For example, if the test procedure identifies a batch as occurring over a 12 or 24 hour period, then batches may not be left open for the time period stated in Section 5.3.1.2.1.

5.3.1.2.5 Methanol or water VOC or GRO samples prepared in the laboratory from ENCORES or jars cannot be combined into a sequence with samples that have not been prepared by the laboratory so as to create a batch that contains more than 20 samples or runs for longer than 24-hours.

5.3.1.2.6 An analytical batch must include the analysis of a spiked sample and a duplicate sample (or matrix spiked duplicate) every 20 samples in the batch. In addition, internal quality control dictates that a LCS sample is also included in the batch.

5.3.1.2.7 Always analyze the quality control samples at the beginning of the analytical batch. Quality control samples include the MS, MSD, LCS, LCSD, MB, CCB, and CCV.

5.3.1.2.8 Always verify batch completion date in LIMS.

5.3.2 Accuracy - The nearness of a result or the mean (average) of a set of results as compared to the true value. Accuracy is assessed by means of reference samples, laboratory control sample (spikes), matrix spikes, etc, and is measured in percent recovery.

5.3.3 Blank - There are several types of blanks. The various types are defined below.

5.3.3.1 Calibration Blank - specified in some analytical procedures, is an aliquot of analyte free matrix used to establish a zero-concentration instrument response value.

5.3.3.2 Reagent Blank (as defined under AIHA LAP Accreditation) - includes all the reagents using the same procedure as is used for samples.

5.3.3.3 Method Blank, referred to as a media blank (defined under AIHA LAP Accreditation) - Blank sampling media and analytical reagents analyzed, when applicable, with each batch of samples, using the same procedure that is used for samples. Typical media includes wipes, filters, and air cartridges. Clients should supply specimens of blank sampling media from the same source lot as was used for collecting the field samples.

5.3.3.4 Method Blank (as defined for environmental samples under NELAC or other state accreditations) - an aliquot of analyte-free matrix, usually reagent water or clean sand, to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is carried through the complete sample preparation and analytical procedure. The method blank is used to document the absence of contamination resulting from the analytical process.

5.3.3.4.1 Except for certain conditions listed below, all analytes associated with the blank must have concentrations less than the reporting limit.

5.3.3.4.1.1 The reporting limit may be raised above the level of contamination in the method blank and associated samples with documentation of client approval. (Note: This is not acceptable under <u>any</u> AIHA LAP Accreditation Programs.)

5.3.3.4.1.2 Sample results are 10 times the concentration of the method blank. The data may be reported with a flag indicating that low level contamination was detected in the method blank. Report data with a "B" qualifier.

5.3.3.4.2 Field Blank (Usually associated with environmental samples under NELAC or other state accreditations) - also called an equipment blank. A field blank is an aliquot of analyte–free water brought to the field in sealed containers, transferred to a sample container, and transported back to the laboratory with the samples to be analyzed. The field blank is used to evaluate any possible contamination introduced to the samples during the field collection process.

5.3.3.4.3 Trip Blank - an aliquot of analyte-free water which accompanies the empty containers to the field and the collected samples back to the laboratory. The trip blank is an indicator of possible sample contamination originating from site conditions and sample transportation.

5.3.4 Initial Calibration Verification (ICV) Standard - An ICV is a standard that has been prepared from a source that is not the same as the source used for the preparation of the calibration curve. A second source represents either, a different lot number of standard purchased from the same vendor, or the same standard purchased from a second vendor. ICV standards are not prepared using the same procedures as samples (e.g., digestions or extractions). The individual test methods describe the preparative procedures and suppliers for these standards. ICV standards are analyzed immediately after a successful calibration curve has been developed. Typically, the ICV standards are prepared so that their concentrations represent a midpoint of the calibration curve.

5.3.5 Continuing Calibration Verification (CCV) Standard - A CCV is a standard that has been prepared from the same source as the calibration standards. CCV standards are not prepared using the same procedures as samples are prepared (e.g. digestions/extractions). Individual test methods describe the preparative procedures and suppliers for these standards. CCV standards must be analyzed every 10 samples throughout the analytical batch, and at the beginning and end of the analytical batch.

5.3.6 Laboratory Control Sample (LCS) - Typically prepared by spiking an analyte free matrix such as an aliquot of reagent water or analyte–free soil (Work done under AIHA LAP IHLAP accreditation, the LCS/LCSD is prepared by spiking the same media used for sampling. For AIHA LAP ELLAP accreditation, the appropriate blank matrix/media is spiked) with the analyte(s) of interest. The LCS is prepared and analyzed employing the same methodology as the associated samples. The LCS is used to monitor, assess, and control the laboratory's performance of the methods employed for sample preparation and analysis. The LCS must be performed once per analytical batch, extraction batch, or digestion batch. An extraction or digestion batch is defined as twenty or fewer samples of similar matrix analyzed in a 24-hour period using similar preparative and/or extraction techniques. In many cases, a duplicate LCS sample (LCSD) will be analyzed along with the LCS.

5.3.7 Deionized Water (DI Water, DIW) - Reagent free water that is prepared by passage through various filters and membranes.

5.3.8 Environmental Sample - An environmental sample or field sample is a representative portion of any matrix (aqueous, non-aqueous, mixed waste, etc.) collected from any source for which the determination of the composition of the contamination is requested or required. For the purpose of this procedure, environmental samples are classified as follows:

5.3.8.1 Aqueous - Aqueous samples include surface water, ground water, drinking water, or wastewater. Wastewater consists of municipal and industrial influents and effluents.

5.3.8.2 Soils - Soil samples consist of sediments, soils, and sludges.

5.3.8.3 Non-Aqueous Liquids - Non-aqueous liquids consist of solvents, oils, and fuels. These sample types are not miscible with aqueous samples.

5.3.8.4 Non-Soil Solids - Non-soil solids consist of solid waste, precipitate waste, industrial sludges, concrete, wood, paint chips, ash, and wipes.

5.3.8.5 Bioassay - Bioassay samples consist of bio-solids and municipal waste treatment sludges.

5.3.8.6 Air - Air samples consist of filters, absorbent traps, activated carbon, and passive monitors used in the collection of air samples. Additionally, air samples can be collected in SUMMA canisters or Tedlar bags. In these two cases, the sample is the air itself.

5.3.9 External Quality Control - Practices that monitor the data quality from sources outside the control of the laboratory (e.g. multi-laboratory performance evaluation samples & external audits).

5.3.10 Instrument Detection Limits (IDL) - Minimum concentration limits of an analyte above the instrument noise level that can be detected & quantified with a high degree of confidence (>95%).

5.3.11 Internal Quality Control - Those practices implemented internally to monitor the quality of data and which are under the control of the laboratory (i.e. intra-laboratory performance samples, internal audits, single blind samples, etc.)

5.3.12 Matrix Spike / Matrix Spike Duplicate (MS/MSD) - An environmental sample to which predetermined quantities of specific analytes are added prior to sample preparation and analysis. Percent recoveries are calculated for each of the spiked analytes to assess the effect of the matrix on analyte recovery. In addition, a calculation of precision is made between the results of the MS/MSD to determine reproducibility of results in a specific matrix. This is measured by either the Relative Percent Difference (RPD) or Percent Relative Standard Deviation (%RSD). MS and MSD samples

are analyzed with each analytical, extraction, or digestion batch of up to 20 samples. MS and MSD precision and accuracy limits are developed from quality control data.

5.3.13 Method Detection Limits (MDL) - The term MDL is defined by the EPA as the minimum concentration of a substance that can be measured and reported, in a specific matrix, with 99% confidence that the measured concentration is distinguishable from method blank results (Note: previous definition was that the measured concentration was greater than zero). Initial MDLs are calculated two ways. First, they are calculated any analyte presence in method blanks as MDL_b (Blank MDL). If some but not all of the method blanks for an individual analyte give numerical results, the Blank MDL is set equal to the highest result. Second, the MDL is calculated from spiked samples, giving the MDL_S (Spike MDL). The MDL used will be the higher MDL between the Blank MDL and the Spiked MDL. MDLs are verified quarterly by analyzing two spiked samples. Annual reverification using data from the four quarterly MDL verifications or from using the last 50 or six months' worth of blanks, whichever is greater. The annual reverification is performed within 13 months of the initial MDL. The calculated MDL using the quarterly checks must be within a factor of 0.5 to 2.0 of the initial MDL. If it is, the reverification is complete and the MDL value remains the same until the next reverification. If the calculated MDL is not within a factor of 0.5 to 2.0 of the (initial) MDL study, the initial study must be repeated.

5.3.14 Precision - The agreement of a set of replicate results. Typically, the laboratory analyzes LCS and LCSD or MS and MSD samples and reports the results as RPD or %RSD.

5.3.15 Practical Quantitation Limit (PQL) - is a term that is not used today by regulators. Historically, the PQL is viewed as five times the Method Detection Limit (MDL). Frequently, it is a general term meaning reporting limit.

5.3.16 Qualifiers - A phrase or word group that limits or modifies the meaning. (See section 12.5.4)

5.3.17 RCRA - Resource Conservation Recovery Act

5.3.18 Relative Percent Difference (RPD) - A measure of agreement between two replicate results, expressed as follows:

$$RPD = 100 * \frac{X_1 - X_2}{\overline{X}}$$

where: X_1 and X_2 = the two results

$\overline{X}$ = mean value of the results

5.3.19 Relative Standard Deviation (RSD) – The variance from the mean or true value divided by the mean or true value, expressed as a percentage.

$$\% RSD = 100 * S/\overline{X}$$

where:

$\overline{X}$ = arithmetic mean of the measurements

S = variance

5.3.20 Representativeness - The degree to which data represent a characteristic of a population or set of samples. It is a measurement of both analytical and field sampling precision.

5.3.21 Standard Curve - A curve, which plots known standard concentrations or amounts of an analyte versus the instrument response for the analyte. This curve is used to determine the concentration of the analyte in the unknown samples.

5.3.22 Surrogate - Organic compound(s) which is/are similar to analytes of interest in chemical composition, extraction efficiency, and chromatographic retention, but are not normally found in environmental samples. These compounds are spiked into all blanks, standards, samples, and spiked samples prior to analysis. Percent recoveries are calculated for each surrogate to assess the effectiveness of the sample preparation and analysis and any potential matrix effects.

5.3.23 TNI - The NELAC Institute

5.3.24 AIHA LAP - American Industrial Hygiene Association, Laboratory Accreditation Program

5.3.25 Method of Standard Additions - The standard addition technique involves adding known amounts of standard to one or more aliquots of the processed sample solution. This technique compensates for a sample constituent that enhances or depresses the analyte signal, thus producing a different slope from that of the calibration standards. It will not correct for additive interferences that cause a baseline shift.

5.3.26 Estimation of Uncertainty - is the parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurement. (See section 12.1 for more information.)

5.3.27 Measurand Quantity intended to be measured or analyte concentration. The measurands for methods under AIHA LAP accreditation are available in the SOPs. (Sec 12.1 for more info.)

5.3.28 Interim Limits - are used to establish the level of uncertainty when limits are not available until enough laboratory data has been compiled to establish historical limits. Interim limits may be derived from published methods, those limits within similar analysis, LCS recovery ranges, or based on reasonable expectations from laboratory experience.

5.3.29 Lower Limit Of Quantitation (LLOQ) - As defined in EPA's SW-846 Compendium, it is the lowest point of quantitation, or in most cases, the lowest point in the calibration curve, which is ideally less than or equal to the desired regulatory action levels based on the stated project requirements.

5.3.30 Minimum Level - is a term from 40CFR136 that refers to either the sample concentration equivalent to the lowest calibration point in a method or a multiple of the MDL, whichever is higher. Minimum Levels may be obtained in several ways: they may be published in a method; they may be based on the lowest acceptable calibration point used; or they may be calculated by multiplying the MDL (from the method or as determined by the laboratory) by a factor of 3.

5.3.31 BRL (Below Reporting Limit) - The acronym BRL is used to report the PQL in an easy to understand manner. On EETSE Atlanta analytical reports, BRL is next to the Reporting Limit. Together, BRL and the Reporting Limit mean that if the analyte were present in the sample, it would be below the reporting limit. It would be below the range of specified limits of precision and accuracy. In most cases, this corresponds to the lowest point on the calibration curve. The relationship between the MDL and the PQL (Reporting Limit) is that the MDL is the point at which the analyte is detected but the PQL is the point at which the quantitation is considered to be of known precision and accuracy. Concentrations between the MDL and PQL are estimated values.

5.3.32 Risk - That which makes achieving an objective uncertain (or the effect of uncertainty in objectives)

5.3.33 Risk Assessment - Comparison of the risk likelihood and impact to the severity of the risk's impact.

5.3.34 Risk Management - is the identification, assessment and prioritization of risks followed by analysis to minimize, monitor, and control the impact to maximize the realization of opportunities.

5.3.35 Opportunities - Events with potential positive outcomes for the organization or company.

5.4 Data Quality Objectives for Environmental Testing

5.4.1 Precision. The laboratory objective for precision is to meet the performance criteria demonstrated for all analytical methods as published by the USEPA under SW-846 and 40 CFR Part 136. These criteria are met on similar samples and similar sample matrices. Precision is documented based on replicate analysis, usually duplicate or matrix spike duplicate samples.

5.4.2 Accuracy. The laboratory objective for accuracy is to meet the performance criteria demonstrated for these analytical methods as published by the USEPA under SW-846 and 40 CFR Part 136. These criteria are met on similar samples and similar sample matrices. Accuracy is documented based on recovery data; usually matrix spike samples.

5.4.3 Representativeness. The laboratory objective for representativeness is to provide data which is representative of the sampled medium. The representativeness of the analytical data is a function of the procedures used in processing the samples.

5.4.4 Comparability. The comparability objective is to provide analytical data for which the accuracy, precision, representativeness, and reporting limit statistics are similar in quality to data generated by other laboratories for similar samples and to data compiled by EETSE Atlanta over time. The comparability objective may be documented by any of the following:

5.4.4.1 Inter-laboratory studies carried out by regulatory agencies.

5.4.4.2 Inter-laboratory studies initiated for specific projects or contracts.

5.4.4.3 Comparison of periodically generated statements of accuracy, precision, and reporting limits to those of other laboratories.

5.4.4.4 Through approval from the US EPA or other regulatory agencies for any procedure to which significant modifications have been made.

5.4.5 Completeness. The completeness objective for data can be set for a particular project and is expressed as the ratio of the valid data to the total data over the course of the project. The comparison between the amount of valid, or usable, data you originally planned to collect, versus how much you collected.[Appendix XI Footnote 37] (from EPA, it is usually described as a measure of the amount of available data from a statistical system compared to the amount that was expected to be obtained.)

5.5 Criteria for Quality Indicators

5.5.1 The precision and accuracy acceptability limits for analyses performed at EETSE Atlanta are located in the LIMS and posted on the portal server. The limits in the tables are either laboratory-generated or derived from USEPA methods.

5.5.2 Table 5-3 defines the criteria for data acceptability. Data may be accepted when QC falls outside these limits if probable cause can be attributed to the matrix, and laboratory control samples (LCS) show that the method is in control. Deviations are documented in the final report to the client. In instances where an LCS limit is not available, a limit of 30-170% recovery may be used until in-house limits are available. (Note: Sometimes an alternative default limit may be found in a published method and substituted.) In some cases, lower default limits may be set with approval from the Quality Assurance Manager and Technical Director. The acceptable range of some compounds may be broader, based on prior knowledge of the analyte (e.g., phenols in EPA Method 8270C).

5.5.3 Statistically Derived Limits

5.5.3.1 Selected methods and programs require statistically derived accuracy and precision limits. EETSE Atlanta routinely uses statistically derived limits to evaluate method performance and to determine when corrective action is appropriate.

5.5.3.2 The laboratory periodically updates the limits as stated, but no less than annually. Analysts must use the current limits as found in LIMS.

5.5.3.3 The QA Manager maintains an archive of all limits used within the laboratory. If a method defines the QC limits, the method limits are used. If a method requires the generation of historical limits, they can be derived from data in the LIMS database or by viewing archives.

5.5.4 Development of new QC limits.

5.5.4.1 The QA Manager determines limits using the in-house LIMS system. This is accomplished by the statistical analysis of data for each test method where the method specifies that internal limits are developed.

5.5.4.2 Reviewed data types within the methods include LCS, LCSD, MS, MSD, and surrogates in samples, control samples, and spikes. It is recommended that surrogates are evaluated on a separate basis for samples, LCS, and MS since recovery limits will be wider for client samples than for laboratory control samples.

5.5.4.3 QC limits are updated in LIMS through the Quality Control Section. To change limits, activate the tab called “control charting”. Enter the desired test code, analyte, and sample type. Enter the number of desired data points, and then “get data”.

5.5.4.4 Ideally, 20 or more data points chosen. For tests which data is generated more frequently, e.g. volatile surrogate recoveries in samples, usually, 40 data points or more are used.

5.5.4.4.1 For tests in which there are less than 20 data points, interim limits specified by the method are used unless approved by the QA Manager. If interim limits are not specified by the method, the QA Manager and Technical Director must choose interim limits that represent an estimation of the current laboratory performance. The data in the tables should be footnoted accordingly.

5.5.4.4.2 For tests in which data is generated more frequently, e.g. volatile surrogate recoveries in samples, usually, 40 data points or more are used. The LIMS will pick data points in historical order beginning with the date the action is being performed. The LIMS will compile as many data points are available if the requested number exceeds the number of points in LIMS The LIMS will pick data points in historical order beginning with the date the action is being performed. If the requested number exceeds the number of points in LIMS, then LIMS will compile as many data points as are available.

5.5.4.5 Data should be observed for outliers, and these samples de-selected using the “radio buttons”. Once the data is reviewed, limits can be recalculated by choosing the “Re Calc Stats” tab. Outlying data points are determined by the following two methods:

5.5.4.5.1 Grubbs Test - is a statistical test used to detect outliers in a univariate data set assumed to come from a normally distributed population.

5.5.4.5.2 Manual observation of data set to verify that the data points selected are within the calculated control limits. If they are not, the data points must be “de-selected” and the limits recalculated until the data is within the calculated limits.

5.5.4.6 The lower limit determined from historical data shall not be set to a value less than 10. That is, if the calculated lower limit is < 10, a default value of 10 will be used for the lower limit unless specified by the published method.

5.5.4.7 When the data set is acceptable, choose the "Preview" tab to view data in a page format.

5.5.4.8 Through the "Windows" application, print the data in "Adobe" format by selection of the proper network printer. The file should be saved in one of the following folders depending on which QC type:

TestMethod_Matrix_LCS_LCSD_REC
TestMethod_Matrix_LCS_LCSD_RPD
TestMethod_Matrix _MSD_REC
TestMethod_Matrix _MSD_RPD
TestMethod_Matrix_SURR_REC

5.5.5 Review of revised QC limits

5.5.5.1 After data has been revised for each test method and matrix, results are discussed with the appropriate department managers and Technical Director, if there are concerns about the new limits. The updated limits are then entered into the laboratory LIMS system.

5.5.5.2 New limits are calculated or reviewed every one to two years by the QA Manager with updates as necessary.

5.6 External Quality Assurance Objectives

5.6.1 External Quality Control is the process of employing outside sources to monitor the quality of the data produced by the laboratory. Included in the external quality control program are the analysis of performance evaluation samples and participation in performance evaluation audits.

5.6.1.1 EETSE Atlanta, Inc. analyzes Proficiency Test (PT) samples for each PT field of testing as defined in The NELAC Institute (TNI) and AIHA LAP Fields of Test tables according to matrix type, analyte, and regulatory or environmental program. Samples are obtained from NELAP-designated PTOB / PTPA-approved PT providers (such as Environmental Resource Associates) for NELAP compliance or directly from AIHA LAP to meet their program requirements. The results of the analyses are submitted to the PT Provider for scoring. Study reports are maintained for a minimum of five years on the portal server. The analyses of PT studies are conducted in accordance with all TNI or AIHA LAP. Where required (as with gravimetric analyses for AIHA LAP), an internal PT will be used.

5.6.1.1.1 EETSE Atlanta participates in a minimum of two single-blind, single-concentration PT studies per year for each PT field of testing for which it is accredited. Studies are performed at least 15 calendar days apart. Successful completion of two of the last three proficiency rounds for a given PT field of testing must occur in order to maintain accreditation.

5.6.1.1.2 Blind water or soil PT samples contain amounts of specific constituents that are unknown to laboratory personnel. Upon arrival, PT samples are logged into the Laboratory Information Management System (LIMS) and tracked as routine environmental samples. PT samples provided by the vendor may be 'whole' samples or may have been provided in a concentrated form. PT vendor instructions are followed and dilutions performed on the concentrated vials to make them the 'whole' sample to be tested. Routine procedures for dilutions and analysis are followed per method specific SOPs. The laboratory results must be completed and reported within the required turnaround time.

5.6.1.1.3 EETSE Atlanta, Inc. maintains copies of all written, printed, and electronic records, including, but not limited to bench sheets, instrument chromatograms or printouts, data calculations, and data reports resulting from the analysis of any PT sample. These records are maintained for five years or for as long as required by the applicable regulatory program, whichever is greater. These records include a copy of the PT study report forms used to report PT results. All laboratory records are available to assessors of the Primary Accrediting
Authority during on-site audits.

5.6.1.1.4 Whenever a study is failed, EETSE Atlanta determines the cause for the failure and takes the necessary corrective actions. The investigation and action taken are documented into QA records and provided, if required, to the Primary Accrediting Authority.

5.6.1.2 Performance evaluation samples are also obtained from the following list of suppliers.

5.6.1.2.1 ELPAT. This proficiency testing program is administered by the American Industrial Hygiene Association-Laboratory Accreditation Program (AIHA LAP). Once a quarter, the laboratory receives a set of proficiency samples from Research Triangle Institute for the analysis of lead content. The matrices are soils, wipes, and/or paint chips.

5.6.1.2.2 PAT. This proficiency testing program is administered by the American Industrial Hygiene Association-Laboratory Accreditation Program (AIHA LAP). Once a quarter, the laboratory receives a set of proficiency samples to be analyzed for metals, asbestos fibers, This program is required as part of the laboratory's certification to perform analyses on samples that measure indoor air quality.

5.6.1.2.3 EMPAT. This proficiency testing program is administered by the American Industrial Hygiene Association-Laboratory Accreditation Program (AIHA LAP). EMPAT fungal proficiency samples are available for both the 'Direct Examination'. Once a quarter, the laboratory receives notification that the Fungal Direct Examination Proficiency Testing Program has opened on the AIHA LAP website. The lab has access to the portal for 24 hours a day for 7 days at which time the study closes. This program requires the identification of selected slides within a set amount of time.

5.6.1.2.4 North Carolina Department of Environmental, Health and Natural Resources.
Once a year the laboratory receives performance samples for certification by North Carolina for all analyses not already submitted under other programs. These samples are critical for the continuation of certification by the state of North Carolina. To renew certification each year, the lab must submit acceptable PT sample results to the NC WW/GW LC Program for each parameter, analyte, technology and matrix (where a method is matrix-specific) by October 31. A laboratory that fails a PT sample for a parameter method technology must take steps to identify the root cause of the failure, take corrective action, report the corrective action taken to NCDENR, and participate in a second PT study meeting the criteria listed previously in this policy. The corrective action response must include the laboratory's root cause analysis and a copy of any objective evidence (e.g., calibration curves, revised procedures, records, training records, standard operating procedures, etc.) to indicate that the corrective actions have been implemented /completed. The results of the remedial PT must be received in this office within 60 days from the date the failed results are issued by the accredited proficiency testing provider. A laboratory failing the second (or remedial) PT study may be decertified for that parameter method technology (not necessarily for all technologies for that parameter).

For multi-analyte parameters (e.g., organic analyses), when greater than 80% of analytes are acceptable, but one or more individual analytes are graded unacceptable, acceptable performance has been demonstrated for the parameter method technology. The laboratory must, however, analyze a remedial PT for the individual analytes that were graded unacceptable. When a remedial PT is graded unacceptable for an individual analyte (constituting a second unacceptable result), the laboratory must qualify data for those individual analytes as "estimated" (whether detected or not) until acceptable results are obtained on two consecutive remedial PTs for the analyte in question.

5.6.1.3 Performance Audits

5.6.1.3.1 In order to maintain certification in many states, to comply with commercial contracts, and to satisfy many agency requirements, EETSE Atlanta, Inc. must undergo initial and ongoing audits performed by external auditors. These audits may take the form of technical and/or evidentiary audits. Every section of the laboratory, both analytical and clerical, should be ready at all times to participate in these audits.

5.6.1.3.2 In the event that adverse findings or deficiencies are discovered, or observations and/or recommendations are made during an audit, QA and laboratory management shall review the comments and submit a response, including corrective actions, to the audit report.

5.6.1.4 State Audits

5.6.1.4.1 State Audits are performed in accordance with each individual state's certification program. These audits are generally performed to determine the laboratory's suitability to perform environmental analyses according to the parameters dictated by that state.

5.6.1.5 Commercial Audits

5.6.1.5.1 Audits performed by commercial clients may be scheduled on a pre-award basis for a contract. Once the contract is awarded, audits may be scheduled at the request of the client or at a pre-determined frequency. The client, as well as professional audit teams, may perform audits required by commercial clients.

5.7 Internal Quality Control

5.7.1 The internal quality control program serves two primary functions. One function is to monitor the reliability of the data (e.g., accuracy and precision). The other function is to control and maintain the quality of the data (e.g., the use of ACS grade reagents, traceable standards, etc.).

5.7.2 The following sections outline the specific actions and procedures employed to monitor the process for producing and reporting quality data that is consistent with the Quality Control Program. Processes such as, but not limited to, validity of results, verification of operator competence, recovery of known spikes, analysis of reagent blanks, calibration with traceable standards, analysis of duplicates, and maintenance of quality control charts must be employed and continually monitored. The laboratory may also adopt additional quality assurance procedures; however, the minimum requirements are discussed below. The QA Manager and Technical Director, under restrictions by the methodology and in conjunction with the appropriate laboratory management staff, shall determine which requirements shall be implemented for each section.

5.7.3 Training & Certification of Operator Competence. Quality Control begins with the establishment of basic laboratory techniques and skills. It is imperative that analysts receive proper training before performing independent laboratory analyses. Each analyst must demonstrate proficiency of laboratory techniques and skills. Records to that effect are kept in the employee's personal training files.

5.7.4 Documentation. Regardless of which analytical procedures are used in the laboratory, the methodologies employed shall be carefully documented.

5.7.4.1 Standard Operating Procedures (SOPs) and approved methods may be periodically modified, updated, or replaced in their entirety due to advances in technology, regulatory protocols, or at the discretion of laboratory management. All proposed changes, however, are reviewed by the Technical Director to ensure compliance with all regulatory protocols.

5.7.4.2 If a client requests a change of procedure, the change must be pre-approved by the laboratory prior to use. The change must be documented in writing and kept on file as part of the laboratory project records.

5.7.4.3 If a method is modified such that it no longer complies with the provisions set forth by the accrediting agencies, the client will be informed.

5.7.4.4 Documentation of analytical procedures for generating laboratory data shall be clear, concise, adequately referenced, and reflect the actual steps employed by the analyst.

5.7.5 Standard Operating Procedures (SOP). Methodologies employed in the laboratory are documented in SOPs. (Table 5-3 shows a Summary of Calibration and QC Procedures for Various Tests.) See Chapter 8 gives detailed information on SOPs.

5.7.6 Initial Calibration Verification (ICV) Standard. Individual component recovery of the ICV standard is calculated using the following equation:

$$\text{ICV Standard Percent Recovery} = \frac{A}{T} x100$$

where:
A = concentration measured
T = true value of the spiking concentration

5.7.6.1 The ICV must be made from a different source than the calibration curve standards.

5.7.6.2 The acceptable recovery limits for the ICV standards vary based on the individual procedure and are specified in Table 5-3.

5.7.6.3 If the recoveries of any of the ICV standards are not within the limits specified in Table 5-3, the test method may not be performed. The analyst must follow the out-of-control procedures discussed in Section 5.8 before initiating any analyses.

5.7.7 Continuing Calibration Verification (CCV) Standard. Individual component recovery of the CCV standard is calculated using the following equation:

$$\text{CCV Standard Percent Recovery} = \frac{A}{T} x100$$

where:
A = concentration measured
T = true value of the spiking concentration

5.7.7.1 The acceptable recovery limits for the CCV standards are procedure dependent and are specified in Table 5-3.

5.7.7.2 If the recoveries of any of the CCV standards are not within the limits specified in Table 5-3, the testing must be discontinued. The analyst must follow the out-of-control procedures discussed in Section 5.8 before continuing any analyses.

5.7.8 The Laboratory Control Sample (LCS)

5.7.8.1 The individual test methods describe the preparative procedures and suppliers for the LCS & LCSD standards. The LCS & LCSD samples are prepared in either reagent grade water or sand in accordance with the procedural steps followed for the preparation of a matrix spike sample.

5.7.8.2 Individual component recovery of the LCS(D) is calculated using the following equation:

$$\text{LCS (LCSD) Spike Percent Recovery} = \frac{A}{T} x100$$

where:

A = concentration measured
T = true value of the spiking concentration

5.7.8.3 Precision between the LCS and LCSD recoveries is calculated using the following equation:

$$\% \text{ RPD} = \frac{\text{Difference between LCS and LCSD recoveries}}{\text{Average of LCS and LCSD recoveries}} \times 100$$

5.7.8.4 The acceptable recovery limits for the LCS standards vary based upon the individual procedure and are specified in LIMS test codes.

5.7.8.5 If recoveries of any of the LCS standards are not within the limits specified in the table, the testing must be stopped. If the precision between the two recoveries is not within the limits specified in the table, the testing must be stopped. The analyst must follow the out-of-control procedures discussed in Section 5.8 prior to continuing any analyses.

5.7.9 Matrix spike (MS) and matrix spike duplicate (MSD). Individual component recovery of the matrix spike is calculated using the following equation:

$$\text{Matrix Spike Percent Recovery} = \frac{(A - B)}{T} \text{x}100$$

where:

A = concentration measured after spiking
B = background concentration
T = true value of the spiking concentration

5.7.9.1 MS and MSD sample recovery limits are used to determine matrix effects on the recovery target analytes. The acceptable recovery limits for the MS and MSD standards are indicated in LIMS test codes.

5.7.9.2 It is the discretion of the department manager to have a batch re-processed or re-analyzed after assessment of the matrix spike recovery values and other batch QC data. The analyst must follow the out-of-control procedures discussed in Section 5.8 prior to continuing any analyses.

5.7.9.3 In the event that insufficient sample is provided for MS/ MSD analysis, the narrative of the final report must be amended to indicate lack of sample for analysis of MS and / or MSD.

5.7.10 An Initial Demonstration of Capability (IDOC) study is performed to establish the ability of an analyst and/or analytical system to generate acceptable precision and accuracy data. An IDOC study is performed on each certified method and matrix analyzed in the laboratory where applicable. Samples prepared for the IDOC studies are made from a second source independent of the standard source used for the calibration determination. A second source standard may be a standard purchased from the same manufacturer but a different lot or batch. Four LCS's are prepared and analyzed. To establish the ability to generate acceptable accuracy and precision, the analyst must perform the following operations:

5.7.10.1 Because of the nature of several test methods, IDOCs cannot be performed. These tests represent methods where samples of known concentrations cannot be prepared in the laboratory. Specific requirements for these test methods are described in Table 5-1***.

5.7.10.2 Calculate the average recovery (x) in µg/L, and the standard deviation of the recovery(s) in µg/L, for each analyte using the four results. Demonstration of Capability must be updated and documented annually or more frequently if required by method with a Continuing Demonstration of Capability (CDOC). Other options for CDOC include the use of successfully passed third party Proficiency Test (PT) studies and Method Detection Limit studies that meet recovery and reporting limit criteria. (See Table 5-1)

5.7.10.3 The Method Performance Section of the individual SOP provides laboratory recovery and precision data for the method. Similar results from spiked water should be expected. Results are considered comparable if the calculated standard deviation of the recovery does not exceed the single laboratory RSD or 10% (20% for some organic analytes), whichever is greater and the mean recovery lies within the interval indicated by the test method, or X ± 15%, whichever is greater. Specific requirements for each NELAP certified test method as well as those required by AIHA LAP are described in Table 5-1***.

Table 5-1 Demonstration of Capability Acceptance Criteria

Certified Method	DOC Requirement	Control Limits/ Acceptance Criteria*
AIHA LAP METHODS		
SW3050B / N7082 (Lead Paint)	IDOC: 4 sets of 5 Ref CDOC: Batch QC or PT	80-120%Rec LCS Control Limits, MDLs or PT Acceptance Criteria
SW3050B / 7000B (Lead in Soil)	IDOC: 4 sets of 5 Ref CDOC: Batch QC or PT	80-120%Rec LCS Control Limits, MDLs or PT Acceptance Criteria
N7082 (Lead in Dust Wipe)	IDOC: 4 sets of 5 Ref CDOC: Batch QC or PT	80-120%Rec LCS Control Limits, MDLs or PT Acceptance Criteria
N7303 (Lead in Air)	IDOC: 4 sets of 5 Ref CDOC: Batch QC or PT	80-120%Rec LCS Control Limits, MDLs or PT Acceptance Criteria
N7400 (Asbestos PCM)	PT Samples	PT Acceptance Criteria
Fungal Air Direct Exam (Micro)	PT Samples	PT Acceptance Criteria
Fungal Bulk Direct Exam (Micro)	PT Samples	PT Acceptance Criteria
Fungal Surface Direct Exam (Micro)	PT Samples	PT Acceptance Criteria
SM2120B Color	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
SM2120F Color ADMI	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
E100.2	Prep, LCS or PT	Meet Grid QC, Calib of TEM, EDXA, Camera
E120.1 Conductivity	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
SM4500H^{+}B-2011 pH	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
SM2540C TDS	4 LCS or PT	PT acceptance Criteria
SM2540D TSS	4 LCS or PT	LCS Control Limits or PT acceptance Criteria

Certified Method	DOC Requirement	Control Limits/ Acceptance Criteria*
SM2540B TS	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
E160.4 VS	PT	PT acceptance Criteria
SM2540F Settleable Solids	PT	PT acceptance Criteria
E1664B Oil and Grease_TPH	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
E180.1 Turbidity	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
E200.7 ICP EETSE Atlanta Metals	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
E200.8 ICP MS Metals	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
E245.1 Mercury	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
E300 Anions by IC	4 LCS or PT; LCR / MDL	LCS Control Limits, MDLs or PT acceptance Criteria
SM2310B Acidity	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
SM2320B Alkalinity	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SM4500Cl G-2011 Residual Chlorine	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SM4500CN G-2016 Amenable Cyanide	4 LCS	LCS Control Limits
SM4500CN E-2016 Total Cyanide	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
E350.1 Ammonia (as N)	4 LCS or PT; LCR / MDL	LCS Control Limits, MDLs or PT acceptance Criteria
E351.2 TKN	4 LCS or PT; LCR / MDL	LCS Control Limits, MDLs or PT acceptance Criteria
E353.2 Nitrate (as N)	4 LCS or PT; LCR / MDL	LCS Control Limits, MDLs or PT acceptance Criteria
E353.2 Nitrate_Nitrite (as N)	4 LCS or PT; LCR / MDL	LCS Control Limits, MDLs or PT acceptance Criteria
NECi N07-0003 Nitrate-Nitrite (DA)	4 LCS or PT; LCR / MDL	LCS Control Limits, MDLs or PT acceptance Criteria
E353.2 Nitrite (as N)	4 LCS or PT; LCR / MDL	LCS Control Limits, MDLs or PT acceptance Criteria
SM4500O H-2016 Dissolved Oxygen	4 LCS	LCS Control Limits
E365.1 Ortho Phosphorus	4 LCS or PT; LCR / MDL	LCS Control Limits, MDLs or PT acceptance Criteria
E365.1 Total Phosphorus	4 LCS or PT; LCR / MDL	LCS Control Limits, MDLs or PT acceptance Criteria
SM4500S2 F-2011 Sulfide	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SM4500SO3 B-2011 Sulfite	4 LCS or PT	RSD Limit ≤ RPD Limits
SM5210B BOD	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
E410.4 COD	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SM5310B TOC	4 LCS or PT; LCR / MDL	LCS Control Limits, MDLs or PT acceptance Criteria
E420.1 Total Phenolics	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
E420.4 Total Phenolics	4 LCS or PT; LCR / MDL	LCS Control Limits, MDLs or PT acceptance Criteria
SM5540C MBAS Surfactants	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
E610 PAHs	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
E615 Herbicides	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
E624.1 VOCs	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
E625.1 SVOCs	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
FL-PRO	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
PMOIST	4 LCS or PT	Demonstration using Real World Samples
RSK-175 Dissolved Methane, Ethane, Ethene	4 LCS	MDLs or LCS Control Limits
SM10200H Chlorophyll	4 LCS	LCS Control Limits
SM2340B Hardness	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
SM3500Cr B Hexavalent Chromium	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SM3500Fe B Ferrous Iron	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria

Certified Method	DOC Requirement	Control Limits/ Acceptance Criteria*
SM5210B CBOD	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
SM9222B Total Coliforms	PT	PT acceptance Criteria
SM9222D Fecal Coliforms	PT	PT acceptance Criteria
SM9223B E.Coli / Total Coliforms	PT	PT acceptance Criteria
SW1010 Flash Point	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
SW1030	DUP	Demonstration using Real World Samples
SW1311 TCLP & 1312 SPLP	SOP Signoff/EETSE Atlanta Training	N/A
SW6010 ICP EETSE Atlanta Metals	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW6020 ICP MS Metals	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW7196 Hexavalent Chromium	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW7470 Mercury in Water	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW7471 Mercury in Soils	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW7473 Mercury in Soils	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW8011 EDB DBCP	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW8015 DAI	4 LCS	LCS Control Limits
SW8015 DRO or GRO	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW8081 Pesticides	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW8082 PCBs	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW8151 Herbicides	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW8260 Oxygenates	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW8260 VOCs	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW8270 SVOCs	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW8310 PAHs	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW8315 Formaldehyde and Acetaldehyde	4 LCS	MDLs or LCS Control Limits
SW9010_9014 Cyanide	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW9030_9034 Sulfide	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW9040 pH in Water	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
SW9045 pH in Soil	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
SW9050 Conductivity	4 LCS or PT	LCS Control Limits or PT acceptance Criteria
SW9056 Anions by IC	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW9060 TOC	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW9065 Total Phenolics	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW9070 Oil and Grease_TPH in Water	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW9071 Oil and Grease_TPH in Soils	4 LCS or PT	LCS Control Limits, MDLs or PT acceptance Criteria
SW9095 Free Liquids by Paint Filter	SOP Sign-Off Only	Demonstration using Real World Samples
TO-14A, TO-15	4 LCS	MDL or LCS Control Limits

5.7.10.4 The large number of analytes in multi-element analyses presents a substantial probability that one or more will fail at least one of the acceptance criteria when all analytes of a given method are determined. Should this occur, re-analyze only the failed analytes, following the procedures discussed in this section.

5.7.10.5 When one or more of the analytes tested fails at least one of the acceptance criteria, the analyst must proceed according to the out-of-control procedures discussed in Section 5.8.

5.7.10.6 Due to the nature of several test methods, IDOCs cannot be performed. These tests represent methods where samples of known concentrations cannot be prepared in the laboratory. Tests that are included in this category are EPA 110.2, 160.3, 160.4, 160.5, 150.1, 9040, 9045, 1010, SM 2340B, SM2340G, SM9223, and SM9222. To complete IDOCs for these tests, the analyst(s) must satisfactorily pass available PE samples for all appropriate matrices.

5.7.10.7 Analyst Demonstration of Capability and training includes the following:

Quality Assurance Manual Training (annually)
Data Integrity (Legal & Ethical) Training (annually)
SOP Training (initially and as updated)
ICNs associated with the SOPs (initially and as updated)
Demonstration of Capability (program specific)
Procedure and Checklist Training (initially and as updated)

Individuals are authorized to perform analysis when these documents have been completed and signed by the individual(s) and referenced managers.

5.7.10.8 AIHA LAP Training Requirements

AIHA LAP Technician/Analyst Training Requirements. All technicians and analysts must complete training and demonstrate proficiency prior to analysis of any ELLAP or IHLAP program samples. The laboratory documents the competence requirements for each function influencing laboratory activities, including requirements for education, qualification, training, technical knowledge, skills and experience using the following:

- Resumes for the determination of education and previous experience
- Standard Operating Procedures (SOPs) and other training verified with sign-offs (QA Manual, Data Integrity, Health & Safety, general procedure training, etc.)
- Proficiency Testing results
- Routine Quality Control performance
- Frequency of Corrective Action Reports pertaining to analyst
- Observations from management
- Internal audit assessments

The training and proficiency demonstrations must meet the requirements specified in the AIHA LAP LQAP Policy Document, Modules 2A, 2B and 2C and are described in Section 1.2 and 1.3 below.

5.7.10.8.1 ELLAP Specific Technician/Analyst Training Requirements:

5.7.10.8.1.1 Initial demonstration of capability.

Each technician/analyst must complete at least 20 days work/training in the prep and / or metals analysis lab using technologies/instrumentation similar to that to be used for ELLAP samples under the direct supervision of an ELLAP trained tech / analyst prior to unsupervised prep / analysis of ELLAP regulated client samples.

Each analyst/technician must read, understand & agree to follow the laboratory SOP and document using the SOP Acknowledgement sign-off form. Each technician / analyst must prep and/or analyze as appropriate at least 2 blind reference material test samples. These samples may be AIHA LAP provided PT samples or laboratory prepared Certified Reference Material of the appropriate

matrix, i.e. soil, paint, wipe (spiked with bag house dust) or air filter. Results must fall within the PT acceptance range or laboratory LCS range as appropriate.

Each technician/analyst must complete a minimum of 4 independent test runs of sample preparation/analysis prior to prepping/analyzing actual samples. This test is performed through the digestion/analysis of four separate groups of 5 replicate, matrix specific Certified Reference Material samples, with each group separated by at least one day. To be deemed acceptable per ELLAP requirements, 75% of the replicates in each group must recover within 90-110% of the true value. Any individual group that fails to meet the ELLAP criteria must be repeated in its entirety (all 5 replicates repeated).

Once all requirements in 5.7.10.8.1.1 have been met, the technician/analyst will be approved to begin unsupervised prep/analysis of client samples. Documentation of approval to begin work is defined as the date signed by the Technical Director (or designee) on the Demonstration of Capability Certification form.

5.7.10.8.1.2 Continuing Demonstration of Capability (CDOC). Each technician/analyst must demonstrate continued capability at least every 6 months through the analysis of AIHA LAP provided PT samples or in house laboratory QC samples, i.e. LCS samples. Results must fall within the AIHA LAP PT acceptance criteria or Policy Module 2C, Table 2C-1 LCS control limits per samples used.

5.7.10.8.1.3 All IDOC and CDOC documentation for ELLAP related procedures is maintained and available for review for at least 5 years.

5.7.10.8.2 IHLAP Chemistry Specific Technician/Analyst Training Requirements:

5.7.10.8.2.1 Initial demonstration of capability.
Each technician/analyst must complete at least 20 days of work/training in the prep and/or metals analysis lab using technologies/instrumentation similar to that used for IH samples under the direct supervision of an IH trained technician/analyst prior to unsupervised prep and/or analysis of IH regulated client samples. Each analyst /technician must read, understand and agree to follow the laboratory SOP as documented using the SOP Acknowledgement sign-off form. Each technician / analyst must prep and/or analyze as appropriate at least 2 blind reference material samples (concentration unknown to the technician/analyst). These samples may be AIHA LAP provided PT samples or laboratory prepared Certified Reference Material added to the method specific media used for client samples. Results must fall within the PT acceptance range or laboratory LCS range as appropriate. Once all requirements in 5.7.10.8.2.1 have been met, the technician/analyst will be approved to begin unsupervised prep/analysis of client samples. Documentation of formal approval to begin work is defined as the date signed by the Technical Director on the Demonstration of Capability Certification form.

5.7.10.8.2.2 Continuing Demonstration of Capability (CDOC). Each technician/analyst must demonstrate continued proficiency at least every 6 months through the analysis of AIHA LAP provided PT samples or in house laboratory QC samples, i.e. LCS samples. Results must fall within the AIHA LAP PT acceptance criteria or laboratory established LCS control limits as appropriate. CDOCs are documented via AIHA LAP PT reports or LIMS LCS data as appropriate.

5.7.10.8.2.3 All IDOC and CDOC documentation for IHLAP related procedures is maintained and available for review for at least five (5) years.

5.7.10.8.3 IHLAP Asbestos by PCM Specific Technician/Analyst Training Requirements:

5.7.10.8.3.1 All PCM technicians/analysts must complete a NIOSH 582 equivalent training course and successfully pass the course examination during their training period and prior to beginning unsupervised work on client samples.

5.7.10.8.3.2 Initial demonstration of capability.
Each technician/analyst must complete at least 20 days of work/training in the PCM analysis lab using technologies/instrumentation similar to that to be used for IH/PCM samples under the direct supervision of an IH/PCM trained technician / analyst prior to unsupervised prep and/or analysis of IH/PCM regulated client samples. Each analyst/technician must read, understand and agree to follow the laboratory SOP as documented using the SOP Acknowledgement sign-off form.

Each technician/analyst must prep and/or analyze as appropriate at least 2 blind reference material test samples (concentration unknown to the technician/analyst). These samples may be an AIHA LAP provided PT samples or laboratory prepared Reference Slides. Results must fall within the PT acceptance range or laboratory reference slide counting acceptance ranges as appropriate.

Once all requirements in 5.7.10.8.3.2 have been met, the technician/analyst will be approved to begin unsupervised prep/analysis of client samples. Documentation of formal approval to begin work is defined as the date signed by the Technical Director on the Demonstration of Capability Certification form.

5.7.10.8.3.3 Continuing Demonstration of Capability (CDOC).
Each technician/analyst must demonstrate continued proficiency at least every 6 months through the analysis of AIHA LAP provided PT samples or laboratory prepared Reference Slides. Results must fall within the AIHA LAP PT acceptance criteria or laboratory reference slide counting acceptance ranges as appropriate. CDOCs are documented via AIHA LAP PT reports or in the QC data log books maintained in the PCM laboratory as appropriate.

5.7.10.8.3.4 All IDOC and CDOC documentation for IHLAP related procedures is maintained and available for review for at least 5 years.

5.7.10.8.4 EMLAP Specific Technician Training Requirements:

5.7.10.8.4.1 EMLAP laboratory technicians must meet minimum educational requirements of a high school diploma or GED.

5.7.10.8.4.2 Initial demonstration of capability.
Each technician must complete at least 6 months documented training for Air Direct Exam (spore trap) and work/training in the EMLAP microbiology laboratory under the direct supervision of an EMLAP trained technician / analyst prior to performing unsupervised technician level work on EMLAP regulated client samples.

Each technician must read, understand and agree to follow the laboratory SOP as documented using the SOP Acknowledgement sign-off form.
Technician level personnel are limited to preparatory operations and assistance in all steps leading to the identification of microorganisms and may not perform analyses or be responsible for the final decisions related to the identity of microorganisms, except as described below:

"Technicians may function as analysts for Air-Direct Examination (spore traps) analysis after completion of 12 months documented on the job training and demonstrated proficiency. During the 12 month analyst training period, the trainee may perform work under the direct supervision of another qualified analyst. All work must be reviewed by another qualified analyst prior to release of data."
Technicians functioning as analysts shall demonstrate proficiency by successful analysis of EMLAP PT samples or laboratory reference slides to document their ability to identify genus/groups of fungi reported. The technician must also complete and pass the laboratory Fungal Identification Examination/Quiz as administered by the Micro Dept. Manager. Once all requirements in 5.7.10.8.5.2 have been met, the technician will be approved to begin unsupervised prep/analysis of client samples. Documentation of formal approval to begin work is defined as the date signed by the Technical Director on the Demonstration of Capability Certification form.

5.7.10.8.4.3 Continuing Demonstration of Capability (CDOC).
Each technician must demonstrate continued proficiency at least every 6 months through the analysis of AIHA LAP provided PT samples or laboratory prepared Reference Slides. Results must fall within the AIHA LAP PT acceptance criteria or laboratory reference slide counting acceptance ranges as appropriate. CDOCs are documented via AIHA LAP PT reports or in the QC data log books maintained in the microbiology laboratory as appropriate.

5.7.10.8.4.4 All IDOC and CDOC documentation for EMLAP related procedures is maintained and available for review for at least 5 years

5.7.10.8.5 EMLAP Specific Analyst Training Requirements:

5.7.10.8.5.1 EMLAP laboratory analysts must meet minimum educational requirements of a baccalaureate degree in microbiology, biology or related life science.

5.7.10.8.5.2 Initial demonstration of capability.
Each analyst must complete at least 3 months of documented training fro Air Direct Exam (spore trap) and at least 6 months of work/training in the EMLAP microbiology laboratory prior to performing unsupervised work on EMLAP regulated client samples. Each analyst must read, understand and agree to follow the laboratory SOP as documented using the SOP Acknowledgement sign-off form. Each analyst must prep and/or analyze as appropriate at least 2 blind reference material test samples. These samples may be an AIHA LAP provided PT samples or laboratory prepared Reference Slides. Results must fall within the PT acceptance range or laboratory reference slide counting acceptance ranges as appropriate and document proper identification of genus/species and genus/groups of fungi reported.

Once all requirements in 5.7.10.8.5.2 have been met, the technician/analyst will be approved to begin unsupervised prep/analysis of client samples. Documentation of formal approval to begin work is defined as the date signed by the Technical Director on the Demonstration of Capability Certification form.

5.7.10.8.5.3 Continuing Demonstration of Capability (CDOC). Each technician/analyst must demonstrate continued proficiency at least every 6 months through the analysis of AIHA LAP provided PT samples or laboratory prepared Reference Slides. Results must fall within the AIHA LAP PT acceptance criteria or laboratory reference slide counting acceptance ranges as appropriate. CDOCs are documented via AIHA LAP PT reports or in the QC data log books maintained in the microbiology laboratory as appropriate.

5.7.10.8.5.4 All IDOC and CDOC documentation for EMLAP related procedures is maintained and available for review for at least 5 years.

5.7.11 The Method Detection Limit (MDL). MDL studies are performed initially for a test and verified quarterly. Reverification occurs annually within 13 months of the initial MDL study. The MDL Procedure is as follows:

5.7.11.1 Estimate the MDL

5.7.11.1.1 Use the previous MDL study.

5.7.11.1.2 Use 3 times the standard deviation of (low level ideally) spikes.

5.7.11.1.3 Determine the concentration or region of your calibration curve where there is a significant change in sensitivity and use that concentration. (This could also be at your instrument's limitation to detect.)

5.7.11.2 Determine the Initial MDL

5.7.11.2.1 Determination of the Blank MDL (MDL_b) using method blank values for certain analytes is the first step to determining an MDL. For those analytes that show identified concentrations in Method Blanks, enter the values into the MDL spreadsheet (that is posted with the MDL procedure) and determine the MDL. If some but not all of the method blanks for individual analytes give numerical results, set the MDL equal to the highest result.

5.7.11.2.2 Determination of the Spiked MDL (MDL_S) - Next perform the Spiked MDL (MDL_S) study in one of the following ways

5.7.11.2.2.1 <u>Single Instrument Spiked MDL</u>

5.7.11.2.2.1.1 Prepare and analyze at least seven replicates at a concentration determined by the estimated MDL procedure. These seven replicates must be prepared in at least three separate batches and analyzed (run) on three different days. (Run each of the 3 batches on different days.) Enter the values obtained into the MDL spreadsheet (that is posted with the MDL procedure).

5.7.11.2.2.1.2 Use 2 or 3 study replicate values (for a total of 5) from the previous two MDL studies performed within the last 24 months assuming the spike concentration used for those studies is the

same concentration to be used for the initial MDL determination. In addition, prepare and analyze at least two more replicates at the same concentration. Populate the MDL spreadsheet with those values.

5.7.11.2.2.1.3 Submit both spreadsheets to the Department Manager or the QA Manager for review and approval.

5.7.11.2.2.2 Multiple Instrument Spiked MDL

5.7.11.2.2.2.1 Prepare and analyze at least two replicates per instrument (minimum seven total replicates) at a concentration determined by the estimated MDL procedure. Replicates must be prepared in at least three separate batches and analyzed (run) on three different days. Enter the values obtained into the MDL spreadsheet (that is posted with the MDL procedure).

5.7.11.2.2.2.2 Use 2 or more study replicate values per instrument from the previous two instruments' MDL studies performed within the last 24 months assuming the spike concentration used for those studies is the same concentration to be used for the initial MDL determination. Enter these values into the MDL spreadsheet.

5.7.11.2.2.2.3 Submit both spreadsheets to the Department Manager or the QA Manager for review and approval.

5.7.14.1 Method Blank (MB). For each method, the analyst must analyze reagent water blank daily to demonstrate that interferences from the analytical system is under control. The method blank is treated in the same manner as any sample, including any sample preparations such as digestions and extractions.

5.7.12.1 In the method blank, the concentration of any analyte of interest should not exceed the laboratory established practical quantitation limit (PQL). If contamination is detected in the blank, one of the following conditions must be met, or re-analysis of all associated samples is required (Section 5.8, Out of Control Procedures).

5.7.12.1.1 With documentation of client approval, the PQL may be increased above the level of contamination in the method blank and the associated samples. Report data with a "B" qualifier.

5.7.12.1.2 For sample results greater than or equal to 10 times the concentration of the method blank, the data may be reported with a flag indicating that low level contamination was detected in the method blank. Report data with a "B" qualifier.

5.7.13 Surrogates and Surrogate Recovery measured during the analysis of organic compounds. In order to monitor sample extraction efficiency, all client samples, blanks, and QC samples are fortified with surrogate spiking compounds before extraction and injection into the instrument.

5.7.13.1 Acceptance Criteria: Acceptable surrogate recoveries are contained in LIMS.

5.7.13.2 At a minimum, the laboratory annually updates surrogate recovery limits on a matrix-by-matrix basis for each test method.

5.7.13.3 If the surrogate recovery fails the above stated acceptance criteria, the analyst must proceed according to the out-of-control procedures discussed in Section 5.8.

5.7.13.4 Calibration curves. At a minimum, a 5 point calibration curve must be developed for each surrogate that is used in a particular test method.

5.7.14.2 Internal standard retention time - The retention times of the internal standards in the calibration verification standard must be evaluated immediately after or during GC or GC/MS acquisition.

5.7.14.2.1 If the retention time for any internal standard changes by more than 30 seconds from the retention time of the mid-point standard in the most recent initial calibration sequence, then the chromatographic system must be inspected for malfunctions and corrections must be made. Proceed according to the out-of-control procedures discussed in Section 5.8.

5.7.14.2.2 Internal standard response – If the area for any of the internal standards in the ICV or CCV changes by more than a factor of two (-50% to +100%) from that of the mid-point standard level in the most recent initial calibration sequence, the mass spectrometer or GC system must be inspected for malfunctions and corrections must be made unless the exceedance is caused by matrix interference. Proceed according to the out-of-control procedures discussed in Section 5.8.

5.7.14.3 Determination of Retention Time Window. Before establishing windows, be certain that the GC, GC/MS, or HPLC system is within optimum operating conditions. To determine the retention time window, make three injections of the sought for standard(s) or analyte(s) throughout the course of a 72 hour period. Serial injections over less than a 72-hour period result in retention time windows that are too tight.

5.7.14.3.1 Calculate the standard deviation of 3 absolute retention times for the standard(s).

5.7.14.3.2 The retention time window for individual peaks is defined as plus-or-minus (+/-) three (3) times the standard deviation of the absolute retention time.

5.7.14.3.3 In those cases where the standard deviation for a particular analyte is zero, the laboratory should use +/- 0.05 minutes as a retention time window.

5.7.14.3.4 The laboratory must calculate retention time windows for each standard on every existing GC column and on each new GC column when it is installed. The data is be retained by the laboratory for a period of 5 years.

5.7.14.4 For TCLP analysis, a matrix spike should be prepared and analyzed for each waste type (e.g., oil, solid) associated with a batch of 20 or fewer samples of similar matrix.

5.7.15 Additional Quality Control Parameters Required for Metals Analysis by 7000 Series Methods.

5.7.15.1 Dilution test. For each analytical batch, select one typical sample for serial dilution to determine whether interferences are present. The concentration of the analyte should be at least 25 times the estimated detection limit.

5.7.15.1.1 Determine the apparent concentration in the undiluted sample. Dilute the sample by a minimum of five fold (1 + 4) and reanalyze.

5.7.15.1.2 If all of the samples in the batch are below 10 times the detection limit(s), perform the spike recovery analysis.

5.7.15.1.3 Agreement within 10% between the concentration of the undiluted sample and five times the concentration of the diluted sample indicates the absence of interferences, and such samples may be analyzed without using the method of standard additions.

5.7.15.2 Spike Recovery Test: If results from the dilution test do not pass (or if none of samples in the batch are at a concentration level 10 times the MDL) the spike recovery test must be performed.

5.7.15.2.1 Withdraw another aliquot of the test sample and add a known amount of analyte to bring the concentration of the analyte to 2 to 5 times the original concentration.

5.7.15.2.2 If all of the samples in the batch have analyte concentrations below the detection limit, spike the selected sample at 20 times the detection limit.

5.7.15.2.3 Analyze the spiked sample and calculate the spike recovery. If the recovery is less than 85% or greater than 115%, the method of standard additions shall be used for all samples in the batch or data qualified and narrated with client report.

5.7.16 Additional Quality Control Parameters Required for Metals Analysis by ICP Methods.

5.7.16.1 The upper limit of the linear dynamic range must be established for each wavelength utilized. This is accomplished by measuring the signal response of a standard that is 10% higher than the upper range of the calibration curve.

5.7.16.2 The laboratory must establish and verify every six months an inter-element spectral interference correction routine to be used during sample analysis. See the individual ICP method SOPs for instructions on performing this test.

5.7.16.3 Duplicate or matrix spike duplicate samples. For all target metals, one sample per analytical batch is digested and analyzed in duplicate or as matrix spike duplicate. The results are compared and should meet the precision control limits established.

5.7.16.4 An instrument blank should be run after any sample giving a response that exceeds the calibration range of the instrument. This is done to show that there is no carry-over to the next analysis. The instrument blank shall consist of a high purity solvent (e.g., hexane for pesticide analysis by GC/ECD, methylene chloride for semi-volatiles analysis by GC/MS).

5.7.17 Additional Quality Control Parameters Required for Microbiological Test Methods.

5.7.17.1 Laboratory water quality must be checked and documented at the frequency indicated in the following table.

Table 5-2 Laboratory Water Quality Criteria

Requirement	Criteria	Frequency
pH	5.5-7.5	Each day test is performed
Residual Chorine	<1.0 mg/L	Each day test is performed
Conductivity	<1.0 µmho/cm @25°C	Each day test is performed
Heterotrophic Plate Count	<500 colony forming units/ml	Monthly
Bacteriological Ratio	0.8-3.0	Annually
Cd, Cr, Cu, Ni, Pb, Zn	<0.05 mg/L each, total <1.0 mg/L	Annually
NH_3, Organic Nitrogen	<0.1 mg/L	Monthly
TOC	<1.0 mg/L	Monthly
Student's t value	<2.78 (Annual use test)	Annually

5.7.17.2 The laboratory maintains records of monthly checks on sterile water and membrane filters as evidence of trends in contamination levels for microbiology through Heterotrophic Plate Count measurements. If the contamination level exceeds 1000 CFU/ml, all equipment should be checked for sterility and re-sterilized as necessary. In addition, if additional testing indicates that the problem is still present, then the room used for bacteriological testing should be cleaned with a disinfectant soap and plate counts measured again. Repeat the process as necessary.

5.8 Procedures for Assessing and Treating Out-of-Control Situations.

5.8.1 Quality control analyte samples consist of the following: Method Blanks, Duplicates, Laboratory Control Sample, Laboratory Control Sample Duplicate, Matrix Spike, Matrix Spike Duplicate, Initial Calibration Verification, Continuing Calibration Verification, BFB and DFTPP tunes, internal standards, surrogates, post digestion spikes, and dilution tests.

5.8.2 If any of the quality control analyte recovery values are outside either the laboratory or method-established control limit(s), they are considered to be out-of-control.

5.8.3 The resolution of an out-of-control situation, with identification and correction of the root cause, must be documented prior to initiating subsequent analyses. Documented corrective action (which may or may not require re-analysis) must also be performed if any of the recovery values in the LCS exhibit any "out-of- control" patterns.

5.8.4 Out-of-control conditions include the following special situations:

5.8.4.1 When the acceptance criteria for the continuing calibration verification has a high bias and there are associated samples that are non-detects, then the non-detects may be reported. Otherwise, the samples affected by the unacceptable calibration verification shall be re-analyzed after the source of the problem has been corrected.

5.8.4.2 When the acceptance criteria for the continuing calibration verification have a low bias, those sample results may be reported if they exceed a maximum regulatory limit or decision level. Otherwise, the samples affected by the unacceptable verification shall be re-analyzed after the source of the problem has been corrected.

5.8.4.3 The root cause of such failures must be investigated and documented in a Non-Conformance Report (NCR). Any corrective actions identified as a result of the investigation must be implemented and documented in a Corrective Action Report (CAR) prior to reprocessing the affected sample batch.

5.8.4.4 The QC requirements for each test method are listed LIMS test codes. They are also posted as charts and tables on the portal server. Unless otherwise indicated, if tables and charts have been produced, the precision and accuracy limits were determined from laboratory data.

5.8.5 Risks and Opportunities

The laboratory has adopted a risk management approach to Risk and Opportunities defined in ISO / IEC 17025:2017 section 8.5. This requires the laboratory to determine risks and opportunities, evaluate their severity and impact, and to address these risks with actions that will ultimately improve results and prevent future negative effects.

The laboratory addresses risks and opportunities quarterly as part of the laboratory's quarterly audit by way of the Risk Assessment Table and Chart. Risks are identified via the laboratory and upper management staff by the evaluation of corrective actions, internal audits, complaints, management reviews, procedures, occurrences, meeting discussions, incidents, and personnel suggestions. Each identified risk is recorded in the Risk Assessment Table (Table 5-3) and assigned a score from 1-5 for the likeliness of occurrence. This scale from 1 to 5 gives an indication of the likelihood of the occurrence. (1=Unlikely, 2=Seldom, 3=Occasional, 4=Likely, 5=Definite). In addition, a severity of impact score is assigned from 1-5. This rates the impact of the event, if the event occurred. (1=Insignificant, 2=Marginal, 3=Moderate, 4=Critical, 5=Catastrophic).

These scores are combined. Each score combination correlates to a risk rating, which shows the necessity of action requirement. This risk ratings are Extreme, High, Medium, and Low. This risk

rating prompts an action in accordance with the rating: Extreme - Act Now, High - Further Action Necessary Soon, Medium - Further Action Optional, Low - No Further Action.

The Risk Assessment Chart (Table 5-3) assists with the visualization of the risk severity and corresponds to the Risk Assessment Table, where each risk data point will show up on this "heat map" (termed by the colors used) of Likelihood vs. Impact. The heat map is shaded from green to red, where green indicates low risk and no action is necessary, yellow indicates medium risk and action is optional, orange indicates high risk and action is necessary soon, and red indicates extreme risk and action is needed immediately. In response to these results, actions taken to mitigate the specified risks are detailed in the Risk Assessment Table to track progress.

This Risk Assessment Table and Chart is included in the Quarterly Report to Management.

Identified Risks are mitigated through:

- Training and Awareness
- Continued Audits (Internal, External, Customer, Third Party)
- Design and organization for efficiency, reliability, ease, and maintainability
  After implementation of the risk action, the risks are monitored by tracking and evaluating performance, ensure "lesson learned" feedback goes into future planning and activities, and by established metrics (such as QC charting).

All of these stated components will be evaluated by upper and departmental management during the annual management review to verify the effectiveness of the risk resolution.

5.8.6 Improvement

Opportunities for improvement can be identified through risk management approach utilizing the Risk Assessment Table and Chart, or by the review of the operational procedures, the use of the policies, overall objectives, audit results, corrective actions, management review, suggestions from personnel, risk assessment, analysis of data, and proficiency testing results.

The laboratory identifies and selects opportunities for improvement and implements the necessary actions in a number of ways.

Opportunities for improvement are identified by using the following practices:

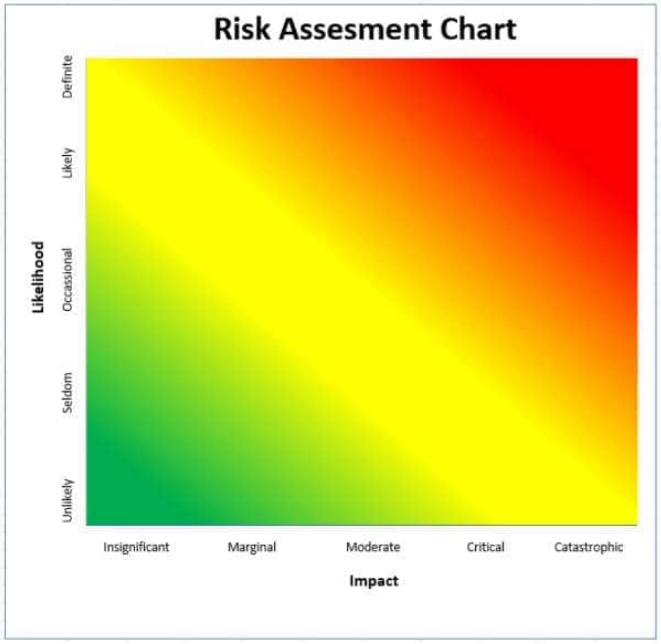
1. Corrective Actions
2. Data or QA Review
3. Internal Audits
4. Weekly management meeting discussions
5. Departmental management reviews
6. Proficiency testing results
7. Review of operational procedures
8. Feedback from personnel and clients

As with Risk and Opportunities, improvements will be evaluated by upper and departmental management during the annual management review to verify the effectiveness of the risk resolution.

Table 5-3 Risk Assessment Table and Chart

Risk Assesment Table

Description of Identified Risk	Risk	Likelihood (1-5)	Impact (1-5)	Action Requirement	Action Taken
	R1			Act Now	
	R2			Act Now	
	R3			Act Now	
	R4			Act Now	
	R5			Act Now	
	R6			Act Now	
	R7			Act Now	
	R8			Act Now	
	R9			Act Now	
	R10			Act Now	
	R11			Act Now	
	R12			Act Now	
	R13			Act Now	
	R14			Act Now	
	R15			Act Now	
	R16			Act Now	
	R17			Act Now	
	R18			Act Now	
	R19			Act Now	
	R20			Act Now	
	R21			Act Now	
	R22			Act Now	
	R23			Act Now	
	R24			Act Now	
	R25			Act Now	



Risk Rating	
Low	No Further Action
Medium	Further Action Optional
High	Further Action Necessary Soon
Extreme	Act Now

Likelihood	Impact
Unlikely (1)	Insignificant (1)
Seldom (2)	Marginal (2)
Occasional (3)	Moderate (3)
Likely (4)	Critical (4)
Definite (5)	Catastrophic (5)

5.9 Inter-laboratory QA and QC

5.9.1 Each section of the laboratory may be given blind and double blind samples to analyze for requested parameters. Blind samples may be assigned in containers to be diluted, digested, and/or extracted and analyzed by the appropriate laboratory section. Double-blind samples arrive on a pre-scheduled basis from a "client" as real samples to be analyzed by designated analytical sections for specific analytes.

5.9.2 Blind QC samples may be used as a test of proficiency for analysts needing certification and/or qualification for performing an analysis. The Section Supervisor should obtain the QC sample from, either, the Quality Assurance Department or from a source independent of the source of standards for the analysis.

5.9.3 Double blind samples represent quality control samples whose analyte concentrations are known to, either, an outside source, such as a client, or an inside source, such as the Quality Control Manager, Project Managers, or the Technical Director.

5.9.3.1 Double blind samples will arrive in the lab as real samples and their identity will not be known to anyone as quality control samples except for Quality Assurance and Department Manager.

5.9.3.2 The results of these double-blind samples will be sent to the "client" to be compared to the true value of the samples. The laboratory's performance on these samples may be compared to other laboratories in the program (if applicable). These results will be mailed to the Quality Assurance Department.

5.9.3.3 When the double blind samples are created within the laboratory, a report will be generated by the Quality Assurance Manager or the Technical Director that indicates the true value of the analyte. These values will be compared to the reported value by the laboratory. The analysis of double blind samples is used as an aid to improve quality control within the laboratory.

5.10 Sample Dilution

5.10.1 All instruments are periodically calibrated with calibration curves. The calibrations typically are developed by comparison of area or intensity against sample concentration. Per the requirements of the various accreditation agencies, the calibrations are verified initially and periodically, usually every day or every 12 hours.

5.10.2 Various test methods additionally require that the linear range of the instrument is determined on a specified frequency.

5.10.3 In the event that a measured sample concentration exceeds the concentration of the highest calibration standard or the linear range of the instrument (where determined), the sample must be diluted per the following procedure.

5.10.3.1 The analyst should attempt to dilute the sample so that the measured concentration of the diluted sample is approximately 60% that of the highest standard in the calibration curve.

5.10.3.2 Sample must be diluted with the same matrix as the undiluted sample as indicated below.

5.10.3.2.1 Aqueous samples are diluted with reagent grade distilled water.

5.10.3.2.2 Extracts in solvents are diluted with the same solvent of the same purity.

5.10.3.2.3 ICP digestates are diluted with nitric acid or hydrochloric acid-water mixtures that emulate the original matrix.

5.10.3.3 The sample dilution is reported in the LIMS and on the data sheet. The results are reported to the client and the reporting limits are automatically adjusted by the LIMS system to account for the sample dilution.

Table 5-4 Summary of Calibration and QC Procedures for Various Tests

Method	QC Check	Frequency	Acceptance Criteria	Corrective Action (3,4)
SW-8081B	Five-point initial calibration	Initial calibration prior to sample	RF = 20%	Correct problem then repeat initial
Pesticides	for all analytes	analysis		calibration
SW-8082A				
PCB			Linear - least squares regression	
SW-8151A			r>0.995	
Herbicides	Second source calibration	Once per five point initial	All analytes within 15% of	Correct problem then repeat initial
SW-8015C	verification standard (ICV)	calibration - from second source.	target value	calibration
Organics			GRO/DRO = 15% PRO = 20%	
GRO	Retention time window	System set-up	3 times standard deviation for	Correct problem then re-analyze
DRO	calculated for each analyte		each analyte retention time from	all samples analyzed since
FL-PRO			72 hour study	retention time check
SW-8315A	Continuing calibration	Before sample analysis, after	All analytes within 15% of	Correct problem then repeat initial
Carbonyls	verification	every 10 samples, and at the end	target value	continuing calibration verification
		the analysis sequence with	GRO/DRO = 20% PRO = 25%	and re-analyze all samples since
		varying concentrations	8081B/8082A = 20%	last successful CCV
		GRO/DRO Every 12 hours before		
		sample analysis, after every 10		
		samples, and at the end of the		
		analytical sequence		
		GRO/DRO = RT window		
		required analyzed at same		
		frequency as CCV		
	Breakdown check (Endrin	Daily prior to analysis of samples	Degradation <15%	Inlet column maintenance; repeat
	and DDT)(1)			breakdown check. Correct problem
	Method Blank	Once per analytical batch	No analytes detected > PQL	Then re-prep and analyze the method
				and all samples processed with the
				contaminated blank.
	LCS/LCSD	One per prep batch	See LIMS Test codes	Re-prep and analyze the LCS/LCSD
				& all samples in the affected batch
	Surrogate Spike	Every sample, spiked sample,	See LIMS Test codes	Check system, re-inject, re-extract
		standard, and method blank		
	MS/MSD	One per prep batch	See LIMS Test codes	None - Narrate the results in LIMS
	IDOC	Every time a new analyst	See LIMS Test codes	Analyst cannot perform the test
		performs the test method for the		method until the IDOC passes
		first time - second source.		method criteria
	LLOQ	Initial	LCS range ±20%	
		Annually	0.5-2 times established LLOQ	Re-evaluate, repeat study
	MDL	Initial Blank & Spike MDL Study	MDL < Spike Level	Re verification, repeat study
		Quarterly Verification. Annual	Analyte specific per test	
		MDL Study Re verification		
	Second column	100% for all positive results	Same results as primary	Only report the results that match.
	confirmation (2)	(not for 8015B)	column analysis	Use the highest results
SW-8260D	Tune BFB for 8260B	Prior to initial calibration		Analyst cannot perform the test until
SW-8270E	Tune DFTPP for 8270D	Prior to initial calibration		the tune passes method criteria
	Five-point initial calibration	Initial calibration prior to sample		Correct problem then repeat initial
	for all analytes	analysis.		calibration
	Second source calibration	Once per five point initial	All analytes within 30% of	Correct problem then repeat initial
	verification standard (ICV)	calibration-second source.	target value	calibration
	Retention time window	Each Sample	Relative retention time (RRT) of	Correct problem then re-analyze

Method	QC Check	Frequency	Acceptance Criteria	Corrective Action (3,4)
	calculated for each analyte		the analyte within 0.06 RRT units	all samples analyzed since
			of the RRT	retention time check
	Continuing calibration	Daily prior to analysis of samples		Correct problem then repeat initial
	verification	and every 12 hours of analysis		continuing calibration verification
		time.		and re-analyze all samples since
				last successful CCV. If not met the
SW-8260D	Internal Standards	Every sample/standard	Target compounds ≤20%	system should be evaluated, and
SW-8270E			Retention Time RT +/-30 seconds	corrective action should be taken
			from RT of the mid- point in the	before analysis. If criterion is not met
			CCV/ICAL(sample/standard)	for more than 20% of the compounds
			EICP area within -50% to +100%	Included In the initial calibration, then
			of ICAL mid-point standard	corrective action must be taken prior to
	Internal Standards	Every sample/standard	Target compounds ≤20%	analysis of samples. Inspect GC/MS for
				malfunctions; mandatory re-analysis of
				samples analyzed while system was
				malfunctioning. Correct problem then
	Method Blank	Once per analytical batch	No analytes detected > PQL	re-prep and analyze method blank and
				all samples processed with the
				Contaminated blank.
	LCS/LCSD	One per prep batch	See LIMS Test codes	Re-prep and analyze the LCS/LCSD
				and all samples in the affected
				analytical batch
	Surrogate Spike	Every sample, spiked sample,	See LIMS Test codes	Check system, re-inject, re-extract
		standard, and method blank		
	MS/MSD	One per prep batch	See LIMS Test codes	None - Narrate the results in LIMS
	IDOC	Every time a new analyst	See LIMS Test codes	Analyst cannot perform the test
		performs the test method	LCS Accuracy for Limits	method until the IDOC passes
		for the first time - second source.		method criteria
	LLOQ	Initial	LCS range ±20%	
		Annually	0.5-2 times established LLOQ	Re-evaluate, repeat study
	MDL	Initial Blank & Spike MDL Study	MDL < Spike Level	Re verification, repeat study
		Quarterly Verification. Annual	Analyte specific per test	
		MDL Study Re verification		
SW-7000B	3-point initial calibration	Daily initial calibration prior to	Correlation coefficient >0.995 for	Correct problem then repeat initial
Metals	(min. 3 stds and a blank)	sample analysis	linear regression	calibration
	Second source calibration	Once per initial daily calibration	All analytes within 10% of	Correct problem then repeat initial
	verification standard (ICV)	second source.	target value	calibration
	Continuing calibration	Before sample analysis, after	All analytes within 20% of	Correct problem then repeat initial
	verification	every 10 samples, and at the end	target value	continuing calibration verification
		the analysis sequence		and re-analyze all samples since
				last successful CCV
	Method Blank	Once per analytical batch	No analytes detected > PQL	Correct problem then re-prep and
				analyze method blank and all samples
				processed with that blank.
	LCS/LCSD	One per prep batch	See LIMS Test codes	Re-prep and analyze the LCS/LCSD
				and all samples in the affected batch.
	MS/MSD	One per prep batch	See LIMS Test codes	None - Narrate the results in LIMS
	IDOC	Every time a new analyst	See LIMS Test codes	Analyst cannot perform the test
		performs the test method	LCS Accuracy for Limits	method until the IDOC passes
		for the first time - second source.		method criteria
	LLOQ	Initial	Spike ±35%, RSD <20%	
		Quarterly	Spike ±35%, RSD <20%	Re-evaluate, repeat study
	MDL	Initial Blank & Spike MDL Study	MDL < Spike Level	Re verification, repeat study
		Quarterly Verification. Annual	Analyte specific per test	
		MDL Study Re verification		
	Dilution test: 1:4 dilution	Each preparatory batch	Five times dilution sample result	Perform post digestion spike

Method	QC Check	Frequency	Acceptance Criteria	Corrective Action (3,4)
		Sample concentration must be	must be within 10% of the	addition
		20X MDL	undiluted sample result	
	Recovery Test	When dilution test fails or	Recovery within 15% of target	Perform method of standard
		sample concentration < 20X MDL	results	additions
SW-9010C	Initial calibration	Daily initial calibration prior to	Correlation coefficient >0.995 for	Correct problem then repeat initial
CN Distil	(six standards and a blank)	sample analysis	linear regression	calibration
Cyanide				
	Distilled standards (one	Once per initial daily calibration	All analytes within 10% of	Correct problem then repeat initial
	high and one low)		target value	calibration
	Second source calibration	Once per initial daily calibration	All analytes within 15% of	Correct problem then repeat initial
	verification standard (ICV)	second source.	target value	calibration
	Continuing calibration	Before sample analysis, after	All analytes within 15% of	Correct issue, repeat initial continuing
	verification	every 10 samples, and at the end	target value	calibration verification and re-analyze
		the analysis sequence - varying		all samples since last successful CCV.
		concentrations		
	Method Blank	Once per analytical batch	No analytes detected > PQL	Correct problem, re-prep and analyze
				method blank and all samples
				processed w/ contaminated blank.
	LCS/LCSD	One per prep batch	All analytes within 15% of	Re-prep, reanalyze the LCS/LCSD and
			target value	all samples in the analytical batch
	MS/MSD	One per prep batch (9010B)	All analytes within 30% of	None - Narrate the results in LIMS
		Every 10 samples (9012A)	target value	
	IDOC	Every time a new analyst	See LIMS Test codes	Analyst cannot perform the test
		performs the test method	LCS Accuracy for Limits	method until the IDOC passes
		for the first time - second source.		method criteria
	LLOQ	Initial	Spike ±35%, RSD <20%	
		Quarterly	Spike ±35%, RSD <20%	Re-evaluate, repeat study
	MDL	Initial Blank & Spike MDL Study	MDL < Spike Level	Re verification, repeat study
		Quarterly Verification. Annual	Analyte specific per test	
		MDL Study Re verification		
EPA-624.1	Tune BFB for 8260B	Prior to initial calibration and	See individual method for	Analyst cannot perform the test
EPA-625.1	Tune DFTPP for 8270C	continuing calibration verification	tune criteria.	method until the tune passes
		every 12 hours		method criteria
	5-point initial calibration	Initial calibration prior to sample	%RSD<35%	Correct problem then repeat initial
	for all analytes	analysis		calibration
	Second source calibration	Once per 5 point initial	All analytes within range of	Correct problem then repeat initial
	verification standard (ICV)	calibration	method criteria (SOPs/Methods)	calibration
	Continuing calibration	Daily prior to analysis of	All calibration analytes within	Correct problem then repeat initial
	verification	samples - varying concentration.	Range of method specified criteria	continuing calibration verification
			(SOPs/Methods)	and re-analyze all samples since
				last successful CCV
	Internal Standards	Every sample/standard	Retention time +/-30 seconds	Inspect GC/MS for malfunctions;
			from retention time of the mid-	mandatory re-analysis of samples
			Point in the CCV/ICAL	analyzed while system was
				malfunctioning.
	Retention time window	Each Sample	Relative retention time (RRT) of	Correct problem then re-analyze
	calculated for each analyte		the analyte within 30 seconds	all samples analyzed since
			of the RT	retention time check
			(sample/standard)	
			EICP area within -50% to +100%	
			of ICAL mid-point standard	
	Method Blank	Once per analytical batch	No analytes detected > PQL	Correct problem then re-prep and
				analyze method blank and all samples

Method	QC Check	Frequency	Acceptance Criteria	Corrective Action (3,4)
				processed with this blank.
	LCS/LCSD	One per prep batch	See LIMS Test codes	Re-prep and analyze the LCS/LCSD
				and all samples in the affected
				analytical batch
	Surrogate Spike	Every sample, spiked sample,	See LIMS Test codes	Check system, re-inject, re-extract
		standard, and method blank		
	MS/MSD	One per prep batch	See LIMS Test codes	None - Narrate the results in LIMS
	IDOC	Every time a new analyst	See LIMS Test code or QC Charts	Analyst cannot perform the test
		performs the test method	LCS Accuracy for Limits	method until the IDOC passes
		for the first time - second source.		method criteria
	MDL	Initial Blank & Spike MDL Study	MDL < Spike Level	Re verification, repeat study
		Quarterly Verification. Annual	Analyte specific per test	
		MDL Study Re-verification		
TO-14A	New Canister Check	New - pressurize with humidified	demonstrate <0.2ppb of target	Re-clean canister and retest
TO-15		UHP nitrogen; analyze after aging	analytes	
VOC		24 hours to determine cleanliness		
	Canister Leak Check	Pressurize to 30 psig and check	Pressure should not vary more	Repair canister and retest
		pressure after 24 hours	than +/- 2 psig over 24 hours	
	Canister Blank Check	Pressurize to 30 psig with	demonstrate <0.2ppbv of target	Re-clean canister and retest
		humidified UHP nitrogen	analytes; requires 24 hours of	
			aging prior to analysis	
	Sampling System	Pass humidified UHP nitrogen	demonstrate <0.2ppbv of target	Re-clean canister and retest
	Certification	through sampling system and	analytes	
	(Zero Air Certification	demonstrate <0.2ppbv of target		
	using UHP Nitrogen)	analytes		
	Dynamic Calibration	Pass humidified UHP nitrogen	demonstrate <0.2ppbv of target	Clean system and retest
	System Certification	through the dynamic calibration	analytes	
		system		
	Sampler System	Use humidified gas standards to	Recovery between 90 and 110%	Clean system and retest
	Certification	compare results from a canister		
		collected with the sampling		
		system and on-line GC-MS		
	Instrument Performance	Prior to the analysis of any	Verify the mass spectral ion	Retune or perform routine
	Check (BFB Tuning)	samples, blanks, or calibration	abundance is in accordance with	maintenance then retune
		standards, load 50 ng or less of	Table 7-1 of SOP	
		BFB every 24 hours		
	Initial Calibration (ICal)	Prior to analysis of samples and	R^2>0.995	Correct problem and recalibrate
		blanks but after the instrument		
		performance check (following any		
		corrective action):		
		Variation of Relative Response	<30% RSD for the RRF each	Correct problem and recalibrate
		Factor (RRF)	target analyte	
		Variation of Relative Retention	Each standard within 0.06 RRT	Correct problem and recalibrate
		Time (RRT)	Units of mean for each analyte	
	Internal Standard (IS)	Each IS response	Must be within 40% of the mean	Correct problem and recalibrate
	ICAL Response		response over the ICAL	
		IS ICAL Retention Time	Each IS should be within 20 s of	
			the mean retention time over the	
			ICAL	
	Daily Calibration	Prior to the analysis of samples	Must be within +/- 30% for ICAL	Reanalyze; if still fails, perform

Method	QC Check	Frequency	Acceptance Criteria	Corrective Action (3,4)
	(Continuing Calibration	and blanks but after tuning criteria	for each target analyte	instrument maintenance and reanalyze
	Verification-CCV)	have been met, analyze mid-level		
		standard		
	Laboratory Method Blank	Analyze one every 24 hours;	Blank should not contain any	Reanalyze; prepare new canister and
TO-14A	(LMB)	pressurize (2 atm) clean canister	target analyte greater than PQL.	analyze
TO-15		with >20% relative humidity UHP	Each IS response in the blank	
VOC		nitrogen	must be within +/- 0.33 minutes	
			of the most recent calibration	
	Sample Technical	Analyzed on a GCMS system	Meeting the BFB Tune, ICAL, and	Reanalyze sample. Qualify / Narrate
	Acceptance Criteria		continuing calibration criteria	data appropriately
			outlined in SOP	
		Analyzed with a LMB meeting	Must meet method in SOP. All	
		criteria	target analytes within ICAL range.	
			Ea. IS RT within+/- 30% minutes	
			of the most recent calibration.	
EPA-245.1	Initial calibration (minimum	Daily initial calibration prior to	Correlation coefficient >0.995 for	Correct problem then repeat initial
Mercury	5 standards and a blank).	sample analysis.	linear regression.	calibration.
	Linear Dynamic Range	Once Annually	Analyte within 10% of target	Calibration range lowered to meet
			value (not necessary if diluting	LDR results.
			within calibration curve).	
	Second source calibration	Once per five point initial	All analytes within 5% of	Correct problem then repeat initial
	verification standard (ICV)	Calibration - second source.	target value	calibration
	Continuing calibration	Before sample analysis, after	All calibration analytes within 10%	Correct problem then repeat initial
	verification	every 10 samples, and at the end	of target value before	continuing calibration verification
		of the analysis sequence -	sample analysis	and re-analyze all samples since
				last successful CCV
	Method Blank	Once per analytical batch	No analytes detected > PQL	Correct problem then re-prep and
				analyze method blank and all samples
				processed with that blank
	LCS/LCSD	One per prep batch	See LIMS Test codes	Re-prep and analyze the LCS/LCSD
				and all samples in that batch
	MS/MSD	One per prep batch	See LIMS Test codes	None - Narrate the results in LIMS
	IDOC	Every time a new analyst	See LIMS Test codes	Analyst cannot perform the test
		performs the test method for the	LCS Accuracy for Limits	method until the IDOC passes
		first time - second source.		method criteria
	LLOQ	Initial	Spike ±35%, RSD <20%	
		Quarterly	Spike ±35%, RSD <20%	Re-evaluate, repeat study
	MDL	Initial Blank & Spike MDL Study	MDL < Spike Level	Re verification, repeat study
		Quarterly Verification. Annual	Analyte specific per test	
		MDL Study Re verification		
EPA 200.7	Initial calibration (minimum	Initial calibration prior to sample	Not applicable	Correct problem then repeat initial
SW-6010D	1 standards and a blank)	analysis		calibration.
ICP Metals				
	CRI /LLICV/LLCCV	Set to PQL	Result must be greater than	Correct problem the repeat initial
			calibration blank, <PQL	calibration
			±30% for all analytes	
	Check Standard	Calibration verification	All analytes within 5% of	Correct problem, then reanalyze the
			target value	calibration standard and check std.
	Second source calibration	Once per initial calibration -	Mean value of all analytes	Fix problem, repeat initial calibration
	verification standard (ICV)	second source.	within 5% of target value for 200.7	
			within 10% for 6010D	

Method	QC Check	Frequency	Acceptance Criteria	Corrective Action (3,4)
	ICSA	Interference analytes Ca, Fe, Mg, Al	Concentrations of analytes	Stop analysis; fix problem. Reanalyze
		Beginning, end & periodic intervals	within 20% of target value	ICS; reanalyze all affected samples.
	ICSAB	Interference analytes Ca, Fe, Mg, Al	Concentrations of analytes	Stop analysis; fix problem. Reanalyze
EPA 200.7		Beginning, end & periodic intervals	within 20% of target value	ICS; reanalyze all affected samples.
SW-6010D				
ICP Metals	Linear dynamic range	Every six months	All analytes within 10% of	Calibration range adjusted to meet
			target value.	calibration results.
	Calibration blank	After every calibration verification	No analytes detected within +/-	Correct problem then repeat initial
			one MDL	continuing calibration verification
				and re-analyze all samples since
				last successful calibration blank
	Continuing calibration	Before sample analysis, after	Analytes within 10% of target	Repeat calibration and re-analyze
	verification (CCV)	every 10 samples, and at the	value for method 200.7,	all samples since last successful
		end of the analysis sequence -	within 10% for method 6010D	calibration verification.
	Method Blank	Once per analytical batch	No analytes detected within +/-	Correct problem then re-prep and
			one MDL	analyze method blank and all samples
				processed with the contaminated blank
	Duplicate	One per batch	%RSD must be 20% for water	Reanalyze duplicate sample.
		Sample concentration must be	%RSD must be 30% for soil	Check system, re-prep, re-analyze
		4X MDL or greater for valid results		as needed
	LCS/LCSD	One per prep batch	200.7: within 15% of target	Re-prep and analyze the LCS/LCSD
			6010D: within 20% of target	and all samples in that batch
	Dilution test: 1:4 dilution	Each preparatory batch	Five times dilution sample result	Perform post digestion spike
		Sample concentration must be	must be within 20% of the	addition
		20X MDL	undiluted sample result for	
			6010D and 10% for 200.7	
	Recovery Test	When dilution test fails or	Recovery within 25% of target	Perform method of standard
		sample concentration < 20X MDL	value	additions
	MS/MSD	One per prep batch	All analytes within 20% RPD	Check system, re-prep, re-analyze
			MS- (200.7 70-130%)	as needed
			(6010D 75-125%)	
			PDS-(200.7 85-115%)	Sample Conc. > 10X spike Conc., if
			(6010D 80-120%)	not , cannot validate MS
	IDOC	Every time a new analyst	See LIMS Test code or QC Charts	Analyst cannot perform the test
		performs the test method	LCS Accuracy for Limits	method until the IDOC passes
		for the first time - second source.		method criteria
	LLOQ	Initial	Spike ±35%, RSD <20%	
		Quarterly	Spike ±35%, RSD <20%	Re-evaluate, repeat study
	MDL	Initial Blank & Spike MDL Study	MDL < Spike Level	Re verification, repeat study
		Quarterly Verification. Annual	Analyte specific per test	
		MDL Study Re verification		
EPA 200.8	Initial calibration (minimum	Initial calibration prior to sample	Not applicable	Correct problem then repeat initial
SW-6020 B	1 standards and a blank)	analysis		calibration.
Metals				
	CRI /LLICV/LLCCV	Set to PQL	Result must be greater than	Correct problem the repeat initial
			calibration blank, <PQL	calibration
			±30% for all analytes	
	Check Standard	Calibration verification	All analytes within 5% of	Correct problem, then reanalyze the
			target value	calibration standard and check std.
	Second source calibration	Once per initial calibration -	Mean value of all analytes within	Correct problem then repeat initial
	verification standard (ICV)	second source.	5% of target value for 200.8	calibration
			within 10% for 6020B	
	ICSA	Interference analytes Ca, Fe, Mg, Al	Concentrations of analytes	Terminate analysis; correct problem

Method	QC Check	Frequency	Acceptance Criteria	Corrective Action (3,4)
		Beginning, end & periodic intervals	within 20% of target value	reanalyze ICS; reanalyze all affected
		(every 12 hours)		samples.
	Linear dynamic range	Every six months	All analytes within 10% of	Calibration range adjusted to meet
			target value.	calibration results.
EPA 200.8	Calibration blank	After every calibration verification	No analytes detected within +/-	Correct problem then repeat initial
SW-6020 B			one MDL	continuing calibration verification
Metals				and re-analyze all samples since
				last successful calibration blank
	Continuing calibration	Before sample analysis, after	Analytes within 10% of target	Repeat calibration and re-analyze
	verification (CCV)	every 10 samples, and at the	value for method 200.8,	all samples since last successful
		end of the analysis sequence -	within 10% for method 6020B	calibration verification.
	Method Blank	Once per analytical batch	No analytes detected within +/-	Correct problem then re-prep and
			one MDL	analyze method blank and all samples
				processed with the contaminated blank
	Duplicate	One per batch	%RSD must be 20% for water	Reanalyze duplicate sample.
		Sample concentration must be	%RSD must be 30% for soil	Check system, re-prep, re-analyze
		4X MDL or greater for valid		as needed
		results.		
	LCS/LCSD	One per prep batch	200.8: within 15% of target	Re-prep and analyze the LCS/LCSD
			6020B: within 20% of target	and all samples in the affected
				analytical batch
	Dilution test: 1:4 dilution	Each preparatory batch	Five times dilution sample result	Perform post digestion spike
		Sample concentration must be	must be within 10% of the	addition
		20X MDL	undiluted sample result for	
			6020 B or A and 10% for 200.8	
	Recovery Test	When dilution test fails or	Recovery within 25% of target	Perform method of standard
		sample concentration < 20X MDL	value	additions
	MS/MSD	One per prep batch	All analytes within 20% RPD	Check system, re-prep, re-analyze
			MS/MSD-200.8: 70-130%	as needed
			MS/MSD-6020B: 75-125%	
			PDS-6020B: 75-125%	Sample Conc. > 10X spike Conc., if
				Not, cannot validate MS
	IDOC	Every time a new analyst	See LIMS Test code or QC Charts	Analyst cannot perform the test
		performs the test method	LCS Accuracy for Limits	method until the IDOC passes
		for the first time - second source.		method criteria
	LLOQ	Initial	Spike ±35%, RSD <20%	
		Quarterly	Spike ±35%, RSD <20%	Re-evaluate, repeat study
	MDL	Initial Blank & Spike MDL Study	MDL < Spike Level	Re verification, repeat study
		Quarterly Verification. Annual	Analyte specific per test	
		MDL Study Re verification		
EPA 608.3	Minimum 3-point initial	Initial calibration prior to sample	RF = 20%; Linear - least squares	Correct problem then repeat initial
Pest/PCB	calibration for all analytes	analysis	regression r>0.995	calibration
	Second source calibration	Once per five point initial	All analytes within 20% of	Correct problem then repeat initial
	verification standard (ICV)	calibration - from second source	target value	calibration
	Retention time window	Each day test is performed.	3 times standard deviation for ea.	Fix problem then reanalyze samples
	calculated for each analyte		analyte RT from 72 hour study	analyzed since retention time check
	Continuing calibration	Before sample analysis, after every		Fix problem. Repeat initial continuing
	verification	20 injections, at the end of analysis		calibration verification; reanalyze all
		sequence - varying concentrations		samples since last successful CCV
	Breakdown check (Endrin	Daily prior to analysis of samples	Degradation <20%	Inlet column maintenance; repeat
	and DDT)(1)			breakdown check
	Method Blank	Once per analytical batch	No analytes detected > PQL	Correct problem, re-prep and analyze
				method blank & all samples processed
				with the contaminated blank.

Method	QC Check	Frequency	Acceptance Criteria	Corrective Action (3,4)
	LCS/LCSD	One per prep batch	All analytes within range of	Re-prep and analyze the LCS/LCSD
			method criteria (SOPs/Methods)	and all samples in the affected batch.
EPA 608.3	Surrogate Spike	Every sample, spiked sample,	All analytes within range of	Check system, re-inject, re-extract
Pest/PCB		standard, and method blank	method criteria (SOPs/Methods)	
	MS/MSD	Every batch	All analytes within range of	None - Narrate the results in LIMS
			method criteria (SOPs/Methods)	
	IDOC	Every time a new analyst	All analytes within range of	Analyst cannot perform the test
		performs the test method	method criteria (SOPs/Methods)	method until the IDOC passes
		for the first time - second source.		method criteria
	MDL	Initial Blank & Spike MDL Study	MDL < Spike Level	Re verification, repeat study
		Quarterly Verification. Annual	Analyte specific per test	
		MDL Study Re verification		
	Second column	100% for all positive results	Same results as primary	Only report the results that match.
	confirmation (2)		column analysis	Use the highest results
SM2540C	Verification standard	Each batch	All analytes within 10% of	Repeat test. If results are still not
TDS	Single standard		target value	within 10%, report result and narrate
SM2540D	(if available)		Flashpoint result 77-82°F	in LIMS.
TSS				
SM2540B	Method Blank	Once per analytical batch	No analytes detected > PQL	Correct problem, re-prep and analyze
T. Residue				method blank and samples processed
EPA-160.4				with the contaminated blank.
VS				
SM2540F	Duplicate	One per batch	%RSD must be 20% for water	Reanalyze duplicate sample. If results
Sett Solids		Sample concentration must be	and 30% for soil.	not within RSD limits, report QC
SM-2540E		2X MDL or greater for valid		failure in LIMS or flag as
SW-1010A		results.		non-homogenous for soils.
Flashpoint				
SW1030	IDOC	Every time a new analyst	See LIMS Test code or QC Charts	Analyst cannot perform the test
Ignitability		performs the test method	LCS Accuracy for Limits	method until the IDOC passes
EPA-350.1		for the first time - second source.		method criteria
Ammonia	Five-point initial calibration	Initial calibration prior to sample	RF = 10%	Correct problem then repeat initial
EPA-351.2	for all analytes	analysis	Linear - least squares regression	calibration
TKN	(Excludes BOD, CBOD)		r>0.99; ≥0.995 for 9056A	
EPA-353.2				
NO3/NO2				
NECi-07-0003				
NO3/NO2				
EPA-365.1	Second source calibration	Once per five point initial	All analytes within 10% of	Correct problem then repeat initial
	verification standard (ICV)	calibration - from second source.	target value	calibration
Phosphorus				
Sulfate				
SM4500S2F-2011	Continuing calibration	Before sample analysis, after	All analytes within 10% of	Correct problem then repeat initial
SW-9034	verification	every 10 samples, and at the end	target value	continuing calibration verification
Sulfide		the analysis sequence - varying		and re-analyze all samples since
SM4500SO3B-2011		concentrations		last successful CCV
Sulfite	Method Blank	Once per analytical batch	No analytes detected > PQL	Correct problem then re-prep and
EPA-410.4				analyze method blank and all samples
COD				processed with the contaminated
SM5310B				blank.
SW-9060A	LCS/LCSD	One per prep batch	See LIMS Test codes	Re-prep and analyze the LCS/LCSD
TOC				and all samples in the affected
EPA-420.1				analytical batch
EPA-420.4				
SW-9065				
Phenolics				
SM5540C				
MBAS				
EPA-300.0	MS/MSD	Every 10 samples (9038)	See LIMS Test codes	None - Narrate the results in LIMS
SW-9056A		One per prep batch (remainder)		
IC				
Oil & Grease	IDOC	Every time a new analyst	See LIMS Test codes	Analyst cannot perform the test
SW-9071B		performs the test method	LCS Accuracy for Limits	method until the IDOC passes
SW-1664B		for the first time - second source.		method criteria
SM5210B				
BOD	LLOQ	Initial	Spike ±35%, RSD <20%	

Method	QC Check	Frequency	Acceptance Criteria	Corrective Action (3,4)
SM5210B		Quarterly	Spike ±35%, RSD <20%	Re-evaluate, repeat study
CBOD				
	MDL	Initial Blank & Spike MDL Study	MDL < Spike Level	Re verification, repeat study
	(Excludes BOD, CBOD)	Quarterly Verification. Annual	Analyte specific per test	
		MDL Study Re verification		
SM2310B	Verification standard	Each batch	All analytes within 10% of	Repeat test. If results are still not within
Acidity	Single standard (if available)		target value	10%, report result; narrate in LIMS
SM2320B				
Alkalinity	Method Blank	Once per analytical batch	No analytes detected > PQL	Correct problem, re-prep and analyze
				method blank and samples processed
				with the contaminated blank.
Wastewater				
Coliforms	Duplicate	One per batch	%RSD must be 20% for water	Reanalyze duplicate sample. If results not
SM9222D		Sample concentration must be	and 30% for soil.	within RSD limits, report QC failure in LIMS
F. Coliform		2X MDL or greater for valid results.		or flag as non-homogenous for soils
SM9222B				.
T. Coliform	IDOC	Every time a new analyst	See LIMS Test code or QC Charts	Analyst cannot perform the test
		performs the test method	LCS Accuracy for Limits	method until the IDOC passes
		for the first time - second source.		method criteria
	Method Blank	Once per analytical batch	No analytes detected > PQL	If method blank is contaminated,
Drinking Water				reanalyze duplicate sample.
Coliforms	Duplicate	If available		
F. Coliform				
SM9223				
T. Coliform	IDOC	Every time a new analyst		Analyst cannot perform the test
SM9221D		performs the test method		method until the IDOC passes
		for the first time - second source.		method criteria.
EPA-120.1	Method Blank	Once per analytical batch	No analytes detected > PQL	Correct problem then re-prep and
Conductivity				analyze method blank and all samples
Color				processed with the contaminated blank.
SM2120F				
SM2120B	Single Standard	Once per analytical batch	All analytes within 10% of	Correct problem then repeat initial
SM4500H+B-2011			target value	calibration
pH			Conductance and color standard	
EPA-180.1			within 5% of target value.	
Turbidity				
SM4500ClG-2011				
Residual Chlorine				
SW-9095B	Duplicate	One per batch	%RSD must be 20%	Reanalyze duplicate sample. If results
Paint Filter			pH Duplicates <0.1 pH Units	not within RSD limits, report QC
SM4500OH-2016				failure in LIMS
DO				
SW-1311	Method Blank	Once per analytical batch	No analytes detected > PQL	Correct problem then re-prep and
TCLP				analyze method blank and all samples
SW-1312				processed with the contaminated
SPLP				blank.
	Post extraction duplicate	One per batch	%RSD must be 20%	Reanalyze duplicate sample. If results
				not within RSD limits, report QC
				failure in LIMS
	Post extraction spike	Once per analytical batch	See individual test methods.	See individual test methods.

1. Endrin/DDT breakdown check for 8081B only.
2. Excludes chlordane, toxaphene, and PCB.
3. Sample data associated with QC non-conformances resulting in high bias may be reported if all target analytes are below reporting limits.
4. In the event that reanalysis is not possible, I.e. no remaining sample, holding times expired, etc., data may be reported with non-Conformance and its potential effect on the data described in a Case Narrative.

6.0 SAMPLE BOTTLE AND PRESERVATIVE PREPARATION

6.1 EETSE Atlanta does not provide sampling services, therefore, has no sampling plan or procedures. If requested by the client, EETSE Atlanta does provide appropriate pre-cleaned sample containers. The laboratory assumes responsibility for supplying the proper containers and preservatives.

6.2 Sample Container Preparation: Table 3-3 within EETSE Atlanta SOP SR-09002 Sample Receiving contains information for the correct containers needed for each analysis.

6.2.1 A laboratory label and proper preservative are added to the sample bottle prior to shipment or pick-up by the client. Some clients may request several cases of bottles, preservative in separate containers, and separate labels. Should this occur, the client would be responsible for label attachment and the addition of preservatives in the field. If the client performs these duties, this is indicated on the bottle label and the chain of custody.

6.2.2 If contamination is observed in trip blanks, a representative from each "lot" of sample containers may be analyzed for the detected parameter(s) to ascertain the cause.

6.2.3 Bottle contamination checks are typically accomplished by filling the bottle with DI water and analyzing for the analytes in question. If any results are above the reporting level, contamination is present and the source must be found.

6.2.3.1 A typical method of laboratory contamination is the introduction of volatile compounds into VOC vials by the use of extraction chemicals such as methylene chloride. Another means of laboratory contamination is the cross contamination of analytes into reagent bottles through poor analytical techniques. An example would be returning aliquots of reagents to their original containers after use. In this instance, contaminants in the reagents are measured as part of the sample result when the reagent is used in the test. Finally, cross contamination can occur during analysis when glassware that is used for the test is not been properly cleaned between samples.

6.2.3.2 If the analysis indicates that the contamination source is the bottle manufacturer, the vendor or manufacturer must be informed immediately. Use of the affected bottles must stop immediately and another lot of bottles used instead.

6.2.3.3 Methods of eliminating sample contamination are discussed in the individual analyte SOPs.

6.2.3.4 Procedures for checking sample bottles for sterility and metals contamination are outlined in the Sample Receiving SOP (Sec. **3.2**).

6.3 When the addition of preservatives is performed by laboratory personnel, the preservation type and amount used is marked on the label. This procedure informs the sample collection agent that the sample bottle has pre-measured preservative in it. Additionally, it provides important safety information for the sample collection agent.

6.4 Preservatives prepared by the laboratory are documented in a Preparation Standard logbook. The logbook contains the preservative preparation information including the preservative lot number and if the chemical was used "as is" from the manufacturer or if it was prepared in the lab. See Sec. 6.7.

6.5 Proper packing of bottles is essential to prevent breakage during shipping. All bottles should be wrapped in bubble wrap and the container, usually a cooler, filled with packing material.

6.6 Certain biological analyses require a sterile bottle for sampling. This includes plate counts, E-coli, and Total Coliform analyses. The laboratory purchases sterilized bottles for these analyses. Never break the seal on these bottles or open them as this can contaminate the bottles.

6.7 Preservatives and removal of interferences.

6.7.1 There are several preservatives used to increase the holding time for an analysis. In most cases, these preservatives are required by the test method, and are added to alter the sample pH or to remove possible interferences. The preservatives used at EETSE Atlanta include the following:

6.7.1.1 HCl: 1:1 Hydrochloric Acid (2 ml per liter of sample) is added to VOC vials and other sample bottles to lower the resultant pH to ≤ 2 after the addition of sample to the bottle.

6.7.1.2 H_2SO_4: Concentrated Sulfuric Acid (2 ml per liter of sample) is added to sample bottles to lower the resultant pH to ≤ 2 after the addition of sample to the bottle.

6.7.1.3 NaOH: Solid Sodium Hydroxide pellets are added to sample bottles to raise the resultant pH to ≥ 12 after the addition of sample to the bottle.

6.7.1.4 HNO_3: Two ml per liter of sample of a 1:1 Nitric Acid (1 part concentrated Nitric Acid mixed with 1 part DI water) is added to sample bottles to lower the resultant pH to ≤ 2 after the addition of sample to the bottle.

6.7.2 Low results can be expected when analyzing for BOD, Volatile Organics, and Pesticides in the presence of chlorine. These samples must be tested for the presence of chlorine. This procedure is performed by placing a sample drop on a starch-potassium iodide paper strip. If the strip turns blue, chlorine is present and treatment is needed. Chlorine removal is accomplished through the addition of sodium thiosulfate (usually 2 – 4 ml of a 0.008% or a 1 N solution). Following the addition of this compound, the destruction of chlorine is verified through a subsequent chlorine check.

6.7.3 Low results can also be expected when analyzing for BOD in the presence of cyanides. Testing for the presence of cyanide is performed by placing a drop of sample on a lead acetate paper strip. If the strip turns black, cyanide is present and treatment is needed. Cyanide removal is accomplished through the addition of ascorbic acid, a few grains at a time, until the paper does not turn black. A few more grains can be added to the sample to ensure cyanide removal.

6.8 Bottle Kit Preparation

6.8.1 Number of bottles required per test, type of preservatives, and bottle type are method specific.

6.8.2 Table 3-3 within EETSE Atlanta SOP SR-09002 Sample Receiving indicates the preservation, holding times, and containers required for the types of tests and matrices analyzed in the laboratory.

7.0 CUSTODY OF SAMPLES, EQUIPMENT, AND SUPPLIES

7.1 Review of New Work

7.1.1 The Laboratory Manager is primarily responsible for determining the capacity of the facility and its resources to handle new work, although other senior members of management may be called upon to provide expertise and input as needed. This determination consists of a comprehensive appraisal of the client's projected needs. Factors assessed are the ability of the laboratory to comply with the requirements of its accreditations while maintaining the expected level of legal defensibility and analytical validity of all reported data.

7.1.2 Prior to the acceptance of any new requests, tenders, or contracts by EETSE Atlanta the appropriateness of facilities and resources is considered utilizing the information in the following sections. If the facility and/or resources are inadequate to perform the work, the Laboratory Manager may exercise his discretion to refuse to perform all or part of a particular project. The Executive Director of Customer Service will be informed of this decision and the Project Managers will inform the client. The laboratory affords clients cooperation to clarify requests and to monitor the

laboratory's performance in relation to the work performed (while ensuring confidentiality to other clients). Differences between the request and the contract shall be resolved before laboratory activities commence.

7.1.2.1 Facilities. The facility must be suitable for the proper receipt and storage of the number and type of samples proposed to be accepted.

7.1.2.2 Resources.

7.1.2.2.1 Stipulated methods, sample preparations, final reports, data packages, and deliverables are reviewed to determine the availability of suitable instrumentation and personnel.

7.1.2.2.2 The laboratory must be capable of meeting all analytical requirements for the selected test methods. The specified requirements and methods must be adequately defined, documented, and understood.

7.1.2.2.3 The laboratory shall advise and obtain approval from the client before subcontracting work to another laboratory.

7.1.2.3 Contracts

7.1.2.3.1 The methods and procedures selected will be meet the customer's requirements.

7.1.2.3.2 The lab informs the customer when requested method is inappropriate or out of date.

7.1.2.3.3 Any differences between the request or tender and the contract shall be resolved before laboratory activities commence.

7.1.2.3.4 Each contract shall be acceptable to both the laboratory and customer.

7.1.2.3.5 Deviations requested by the customer shall not impact the integrity of the laboratory or the validity of results.

7.1.2.3.6 The customer shall be informed of any deviation from the contract.

7.1.2.3.7 If a contract is amended after work has commenced, amendments shall be communicated to all affected parties.

7.1.2.3.8 The laboratory shall cooperate with customers in clarifying requests and monitoring the laboratory's performance in relation to the work performed.

7.1.2.4 Records of Reviews

7.1.2.4.1 Records of Reviews including changes shall be retained.

7.1.2.4.2 Records shall also be retained of pertinent discussions relating to customer's requirements or laboratory activities.

7.1.3 Technical and Management Capability

7.1.3.1 The review of capability must establish that the laboratory possesses the necessary physical personnel, information, and resources to perform the tests in question. Additionally, the laboratory personnel must have the skills and expertise required for performing these tests.

7.1.3.2 The laboratory shall have adequate personnel at all times during the performance of analytical testing to ensure that clients receive data which meets the terms and conditions of the work agreement.

7.1.3.3 The review may consider the results of previous work of a similar nature or, where new testing is being implemented, the results of inter-laboratory testing, trial tests, proficiency samples, MDL studies, etc.

7.1.4 Discrepancies

7.1.4.1 Any differences between the request or tender and the capability of the laboratory to fulfill the proposed work are resolved before any testing begins. (The Chain of Custody is used to verify discrepancies because it is a form of contract.)

7.1.4.2 Modifications are allowed upon consent of the client. Changes are documented in the contract prior to acceptance. Each contract shall be acceptable to both the laboratory and the client.

7.1.4.3 Problems encountered during any stage of reviewing the testing are addressed and resolved to the satisfaction of both the laboratory and the client.

7.1.5 Records

7.1.5.1 The laboratory maintains any records for the initial review of new work entering the laboratory, including any significant changes in the proposed work plan.

7.1.5.2 Communication logs (telephone calls, on-site visits, meetings, e-mails, etc.) are used to record all pertinent discussions concerning the client's requirements. Logs must include the date, time, brief details of the exchange, resolution of any complaints, and identification of the parties involved.

7.1.5.3 Subcontracted work is described and documented prior to receipt of work from the client.

7.1.6 Once work has been accepted, the Director of Project Management is responsible for setting up the client in the LIMS system, setting up an account with the client, and monitoring the project to ensure that all of the client's requirements are met.

7.2 Sample Receipt

7.2.1 The laboratory has defined protocols for receiving samples and for the "logging in" process. These protocols provide information to the analysts regarding requested analyses, holding times, types of preservation, matrices, etc.

7.2.2 Sample Acceptance Policy - The laboratory will accept or reject samples for analytical testing based on presence, absence, or resolution of the required criteria specified for labeling, preservation, documentation, identification, hold time, container type, or volume. If this information is missing or comes into question, a corrective action report will be started to address any nonconformances. Upon completion of the corrective action, it will be determined if the laboratory accepts the samples. Samples will be considered accepted upon final login review. Unaccepted samples will be noted in the project narrative if other samples received meet the requirements.

7.2.2.1 The lab sample acceptance policy outlines circumstances under which sample are accepted and rejected. This policy is available to sample collection personnel and includes the following:

7.2.2.1.1 Documentation shall include sample identification, the location, date and time of collection, collector's name, preservation type, sample type and any comments concerning the samples.

7.2.2.1.2 Client samples should be properly labeled with unique identification. Indelible ink should be used along with water resistant labels.

7.2.2.1.3 Sample containers should be suitable for the requested test and the analysis hold time must be adhered to. (See Table 3-3 within EETSE Atlanta SOP SR-09002 Sample Receiving for Preservation, Hold Time, and Containers required.)

7.2.2.1.4 Sufficient sample volume must be available for the requested tests. If the client does not provide enough sample for all the tests, it will be noted on the sample receipt checklist. The project manager will contact the client to determine which tests the lab is to perform on the sample and whether or not the client will provide additional sample for other tests.

7.2.2.1.5 If samples show signs of damage, contamination or inadequate preservation, or any other concern, a corrective action must be initiated to determine if samples are acceptable for the requested analysis. Project managers with the assistance of the Director of Project Management, Technical Director, Quality Assurance Manager, or the Laboratory Manager address and close the corrective action by either accepting or rejecting the samples. (Corrective Actions and Nonconformances section 13.0) Data that does not meet the requirements will be qualified by a statement in the report narrative.

7.2.3 Upon receipt, each sample is identified by a laboratory-issued project number and a unique individual sample number. Properly followed, the preceding procedures provide court defensible documentation related to sample release to the lab, proper preservation and handling, and traceability throughout the analytical and reporting process.

7.2.4 Samples usually arrive at the laboratory in one of three ways: 1) delivered by carrier (UPS, Federal Express, and Mail), 2) delivered by courier, or 3) delivered by client personnel. In all cases, a document called a “Chain of Custody” (COC) must accompany the samples. This document, supplied by the laboratory to clients, is designed to provide to the laboratory all the necessary information about the client, samples, and which analyses are required. In addition, this document provides evidentiary information indicating who had samples in their possession at any time and when possession was changed. In some instances, the client provides their own chain of custody.

7.2.5 Once samples have been relinquished to the laboratory, they are checked for condition including the type(s) of preservation employed (temperature, pH, etc.), correctness of containers, and if the COC has been properly completed and signed.

7.2.5.1 Almost all soil and water matrix samples require a transport temperature of (0 - ≤6°C.) The samples should be packed in ice in a thermal container. Typically, an insulated ice cooler is used for sample transportation. The cooler should have a temperature blank included for use as a sample temperature check. The temperature blank is a plastic bottle filled with water.

7.2.5.1.1 Temperature is measured with a calibrated thermometer. The thermometer is individually identified and labeled with its calibration expiration date. The temperature of the blank must always be recorded during the login procedure. If the temperature is outside the 0 - ≤6°C range, this should be annotated so that the project managers can notify the client.

7.2.5.1.2 Samples that are hand-delivered to the laboratory immediately after collection may not meet these temperature criteria. In these cases, the samples shall be considered acceptable there is evidence that the chilling process has begun (such as arrival on ice).

7.2.5.2 Before placement in the storage area, samples must be checked for integrity. If any bottles are broken or have leaked, the client must immediately be contacted. This is particularly important if there are no duplicates of the sample in order to obtain instructions from the client on how to handle the situation. It may be necessary to re-sample for the incomplete tests.

7.2.5.3 Sample labels are checked against the Chain of Custody for accuracy and discrepancies. Custody seals must be intact if used. This procedure is best accomplished by sorting samples by their location rather than by their testing requirements. For example, all samples labeled "MW-1A" are combined and may include VOCs, metals, SVOCs, etc. Make sure that all sample labels match the COC for number of analyses, sample ID, matrix, etc. If a discrepancy is found, the variance is noted on the Sample Receipt checklist and the client is contacted to clarify the problem.

7.2.5.4 Samples are checked for type and proper degree of preservation. This only applies to aqueous samples and never to volatile organic samples (VOC samples are checked after the vial has been opened and the sample analyzed). There are several types of preservation required for the different analyses. Most involve either a high or low pH.

7.2.5.4.1 To check the sample for pH, take a clean disposable Pasteur pipette and touch its tip to the top of the aqueous surface. Sample should be drawn by capillary action up the tube. Remove the pipette, recap the sample and touch the Pasteur pipette to some pH paper. Read the paper to the nearest pH unit.

7.2.5.4.2 Check the preservation chart (Section 6) to see if the pH is in the range required for the sample. If not, notify the Project Manager immediately. The Project Manager may require the addition of proper preservative to the sample. If the holding time is affected by inappropriate preservation, this should also be communicated to the client and analysts through the Project Manager.

7.2.5.5 Samples are checked for holding time. Holding times begin the moment the sample is taken, not when it is received. While most analyses have a holding time of several days, holding times vary widely from as little as 15 minutes to as long as 6 months. The time involved in shipment of a sample to the laboratory can greatly reduce the amount of time the analyst has to perform the procedure. It is therefore critical that holding times be noted accurately and the appropriate analyst or manager notified immediately if holding time is running out (less than 24 hours left).

7.2.5.6 Results of observations are noted on a "Sample Receipt Check List" at login. (See Procedures within EETSE Atlanta SOP SR-09002 Sample Receiving)

7.2.6 Samples are then placed in the sample holding area, either in the appropriate cooler or on the correct shelf. If the project requires a continuous Chain of Custody, they must be logged out of the area by the analyst and logged back in when analysis is completed using the logbook provided. If the sample is completely exhausted, this must be noted in the logbook.

7.2.7 Any deviations must be brought to the attention of the client and/or the Project Manager so the client may be contacted for directions on how to proceed. For example, some samples may be unsuitable for testing if the temperature has not been maintained.

7.2.8 After all sample information is logged into the computer, a printout of the entered data is made. A second individual must verify the accuracy of the sample information entered. If the log-in, COC, and all sample information are approved, the checking individual initials the work and the project folder is given to the Project Manager.

7.2.9 Occasionally, samples require special storage times after the analyses are complete. This should be noted when these samples arrive at the laboratory to avoid them being prematurely discarded. To apprise all affected personnel, annotate this information into LIMS. These samples are to be stored

in the special holding area designated by the Sample Receiving Department. A Project Manager will notify the Sample Receiving Department which samples are required to be placed in this area.

7.2.10 Sample bottles are segregated according to their required analyses. Samples analyzed for volatile organics are placed in a separate cooler/refrigerator from semi-volatile organics or inorganics due to the possibility of cross-contamination from inorganic and waste samples. Samples for metal analyses do not require cooling. These samples may be placed on the shelf at room temperature.

7.2.11 Once samples have been removed from a cooler, the cooler must be cleaned before reuse. Usually, rinsing and air drying of the cooler will be sufficient. Make sure to return clients' coolers.

7.3 Review of Sample Login

7.3.1 When samples (a project) arrive at the laboratory, a project is created in the laboratory information management system (LIMS) and reviewed by a project manager as discussed in the Section 7.3.3.

7.3.1.1 A "Review of Sample Login" report is filled out by the sample custodian and this report is turned in to the project manager. The project manager reviews the information to ensure that all analyses, sample IDs, etc. are correct.

7.3.1.2 If any problems were found, they are corrected. A copy of the problem and its resolution is transmitted to the Sample Receiving Manager.

7.3.2 Sample Receipt Checklist (SRCL)

7.3.2.1 The sample receipt checklist (Appendix VII) is a list of all information pertaining to the arrival of a project at the laboratory. If any problems are found, such as errors on the chain-of-custody (COC), or any situation does not comply with the procedure or method, such as problems with sample preservation or holding time, the project manager is notified immediately in order to contact the client. The following list represents the questions asked on the SRCL:

7.3.2.1.1 Was the shipping container/cooler in good condition?

7.3.2.1.2 If there were custody seals on the shipping container/cooler, were they intact?

7.3.2.1.3 If there were custody seals on the samples, were they intact?

7.3.2.1.4 Was the container/temperature blank in compliance?

7.3.2.1.5 Was the chain-of-custody present?

7.3.2.1.6 Was the chain-of-custody signed when relinquished and received?

7.3.2.1.7 Did the chain-of-custody agree with sample labels?

7.3.2.1.8 Were samples received in the appropriate containers to perform the requested analysis? If VOA vials were received, were all vials void of headspace?

7.3.2.1.9 Were all sample containers received intact?

7.3.2.1.10 Was sufficient sample volume received to perform requested analysis?

7.3.2.1.11 Were all samples received within the EPA recommended holding times and within the recommended temperature ranges?

7.3.2.1.12 Was turnaround time marked on the chain-of-custody?

7.3.2.1.13 If samples were submitted for volatiles analysis, did they have zero headspace?

7.3.2.1.14 Was the pH acceptable for water samples upon receipt?

7.3.2.1.15 Were samples in good condition?

7.3.2.1.16 Is a known blank included for diffusive samples or AIHA LAP lead analysis?

7.3.2.2 All information at the top of the SRCL, such as client name, date/time received, and carrier name, must also be checked for accuracy. All out-of-compliance and non-conforming events are documented on the SRCL as well as in the PM non-conformance corrective action in LIMS. The client is contacted to discuss the issue or conflict. Resolution, as agreed upon by the client, is documented in the PM corrective action in LIMS and SRCL. Either the Director of Project Management or the Laboratory Manager closes out all corrective actions.

7.3.2.3 In addition, for Drinking Water samples associated with Waster Suppliers, the following Sample Information will be documented for samples where applicable and when available.

7.3.2.1.1 Name of System (PWSS identification number if available)

7.3.2.1.2 Sample Identification (if any)

7.3.2.1.3 Sample Site location

7.3.2.1.4 Sample Type (e.g. routine, repeat, raw or process)

7.3.2.1.5 Date and Time of collection

7.3.2.1.6 Analysis required

7.3.2.1.7 Disinfectant Residual (if available)

7.3.2.1.8 Name of sampler and organization (if not water system)

7.3.2.1.9 Sampler's Initials

7.3.2.1.10 Person(s) transporting sample from system to laboratory (If not sampler), if shipper used, shipping records available

7.3.2.1.11 Any remarks

7.3.3 Procedure for Creating and Reviewing Projects in LIMS
(See Procedures within EETSE Atlanta SOP SR-09002 Sample Receiving)

7.4 A Corrective Action Report is generated in LIMS for any sample receiving non-conformance. Section 13 of this Manual describes the Corrective Action Process in detail.

7.5 Health and Safety

7.5.1 All samples should be considered to be hazardous. Until a sample is analyzed, it is impossible to determine what type of contamination is involved. With this in mind, always wear the following safety equipment when handling samples.

7.5.1.1 Safety Glasses: OSHA approved safety glasses must be worn when working with samples. Safety glasses prevent an invasion of the sample into the eye and protect the eyes in case of a sample explosion.

7.5.1.2 Latex Gloves: Latex Gloves must be used when handling samples. Latex gloves protect the hands from the effects of corrosive materials, such as strong acids or bases. In addition, gloves prevent the introduction of hazardous materials into the body by absorption through the skin.

7.5.1.3 Sensible Clothing: Long pants and close-toed shoes (no sandals) must be worn at all times while working in the sample receiving area. Many of the samples received by the laboratory are 1 liter or greater in size. A liter of water weighs slightly more than 2 pounds. Dropping a liter of water on an unprotected toe from waist height can fracture the toe. Never wear any clothing that you are not afraid to ruin. Many of the preservatives used in the laboratory are acidic and will eat a hole in most natural materials. If the fiber is man-made, such as nylon, any strong solvent will melt it.

7.5.1.4 Lab Coat: Required when in the laboratory or handling samples or chemicals. Not only does it protect your clothing, but it also provides an additional cloth barrier against splashes and spills.

7.6 Sample Custody

7.6.1 EETSE Atlanta has implemented sample chain-of-custody procedures to provide accurate, verified, and traceable records of sample possession and handling, from sample container shipment through laboratory receipt and sample disposition.

7.6.2 Documentation of sample collection, shipment, laboratory receipt and custody is accomplished utilizing a chain-of-custody record. A sample is considered in custody if the following conditions have been met.

7.6.2.1 The sample(s) are in the physical possession of the sampler or courier.

7.6.2.2 The sample(s) are in view after being in the physical possession of the sampler or courier.

7.6.2.3 The cooler(s) or sample bottle(s) are sealed, so that sample integrity is maintained, while in the possession of the sampler or transferee.

7.6.2.4 The cooler(s) or sample bottle(s) are in a secured area restricted to authorized personnel.

7.6.3 Custody Record Maintenance

7.6.3.1 Laboratory records, including copies of the chain-of-custody forms and any associated documentation, are maintained in a secure area with any associated project records.

7.6.3.2 Laboratory data are recorded in bound notebooks and entries are made in waterproof ink.

7.6.3.3 Laboratory data entry errors are deleted with a single-line through the error. The correction is initialed and dated by the analytical staff member making the change.

7.6.3.3.1 Correction tape or other substances designed to obliterate documentation are strictly prohibited in the laboratory and custody areas.

7.6.3.4 Laboratory information is documented on prepared forms. All forms for recording laboratory data include a space for the date and for initials that must be completed by the data recorder. Laboratory documentation not recorded on pre-prepared forms is also dated and initialed.

7.6.4 The sample custodian, under either routine or special legal chain-of-custody procedures, receives all samples. Legal custody is a special type of sample custody in which all events associated with a specific sample are documented in writing.

7.6.5 Laboratory Provided Sample Containers

7.6.5.1 Sample containers provided by EETSE Atlanta are manufactured from EPA-designated materials, contain EPA-prescribed preservatives, and are affixed with an EETSE Atlanta identification label.

7.6.5.2 Pre-cleaned sample containers are purchased by EETSE Atlanta. When deemed necessary by the Technical Director, containers from each lot are pre-certified in house prior to use. A lot number is affixed to each container for purpose of traceability.

7.6.6 Chain of Custody Documentation, Traceability, and Sample Integrity

7.6.6.1 Formal chain-of-custody procedures are initiated by a sample custodian responsible for the organization and relinquishing of sample containers to the client or field personnel.

7.6.6.2 Properly record all fields of information on the chain-of-custody form. Proper completion of the form is the responsibility of the client's field sampling manager and is required prior to relinquishing the samples.

7.6.6.3 If the site location is different from the client address, the site location is recorded in the "Project Name" space on the chain-of-custody form, or on the right hand side of the form if additional space is required. The sample identifications assigned in the field are recorded in the "Sample Identification" column.

7.6.6.4 Common carriers may identify themselves by signing the "Relinquished By" space on the chain-of-custody form.

7.6.6.5 Maintain chain-of-custody for samples transported from the field to the laboratory by common carrier. Completed custody forms must accompany each sealed cooler by placing them in a plastic bag taped to the inside lid of the cooler.

7.6.6.6 Maintain a copy of each air bill package tracking form associated with a shipment of samples in the appropriate client files.

7.6.6.7 The custody-technician is responsible for the inspection of shipping containers upon laboratory receipt for overall integrity to ensure that the contents have not been altered or tampered with during transit. If tampering is apparent, the sample custodian immediately contacts the assigned project manager who is responsible for notifying the client.

7.6.6.7.1 The cooler inspection form, filed by the sample custodian, describes the deficiency and annotates any corrective action required by the client. Document any appropriate changes on the accompanying project chain-of-custody form, which is dated and signed by the sample custodian or project manager.

7.6.6.8 If shipping containers arrive intact, the sample custodian in the receiving area immediately opens them. The chain-of-custody form and temperature bottle are removed for inspection. Upon receipt, the container temperature is documented in a sample registry or, if requested by the client, documented on the chain-of-custody form.

7.7 Continuous Chains of Custody

7.7.1 A "Continuous Chain of Custody" sets protocols for keeping an unbroken, or continuous, chain of custody. The intent of this procedure is to enable EETSE Atlanta employees to track samples from the time and date of receipt to the time and date of disposal, particularly where legal cases are involved. In doing this, a constant record is kept of when and by whom samples are removed from the Sample Receiving Department. EETSE Atlanta will use its standard Chain of Custody (CoC) internally as a "Continuous Chain of Custody" if requested by a client.

7.7.2 Project Managers will notify the Sample Receiving Department when jobs require this unbroken Chain of Custody.

7.7.3 A sequential laboratory identification number is assigned to the project and recorded on the chain-of-custody form, on each sample container submitted with the project, and in the Laboratory Information Management System (LIMS).

7.7.3.1 Accurate and complete sample documentation must be provided on the chain-of-custody form in order to log samples into LIMS. The information entered includes all information necessary to maintain chain-of-custody including laboratory ID, client (field) ID, and initials of the sample receipt custodian.

7.7.3.2 Ancillary information, such as sample collection date and requested analyses, is also transferred directly from the chain-of-custody form into the LIMS and appears on the client project-specific acknowledgement.

7.7.4 Once the chain of custody is verified, the project is logged into the LIMS to transfer the desired work order request to the laboratory.

7.7.4.1 The sample custodian checks the information on each sample's label against that on the chain-of-custody form for discrepancies.

7.7.4.2 The sample custodian also inspects all samples for leakage or obvious seal (if provided) tampering. All samples are unpacked in a well-ventilated sample receipt area.

7.7.4.3 Samples received in plastic containers, or those that appear to be accumulating or evolving gas, are treated cautiously and inspected under a chemical hood since they may contain toxic fumes or be of an explosive nature.

7.7.4.4 A "Cooler Receipt Form" is completed to document custodial concerns at sample login.

7.7.5 Custody discrepancies noted by the sample custodian are transmitted to the project and sample manager and are resolved with the client prior to laboratory work assignment. Discrepancies are documented on the Anomaly Report.

7.7.5.1 The Project Manager and the Sample Custodian attempt to resolve custody discrepancies expeditiously to avoid holding time compromises. After a decision concerning a sample has been made, the Project Manager or Sample Custodian makes an initialed note in the work order narrative. The person, who was notified, time, date, and resolution, if applicable, is documented. This information is also documented on the Sample Custody Excursion form.

7.7.5.2 Email or hard copy of custodial resolutions or project order alterations is secured from the client prior to work initiation. Copies of this documentation are mailed to the client and maintained in the client file.

7.7.6 After addition of the project sequential identification number, the samples are distributed to the appropriate sample storage areas. Sample storage temperature logs are maintained for all sample storage refrigerators to assure proper temperature maintenance throughout the analytical process.

7.7.7 As soon as possible, all samples received by EETSE Atlanta are checked, by the appropriate preparation or analytical department, for proper pH adjustment. The pH of each sample is measured, documented, and adjusted if necessary. To avoid compromising sample integrity, volatile samples are checked for proper pH adjustment only at the time of analysis. The pH of volatile samples is not adjusted.

7.7.8 Only authorized personnel are permitted within the laboratory areas where sample access is possible. Sample storage areas are designed to segregate volatile and non-volatile samples. Standards and extracts are also departmentally controlled and stored separately.

7.7.9 The set of analyses required for a group of samples is project-dependent. After sample registry login and verification, samples are transferred from the receiving area to the appropriate sample preparation area. Those samples not requiring preparation are immediately sent to the sample analysis storage area. Using LIMS-generated sample preparation worksheets for guidance, samples are extracted, digested, or distilled as appropriate. The extracts, digestates, or distillates are then transferred to the appropriate analysis section, where analysis is performed.

7.7.10 For projects where the client requires in-laboratory custody records, the EETSE Atlanta project manager informs the sample custodian that they need to coordinate custody activities prior to sample receipt. For these samples, staff complete department-specific in-laboratory sample tracking forms. Samples
and sample preparations are stored in approved sample storage areas.

7.7.11 Sample holding times are tracked via the LIMS. Sample collection dates are routinely entered into the LIMS with all sample logins. This information allows holding times specific to each departmental analysis to be tracked by department managers, supervisors, chemists, and analysts through the use of daily status sheets, reference sheets, and preparation worksheets.

7.7.11.1 Date analyzed is recorded via instrument outputs as an integral part of the raw data.

7.7.11.2 The date of analysis is entered into the LIMS and compared to the date sampled to validate that holding times were not compromised.

7.7.12 Upon completion of analytical work, custody of unused sample portions, extracts, or digests is relinquished to a central secured storage area. Here the samples, digests, or extracts await disposal, which is performed with assistance of the LIMS. The LIMS stores client specific disposal instructions, compiles results from the analyses of composite samples, prepares sample disposal lists, invoices for disposal and sample return costs, and provides a disposal record for all excess samples.

7.7.13 By careful assignment of user passwords and file access/lock codes, EETSE Atlanta maintains a high level of data security in the LIMS. Thus, only authorized EETSE Atlanta personnel can access client files to view data. In addition, data entry and editing is restricted to highly trained data management personnel.

7.7.13.1 Data may be downloaded in a variety of standard formats including ASCII, spreadsheet, database, and text files, such as *.ASC, *.WK1, *.DBF, *.TXT, etc.

7.7.13.2 Additionally, laboratory data may be formatted to match client-specific requirements. These requirements are defined and agreed upon prior to project commencement.

7.7.13.3 Laboratory data is thoroughly reviewed prior to preparation of electronic or disc deliverables. The download process includes electronic and logical error check routines to confirm that the data files delivered are consistent with the client's format and data content needs.

7.7.13.4 A signed digitally signed electronic report is provided with diskette deliverables and an electronic and documentation audit trail of each download event are maintained.

7.8 Data Security

7.8.1 Client information is confidential and should be protected during electronic storage and transmission of results. In order to ensure data integrity and security, all files selected for data downloads are transferred from the LIMS to an isolated PC computer system. Access to downloaded files is then controlled via required matches of employee log-on sequences and confidential passwords. The entire download process is regularly reviewed and maintained by the computer department for system performance.

7.8.2 The LIMS manager maintains internal documentation for all LIMS programs. This documentation includes descriptions of any program additions, deletions, or modifications, the dates of revisions, and the initials of the responsible programmer. To verify proper functioning of the program hardware and software, a simulation account is maintained. When hardware or software is modified, the LIMS uses actual data in the simulation account to verify that the modifications are functioning as anticipated. Anti-virus software serves as an additional protective measure.

7.8.3 Data is entered into the LIMS through direct instrument interfaces and manual entry of data from the chemists' worksheets. Immediately following data entry, approval sheets are printed with the entered data as it appears in the LIMS. Assistant project managers compare all data on the approval sheets against the chemists' worksheets for data transcription errors.

7.8.4 Data worksheets, data approval forms, and final reports are routinely printed for verification and signatures. Hard copies of final reports, field data, chain-of-custody forms, and any ancillary documentation pertinent to the project are kept in a secured storage area and placed chronologically within alphabetically arranged client files.

7.8.5 EETSE Atlanta maintains a security policy. Under this policy, all external doors are either visually monitored by EETSE Atlanta staff or kept locked. Visitors are required to sign in. They are accompanied at all times by an EETSE Atlanta staff member.

7.9 Container Receipt

7.9.1 When the laboratory receives containers, they are entered into the Received Container Logbook. An EETSE Atlanta ID Container number unique to that case of containers is issued. Contamination is checked for in containers that do not include a Certificate of Quality Environmental Compliance.

7.9.2 The following is a step-by-step guide for entering all information associated with the container:

7.9.2.1 A unique EETSE Atlanta ID # is given to each box of containers. This number is given in numerical sequence by adding one to the previous number.

7.9.2.2 Under "Container Description", enter a brief description of the bottle type. Include: bottle size, plastic or glass, clear or amber, preservatives, and pre-cleaned, if noted.

7.9.2.3 Enter the date that the containers were received at the laboratory in the "Date Received" box.

7.9.2.4 Under "Vendor Name", enter the name of the vendor that the containers were ordered from. The sample-receiving manager has this information.

7.9.2.5 Enter the vendor lot number under the "Vendor Lot #" box. This number is found on a vendor provided label on the outside of each case of bottles.

7.9.2.6 Under "Date Expires", enter the date that the containers will expire. This date will be one year after the containers were received at the laboratory, unless otherwise stated by the manufacturer.

7.9.2.7 Enter the number of containers in each case under the "No. of Containers in Lot" box. This information is found on a vendor provided label on the outside of each case of bottles.

7.9.2.8 A Certificate of Quality Environmental Compliance is found inside of each box of glass containers. This information is filed in the sample-receiving department. All plastic containers will be checked for contamination in each new lot that is received by the laboratory. The

EETSE Atlanta lab number will be written in the "Contamination check OK" box. The information for the contamination check will be found in the LIMS system.

7.9.2.9 Enter the initials of the person that received the containers in the "Initials" box.

7.9.2.10 After each case of containers has been properly entered into the Received Container Logbook, the EETSE Atlanta ID # and the expiration date should be written clearly on each case of containers in permanent ink. The containers should then be placed in the for use bottle storage area.

7.9.3 A logbook of records shall be kept in the sample-receiving department. It should be checked periodically by the sample receiving department manager to ensure that it is properly maintained.

7.10 Subcontracting to Other Laboratories (See Procedures within EETSE Atlanta SOP SR-09002 Sample Receiving)

7.11 Purchasing Services and Supplies

7.11.1 Procurement Document Control

Vendors of analytical supplies to EETSE Atlanta Inc. are regarded as a resource to and an extension of the laboratory. Standards for quality identified in this document shall be applicable to vendors.

7.11.2 The purpose of the procurement control document is to assure the quality and traceability of procured items (equipment, materials, or services) in instances in which the specifications could affect the quality of the services provided by EETSE Atlanta, Inc. This includes such quality related items as the calibration of instruments by outside laboratories, purchase of standards, subcontracted services, and materials requiring testing before use.

7.11.3 Control of purchased materials, equipment, and services is a system designed to insure products and services conform to the procurement requirements. This system includes provisions for vendor evaluation and selection, objective evidence of quality furnished by the vendor, and examination of products or services upon delivery. Prior to the use of such products and services, documented evidence of conformation to the procurement requirements must be provided. This evidence is maintained in the analytical department office records.

7.11.4 It is the responsibility of the Accounting Department to insure the development and implementation of procedures to control purchased products and services. It is the responsibility of the purchasing agent to specify quality objectives for procured items and services. Purchased materials that fail to meet established criteria are documented by Non-conformance reports issued by the purchaser.

7.11.5 Procedures and Responsibilities

7.11.5.1 It is the responsibility of the purchasing agent to provide assurance, when required, that all applicable regulatory requirements, industry codes, and standards appear with the purchase documentation for the affected services and products.

7.11.5.2 The Purchasing Department retains Purchase Orders for control purposes.

7.11.5.3 Purchased items which do not meet the minimum standards set forth by the purchasing agent are processed according to procedures set forth in Section 13.0, "Corrective Action."

7.11.5.4 The appropriate manager or supervisor and QA Manager review purchase orders to ensure that quality related services or products meet the criteria of the laboratory's accreditations.

7.11.5.5 Purchase orders for standard catalog items do not require QA review unless they include thermometers, thermistors, hydrometers, pipettors, or analytical balance weights.

7.11.5.6 Where possible, reference materials (such as calibration standards) are purchased from a supplier that conforms to ISO Guide 34 in combination with ISO/IEC 17025, accreditation by an ILAC recognized signatory. External Calibration services shall, wherever possible, be obtained from providers accredited to ISO/IEC 17025 by an ILAC recognized signatory.

8.0 ANALYTICAL PROCEDURES

8.1 Method Sources and supporting procedures include the following:

8.1.1 Analytical methods used are currently accepted and approved by the US EPA, NIOSH, and "Standard Methods".

8.1.2 Other reference procedures for non-routine analyses including methods stipulated by specific states, such as Underground Storage Tank methods, or by ASTM.

8.1.3 Appendix X includes the list of controlled outside reference documents maintained by EETSE Atlanta. Control and updating of the reference document is completed annually by the Technical Director. Electronic document updates or web links to current revisions are posted to the laboratory portal server library, and Appendix X is updated with the annual update to the QA Manual.

8.1.4 The laboratory has a procedure (for the AIHA LAP program) in the form of a Standard Operating Procedure (SOP) for the validation of methods in the event a laboratory designed method or a non-standard method is used.

8.1.5 Laboratory Standard Operating Procedures (SOPs) are located on the company's intranet archival system, commonly referred to as the "portal server". These procedures contain the description of the preparation, calibration, analysis and/or verification test procedures.

8.2 Document Control. This section describes the procedures for control and maintenance of documentation through a document control system, which ensures that standard operating procedures, manuals, and reference documents clearly indicate the time period during which the procedure or document was in force. Regardless of which analytical procedures are used in the laboratory, the methodology shall consist of carefully documented Standard Operating Procedures (SOPs) and approved methods which may be periodically modified, updated or replaced entirely due to advances in technology or changes in regulatory protocols. Some clients may require pre-approval of method revisions before modifications are used to generate data. Documentation of analytical procedures for generating laboratory data shall be clear, concise, adequately referenced, and reflect the actual steps employed by the analyst.

8.2.1 Procedures
Methodologies employed in the laboratory are documented by the creation of an SOP. This document provides the analyst with the information necessary to perform the analysis. Every SOP is created in accordance with this QA document. It follows the intent of the method it is patterned after, but provides any additional information essential to the specific instrument instructions, specific quality concerns, etc.

8.2.1.1 If an SOP is not available for a specific analysis, the analyst will follow EPA, Standard Methods,
NIOSH, or other regulatory methodology as required. Deviations are not allowed.

8.2.1.2 Before a new method is accepted for routine use, adequate performance must be demonstrated. This includes an MDL study, IDOC, and related QA/QC procedures as required by the method.

8.2.1.3 Appropriate management personnel evaluate the merits of all new methods and recommend approval or rejection based on the available data. This committee includes, at a minimum, the Laboratory Manager and Technical Director. If the method is approved, a Standard Operating Procedure is created and the procedure is implemented.

8.2.1.4 All analytical procedures must provide documentation so that the complete process used to produce data can be reconstructed.

8.2.1.5 All deviations from an approved analytical procedure are authorized and documented by the Technical Director.

8.2.2 Changes to an approved procedure require, at a minimum, an Interim Change Notice. A complete revision and re-issuance of the SOP may be required. SOPs are reviewed at least annually.

8.2.3 A list of all current SOPs including their review and revision status is maintained electronically on EETSE Atlanta_server\L\Current SOP\SOP Masterlist. Current SOPs are maintained electronically on the EETSE Atlanta Portal Server in the Technical Management folder. All controlled documents are in "Read Only" format and password protected. The Business Unit Manager, Technical Director and their appointees are the only laboratory employees with edit access to these folders. In addition, a master list of controlled documents is maintained for documents other than SOPs. This includes various forms, software, references, etc. It is located at EETSE Atlanta_server\L\Current SOP\ Documents_Master_List_Non-SOPs.

8.3. Instructions and Procedures

It is the policy of EETSE Atlanta Inc. that all analyses and operations are performed using approved written procedures which are to be available to the personnel conducting the analysis /operation. The procedures assume one of two general formats. These formats are "Temporary Procedures" and "Standard Operating Procedures."

8.3.1 Temporary procedures are designed to accommodate the transition from a developing analytical service or method to an established procedure in the most efficient manner. They are less than formal procedures but are adequate to document the procedural treatment of samples. Effective dates and expiration dates are documented. Temporary Procedures, approved by a manager and the Technical Director, can be handwritten procedures and contain at a minimum the following information:

8.3.1.1 Health and safety requirements to perform procedure (if necessary).

8.3.1.2 Actual analytical method (step by step).

8.3.1.3 Materials list (if necessary).

8.3.1.4 Reagents (if necessary).

8.3.1.5 Calculations needed to perform procedure.

8.3.1.6 Reference sources from which procedure was developed.

8.3.2 Standard Operating Procedures (SOPs) are a formal treatment of an analytical or administrative procedure. Analytical SOPs shall be generated using nationally recognized procedures and incorporate EETSE Atlanta, Inc., operations and instrumentation. The SOPs are revised as required by the appropriate Managers and are reviewed and authorized for continued use at least annually. Analytical SOPs contain the following information:

8.3.2.1 Title, issue date and revision number

8.3.2.2 Approval signatures

8.3.2.4 Sample preparation, handling, storage and disposal

8.3.2.5 Definitions

8.3.2.6 Responsibilities

8.3.2.7 Hazards and safety requirements

8.3.2.8 Materials and equipment

8.3.2.9 Standardization and calibration requirements

8.3.2.10 QC sample frequency and performance criteria

8.3.2.11 Operating instructions

8.3.2.12 Example calculations and data sheets

8.3.2.13 References

8.3.3 Administrative Procedures contain the following sections

8.3.3.1 Contents Page

8.3.3.2 Purpose and scope paragraphs

8.3.3.3 Text

8.3.4 Emergency procedures are divided into three sections:

8.3.4.1 Symptoms

8.3.4.2 Immediate actions

8.3.4.3 Subsequent actions

8.3.5 Amendments of Documents by Hand:

8.3.5.1 SOPs are only amended via a permanent or temporary Interim Change Notice (ICN).

8.3.5.2 Spreadsheets, checklists, logbooks, and other documents that are templates which are filled in with data may be amended by a department manager, technical director, QA manager, or laboratory manager's approval. The manager/director should write the change on the document, then initial or sign and date the document.

8.4 Electronic Document Control

The laboratory SOPs are maintained electronically by the Technical Director through the electronic document control system. Hard copy signed originals of the procedures are Maintained by the Technical Director or appointee. Any staff member may request revision to the procedures.

8.5 Creating and Maintaining Standard Operating Procedures

"Standard Operating Procedures" describes the system for preparation, issue, implementation, and revision of formal Standard Operating Procedures for EETSE Atlanta Standard Operating Procedures are defined as written procedures for personnel to perform analyses, technical operations, tests, processes, administrative operations and tasks, or inspection of samples submitted to EETSE Atlanta.

8.5.1 Procedures are tracked, issued, revised, and filed.

8.6 Responsibilities

All technical and administrative staff is familiar with the requirements of this procedure and is responsible for its implementation. To ensure uniform and accurate procedures, the following personnel are assigned with the stated responsibilities:

8.6.1 SOP Author - The Author, when writing SOPs ensures the following:

8.6.1.1 The SOP meets applicable regulatory requirements.

8.6.1.2 The SOP includes the actual instruments and materials associated with EETSE Atlanta, Inc.

8.6.1.3 The SOP follows the requirements of the published standard method(s).

8.6.1.4 The SOP conforms to guidelines established in this document.

8.6.1.5 The SOP meets the applicable requirements of the laboratory's QA Manual.

8.6.1.6 That he responds to reviewer(s) comments in a timely manner.

8.6.2 Section Supervisor - The Section Leader is responsible for the following:

8.6.2.1 Review all new SOPs originating within their section.

8.6.2.2 Ensure the personnel in their department are aware of the SOP and understand their responsibility pertaining to the SOP.

8.6.3 Technical Director - The Technical Director is responsible for the following:

8.6.3.1 If a new SOP needs to be created, the Technical Director may assign the task of drafting SOPs to qualified individuals who possess the requisite experience and good communication/writing skills. The Technical Director may elect to write the SOP.

8.6.3.2 Ensures SOPs are in compliance with current regulations and established methods.

8.6.3.3 Reviews and approves all SOPs.

8.6.3.4 With the assistance of the QA Manager, maintains the SOP development, review, approval, and distribution system as stated in this procedure.

8.6.3.5 With the assistance of the QA Manager, maintains a protected archive of old SOP versions and current versions (controlled document system) for obsolete SOPs.

8.6.4 Laboratory Manager - the Laboratory is responsible for the following

8.6.4.1 Ensures that all sample analyses requested by the client have a current SOP. If a current SOP does not exist, the Laboratory Manager shall initiate a procedure for creation of an SOP.

8.6.5 QA Manager - the Quality Assurance Manager is responsible for the following:

8.6.5.1 With the assistance of the Technical Director, assists in SOP development, review, approval, and distribution system as stated in this procedure.

8.6.5.2 Ensures SOPs are in compliance with current regulations and established methods.

8.7 Definitions

8.7.1 Interim Change Notice (ICN) - A document accompanying any SOP or manual as a mandatory change, but is not included in the original text of the manual or SOP until the next revision.

8.7.2 Controlled Copy - A copy of an EETSE Atlanta Document or SOP that is updated when revisions are issued. All controlled documents are electronic files.

8.7.3 Uncontrolled Copy - A printed copy that is labeled "uncontrolled" and is not updated when revisions are issued.

8.7.4 Technical SOPs - Any SOP that directly addresses the laboratory analysis procedure.

8.7.5 Non-Technical SOP - Any SOP that is used at EETSE Atlanta but does not directly address the laboratory analysis procedures. Examples: QA, QC, Project Management, and Administrative SOPs.

8.8 New Procedure Initiation

8.8.1 Immediate Procedure Initiation

A Temporary SOP should be written when the laboratory receives projects which have requests for analytical procedures that do not have an SOP and the staff feels that the laboratory can perform the requested test procedure in-house.

8.8.2 Planned Procedure Initiation

The department manager/section supervisor, the Laboratory Manager, and the Technical Director determine the need for a new SOP.

8.8.3 As part of the New Procedure Request Form, the QA Manager and the Technical Director complete the following:

8.8.3.1 The Technical Director assigns the appropriate SOP number.

8.8.3.2 The Technical Director completes a Draft SOP or assigns an alternate author.

8.8.3.3 The draft SOP is forwarded to the affected laboratory personnel for review (see Section 8.11). The draft includes all of the text, tables, and attachments formatted as outlined in this SOP.

8.8.3.4 After review by the affected personnel, the Technical Director finalizes the SOP. A hard copy of the SOP is produced for signature and placed into a folder in the QA Managers office. Controlled electronic copies are made available to laboratory staff in "Read Only" format on the EETSE Atlanta Server and Portal Server.

8.9 Standard Operating Procedure Formatting

8.9.1 Title Page

Standard Operating Procedure Title Page Format.

8.9.1.1 Title - The procedure is given a concise, descriptive title. When appropriate, Operational Procedure titles should include the parameter(s) analyzed, sample type, method (if applicable), and analysis technique description (e.g., "Fluoride in Water by Ion Selective Electrode, based on EPA Method 353.3").

8.9.2 Comments - This section includes any reasons for revisions and additional comments as necessary.

8.9.3 Approval Signatures

8.9.4 Header

8.9.4.1 All SOPs have the following header on each page:

8.9.4.2

8.9.4.4 The following recommended header fonts are used:

	Font	Font Size
EETSE Atlanta, Inc. Arial – Bold		12
Address	Arial	8
SOP No, etc	Arial	9

8.9.4.5 Each procedure is uniquely identified by a five digit number preceded by one of the following identifiers to indicate the type of procedure:

Identifier	SOP Type	# Assignments
QA	Quality Assurance	01000 – 01999
AD	Administrative	02000 – 02999
HS	Health & Safety	03000 – 03999
EM	Emergency	04000 – 04999
QC	Quality Control	05000 - 05999
PM	Project Management	06000 – 06999
GL	General Laboratory	08000 – 08999
SR	Sample Receiving	09000 – 09999
OA	Organic Analytical	11000 – 11999
IA	Inorganic/Metal Analytical	13000 – 13999
LP	Leaching Procedure	14000 – 14999
MB	Microbiology	15000 – 15999
ABS	Asbestos	01000 - 01999
WM	Waste Management	17000 - 17999

8.9.4.6 Revision - The first issue of a procedure is not assigned a revision number. It is assigned an "N/A" entry. As revisions are made to the procedure, the revision number is increased sequentially starting with Revision 1 (one).

8.9.4.7 Effective Date - The date when the procedure becomes effective. Use following format: 12/97.

8.9.4.8 Revision Date - Date the current revision became effective. Use the following format: 12/97.

8.9.4.9 Number of Pages - The correct form for this is, Page No.: x of y. Example the fifth page of a 24 page document would be formatted as: Page No.: 5 of 24.

8.10 Table of Contents

Section and sub-sections are listed in the Table of Contents using the font in the body of the SOP. See Attachment 3 for an example of an SOP. In addition, all Tables and Attachments are included in the Table of Contents.

8.10.1 Each Manual has a Table of Contents that includes the following information: SOP document number(s), name(s) of the SOP, date(s), revision number(s), and associated Method Number. When SOPs are revised, this list is edited to reflect the changes.

8.10.1.1 The Title of each SOP is Centered, All Capital letters, and in Boldface type on the Table of Contents page.

8.10.2 SOP Body - Technical Procedures.

8.10.2.1 All procedures are formatted using this section numbering system:

1.0 SECTION

1.1 Sub-Section

1.1.1 Sub-Sub-Section

1.1.1.1 Sub – Sub – Sub – Section

2.0 SECTION

8.10.2.2 To keep all the SOPs uniform, use Arial Font Size 12 for the document.

8.10.2.3 Each Section is underlined and all capital letters.

8.10.2.4 Copies of forms or logbook pages used in conjunction with the SOP and unique to the SOP are attached as Tables or Attachments; sequentially numbered and referenced in the body of the SOP.

8.10.3 All Technical SOPs include the following sections in the same order:

TABLE 8-1 Technical SOPs

Section Number – Title	Purpose	Required Information
1.0 SCOPE AND APPLICATION	- Describes what the method does - Describes the matrices to which a method applies. -May also describe when the method is to be employed.	1. All matrices which may be analyzed using the method. 2. Analytes the method is capable of quantifying. 3. Quantitation range of analytes. 4. Reference to sample
2.0 SUMMARY OF METHOD	Provides a brief description of the procedure and the type of chemistry / instrumentation employed by the laboratory in performing the method.	
3.0 INTERFERENCES	List most common interferences which affect performance of the method. For preparative methods, include interferences which affect the sample analysis.	
4.0 SAMPLE COLLECTION, PRESERVATION , AND HOLDING TIMES	List preservation, storage, and holding time requirements for each matrix listed in Section 1.0.	1. Preservatives 2. Holding Times 3. Acceptable container types.
5.0 REAGENTS AND STANDARDS	List all reagents and standards.	1. Purity of reagents. 2. All concentrations of reagents and standards required. 3. Detailed preparation instructions for each reagent and standard to include initial concentration(s), aliquot volume(s) or weight(s), final volume, final concentration(s), expiration dates.

		4. Listing of the Vendor(s) used to purchase the reagent including the catalog number, vendor address, and telephone number.
6.0 APPARATUS AND MATERIALS	List all apparatus, materials, and equipment, inclusive of data collection and reduction systems.	List make and models or equivalents that might be used in the laboratory
7.0 PROCEDURE	1. This section defines the analytical procedure from start to finish. 2. Address QA/QC requirements when they are appropriate in the overall sequence of activities. 3. Addresses specific record keeping requirements (i.e. when and where to record specific information in run logs and other required laboratory documentation). 4. Includes the handling and disposal of waste when appropriate in the overall sequence of activities. 5. Calculations are included in the text where applicable following the example of SW-846 methods.	Includes at a minimum: 1. Instrument set-up and conditions. 2. Calculations of retention times if applicable. 3. Initial calibrations. 4. Continuing calibrations 5. Analysis sequence, including QC requirements. 6. Calculations – inclusive of conversions for solids. 7. Units required for reporting.
8.0 QUALITY ASSURANCE REQUIREMENTS	Defines additional QA requirements which must be met in addition to all criteria previously listed in the SOP.	Includes a minimum: 1. Blank requirements. 2. Laboratory Control Sample (LCS) requirements. 3. Matrix spike requirements 4. Matrix spikes duplicate or sample duplicate requirements. 5. Any method specific requirements (e.g. MSA for GFAA metals, surrogates for GC/MS procedures, tracers for alpha spectroscopy methods). 6. Corrective actions required when requirements are not met. 7. Frequency of QC samples
9.0 HEALTH AND SAFETY	Details specific health and safety requirements for the method and references any general health and safety requirements which may apply.	1. Protective clothing required. 2. Special hazards associated with chemicals or equipment used in the procedure. 3. Storage and / or disposal of all sample extracts and chemicals used.
10.0 DATA REPORTING	Defines the method for data reporting by the staff to clients.	Includes a minimum: 1. Reporting limits in LIMS. 2. Rounding of data.

11.0 FILE MAINTENANCE	Defines the procedures for data transfer and archiving of data for long term storage.	1. Frequency of data transfer from local computer to server. 2. Method used to transfer data to server. 3. Data storage requirements
12.0 INSTRUMENT MAINTENANCE	Defines the procedures for routine instrument maintenance and entry into logbooks.	
13.0 METHOD PERFORMANCE	Describes the acceptance criteria published in the method.	1. Spike, duplicate precision and accuracy.
14.0 POLLUTION MANAGEMENT	Describes the procedures required to dispose of hazardous wastes.	1. Waste disposal from received samples. 2. Waste disposal from laboratory generated wastes. 3. Required forms to be completed.
15.0 DEFINITIONS	Provides a definition for terms that are used in the SOP.	
16.0 REFERENCES	Provides the source(s) of the information from which the SOP was derived.	
17.0 VALIDATION DATA	Provides the location of information for method validation data.	

Note: The author may add any subsections that are necessary and do not fit in any of the above categories.

8.11 SOP Body - Non - Technical (Administrative)

8.11.1 See Sections 8.10 and 8.11

8.11.2 The author may add any subsections that are necessary.

8.11.3 Copies of any forms or logbook pages used in conjunction with and unique to the SOP are attached as Tables or Attachments, sequentially numbered, and referenced in the body of the SOP.

8.11.4 SOP Body - Immediate SOP (See section 8.8.6 for the definition of "Immediate SOP").

8.11.5 Copy the Regulatory Method

8.11.6 Attach a procedure title sheet

8.11.7 Complete the following sections: 1.0 Health and Safety, 2.0 Reagents and Supplies, and 3.0 Step by Step Procedure. If these sections are included in the regulatory method, the following note can be included under each section: "See Regulatory Method attached section_____".

8.11.8 This is forwarded to the QA Manager who then initiates a new procedure, as described in 8.2.3.

8.12 Procedure Review And Revision

Procedures undergo periodic review and are updated whenever regulatory, programmatic requirements or internal process change.

8.13 Technical Review

8.13.1 A technical review of the draft SOP is performed by affected laboratory personnel and addresses the following items:

8.13.1.1 Does the SOP comply with the technical requirements of the regulatory agency (EPA, USACE, etc.) method?

8.13.1.2 Does the SOP state the step by step procedure of how EETSE Atlanta completes the procedure?

8.13.1.3 Does the procedure formatting follow the procedures outlined in this section?

8.13.2 Comments are written directly on the Draft SOP or on another sheet of paper if needed.

8.13.3 The reviewer(s) discuss comments with the Technical Director and arrive at a finalized document.

8.13.4 The Technical Director makes the necessary changes electronically. The changes include any Interim Change Notices (ICNs) that have been generated for the SOP and are incorporated as stated in the ICN. The electronic copy is stored in the server in the appropriate year labeled folder.

8.13.5 The reviewed SOP is printed and all approval signatures are obtained on the original hard copy.

8.13.6 The approved SOP is electronically placed in the "Current Revisions" folder by the Technical Director. All employees have access to these files in a "read only" format.

8.13.7 SOP Acknowledgement forms (Attachment 1) are distributed to all area supervisors to distribute to all employees who will be using the procedure.

8.13.8 Employees using the new procedure sign SOP Acknowledgement forms and return them to their Supervisor who forwards them to the Technical Director for final approval and scanning.

8.14 Procedure Changes

8.14.1 Analysts, supervisors, or management have the ability to request changes to procedures as part of the continuing procedure maintenance using the "Interim Change Notice" (ICN) form (See Attachment 2).

8.14.2 To complete an ICN, make the required changes to a copy of each affected procedure page. Revise and edit these copies using appropriate standard editor's marks and symbols.

8.14.3 The employee requesting the change ensures the department manager signs the ICN and forwards the ICN to the Technical Director.

8.14.4 The Technical Director signs the ICN, supplies a copy to each applicable department supervisor, ensures that a copy is placed in the controlled SOP folders (see section 8.2), and files it with the controlled QA SOP files.

8.15 Standard Operating Procedures Electronic Document Control Process

8.15.1 All controlled documents are electronic files which are password protected and managed by the Technical Director or designee.

8.15.2 All laboratory personnel have access to a controlled, electronic copy of the SOPs applicable to their job description.

8.15.3 Only uncontrolled documents are issued to clients.

8.15.4 The electronic document control files are arranged such that laboratory personnel have access to only current revisions of controlled documents. All archived revisions, draft procedures, etc. are accessible only to authorized QA or Technical Direction personnel via password access.

8.16 Uncontrolled copies of Standard Operating Procedures are printed, working copies of the documents, and in that regard, are not monitored or tracked.

8.17 Procedure Archive

The Technical Director is responsible for archiving any procedures that are no longer used at EETSE Atlanta.

8.17.1 Historic hardcopies of SOPs not in use are kept in the Technical Director's office. For SOPs associated with AIHA LAP accreditation, the documents are marked "Void" so it is clear they are not in use.

8.17.2 Retired electronic SOPs related to the AIHA LAP are marked as "Obsolete" via a watermark. All electronic SOPs are moved by the Technical Director to the designated archive directory.

8.17.3 Technical Director removes the folder from the "active" files and places it in the archived files.

8.18 Temporary Change

Temporary changes to an SOP may be required for the following reasons: a sample matrix does not permit the SOP steps to be followed as written, or if a client desires a change to an SOP that is currently in use at EETSE Atlanta.

8.18.1 The Temporary Change Notice is completed and approved prior to the use of a revised procedure. See Attachment 2.

Attachment 1

QUALITY ASSURANCE MANUAL STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT

Name (Printed): _____

SOP Title: Quality Assurance Manual

SOP Number: QA-01000 Rev. No. 30

The laboratory analyst signature on this approved SOP signifies the following: The analyst has read the SOP in its entirety and has read the analytical methods referenced in the SOP.

The analyst understands that the SOP is to be followed explicitly. Any deviation from the SOP must be noted in writing. Furthermore, the deviation from the SOP must be approved in writing by the laboratory supervisor and the QA staff prior to the analyst's adoption of the deviation from the SOP.

The controlled electronic copy of this SOP is located on the portal server at: Documents: Quality Assurance: QA Manuals: QA Manual: 2024_QA_Manual_Rev_30.pdf. If a hard copy is desired, you may request one from the Manager/Supervisor.

Do not make a copy or print out the QA Manual yourself. Printed copies are uncontrolled documents.

Print Name: _____ Date: _____

Analyst's Signature: _____ Date: _____

Department Manager Signature: _____ Date: _____

Technical Director's Signature: _____ Date: _____

Attachment 2

eurofins | Environment Testing

Atlanta
3080 Presidential Drive
Atlanta, GA 30340

Temporary SOP or
Interim (Temporary or Permanent) Change Notice
(circle one as appropriate)

Date:

Employee Requesting Change:

SOP Number:

Reference Method Number:

SOP Title/Rev:

Permanent Change Requested:

Approvals (Signature/Date)			
Technical Director	Date	Laboratory Director	Date
Quality Assurance Manager	Date	Department Manager	Date

.doc
Page 1 of 1

9.0 CALIBRATION PROCEDURES AND FREQUENCY

9.1 Identification and Control of Materials, Parts and Components

General. Materials, components or items that are used directly in the production of samples or data that, if not controlled, could jeopardize data quality must be identified.

9.1.1 Traceability of Measurement Policy (for AIHA LAP and other accreditations)

Under EETSE Atlantas' various accreditations (i.e. AIHA LAP accreditation), the laboratory shall demonstrate, when possible, that calibrations of critical equipment and hence the measurement results generated by that equipment, relevant to their scope of accreditation, are traceable to the SI (International System of Units) through an unbroken chain of calibrations.

9.1.1.1 External Calibration services shall, whenever possible, be obtained from providers accredited to ISO/IEC 17025 by an ILAC recognized signatory, a CIPM recognized National Metrology Institute (NMI), or a State Weights and Measures Facility that is part of the NIST Laboratory Metrology Program. Calibration certificates shall be endorsed by a recognized accreditation body symbol or otherwise make reference to accredited status by a specific, recognized accreditation body, or contain endorsement by the NMI. Certificates shall indicate traceability to the SI or reference standard and include the measurement result and if available the associated measurement uncertainty.

If externally provided products and services that affect laboratory activities or are used to support the operation of the laboratory are necessary, the laboratory will ensure they are suitable. When such products and services are intended for incorporation into the laboratories own activities, they are provided directly to the customer by the laboratory, as received from the external provider.

9.1.1.2 Where traceability to the SI is not technically possible or reasonable, the laboratory shall use certified reference materials provided by a competent supplier, or use specified methods and/or consensus standards that are clearly described and agreed to by all parties concerned. A competent supplier is an NMI or an accredited reference material producer (RMP) that conform with ISO Guide 34 in combination with ISO/IEC 17025, or ILAC Guidelines for the Competence of Reference Material Producers, ILCA G12. Conformance is demonstrated through accreditation by an ILAC recognized signatory.

9.1.1.3 Reference materials shall have a certificate of analysis that documents traceability to a primary standard or certified reference material and associated uncertainty, when possible. Where possible, reference materials such as calibration standards should be purchased from a supplier that conforms to ISO Guide 34. When applicable, the certificate must document the specific NIST SRM® or NMI (National Metrology Institute) certified reference material used for traceability.

Calibrations performed in-house shall be documented in a manner that demonstrates traceability via unbroken chain of calibrations regarding the reference standard/material used, allowing for an overall uncertainty to be estimated for the in-house calibration.

Calibration shall be repeated at appropriate intervals, the length of which can depend on the uncertainty required, the frequency of use and verification, the manner of use, stability of equipment, and risk of failure considerations. Table 9-1 provides minimum frequencies.

Periodic verifications shall be performed to demonstrate the continued validity of the calibration at specific intervals between calibrations. The frequency of verifications can be dependent on the uncertainty required, the frequency of use, the manner of use, stability of the equipment, and risk of failure considerations. Internal calibrations and verifications are performed at the stated frequencies in Table 9-1. Reference thermometers, hygrometers, and masses, will be repurchased at the stated frequency rather than recalibrated. This has been determined to be more cost effective.

The laboratory has procedures describing their external and internal calibration and verification activities and frequencies, and the actions to follow if equipment is found to be out of acceptable specification. Laboratory staff performing in-house calibration and verifications shall have received documented training.

9.1.1.4 Standard tracking: Standards and reagents are tracked in the LIMS chemical inventory system for traceability and auditing purposes. The method of standard and reagent tracking is outlined in the subsequent sections.

9.1.1.4.1 When a standard or reagent is needed that is not already on the approved vendor / materials order list, supervisors forward purchase requests to the Technical Director and / or Laboratory Manager for approval. The standard or reagent is ordered from a reputable supply house (EETSE Atlanta typically uses VWR).

9.1.1.4.2 The information supplied to the Technical Director and / or Laboratory Manager must have the supplier standard or reagent name, order number, size or amount of each unit, grade or purity, price, if possible, and quantity. Upon receipt, supplies (and services) are reviewed to ensure they comply with requirements. When a vendor has been approved for services, a note is placed in the comments field of the Vendors database within LIMS.

9.1.1.4.3 When the standard or reagent arrives, it is logged into the LIMS, usually by the department supervisor or by the sample custodian. All reagents and standards received are electronically tracked and documented by computer via the Laboratory Information Management System.

9.1.1.4.4 Each standard or reagent is given a unique chemical inventory number upon receipt. The next available number in the LIMS is automatically assigned, starting with #5001. The computer entry is completed by entering the correct information in the required fields.

9.1.1.4.4.1 The expiration date for neat standards and reagents is determined using the manufacturer's expiration date, if available. Otherwise, a 1 year expiration date is assigned to volatile organic compounds and standards and 5 year date for acids, dry chemicals, solvents, reagents, and other chemicals. Each standard and reagent is clearly and permanently labeled with its expiration date in indelible ink. The assigned expiration date for intermediate standards will not exceed the manufacturer's expiration date of the stock standard.

9.1.1.4.4.2 Secondary standard containers are labeled with the corresponding LIMS tracking number of the source material, the date the contents were prepared, the six month expiration date, the name of the analyte(s), the concentration of each component of the solution, the matrix and the initials of the person who prepared it.

9.1.1.4.4.3 The chemical inventory number must appear on both the standard and reagent container, and the upper, right-hand corner of the certificate of analysis. It must also be included, if applicable, in standard/preparation, analyses or sample preparation log books.

9.1.1.4.4.4 Secondary standard labels must include at minimum: the LIMS chemical inventory number and expiration date. If space is available, secondary label shall also include all of the following: the LIMS chemical inventory number, standard name, intended use (spiking, surrogate, reference, or calibration solution), concentration with units, matrix, expiration date, and initials of the person who prepared the standard. As long as all of the aforementioned information is available, all other information can be found in the LIMS.

9.1.1.4.4.5 Spiking, surrogate, reference and calibration solutions and calculations are recorded in the appropriate "Standard/Preparation Log Book." Logbooks cover the following areas: Organics, Organics Preparation, Semi-Volatile Organics, Microbiology, Metals, Mercury & Wet Chemistry.

9.1.1.4.4.6 Some containers such as standards containers for organics are small and there may not be enough room to list all of the required information on the container. Should this occur, it is permissible to attach a label to the bottle.

9.1.1.4.4.7 When a standard or reagent is added to a sample for any reason, the LIMS chemical inventory number of that standard or reagent and the amount added must be recorded in the appropriate logbook. For example, if a stock standard MET #33-89-5431 of 1000 mg/L is diluted to 100 µg/L, the following line is entered: 1 ml MET #33-89-5431 to 100 ml DI water, 1 ml of 100x to 100 ml DI water, final conc. = 100 µg/L. (NOTE: "MET #33-89-5431" = Metals Department Standard/ Preparation Log Book 33, page 89, LIMS Chemical Inventory Number 5431).

9.1.1.4.4.8 If the standard is used as a stock standard and aliquots of it are diluted to produce working standards, the stock standard's LIMS chemical inventory number is used. The standard concentration or a designator such as "1" or "A" is used to differentiate between each serial dilution.

Table 9-1
Minimum Calibration / Verification Frequency Requirements (for AIHA LAP and other accreditations)

Reference Standard / Equipment	Calibration Frequency	Verification Frequency
Balances	Initial and Annually	Each day of use
Mechanical Pipettors	Initial and when verification fails*	Quarterly
Reference Thermometers	Initial and every 5 years**	Not applicable
Reference Hygrometers	Initial and every 5 years**	Not applicable
Digital Thermometers	Initial and when verification fails*	Quarterly
Alcohol-Hg-Spirit Thermometers	Initial and when verification fails*	Semi-annual
Reference Masses	Initial and every 5 years**	Not applicable
Stage Micrometer	Initial, if damaged, and every 7 years	Not applicable

*Verified internally.
**These reference standards will be repurchased instead of recalibrated in-house.

9.1.2 Control of Materials, Parts and Components
When appropriate, identification of each item is maintained by part number, serial number, or other appropriate methods, either directly on the item, or by labels or records traceable to the item. The system is designed to prevent the use of incorrect or defective items and to maintain identify and control inventory. When appropriate, the system controls items by batch number rather than by individual item. Instrumentation not currently in use or equipment undergoing repair is labeled as "Out of Service."

9.1.3 Handling, Storage and shipping

9.1.3.1 General

This criterion establishes requirements for the proper handling, storage, preservation and shipping of materials, supplies and equipment.

9.1.3.2 Procedures and Responsibilities

All items affecting quality are handled and stored in such a manner as to prevent deterioration and damage to the quality. Items that require shipping are packed to prevent damage. Managers and supervisors are responsible for items under their control.

9.1.4 Procurement Document Control

9.1.4.1 General

9.1.4.1.1 Vendors of analytical material supplied to EETSE Atlanta are regarded as a resource to, and an extension of the laboratory organization. The standards for quality identified in this document shall be applicable to vendors.

9.1.4.1.2 The purpose of the procurement control criterion is to ensure the quality and traceability of procured quality related items (equipment, materials, or services), whose specification could affect the quality of the services of EETSE Atlanta. This includes such quality related items as the calibration of instruments by outside laboratories (when appropriate), purchase of standards, subcontracted services and materials requiring testing before use, as determined by the QA Manager.

9.1.4.2 Procedures and Responsibilities

9.1.4.2.1 It is the responsibility of the purchasing agent to provide assurance, when required, that all applicable regulatory requirements, industry codes and standards appear in the purchase documentation for affected services and products.

9.1.4.2.2 The Purchasing Department retains purchase orders for control purposes.

9.1.4.2.3 Purchased items which do not meet the minimum standards set forth by the purchasing agent are processed according to procedures set forth in Section 13, “Corrective Actions.”

9.1.4.2.4 The appropriate Manager/Supervisor and QA Manager review purchase orders, which may affect quality-related services or products.

9.1.4.2.5 Purchase orders for standard catalog items except those described herein, are exempt from QA review.

9.1.5 Non-conformance

The purpose of this criterion is to establish a system to control materials, parts, or components that do not conform to established requirements in order to prevent their inadvertent use. When significant deficiencies in analytical procedures, materials or components has or may lead to the release of incorrect analytical results to the customer, a Corrective Action Report (CAR) is issued.

9.1.5.1 Procedures and Responsibilities

The Laboratory Manager and the purchaser perform the inspection of the newly received material and equipment. Nonconforming items that fail incoming receipt inspection are identified and segregated until disposition is determined and documented by the Non-Conformance Report. Copies of these documents are maintained by the Purchasing Department or the QA Department, as applicable.

9.2 Instrumentation List

The laboratory maintains an Equipment List spreadsheet of all instrumentation used. The information documented in this spreadsheet sheet includes a unique EETSE Atlanta ID number for each piece of equipment along with type of instrument, manufacturer, model, serial number, software and revision number, firmware, and date received. It also lists in-house standards of traceability such as certified analytical balance weights and calibration thermometers.

In addition, the item, model, serial number, date received, and the date placed into service. Appendix III, "Equipment List," is a summary of the laboratory equipment spreadsheet (For the complete information see the Equipment List spreadsheet).

9.3 Measurement Traceability and Calibration / Procedures for achieving Traceability of Measurements

9.3.1 General

The purpose of this criterion is to assure that instruments and other measuring and testing devices used in activities affecting program quality are properly controlled, calibrated and adjusted at specified periods to maintain accuracy within design and/or procedure limits. Implementation procedures consist of the following as applicable:

9.3.1.1 Identification and control of the item

9.3.1.2 Creation of calibration schedules and procedures based on instrument type, planned use, and design limits and program requirements.

9.3.1.3 Development of calibration sources for use in confirming successful equipment operation.

9.3.1.4 Maintenance of equipment history records to indicate past and status, and to provide reproducibility and traceability of results.

9.3.2 Responsibility

Under the direction of the manager, the supervisors are responsible for the quality of measuring and test equipment under his/her control and for the maintenance of records of calibrations and checks.

9.3.3 General Requirements

All measuring operations and testing equipment having an effect on the accuracy or validity of tests shall be calibrated and/or verified before being put into service and on a continuing basis. The laboratory has an established program for the calibration and verification of its measuring and test equipment. This includes balances, thermometers and control standards.

9.3.4 Traceability of Calibration

9.3.4.1 The overall program of calibration and/or verification and validation of equipment ensures that, wherever applicable, measurements made by the laboratory are traceable to national standards of measurement.

9.3.4.2 Calibration certificates indicate the traceability to national standards of measurement and provide the measurement results and associated measurement uncertainty. Certificates are maintained in the Quality Assurance office files.

9.3.4.3 The laboratory maintains calibration certificates that provide traceability to each standard chemical used within the laboratory. As these standards are purchased, the certificates that accompany the standards are stored in logbooks. Information included in the logbooks includes labels provided by the manufacturer, expiration date, lot number, etc. This information is stored separately for standards purchased by each department and can be accessed by all personnel within the department.

9.3.4.4 Where the traceability of national standards of measurement does not apply, EETSE Atlanta shall provide satisfactory evidence of correlation of results by participation in a program of inter-laboratory comparisons, proficiency testing studies or independent analysis.

9.3.5 Reference Standards

9.3.5.1 Reference standards, as Class 1 weights or traceable thermometers, are used for calibration only and no other purpose, unless it can be demonstrated that their performance as reference standards will not be invalidated. EETSE Atlanta, Inc., maintains certified Class 1 weights, thermometers which have been calibrated by outside agencies that can provide traceability to national standards of measurement. The stage micrometer will be calibrated by a NIST traceable reference.

9.3.5.2 The calibration and verification of reference standards occurs every five years for Class1 weights and thermometers and every seven years for stage micrometers.

9.3.5.3 Where relevant, reference standards and measuring and testing equipment shall be subjected to in-service checks between calibrations and verifications. These reference materials shall, where possible, be traceable to national or international standard reference materials. Standards traceable to NIST, which are used by the laboratory, are listed within individual SOPs.

9.3.6 Calibration- Calibration requirements are divided into two parts: 1) requirements for analytical support equipment, and 2) requirements for instrument calibration. In addition, the requirements for instrument calibration are divided into initial instrument calibration and continuing instrument calibration verification.

9.3.6.1 Instrument Calibration - Analytical instruments are calibrated in accordance with the proper analytical procedure to determine the analyte(s) of interest. After initial calibration of an instrument, a continuing calibration standard is analyzed at specific intervals. The calibration standards must meet the specified QC requirements associated with each test method (see Section 5).

9.3.7 Control of Measuring and Test Equipment

9.3.7.1 The purpose of this criterion is to assure that instruments and other measuring and testing devices used in activities affecting program quality are properly controlled, calibrated and adjusted at specified periods to maintain accuracy within design and/or procedure limits.

9.3.7.2 Equipment calibration specific to microbiological analysis.
The laboratory, under the direction of the section leader, determines and documents temperature stability, uniformity of temperature distribution, and time required to achieve equilibrium conditions in incubators and water baths. This procedure is performed during the following two conditions.

9.3.7.2.1 When new equipment is purchased

9.3.7.2.2 On an annual basis for existing equipment

9.3.7.3 Volumetric accuracy checks for disposable pipettes used in microbiological analysis. The laboratory, under the direction of the section leader, determines and documents volumetric accuracy of disposable pipettes. This is accomplished by checking 5 pipettes per case lot.

9.3.7.4 Mechanical timer accuracy checks. The laboratory, under the direction of the section leader, determines and documents the accuracy of mechanical timers. This is done by the following method and frequency.

9.3.7.4.1 Accuracy check is performed on an annual basis and is documented in the logbook.

9.3.7.4.2 Accuracy is compared against an electronic timing device such as a stopwatch.

9.3.7.5 General Responsibility

Under the direction of the manager, the supervisors are responsible for the quality of measuring and test equipment under his/her control and for the maintenance of records of calibrations and checks.

9.3.8 Reference Measurement Standard List

Reference measurement standards must originate, wherever possible, from sources traceable to NIST. Table 9-3 describes the major standards used in the laboratory and their sources:

Table 9-3
Reference Measurement Standard List

Chemical Standard	Manufacturer/Vendor
PAH Mix	VWR-Restek, Supelco
Toxaphene	ERA, Accustandard, Absolute Stds
Chlordane	ERA, Accustandard, Absolute Stds
Hexavalent Chromium	ERA, Accustandard, Absolute Stds
LAS (MBAS)	ERA, Accustandard, Absolute Stds
Calcium Carbonate	ERA, Accustandard, Absolute Stds
TSS	ERA
O&G	ERA, Accustandard, Absolute Stds
Chemical Standard	Manufacturer/Vendor
Aroclor Mix (PCB)	ERA, Accustandard, Absolute Stds
8260B Matrix Spike	VWR-EM Science
EPA 625 Kit	Restek
Sodium Nitroferricyanide	VWR-Mallinckrodt
Sodium salicylate	VWR-J.T. Baker
Phosphate (P) Standard	Labchem, Inc.; Ricca
Mercuric Oxide	VWR-J.T. Baker
Multi-element Metals Std	SCP
Antimony Standard	SCP
Furan	Aldrich Chemical
Herbicides Mix	ERA, Accustandard, Absolute Stds
DRO/GRO	ERA, Accustandard, Absolute Stds
EDB, DBCP	ERA, Accustandard, Absolute Stds
turbidity	ERA, Accustandard, Absolute Stds
8270C Mix	ERA, Accustandard, Absolute Stds
Semi-Vols Mix	RTC
1,2-diphenylhydrazine	Restek

10.0 PREVENTIVE MAINTENANCE

10.1 Instrument Maintenance

All instrument maintenance is recorded in an instrument specific logbook. Entries are dated and initialed by the analyst making the entry.

10.1.1 Routine

All analytical instruments have a routine schedule of maintenance specified by the manufacturer. Routine maintenance is designed to keep the instrument in good operating condition with as little “down-time” as possible. All Analysts should be proficient in maintaining the instruments for which they are responsible.

10.1.2 Non-Routine
Any maintenance which must be performed in order for sample analysis to proceed, but is not part of the systematic maintenance schedule, is considered non-routine. Non-routine maintenance must be reported to the Section Supervisor immediately so that is its impact on production can be determined. If the ability to analyze samples is adversely affected, the Section Supervisor notifies the Client Services Manager so that alternative action can be coordinated with the client.
(Note: See Appendix II for a complete instrument maintenance summary.)

10.2 Preventive Maintenance

10.2.1 Maintenance Schedule
EETSE Atlanta is equipped with up-to-date computerized instrumentation. In order to gain maximum performance and minimize downtime, regular inspection, maintenance, cleaning, and servicing of all laboratory and field equipment is performed according to the manufacturers' recommendations.

10.2.2 A maintenance log is kept for each piece of laboratory and field instrumentation, detailing all maintenance performed on the instrument.

10.2.1.1 Routine repairs and maintenance are performed and documented by the analyst responsible for the particular instrument.

10.2.1.2 A log of non-routine maintenance is kept in the instrument repair logbook. As part of this information, the analyst or repair technician signs and dates the logbook.

10.2.1.3 Routine maintenance procedures for laboratory instrumentation are given in Appendix II. The service intervals listed in Appendix II are as follows: D = daily; W = weekly; M = monthly; Q = quarterly; SA = semi-annually; and AN = as needed. (A list of all laboratory equipment may be found in Appendix III.)

10.2.3 An extensive approved spare parts inventory is maintained for routine repairs at the facilities, consisting of GC detectors, AA lamps, fuses, printer heads, flow cells, tubing, certain circuit boards and other common instrumentation components.

10.3 Glassware used in general laboratory operations must be of high quality borosilicate glass (e.g. Pyrex or Kimax). Volumetric dispensing glassware must be Class A wherever possible.

Glassware Cleaning. Laboratory glassware cleaning procedures & guidelines are described in Table 10-1.

TABLE 10-1
LABORATORY GLASSWARE CLEANING PROCEDURES

Analysis/Parameter	Cleaning Procedure (In Specified Order)
Extractable Organics (including	Solvents: 13, 1, 2, 3, 4, 7, (6 or 8 optional), 15, 17
Pesticides and Herbicides)	Or, Muffle Furnace: 13, 1, 2, 3, 4, 14, 15, 17
	Or, Oxidizer: 13, 1, 2, 3, 16, 3, 4, 15, 17
Analysis/Parameter	Cleaning Procedure (In Specified Order)
Purgeable Organics	1, 2, 3, 4, (7 optional), 11
	Or, 1, 2, 3, 4, (8 optional), 11
Trace Metals	1, 2, 3, 4, 10, 4
Nutrients, Other Wet Chemistry	1, 2, 3, 4, 9, 4

TKN	1, 2, 3, 4, 18, 4
Minerals, Demands, CN and Phenols	1, 2, 3, 4
Microbiology	1, 2, 3, 4
Residues	1, 2, 3, 4, 12

Key to Laboratory glassware cleaning procedures:

1 Remove all labels with sponge or acetone
2 Wash with hot tap water, scrub stopcocks, and other small parts with brush and inside labware using a laboratory-grade detergent
Organics – Liquinox, Alconox or equivalent
Inorganic Anions – Liquinox or equivalent
Inorganic Cations – Liquinox, Acationox, Micro or equivalent
3 Rinse thoroughly with hot tap water
4 Rinse thoroughly with Deionized (DI) water
6 Rinse thoroughly with pesticide-grade methylene chloride
7 Rinse thoroughly with pesticide-grade methanol
8 Rinse thoroughly with pesticide-grade hexane
9 Rinse thoroughly with Deionized (DI) water
10 Rinse or soak with 1:1 HCl
11 Rinse thoroughly with Deionized (DI) water
12 Rinse or soak with 10% HNO_3
13 Rinse thoroughly with Deionized (DI) water
14 Bake at 105ºC for 3-4 hours (Note: Class A volumetric glassware must NOT be baked!)
15 Bake crucibles at 105 ºC or 180 ºC for 1 hour (prior to use, as per method)
16 After use, rinse with same solvent used
17 Drain, let air dry
18 then heat in muffle furnace for 15-30 minutes
19 Store inverted or capped with suitable material or container stopper
20 Soak in oxidizing agent: chromic acid or equivalent
21 Rinse with solvent used in analysis as the last step prior to use
22 Rinse or soak with 1:1 H_2SO_4

Note: Do not let it run continually while washing glassware due to a limited supply of Deionized Water.

10.4 Contamination Control

Monitoring for contamination is an important factor in order to ensure the highest quality analytical results. A documented routine monitoring program is in place to verify adequate contamination control. Monitoring is present in several forms.

10.4.1 Media (or Method) Blank is analyzed with every batch of samples to show that the extraction and analytical processes are free of contamination. Clean, unused sampling media undergoes the same preparation and analysis as the samples. The same acids, solvents, and other reagents are used as applicable, with each batch of samples. Typical media includes wipes, filters, and air cartridges.

10.4.2 Routine air monitoring is performed and documented monthly to monitor background levels of fibers (PCM) and fungal spores. Samples are collected in the appropriate locations, logged into the LIMS by the QA Department, and results are evaluated by the department managers.

10.4.3 In addition to Method Blanks, the Volatiles Department performs a daily DI water check for contaminants to ensure the starting water for the day meets acceptable criteria. This provides an indication that resin beds and charcoal are need of changing.

10.4.4 Work areas are routinely wiped down and cleaned to remove contamination. The laboratory performs quarterly lead dust wipe checks to ensure the cleaned areas are free from contamination. Dust wipes

are logged in quarterly for designated areas determined by the QA Department. A 12 inch by 12 inch template is used to wipe down defined areas to check. If analytical results are unacceptable for any area, that location is thoroughly cleaned once again followed by re-sampling and analysis.

10.4.5 Hoods are also cleaned on a regular schedule to reduce the chance of contamination in the Asbestos, Metals, and Sample Receiving areas.

10.4.6 Certificates of Analysis and contamination checks received from media (bottle) suppliers are maintained on file by lot # to show items were contaminant free when used for sample collection. In addition, the laboratory performs testing of bottles for selected analysis.

10.4.7 In order to minimize sample contamination, test strips should not be dipped into the sample or onto material on the bottle cover. To check the sample with test paper (such as pH paper or KI paper used for residual chlorine, except for Coliform testing. See next paragraph.), take a clean disposable pipette and draw sample from the top of the aqueous surface. Remove the pipette, recap the sample and touch the pipette to the test paper. Read the paper to the nearest pH unit.

When checking for residual chlorine on coliform samples, either pour sample out of the container directly onto the KI paper or touch the paper to the remaining droplets in the container after the sample has been poured out.

11.0 QC CHECKS AND ROUTINES TO ASSESS PRECISION, ACCURACY AND METHOD DETECTION LIMITS

11.1 Control of Special Processes

11.1.1 In certain processes, the existence of a required level of quality cannot be assured by the examination of the end result alone. Such special processes that relate to the conduct of programs include performance of detailed chemical procedures, interpretation of raw data and the use of advanced data analysis techniques.

11.1.2 For such processes, quality assurance is obtained through the development of thorough analytical and operational procedures. QA is also obtained by personnel screening and documented training to ensure the necessary level of personnel qualifications and capabilities and by the use of QC samples. This section describes how personnel are qualified in accordance with specified requirements.

11.2 Quality Control in the Laboratory

11.2.1 Various types of quality control samples are used at EETSE Atlanta, Inc., in each of the following areas:

- Bulk Asbestos
- Air Asbestos
- Gas Chromatography/Mass Spectrometry
- Gas Chromatography
- Inorganic Analysis
- Wet Chemistry
- Microbiology
- Sample preparation

11.2.2 Some of the activities used to qualify the procedures (and data) are described:

11.2.2.1 Standards

The Section Supervisor (or designee) is responsible for the preparation and documentation of stock standards and working standards. Standard reference materials are obtained from suppliers and have Certificates of Analysis to certify the analyte concentrations. When available, traceable reference materials are to be used. As a minimum, information on reference materials includes manufacturer, lot or batch number, date of receipt, expiration date,

and any other accompanying preparation or assay information. The most recent release of the NIST standards library shall be used for mass spectral interpretation.

11.2.2.2 Calibration and Performance Check of Instruments

Different types of reference material are used to calibrate the various analytical instruments in the laboratory areas. For most of the analytical instruments used in the laboratory, calibration and performance checks are conducted at the beginning of an analytical run, periodically throughout the run and at the end of the run, (e.g., Atomic Absorption Spectrophotometers), while others are calibrated once then checked daily. The performance checks must be from an outside source, such as an alternate manufacturer, or may be from the same manufacturer as long as it originates from a different lot or batch. Calibration is also performed when the analytical method is initially set-up, when an instrument has been through major maintenance, or the instrument fails its QC check.

11.2.2.3 Inter-Laboratory Analysis of QC Samples

Client and method requirements determine the frequency and type of spikes, blanks, splits, method standards, surrogate standard, internal standard and external source analyses. These normally account for 10 – 20% of the data points generated by the laboratory.

11.2.2.4 Inter-Laboratory Analysis

EETSE Atlanta, Inc. participates in various accreditation programs that require the analysis of either agency-supplied performance samples or proficiency test study samples purchased from a TNI or AIHA LAP approved PT provider as required. Results of these performance results are reported and maintained in QA files. Results which are evaluated as “Not Acceptable” are documented and reviewed by the Quality Assurance department and resolved through discussion with analysts and their supervisors, examination of all raw data, re-assessment of sample preparation directions and techniques, and a review of data and calculations.

11.2.2.5 Computational Checks

Any hand calculations are checked by a second individual, in most cases the section supervisor. The person performing the crosscheck must be qualified in the relevant technical discipline. For computations performed automatically using verified software, and which contain a hard copy of the entered computation, only the entries are checked.

11.2.2.6 Review and Analysis of Data

The review and analysis of data for analytical measurements are performed on a timely basis using Quality Control checklists. The data is checked for reasonableness and consistency by the section Supervisor and/or the manager.

11.2.2.7 Detection Limit Studies

The detection limit of an analyte is defined as the smallest amount of an analyte that can be detected (for instrumentation, above the background noise) within a stated confidence limit. There are several types of detection limits that may be applicable to a given method. The Instrument Detection Limit (IDL) is the amount of analyte needed to produce an adequate response above an instrument’s baseline noise. The IDL may be use to estimate a Method Detection Limit (MDL). The Practical Quantitation Limit (PQL), also called the Reporting Limit (RL) is defined as the lowest level of quantitation achievable during routine laboratory operations. Some agencies define the PQL more rigidly as 3.33 times the MDL. However, the PQL is highly matrix dependent.

11.2.2.8 Recovery of Known Additions (Spikes)
Recoveries of known additions of analytes are used to determine the effect of the sample matrix on the given analytical procedure. The Laboratory Control Sample (LCS) and sample Matrix Spike/Spike Duplicate (MS/MSD) are used to monitor and control the analytical process. The recovery of spiked analytes in the sample matrix gives a definitive measure of the sample preparation processes.

11.2.2.8.1 LCS data is used to monitor the laboratory's performance in respect to sample preparation and equipment operation. It is prepared in an analyte free matrix similar to the sample, i.e. water or soil. Recovery limits for the LCS are established by the laboratory through control charting of each analyte.

11.2.2.8.2 A matrix spike/matrix spike duplicate pair is analyzed to determine the effect of the sample matrix on extraction efficiency and analyte recovery. One MS/MSD pair should be prepared and analyzed in every batch of 20 or fewer samples when possible. In some cases, the client may specify which sample is to be used for the MS/MSD. If not, the laboratory picks a representative sample at random. Advisory MS/MSD recovery limits are established for aqueous and soil matrices. For TCLP analysis, a matrix spike is prepared and analyzed for each waste type (e.g. oil, solid) associated with a batch of 20 or fewer samples of similar matrix.

11.2.2.9 Surrogates
As a means of monitoring individual sample extraction efficiency, one or more surrogate compounds are added to each blank, LCS, client sample, and QC sample prior to preparation. Recovery limits for surrogate compounds are established by the laboratory through control charting of each analyte. Typically, one of the following actions will be required when a sample surrogate recovery is out of the established control limits.

- Re-extract and/or reanalyze the sample
- Flag the results as estimated

11.2.2.10 Clients may specify the required action to be taken for recovery failure. Client specific requirements are conveyed to the analytical sections through project management.

11.2.3 Tracking Internal QC Samples
The tracking of internal QC samples through the LIMS provides laboratory personnel with various types of information. This information is used for the following purposes:

11.2.3.1 Long term trends are monitored through the use of quality control charts. Any upward or downward change in the recovery of analytes signifies that some procedural change has taken place. If trending is observed, the Technical Director reviews all test procedures and makes any corrections as required.

11.2.3.2 The number of quality control samples as a function of total laboratory samples is monitored so as to ensure that the laboratory analyzes the adequate number of Quality Control samples for each extraction or analytical batch.

11.2.3.3 The following guidelines are followed when implementing and utilizing QC Charts:

11.2.3.3.1 Through LIMS the Technical Manager plots the percent recovery of the LCS analyte versus the date of preparation or analysis; whichever is most appropriate.

11.2.3.3.2 For organic analyses employing surrogates, the LCS surrogate % recoveries are monitored on QC Charts. The recovery of at least one target Aroclor (PCB) in the Pesticide/PCB LCS is monitored on a QC Chart (e.g. TPH).

11.2.3.3.3 For trace metals determined by inductively coupled plasma (ICP) at least three metals spiked in the LCS are monitored on QC Charts (e.g. Cd, Cr, Ni). For trace metals determined by graphite atomic absorption (GFAA) and cold vapor atomic absorption (CVAA), an LCS for each element is monitored on a QC chart.

11.2.3.3.4 For General Chemistry, an appropriate LCS for each method is used. Each LCS analyte recovery method is monitored on a control chart.

11.2.3.3.5 Each section, prior to the calculation of in-house limits, establishes initial control limits. These preliminary limits are derived from published method criteria if available. If no such criteria are available, the preliminary limits will be mutually set (usually interim limits are set at 70-130% as stated in SW-846) and agreed to by the Department Manager, Technical Director, and Quality Assurance Manager. Twenty data points are recommended to establish the initial calculated control limits. In some cases, it may be appropriate to use fewer data points to establish the first set of calculated limits, however, at no time should fewer than seven data points are used.

11.2.3.3.6 Control chart limits are updated periodically when sufficient additional data points are available. Typically, limits are updated for each set of 20 to 50 new data points. More frequent updates may be warranted in some cases

11.2.3.3.7 Each control chart has upper and lower warning limits established at ± 2 standard deviations ($2\sigma_{n-1}$) from the mean % recovery (centerline)

11.2.3.3.8 Each control chart has upper and lower control limits established at ± 3 standard deviations ($3\sigma_{n-1}$) from the mean % recovery (centerline).

11.2.3.3.9 The analyst performing the method enters the data into LIMS. The data is evaluated frequently to identify trends that might occur in an “out of control” situation

11.2.4 The method blank is an analyte–free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process.

For the method blank to be acceptable for use with the accompanying samples, the concentration of the blank of any analyte of interest cannot exceed the method detection limit or required reporting limit. Section 5 lists certain conditions in which contaminated blanks may be used for quality control purposes.

11.2.5 An instrument blank may be run after any sample that gives a response that exceeds the calibration range for the instrument to show that there is no carry-over to the next analysis. The instrument blank shall consist of high purity solvent (e.g. hexane for pesticide analysis by GC/ECD, methylene chloride for semi-volatiles analysis by GC/MS).

11.2.6 An Initial Calibration Blank (ICB) is analyzed before sample analysis begins to verify there is no carryover contamination or instrument drift. ICB samples usually accompany inorganic instrumental analysis.

11.2.7 The analysis of sample duplicates that contain detectable quantities of analytes is an effective means for assessing the precision of an analysis. Refer to the individual analytical procedures or LIMS test codes for guidance concerning the frequency and criteria for sample duplicate analyses.

11.3 Inter-laboratory Quality Control

Each section of the laboratory may be given blind and double blind samples to analyze for requested parameters. Blind samples may be assigned in containers to be diluted, digested, and/or extracted and analyzed by the appropriate laboratory section. Double-blind samples may arrive on a pre-scheduled basis from a "client" as real samples to be analyzed by designated analytical sections for specific analytes.

11.3.1 Blind QC Samples

Blind QC samples may be used as a test of proficiency for analysts needing certification and/or qualification for performing an analysis. The Section Supervisor should obtain the QC sample from either the Quality Assurance Department of from a source independent from the source of standards for the analysis.

11.3.2 Double - Blind QC Samples

Quality Control samples may arrive from a "Client" to be analyzed for specific analytes. These samples will arrive as real samples and will not be known to anyone outside Quality Assurance and Project Management. The results of these double-blind samples will be sent to the "client" to be compared to the true value of the samples. The laboratory's performance on these samples will be compared to other laboratories in the program. These results will be mailed to the Quality Assurance Department. Results are used to identify areas needing improvement.

11.4 Out-of-Control Conditions in Laboratory Control Samples

11.4.1 Any of the following control chart conditions indicates the loss of process control:

11.4.1.1 Any one point that is outside of the control limits.

11.4.1.2 Any three consecutive points that are outside one of the warning limits.

11.4.1.3 Any eight consecutive points on the same side of the centerline.

11.4.1.4 Any obvious cyclic or repetitive pattern seen in the points.

11.4.2 Reactions to "Out-of-Control" Conditions

In the event of an "out-of-control" condition, analyst should respond to the condition as follows:

11.4.2.1 Stop analysis.

11.4.2.2 Investigate the root cause of the failure

11.4.2.3 Implement any required corrective action.

11.4.2.4 Document the situation in a non-conformance memo prior to initiating subsequent analyses.

11.5 Identification of Analytes

11.5.1 Organic Analyses

The identification of analytes is accomplished by comparison of unknown samples with known standards. All standards shall be traceable as specified by the applicable analytical procedure.

11.5.1.1 Gas Chromatography

All sample identifications are made by a comparison of the retention time of the standard peak to the retention time of the unknown peak. The identification of any analyte, which is identified during the primary analysis, is verified through the use of a confirmation column or by GC/MS unless specifically exempted in the applicable procedure.

11.5.1.2 Gas Chromatography/Mass Spectrometry (GC/MS)

For positive identification of an analyte by GC/MS, the spectrum of the analyte must conform to a spectrum of the authentic standard obtained after satisfactory tuning of the mass

spectrometer. The appropriate analytical methods should be consulted for specific criteria for matching the mass spectra, relative response factors and relative retention times to those of authentic standards. Tentative identifications may be made based on conformance to published mass spectra in reference texts or spectral library databases.

11.5.2 Inorganic Analyses

The identification of analytes is accomplished by comparison of unknown samples with known standards. All standards shall be traceable as specified by the applicable analytical procedure.

11.5.2.1 Metals

The concentration of a metal analyte is based on the absorption or emission of light measured at a specific wavelength. The wavelength selected is in accordance with the applicable procedure. Standards used to generate the calibration curve are traceable to NIST or other nationally recognized (e.g. EPA).

11.5.2.2 Wet Chemistry

Standards used to prepare calibration curves or to standardize instruments are traceable to NIST or other national sources (e.g. EPA).

11.6 Quantitation and Reporting of Analytes

11.6.1 Reduction of Sample Data

Data reduction is defined as the processing of instrument generated numbers by an analyst to achieve a final result. Data reduction is used for sample analysis as well as for quality control criteria. Processing of numbers may be achieved using manual and/or computer aided calculations.

11.6.1.1 All data reduction follows calculations found in approved procedures for the analysis.

11.6.1.2 An analyst who is qualified to perform the analysis performs all data reduction. If a Section Supervisor performs data reduction, another qualified analyst reviews the data.

11.6.1.3 All numbers used in the reduction of data are present on data reports and are easily retrievable.

11.6.1.4 All computer-generated calculations are performed using a validated program/spreadsheet.

11.7 Reporting Data

11.7.1 Significant Digits

All digits in a reported result are considered to be definite, except for the last digit, which may be in doubt. Such a number is said to contain only significant figures. If more than a single doubtful digit is carried, the extra digit or digits are not significant. The following rules apply to all reported analytical results from all laboratory sections:

11.7.1.1 All digits from a measurement are recorded. These numbers are used in the calculation of the results. After all calculations have been performed, the number is rounded to the required number of significant digits.

11.7.1.2 The number zero may or may not be a significant digit, depending on placement of the decimal.

11.7.1.3 Final zeroes, after a decimal, are always significant (Ex. 9.80 has three significant figures).

11.7.1.4 Zeroes before a decimal point with non-zero digits preceding them are significant. Zeroes with no non-zero digits before them are not significant (e.g. 10.3 has three significant digits, 0.53 has two significant digits).

11.7.1.5 If there are no non-zero digits preceding a decimal point, the zeroes after the decimal point but preceding other non-zero digits are not significant. These zeroes only indicate the position of the decimal point.

11.7.1.6 The final zero in a whole number may or may not be significant.

11.7.1.7 When mathematical functions are performed on multiple numbers, the number with the least number of significant digits dictates how many significant digits the end result should have.

11.7.2 Rounding Rules

11.7.2.1 Once the number of significant figures obtainable from a particular analysis is established, data resulting from the analysis are reduced according to the standard rules for rounding which state: If the number value to be rounded is 5 or greater, round up. If the number value is less than 5, round down.

11.7.2.2 Rounding off numbers is a necessary operation in all analytical sections of the laboratory. It is automatically applied by the limits of measurement of every instrument and all glassware.

11.7.3 Reporting Units

The appropriate unit of measurement shall accompany all sample results reports.

11.7.4 Reporting on a Wet vs. Dry Weight Basis

When required, solid sample results are reported on a dry weight basis and documented in the report. When results are reported on a wet weight basis, the results are reported "as is".

11.7.5 Reporting % Recovery and RPD

Unless otherwise directed by the customer, the Technical Director, or the QA Manager, the % Recovery and RPD are reported to one decimal place.

11.8 Storage of Quality Related Data

The laboratory retains all data and information that pertains to a project for a period of 5 years. The data may be stored electronically, as hard copy, or both.

11.8.1 Calibration Data

All calibration data, which pertains to a specific project, is stored in an easily retrievable manner. Easily retrievable manner is defined as retrievable in the same day for current projects, or within 24 hours for archived projects.

11.8.2 Quality Control Data

All quality control related data (i.e. blanks, blank spikes/duplicates, matrix spikes/duplicates, etc.) is stored in the associated project file. If more than one project is associated with the QC data, copies are made and stored with each associated project.

11.8.3 Logbooks (Notebooks)

Laboratory logbooks are kept in the laboratory while in use. Once completed, the logbooks are archived in an easily retrievable location.

11.8.4 QC Charts

While in use, QC charts are stored in LIMS. When the QC Chart is no longer being used, it is archived by the section in a central location in the Server.

11.9 Internal Performance Audits

Internal performance audits are a means for the Quality Assurance Department to determine the applicability, effectiveness, and utilization of procedures by all sections. Designated personnel perform the performance audits. At the beginning of each year, and on an on-going basis, a schedule of audits and surveillance is developed and updated by the Quality Assurance Section. Surveillance is performed on an unannounced basis with the sections so that objectivity may be maintained. Findings from audits

and surveillance are documented and corrective actions are implemented. Additional surveillance is scheduled to ensure that all deficiencies are corrected.

11.10 Failure of Quality Control Indicators

When there is a quality control failure that impacts data quality, the event must be documented using the procedures described in Section 13 of this document.

12.0 DATA REDUCTION, REVIEW AND REPORTING

12.1 Introduction: In order to provide the highest quality data possible, an extensive system for data reduction, review, and reporting has been implemented.

12.2 Sample Analysis and Data Reduction

Through the use of the worksheets, the samples are prepared following the procedures given in each of the SOPs that follow EPA's approved methods. The preparation information is recorded in logbooks throughout the laboratory.

12.2.1 Data Reduction

Most sample concentration results are read directly from instrumentation without further reduction or calculations. Dilution factors are applied upon the dilution of samples having concentrations above the calibration range. In many cases, these are put into the computer and correct results are calculated automatically. In other cases, a manual calculation may be made. Data from methods requiring manual reduction prior to reporting include titrimetric methods, BOD, COD, conductivity, manual UV/VIS/IR and residue. All laboratory pH meters are temperature compensated.

The laboratory raw data containing the instrument-generated reports, manually calculated results, and all supporting preparation, calibration, and analytical data are scanned as pdf file and posted in laboratory archives (portal server).

12.2.2 Chromatographic and Data File Identification

Chromatograms and data files are given a unique alphanumeric identification by the chemists initiating the analyses in each section. These file identification numbers reflect either the date the sequence was initiated (GC sections), the order in which samples were analyzed (GC/MS sections), and/or the sample identification and log numbers given by the client and listed on the LIMS.

12.3 Data Transfer and Review

12.3.1 Data Transfer to LIMS

The analytical results are entered on the department worksheets after review or by direct electronic transfer from the instrument data system. The analysts enter the worksheet data into the LIMS. After the data is entered into the LIMS, approval sheets are printed and checked against the information entered into the LIMS for transcription errors and anomalies.

12.3.2 Data Review

Laboratory analytical results are reviewed by at least two analysts or a section supervisor prior to entering the reportable data into the LIMS. The review of the data includes checking the extraction, digestion, distillation, and other preparation logs, ensuring that all precision and accuracy requirements are addressed, and ensuring that all steps of the analyses have been completed. If any problems were indicated during the analysis of the sample batch, it is the responsibility of the analyst and the section supervisor to bring this to the attention of the project manager, section manager and QA manager through a written corrective action report.

12.3.3 Data flags

Data flags are used on reports as needed to inform the project manager and the client of any additional information that might aid in the interpretation of the data. The data flagging system incorporates data qualifiers which are similar to flags specified in the Contract Laboratory Program protocols, as well as additional flags used to help explain batch specific events.

12.3.4 Final Report

When data acquisition and reporting have been completed, the project manager reviews and prepares the final report. Because the project managers have extensive experience in evaluating analytical data, they have developed both objective and subjective techniques for data review. Each value reported is reviewed in the context of the respective environmental matrix and all available QC/QA data.

Final Reports shall include the following:

- Title (e.g. Transmission Electron Microscopy Analysis Report)
- Name and address of the laboratory
- Unique identifying number
- Name and contact information of the customer
- Identification of the method used
- Sample description and if necessary, condition of it
- Date of sampling and receipt
- Date the test was performed
- Date report was issued
- A statement that the results relate only to the items tested as received
- Units of measure, where appropriate
- Deviations from the method
- Reports from Subcontract Laboratories included as they were received

The laboratory is responsible for information provided in the report, except when information is provided by the customer. Data provided by the customer will be clearly identified. A narrative will be added to the report information supplied by the customer can affect the validity of the results.

12.3.4.1 The QA Manager will periodically review test reports in compliance to AIHA LAP LQSR prior to issuance and document this review via a tracking spreadsheet and by adding a comment to the work order.

12.3.4.2 Abnormal values are carefully scrutinized, and samples are reanalyzed if the abnormalities cannot be explained.

12.3.4.3 If the results from spiked samples suggest interferences (low or high bias), attempts are made to remove the interferences, or the data is flagged and/or a project narrative is included with the report. Laboratory qualifiers are defined as follows:

* - Value exceeds maximum contaminant level
B - Analyte detected in the associated method blank
BRL - Below Reporting Limit
E - Estimated (Value reported above quantitation range)
H - Holding times for preparation or analysis exceeded
J - Estimated value detected below Reporting Limit
N - Analyte not NELAC (TNI) certified
Narr - See Case Narrative
NC - Not Confirmed
R - RPD outside accepted recovery limits

Rpt Lim - Reporting Limit
S - Spike recovery outside accepted recovery limits
> - Greater than Result value
< - Less than Result value

12.3.4.3 Clients are instructed to provide sufficient sample for the analysis of Matrix Spike and Matrix Spike Duplicate analysis, however there are times when the laboratory does not receive sufficient aqueous sample volume to perform these analyses. If an aqueous sample batch is analyzed without the inclusion of a spike/spike duplicate sample(s), this fact is added to the report narrative per TNI requirements. Example verbiage is as follows:

The TNI requirement for the analysis of a matrix spike/matrix spike duplicate could not be performed on Batch (#) due to insufficient sample volume submitted.

12.4 Special Project or Data Package Review

If the client requests special handling and/or data packages, the Laboratory Director, Technical Director, or Quality Assurance Manager may also review the project report and the raw data. This review includes checking holding time requirements and calibrations, reviewing all quality control data and/or control charts, and initiating any corrective actions or re-analyses that might be appropriate.

12.5 Quality Control Reports

EETSE Atlanta, Inc. offers four levels of quality control reporting. Each level contains all the information provided in the preceding level, in addition to its own specific requirements. The quality control packages provide data in the following levels:

12.5.1 Level I - method references, preparation and analysis dates, surrogate(s) recoveries and reporting limits.

12.5.2 Level II - Level I information plus results for the blank, LCS and MS/MSD and sample duplicates.

12.5.3 Level III - Level I and II information plus all raw data associated with sample preparation, instrument calibration (if applicable) and sample analysis.

12.5.4 Level IV - Level I, II and III information in a CLP “look-alike” format, and all sample raw data.

12.6 Reporting Criteria

The final report is printed and signed by the Laboratory Manager, the Director of Project Management or a Project Manager after all review has been completed. The Laboratory Manager, the Director of Project Management and Project Managers serve as designees for technical director for report signing. The data flags that may appear in a project report are defined and any additional comments are included in the Case Narrative.

12.6.1 If requested by the client or a project specific QA Plan, custom reports or data packages can be provided. When data packaging is requested, a paginated data package is provided in addition to the project report. The format of the project report and/or data package can be adjusted to meet the needs of the client. All LIMS reports can be downloaded onto diskettes or to most clients’ computers.

12.6.2 When the project report must meet TNI requirements, the report will include a certification statement indicating the results meet TNI standards, an estimated uncertainty statement, and a format that includes the total number of pages in the report.

12.6.3 EETSE Atlanta, Inc., will not intentionally divulge to any person (other than a client or person designated by a client in writing) any information regarding the services provided by EETSE Atlanta or any information disclosed to EETSE Atlanta by the client unless required by law or authorized contractual arrangement. In these instances, the client will be notified unless prohibited by law. Any

information *known* to be potentially endangering to national security or any entity's proprietary rights will NOT be released.

12.6.3 Test results are reported according to client requirements. If a client requests to have reports or information sent by fax, the client is notified in advance of the transmission, whenever possible, and all documents include a cover sheet with the following statement:

NOTICE OF CONFIDENTIALITY

The information contained in this facsimile message may be legally privileged and is confidential information intended only for the use of the individual or entity named above. If the reader of this message is not the intended recipient, you are hereby notified that any use, dissemination, distribution or copy of this facsimile message is strictly prohibited. If you have received this facsimile message in error, please contact us by telephone at (770) 457-8177 and return the facsimile message to us at the address above via the US postal service.

All documents sent by email should include the following statement:
NOTICE OF CONFIDENTIALITY: The information in this email and / or attachments may be legally privileged and is confidential information intended for the use of the individual or entity named in the email address. If the reader of this message is not the intended recipient, you are hereby notified that any use, dissemination, distribution, or copy of this email and / or attachments is strictly prohibited. If you have received this email in error, please notify EETSE Atlanta Customer Service by telephone at (770) 457-8177 or delete the message. Thank you.

12.7 Record Keeping

Procedures are in place to ensure that all records required under TNI Chapter 5 and AIHA LAP program requirements are retained. The laboratory maintains a record keeping system that can produce unequivocal, accurate records that document all laboratory activities.

12.7.1 When an analytical batch is prepped and analyzed, the analyst enters the data into the LIMS system and gives the raw data, quality control data and a copy of the prep log (if applicable) to the department manager to review.

12.7.2 Any problems encountered during sample preparation and analysis are corrected and brought to the attention 12.8.1 Sample Preparation, E of the department manager.

12.7.3 After department manager review, data is validated in the LIMS system for reporting to the client.

12.8 Records of Analysis

12.8.1 Sample Preparation, Extraction, Distillation, and Digestion

All steps of the preparation, extraction, distillation and/or digestion of samples are thoroughly documented. Documentation is determined by the QA Manager, Laboratory Manager, and the Technical Director and includes (if applicable):

12.8.1.1 Standard Identification

12.8.1.2 Dilution Factors

12.8.1.3 Sample Identification

12.8.1.4 Reagent Identification

12.8.1.5 Date the extraction, digestion, and or analysis was performed

12.8.1.6 Initials of the analysts performing the digestion, extraction, and or analysis

12.8.1.7 Volume/weight of sample used

12.8.1.8 Final volumes/weights

12.8.1.9 Initial and final review signatures, where required

12.8.1.10 Instruments used

12.8.2 Preparation of Standards and Reagents

12.8.2.1 The preparation of all standards and reagents are documented. The lot numbers of all standards associated with a particular project are traceable either through the instrument logbook, a QC check list, a worksheet, or another approved document.

12.8.2.2 Original vendor Certificates of Analysis are distributed by the Shipping and Receiving Office to the intended departments.

12.9 Standard and Reagent Traceability

Standards and reagents are tracked in the LIMS chemical inventory system for traceability and auditing purposes. The method of standard and reagent tracking is outlined in the subsequent sections.

12.9.1 When a standard/reagent is needed that is not already on the approved vendor/materials order list, supervisors forward purchase requests to the Technical Director and/or Laboratory Manager for approval. The standard/reagent is ordered from a reputable vendor (EETSE Atlanta typically uses VWR). The laboratory attempts to use certified reference materials from providers who conform to ISO Guide 34.

12.9.2 The information supplied to the Technical Director and / or Laboratory Manager must have the supplier standard or reagent name, order number, size or amount of each unit, grade or purity, price, if possible, and quantity. Upon receipt, supplies (and services) are reviewed to ensure they comply with requirements. When a vendor has been approved for services, a note is placed in the comments field of the Vendors database within LIMS.

12.9.3 When the standard or reagent arrives, it is logged into the LIMS, usually by the department supervisor or by the sample custodian. All reagents and standards received are electronically tracked and documented by computer via the Laboratory Information Management System.

12.9.4 Each standard or reagent is given a unique chemical inventory number upon receipt. The next available number in the LIMS is automatically assigned, starting with #5001. The computer entry is completed by entering the correct information in the required fields.

12.9.4.1 The expiration date for neat standards and reagents is determined using the manufacturer's expiration date, if available. Otherwise, a 1 year expiration date is assigned to volatile organic compounds and standards and 5 year date for acids, dry chemicals, solvents, reagents, and other chemicals. Each standard and reagent is clearly and permanently labeled with its expiration date in indelible ink. The assigned expiration date for intermediate standards will not exceed the manufacturer's expiration date of the stock standard.

12.9.4.2 Secondary standard containers are labeled with the corresponding LIMS tracking number of the source material, the date the contents were prepared, the six month expiration date, the name of the analyte(s), the concentration of each component of the solution, the matrix and the initials of the person who prepared it.

12.9.4.3 The chemical inventory number must appear on both the standard and reagent container, and the upper, right-hand corner of the certificate of analysis. It must also be included, if applicable, in standard/preparation, analyses or sample preparation log books.

12.9.4.4 Secondary standard labels include the LIMS chemical inventory number, the standard name, intended use (spiking, surrogate, reference or calibration solution), and concentration with units, expiration date and initials of the person who prepared it. As long as this is available, all other information can be found in the LIMS.

12.9.5 Spiking, surrogate, reference and calibration solutions and calculations are recorded in the appropriate "Standard/Preparation Log Book." Logbooks cover the following areas: Organics, Organics Preparation, Semi-Volatile Organics, Microbiology, Metals, Mercury & Wet Chemistry.

12.9.6 Some containers such as standards containers for organics are small and there may not be enough room to list all of the required information on the container. Should this occur, it is permissible to attach a label to the bottle.

12.9.7 When a standard or reagent is added to a sample for any reason, the LIMS chemical inventory number of that standard or reagent and the amount added must be recorded in the appropriate logbook. For example, if a stock standard MET #33-89-5431 of 1000 mg/L is diluted to 100 µg/L, the following line is entered: 1 ml MET #33-89-5431 to 100 ml DI water, 1 ml of 100x to 100 ml DI water, final conc. = 100 µg/L. (NOTE: "MET #33-89-5431" = Metals Department Standard/ Preparation Log Book 33, page 89, LIMS Chemical Inventory Number 5431).

12.9.8 If the standard is used as a stock standard and aliquots of it are diluted to produce working standards, the stock standard's LIMS chemical inventory number is used. The standard concentration or a designator such as "1" or "A" is used to differentiate between each serial dilution.

12.10 Standard Verification

12.10.1 Certificates of Analysis

12.10.3.1 Each department is responsible for maintaining all certificates of analysis received with its standards and reagents. The LIMS-assigned chemical inventory number is written in the upper, right-hand corner of each COA. The certificates are maintained on the portal server. The certificates are held for a minimum of five years.

12.10.3.2 Most accrediting authorities require that a certificate of analysis is kept on file for all standards used in the laboratory. If at all possible, a certificate for reagents should also be obtained. This documentation serves two purposes; 1) it gives further traceability for the standard or reagent, and 2) it provides a manufacturer's guarantee that the standard is comprised of the compounds at the levels listed.

12.11 Estimation of Uncertainty (for AIHA LAP accreditation)

Estimation of Uncertainty is the parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurement. A reasonable 'Estimation of Uncertainty' shall be based on knowledge of the performance of the method and on the measurement scope and shall make use of, for example, previous experience and validation data. It is monitored by the monthly checks, proficiency exam results and error rates. The estimate of day-to-day precision is determined by comparison of duplicate samples (or matrix spike duplicates). Results of the two analyses are compared by their relative percent difference, RPD: (A-B) / (Average of A and B).

Estimation of Uncertainty Limits may be method / program specified (e.g. AIHA LAP ELLAP) or based on historical laboratory limits. Interim limits are used until enough data points have been generated to set representative limits. The actual limits are calculated annually and are posted on the portal server.

Estimation of Uncertainty Policy follows the AIHA LAP Accreditation Program requirements with respect to the measurement uncertainty for tests associated with their scope of accreditation. The requirement which underlies this policy is found in ISO/IEC 17025:2017, Section 7.6).

AIHA LAP Uncertainty and Uncertainty Limits Determinations
The Measurement Uncertainty is the result of the evaluation aimed at characterizing the range within which the true value of a test result is estimated to lie, generally within a given likelihood. Non-negative parameter characterizing the dispersion of the quantity values being attributed to the measurand, based on the information used.

12.11.1 Definitions of Terms used by the laboratory

Bias is the total systematic error manifested as a consistent positive or negative deviation from the true value.

Measurand is the quantity intended to be measured or analyte concentration.

Precision is the closeness of agreement between measured quantity values obtained by replicate measurements under the same conditions. Precision is commonly expressed as standard deviation or relative percent difference and can be evaluated by the analysis of duplicate samples or duplicate sampling media spikes.

Type A evaluation of measurement uncertainty: Evaluation of a component of measurement uncertainty by a statistical analysis of measured quantity values obtained under defined measurement conditions. This approach uses existing data from routine laboratory quality control samples such as certified reference material, laboratory control samples, duplicates, or data from method validation studies and proficiency testing (PT) study results.

Type B evaluation of measurement uncertainty: Evaluation of a component of measurement uncertainty determined by means other than a Type A. This approach involves the estimation and compilation of individual uncertainties for each contributing measurement.

Contributors to consider for measurement uncertainty are listed in Table 12-1.

12.11.2 The laboratory utilizes Type A approach for the Estimation of Uncertainty. One or more of the following options are utilized:

12.11.2.1 Uncertainty specified within a standard method. In those cases where well recognized test method (such as NIOSH, OSHA, etc. method), specifies limits to the values of the major sources of measurement uncertainty and specifies the form of presentation of calculated results, laboratories need not do anything more than to follow the reporting instructions as long as they can demonstrate they follow the reference method without modification and can meet specified reliability.

12.11.2.2 Laboratory Control Samples (LCS) and Matrix Spikes. In cases where matrix specific LCS (CRM or media spikes) and/or matrix spike data are available, include uncertainty estimated from the standard deviation of long term data collected from routine sample runs for existing test methods or from the standard deviation of the LCS or matrix spike data for method validation/verification studies for new test methods.

12.11.2.3 Duplicate Data. In cases where sub-sampling occurs and there are data over the reporting limit, include uncertainty estimated from long term duplicate data collected from routine sample runs for existing test methods or method validation/verification studies for new test methods.

12.11.2.4 Proficiency Testing (PT) Sample Data. In cases where the previous options are not available and where PT samples are analyzed with sufficient data above the reporting limit, pooled PT sample data can be used to estimate uncertainty.

12.11.3 Uncertainty determinations specific to each type of testing for AIHA LAP is as follows:

12.11.3.1 Industrial Hygiene Chemical/Gravimetric Analysis.
The laboratory uses the Type A approach to Measurement Uncertainty. Acceptance limits are determined using historical LCS (CRM or media spikes) data for each procedure/target analyte. Once at least twenty values are available, the mean and standard deviation of the data set are calculated. Bias is noted and available for reporting. The data is evaluated for outliers using standard Grubbs Outlier calculations with statistical outliers omitted. Control limits are set at ±3 standard deviation and for measurement uncertainty k=2, or ± 2 standard deviation are used.

Where target analyte spiking is not applicable such as for gravimetric testing, only precision limits are used for uncertainty determinations. If less than 50 points are available for calculation, the limits are considered interim limits.

12.11.3.2 Industrial Hygiene Asbestos by PCM Analysis. Ranges of uncertainty for IH asbestos by PCM testing are determined for precision only using daily reference slide and blind recount analyses as described below.

12.11.3.2.1 The laboratory's set of reference slides includes slides from previous PAT rounds, Round Robins and field samples. The laboratory acceptance limits are determined from data accumulated from blind recounts of these reference slides and established at 95% confidence limits. From blind repeat counts of reference slides, Sr values obtained for 3 following ranges: 5-20 fibers in 100 graticule fields; 20.5-50 fibers in 100 graticule fields; 50.5-100 fibers in 100 graticule fields.

12.11.3.3 Environmental Lead Analysis under the ELLAP Program: Ranges for uncertainty for ELLAP testing for precision and accuracy are determined by the laboratory. Monitoring of method performance and bias is accomplished using statistical process control (charts or database) for monitoring EETSE Atlanta laboratory performance with QC sample analysis (LCS/LCSD, MS/MSD). SOPs (Sec. 13) for Lead in Paint, Lead in Wipes, Lead in Soil (SW 7000D), and Lead in Airborne Dust describe the required minimum performance criteria for QC sample analysis and the method performance for the laboratory. Method performance and bias are evaluated on an annual basis by the QA Manager. If the calculated limits are outside those listed in Table 3 of the current LQSR, an evaluation of them will be performed. All monitoring data in the form of control charts are maintained/posted to the portal server, the laboratory's archival system.

12.11.3.4 Quantifiable Fungal Analysis for reporting under the EMLAP Program. Ranges for uncertainty for quantifiable fungal testing are determined for precision only. Duplicate samples are counted for at least 5% of samples for inter-analyst precision monitoring and replicates samples are counted by different analysts for intra-analyst precision monitoring. Uncertainty ranges are determined using the mean of the range of the logarithm of each count obtained from a minimum of 20 duplicate/replicate pairs. This mean value is multiplied by 3.27 to obtain the final control limit. Once the control limit is determined, the logarithmic range for each ongoing duplicate/replicate pair is determined and must be < control limit value. Specific information used for control limits for each individual EMLAP test method are provided in Table 5-1.

The lab determines measurement uncertainty associated with Spore Trap Analysis by using the Type (A) methodology. QC reference slides are used that have varying spore count levels. 30 data points are used for each QC slide. From these counts the Mean and Standard Deviation are determined. Then the Coefficient of Variation (CV) is calculated for each set of data by dividing the standard deviation by the mean. Then the pooled CV is calculated by adding the squares of the CV values, averaging them and taking the square root. The expanded Measurement Uncertainty (MU) is calculated by multiplying the pooled CV value by the appropriate coverage factor k. For a confidence level of 95%, k is approximately 2 for a data set of 30 points or more. This RSD value is then multiplied by the calculated or observed value of the sample to be expressed as a measurement uncertainty. When reporting results for expanded Measure of uncertainty the test results and the expanded measurement uncertainty are expressed in the same units.
Example with a calculated CV pooled of 0.114:

Expanded MU @ 95% C.L. (k=2) equals CV *pooled (.114)* X 2 = 0.23 (23% RSD)

Bias cannot be determined. No quantitative reference material available
Example analytical uncertainty for air sample with 500 spores/m3:
Expanded analytical uncertainty = 500 spores/m3 X 0.23 = 115 spores/m3

Example of reporting for air sample with 500 spores/m3:
500 spores/m3 with an analytical uncertainty of +/- 115 spores/m3 at the 95% confidence level

12.11.3.5 Qualitative Fungal Analysis for reporting under the EMLAP Program. In order to monitor consistency with regard to genus/species identification, acceptability criteria for taxon identification and taxon abundance ranking are described below. These are laboratory determined; interim criteria as no regulatory guidance or method specified criteria are available.

12.11.3.5.1 Taxon identification acceptability: On the replicate and duplicate analyses, daily reference slide analyses, monthly reference culture analyses and round robin study analyses with at least 3 different organisms present, 60% of all genus/species of fungi and/or genus/group of fungi identified on the original sample at levels >10x LOD should also be identified on the recount.

12.11.3.5.2 Taxon abundance ranking acceptability: On the replicate and duplicate analyses, daily reference slide analyses and round robin study analyses, the top three genus/species of fungi and/or genus/group of fungi by abundance and >10x LOD will be ranked. The recount data should identify these same fungi for the identification to be considered acceptable.

12.11.3.5.3 Consistent fungal ID is also monitored through participation in the Direct Exam Fungal Analysis PT programs administered by EMLAP. Acceptability limits are currently set at 85% correct identification by AIHA LAP.

12.11.3.5.4 It should also be recognized that other, non-quantifiable factors may also add additional uncertainty. These factors may include media selection, organism competition, etc. and are not directly measurable.

12.11.4 The reporting procedure.
Typically, measurement uncertainty is reported per the client's request or when the *known compliance* to a specification limit is affected. The result and the expanded measurement uncertainty are reported in the same units. Both the result and expanded measurement uncertainty will be rounded to the same number of significant figures.

12.11.4.1 Reporting test results the Expanded Measurement Uncertainty

When the reporting of uncertainty is required or requested by a client to be included in the analytical report, the test result and the expanded measurement uncertainty will be reported in the same units. The test result and the expanded measurement uncertainty should both be rounded in a similar manner, meaning the same number of significant figures.

A description of the coverage factor should be included as in the following example:

Total Lead in Air concentration of 50 ug/sample ±5.3 ug/sample at 95% confidence level (k=2)

Where bias is present, report it along with the uncertainty as a probable bias such as:

Total Lead in Air concentration of 50 ug/sample ±5.3 ug/sample at 95% confidence level (k=2)

This method has an average recovery of 99 %, or a probable bias of -0.5 ug/sample.

An example template for the expanded measurement uncertainty calculation is in Table 12-2.

Table 12-1 Contributors to Measurement Uncertainty (Applicable AIHA LAP methods SW700B, N7082, N7300, and N7303)

Example of Contributors to Measurement Uncertainty Chemical Analyses of Lead (Pb) using ICP-EETSE Atlanta and FAA See Example Calculations (to the right of the table)

Contributors to Uncertainty	Representative and Applicable QC Data	Comments to Clarify Contributor Effects
Transportation/Storage/Handling		
shipping time, container & temperature	NA	No impact on bulk paint samples from transportation, storage or normal handling
lab storage time, conditions & temperature	NA	
contamination in lab storage areas	NA	
Laboratory Subsampling		
sample nonhomogeneity	DUP	Sample composition, etc.
blending techniques	DUP	Stirring, sieving, grinding, etc
sample size	DUP	Large enough to allow adequate subsampling
Sample Preparation:		
volumetric glassware	LCS, DUP	NA for Class A; applies for graduated tubes or cylinders, etc.
dispensing device	LCS, DUP	pipettes, and other types of dispensers not Class A
balance	LCS, DUP	balance error is often insignificant compared to other MU sources
temperature	LCS, DUP	Hot plate or ashing temperatures
sample extraction	LCS, DUP	Applies to LCS or DUP if goes through sample preparation
extractant background	LCS, DUP, MB	Analyte or interferant in acids, or other reagents
Lab Environmental Conditions:		
temperature variance	NA	No impact on bulk paint samples
humidity variance	NA	No impact on bulk paint samples
Analysts:		Analyst contributors affect all aspects of analysis from subsampling through data manipulation
different analysts	LCS, DUP	
analyst training level & experience	LCS, DUP	
data interpretation by analyst	LCS, DUP	
Measuring Instruments:		
instrument stability	LCS	Baseline drift, repeatability of averaged readings, etc
carry over effects	LCS, DUP	Impact of high samples on following sample readings; can be monitored by proper use of CCBs
day to day calibration differences	LCS	
interferences	DUP, MS	Due to matrix, inter-element effects, etc. Cannot be routinely determined for typical industrial hygiene sampling media
Calibration Standards/Reference Materials:		
preparation variances	LCS, DUP	Due to analysts, balances, dispensing devices used, etc
calibration stock material uncertainty	CERTIFICATE	Obtain from certificate or estimate
LCS reference material uncertainty	NA	Sample results not corrected for LCS recovery

Test Procedure Variations		
variation within and between reagent lots	LCS	Similar to extractant background effects under Sample Preparation above
extraction or digestion times and temps	LCS	May affect complete dissolution of analyte or loss of material in some cases
sample dependent modifications	LCS	Changes in conditions due to sample size, customer requests, etc
desorption efficiencies within and between lots for sorbent tubes	NA	
Data Manipulation:		
sampling media blank correction	NA	No sampling media with bulk samples
instrument blank correction	LCS	when allowed
Accuracy of calculations	LCS	Manual, spreadsheet, LIMS, etc

DUP = Duplicate, resulting from sub-sampling of a bulk (NOTE: NOT LCS/LCSD duplicate spiked sampling media)
FB = Field Blank
FS = Field Spike
LCS = Laboratory Control Sample, matrix matched and typically taken through the entire analytical process, with each sample batch
MB = Method or matrix blank
NA = Not Applicable

Table 12-1 Contributors to Measurement Uncertainty (AIHA LAP, LLC methods Air SOPs MB-15019, MB-15022, MB-15028; Bulk SOPs MB-15020; and Surface Direct (SOP MB-15020) Exam

Example Contributors to Measurement Uncertainty – Direct Air Environmental Microbiology Analyses

(representative list - may not include of all contributors)
(QC sample types in this list are typical of those utilized in AIHA LAP laboratories)
See Example Calculations (to the right of the table) and tabbed sheets for additional examples

Contributors to Uncertainty	Representative and Applicable QC Data	Comments to Clarify Contributor Effects
Temperature, Storage, Handling:		
shipping time, container & temperature	NA	No impact on direct air exam samples
lab storage time, conditions & temperature	NA	No impact on direct air exam samples
contamination in lab storage areas	NA	No impact on direct air exam samples
Laboratory Subsampling:		
sample nonhomogeneity	NA	Not applicable to direct air exam samples
blending techniques	NA	Not applicable to direct air exam samples
sample size	NA	Not applicable to direct air exam samples
Sample Preparation:		
slides & coverslip contamination	MB	With proper care there should be no contamination of daily blanks; therefore, no impact
mounting medium	MB	With proper care there should be no contamination of daily blanks; therefore, no impact
Lab Environmental Conditions:		
seasonal background spore variances	MB	Samples are not exposed to air for any length of time; therefore there should be no impact
Analysts:		
different analysts	RS	Reference slides analyzed by multiple analysts
analyst training level & experience	RS	Reference slides analyzed by multiple analysts
data interpretation by analyst	RS	Reference slides analyzed by multiple analysts
Measuring Instruments:		
microscope magnification level used	RS	Reference slides analyzed with multiple microscopes
eye piece graticule & field of view calibration	RS	Reference slides analyzed with multiple microscopes
Test Procedure Variations:		
portion and fields of sample analyzed	RS	Varies by analyst
microbial density	RS	High concentrations or clumps of spores may impact results
interferences	RS	Debris level and resolution of spores in field of view
ranges (high, medium, low)	RS	Uncertainty may be concentration dependent. Lab should evaluate this as part of method validation.
Data Manipulation:		
reading, interpreting & reporting results	RS	
Accuracy of calculations	RS	Manual, spreadsheet, LIMS, etc
area or air volume sampled	NA	Typically provided by the customer. This is not part of analytical uncertainty, but must be considered by labs providing sampling and providing combined sampling and analytical uncertainty.

MB = Daily method blank
RS = Daily reference slides

Please note that the original column I (CV of the pair) of the "culturable analyses" tabbed worksheet had a formula incorrectly entered. The worksheet has been corrected and any affected values have been highlighted in yellow.

Table 12-2 Expanded Measurement Uncertainty Calculation Template

Examples of Analytical Measurement Uncertainty for Metals in Air

Metals in Air using hotblock acid digestion and ICP-EETSE Atlanta

Analysis by NIOSH 7300M/7303 Target LCS Recovery of Lead in Air EETSE Atlanta 18434 at 50.0 +/- 0.40 ug, Total

Sample duplicate data in ug, Total for Metals in Air using hotblock acid digestion and ICP-EETSE Atlanta by NIOSH 7300M/7303

Lead

LCS ug, Total	True value ug, Total	LCS % Rec	ug, Total LCS	ug, Total LCSD	Std Dev (S)	CV	CV2
51.9	50.0	103.8	51.9	52.9	0.7071	0.0135	0.0002
49.6	50.0	99.2	49.6	48.7	0.6364	0.0129	0.0002
48.5	50.0	97.0	48.5	50.6	1.4849	0.0300	0.0009
49.2	50.0	98.4	49.2	48.2	0.7071	0.0145	0.0002
50.9	50.0	101.8	50.9	51.7	0.5657	0.0110	0.0001
51.4	50.0	102.8	51.4	47.7	2.6163	0.0528	0.0028
47.4	50.0	94.8	47.4	47.1	0.2121	0.0045	0.0000
47.2	50.0	94.4	47.2	49.8	1.8385	0.0379	0.0014
47.6	50.0	95.2	47.6	47.8	0.1414	0.0030	0.0000
50.0	50.0	100.0	50.0	50.4	0.2828	0.0056	0.0000
50.2	50.0	100.4	50.2	50.8	0.4243	0.0084	0.0001
47.1	50.0	94.2	47.1	46.8	0.2121	0.0045	0.0000
48.3	50.0	96.6	48.3	46.0	1.6263	0.0345	0.0012
46.3	50.0	92.6	46.3	48.2	1.3435	0.0284	0.0008
45.8	50.0	91.6	45.8	49.1	2.3335	0.0492	0.0024
51.0	50.0	102.0	51.0	53.1	1.4849	0.0285	0.0008
47.9	50.0	95.8	47.9	47.7	0.1414	0.0030	0.0000
55.8	50.0	111.6	55.8	55.4	0.2828	0.0051	0.0000
47.8	50.0	95.6	47.8	49.3	1.0607	0.0218	0.0005
50.3	50.0	100.6	50.0	49.9	0.0707	0.0014	0.0000
52.6	50.0	105.2	52.6	49.0	2.5456	0.0501	0.0025
49.8	50.0	99.6	49.8	49.2	0.4243	0.0086	0.0001
48.5	50.0	97.0	48.5	51.8	2.3335	0.0465	0.0022
50.2	50.0	100.4	50.2	47.2	2.1213	0.0436	0.0019
49.2	50.0	98.4	49.2	49.8	0.4243	0.0086	0.0001
52.2	50.0	104.4	52.2	49.2	2.1213	0.0418	0.0018
48.1	50.0	96.2	48.1	48.2	0.0707	0.0015	0.0000
49.2	50.0	98.4	49.2	47.8	0.9899	0.0204	0.0004
48.1	50.0	96.2	48.1	46.7	0.9899	0.0209	0.0004
52.7	50.0	105.4	52.7	48.4	3.0406	0.0601	0.0036
	30 point Mean % Rec.	99.0				$\sum CV^2$	0.0246
	30 point Std Dev	4.4			CV *pooled* =	$\sqrt{(\sum CV^2/30)}$ =	0.0287
	RSD	4.4%					

Combined Rel. Std Dev (SDc) = $\sqrt{}$ [$SD1^2$ + SD 2.87% RSD

SDc = $\sqrt{[(4.4)^2 + (2.87)^2]}$ = 5.25%

Expanded MU @ 95% Conf (k=2) = 10.5%

Bias @ 99.0% Rec of LCS = -1.0%

Example analytical uncertainty for 50 ug, Lead in Air sample:
Expanded analytical uncertainty of 50 ug, Lead in Air = 50 X 0.105 = 5.25 ug, Total

Bias = 50 ug, Total X -0.010 = 0.500 ug, Total

Example of reporting for 50 ug, Total of Lead in Air:
50 ug, Total of Lead in Air with an analytical uncertainty of +/- 5.3 ug, Total at the 95% confidence level and a probable bias of -0.50 ug, Total

Table 12-3
Estimation of Uncertainty Requirements for non AIHA LAP

Method	Uncertainty Based On
E120.1 Conductivity	Method Limits
E160.4 VS	NA
E180.1 Turbidity	Method Limits
E200.7 ICP EETSE Atlanta Metals	Method Limits
E200.8 ICP MS Metals	Method Limits
E245.1 Mercury	Method Limits
E300.0 Anions by IC	Method Limits
E350.1 Ammonia	Method Limits
E351.2 TKN	Method Limits
E353.2 Nitrate_Nitrite	Method Limits
E365.1 Ortho Phosphorus	Method Limits
E365.1 Total Phosphorus	Method Limits
E410.4 COD	Method Limits
E420.1 Total Phenolics	Method Limits
E420.4 Total Phenolics	Method Limits
E615 Herbicides	Historical Limits
E624.1 VOCs	Method Limits
E625.1 SVOCs	Method Limits
E1664B Oil and Grease_TPH	Method Limits
NECi N07-0003 Nitrate-Nitrite	Method Limits
FL-PRO	Method Limits
RSK-175 Dissolved Methane, Ethane, Ethene	Method Limits
SM2120B-2011 Color	NA
SM2120F-2011 Color ADMI	NA
SM2310B-2011 Acidity	NA
SM2320B-2011 Alkalinity	Method Limits
SM2340B-2011 Hardness	Method Limits
SM2540B-2015 TS	NA
SM2540C-2015 TDS	NA
SM2540D-2015 TSS	NA
SM2540F-2015 Settleable Solids	NA
SM2540G-2015 Total, Fixed and Volatile Solids	NA
SM3500CrB-2011 Hexavalent Chromium	Method Limits
SM3500FeB-2011 Ferrous Iron	Method Limits
SM4500ClG-2011 Total Residual Chlorine	Method Limits
SM4500CNG-2016 Amenable Cyanide	Method Limits
SM4500CNE-2016 Total Cyanide	Method Limits
SM4500H^+B-2011 pH	NA
SM4500OH-2016 Dissolved Oxygen	NA
SM4500S2F-2011 Sulfide	Method Limits

Method	Uncertainty Based On
SM4500SO3B-2011 Sulfite	NA
SM5210B-2016 BOD	Method Limits
SM5210B-2016 CBOD	Method Limits
SM5310B-2014 TOC	Method Limits
SM5540C-2011 MBAS Surfactants	Method Limits
SM10200H-2011 Chlorophyll	Historical Limits
SM9222B-2015 Total Coliforms	NA
SM9222D-2015 Fecal Coliforms	NA
SM9223B-2016/QUANTI-TRAY E.Coli	NA
SW1010 Flash Point	NA
SW1030 Ignitability	NA
SW1311 TCLP	Historical Limits
SW1312 TCLP	Historical Limits
SW6010 ICP EETSE Atlanta Metals	Method Limits
SW6020 ICP MS Metals	Method Limits
SW7.3 Reactive Cyanide	Method Limits
SW7.3 Reactive Sulfide	Method Limits
SW7196 Hexavalent Chromium	Method Limits
SW7470 Mercury in Water	Method Limits
SW7471 Mercury in Soils	Method Limits
SW7473 Mercury in Soils	Method Limits
SW8011 EDB DBCP	Historical Limits
SW8015 DAI	Historical Limits
SW8015 DRO	Historical Limits
SW8015 GRO	Historical Limits
SW8081 Pesticides	Historical Limits
SW8082 PCBs	Historical Limits
SW8151 Herbicides	Historical Limits
SW8260 VOCs	Historical Limits
SW8270 SVOCs	Historical Limits
SW8310 PAHs	Historical Limits
SW8315 Formaldehyde and Acetaldehyde	Historical Limits
SW9010_9012 Cyanide	Method Limits
SW9010_9014 Cyanide	Method Limits
SW9030_9034 Sulfide	Method Limits
SW9038 Sulfate	Method Limits
SW9040 pH in Water	NA
SW9041 pH by Paper	NA
SW9045 pH in Soil	NA
SW9050 Conductivity	Method Limits
SW9056 Anions by IC	Method Limits
SW9060 TOC	Method Limits
SW9065 Total Phenolics	Method Limits

Method	Uncertainty Based On
SW9070 Oil and Grease_TPH in Water	Method Limits
SW9071 Oil and Grease_TPH in Soils	Method Limits
SW9095 Free Liquids by Paint Filter	NA
TO-14A, TO-15	Method Limits

12.12 Recommended Storage Conditions

The locations for the storage of all standards, reagents, and working solutions are based upon compatibility of the material with other materials, flammability, and intended use of the material. The following general guidelines apply to the storage of standards and reagents.

12.12.1 The locations for the storage of all standards, reagents, and working solutions are based upon compatibility of the material with other materials, flammability, and intended use of the material. The following general guidelines apply to the storage of standards and reagents.

12.12.2 The recommended storage conditions are included in the chemical inventory of LIMS when adding information pertaining to new standards and reagents.

12.12.3 Each department maintains storage locations for standards, reagents, working solutions, and samples. Department supervisors ensure that all chemicals are properly kept. Department supervisors periodically audit storage areas for possible hazards and violations.

12.12.4 Samples are never stored in the same location as standards or reagents.

12.12.5 The following major categories of chemicals, compressed gases, and samples determine standard and reagent storage conditions in the laboratory:

12.12.5.1 Flammables

12.12.5.2 Oxidizer

12.12.5.3 Acids

12.12.5.4 Bases

12.12.5.5 Compressed flammable gas cylinders

12.12.5.6 Compressed non-flammable gas cylinders

12.12.5.7 VOC Samples

12.12.5.8 Inorganic and SVOC Samples

12.12.6 The certificate of analysis or Material Safety Data Sheet provides relevant information regarding recommended storage conditions for all standards and reagents.

12.13 Handling Standards and Reagents

12.13.1 Safety glasses and latex type gloves must be worn at all times when handling chemicals, samples, standards or reagents. A lab coat is also highly recommended. Closed-toe shoes and clothing that cover the legs (no shorts or dresses) must be worn whenever an analyst is working in the lab.

12.13.2 The toxicity or carcinogenicity of each reagent used in the laboratory has not been fully established. Each chemical should be regarded as a health hazard and exposure to it should be kept as low as reasonably possible. All health and safety concerns for these and any other chemicals are listed in the Material Safety Data Sheets (MSDS) provided by the supplier or

manufacturer of these chemicals. A copy of any MSDS is available for review at any time in notebooks maintained in the Sample Receiving Department.

12.13.3 Proper disposal of all wastes is essential. Containers are provided for all waste according to the type. Follow the waste disposal guidelines found in Section 17.0 for disposing of chemicals.

12.14 Record Keeping Definitions

12.14.1 Prep Log: A prep log is defined as a log of the preparation process that is applied to samples before they are analyzed. This log includes initial volume/weight, final volume, date prepped, batch number, spike amount, all spike information and any comments pertaining to the sample preparation.

12.14.2 Back Log Report: A backlog report is defined as a list of all the samples that need to be analyzed for a specific department. This list is generated from the LIMS system. The list is used by each department manager to create a batch for analysis.

12.14.3 Extraction or Digestion Log: An extraction or digestion log is defined as a log of samples that are either extracted or digested for subsequent analysis. This log includes initial volume/weight, final volume, date prepped, batch number, spike amount, all spike information and any comments pertaining to the sample preparation.

12.15 Procedures for Record Keeping

12.15.1 The record keeping system allows for historical reconstruction of all laboratory activities that produced the analytical data. All raw data (including Quality Control information) from the instrumentation is both posted to the laboratory archive system, referred to as the "Portal Server", and backed up weekly by the IT Department. In addition, instrument sequences are posted to the portal server by instrument, year, month, and sequence. Prep log sheets are posted by batch number, while logbooks are additionally scanned and posted by the QA Department as a backup copy. In addition, electronic data associated with each instrument is periodically stored off site.

12.15.1.4 Project Management: Each project manager has a project folder with the COC and sample receipt checklist (SRCL) in their office until the project is completed. Once the project is completed, either a hardcopy or PDF file of the report and invoice are printed, along with a cover letter and case narrative (if necessary). If everything is correct, the project is reported to the client via email or hardcopy mailing. The PDF files of the COC, Sample Receiving Checklist and invoice are posted to the portal server by work order number, year, and month. Any revisions are posted in the same folder with the revision having "REVISON" in the file name. The reason for the change needs to be documented in the narrative. If the client requires an Electronic Disc Deliverable (commonly referred to as an EDD) or a Data Package, this information is also posted on the Portal Server. Reports are kept for five years.

12.15.1.5 LIMS System: The LIMS system holds all the information relevant to each project that is received at the laboratory, including all client information, and prep and analysis information for each test preformed. LIMS data is backed up daily onto CDs. Copies are stored both on and off site.

12.15.1.6 Entries in manually recorded records are not obliterated by methods such as erasures, overwriting, whiteout or markings. All corrections to record-keeping errors are made by one line marked through the error. The individual making the correction initials and dates the correction.

12.15.1.7 Corrections to electronic records are made by a manual notation that indicates the change to the record. This notation is kept with the affected record.

12.16 Record Storage

12.16.1 All records for each project that is received at the laboratory must be held for a minimum of five years (also, now 5 years for lead analysis records per AIHA LAP). Final reports are maintained electronically on computer hard drives and daily back-up tapes.

12.16.3 Electronic records are stored by department on the laboratory's portal server after scanning or converting the documentation to a PDF file format using Adobe Acrobat®. Customer Service stores the client reports by work order number. Laboratory data is downloaded and stored by department (Asbestos, Inorganic Chemistry, Metals, Microbiology, Sample Prep, Semi-Volatile Organics, Volatile Organics, and Wet Chemistry). Data contained in the Laboratory Information Management System (LIMS) and on other servers is backed up daily onto CDs. There is also a second server that contains a duplicate of this information.

12.16.4 Archive areas are protected against fire, theft, loss, environmental deterioration and vermin. Electronic records are also protected from electronic or magnetic sources. Access to recent records is limited and maintained by logon and password. In addition, a portion of the portal server has been designated specifically as an "Archive area". These Archive areas house information that that is older and has additional access restrictions. Archive areas are regularly inspected as part of the Internal Audit program. Representatives of an accrediting authority may have access to archived information.

12.16.5 In the event that EETSE Atlanta, Inc. transfers ownership, the new proprietors retain sole custody and responsibility for all records. If EETSE Atlanta were to close, records shall be maintained at a commercial archive facility or maintained by another laboratory within the network. Records may also be transferred back to clients, if requested.

12.17 Quality Assurance Records

Where necessary, records are generated and maintained for all quality associated activities conducted during all phases of the analytical work. QA records provide sufficient evidence that all specified QA requirements have been accomplished and satisfied and provide sufficient documentation to substantiate all reported findings and conclusions. These records are retained by EETSE Atlanta, Inc. after the initial issuance of the report for a minimum of five years in accordance with AIHA LAP and TNI requirements. This ensures the availability of the QA historical information. The following types of records shall be identifiable and retrievable:

12.17.1 General QA Records - Records pertaining to procurement activities; results of reviews & audits; qualifications of personnel; Standard Operating Procedures and Document Control Records.

12.17.2 Inspection and Test Data Records - Records pertaining to in-process inspection and tests, Equipment Logs and Maintenance Logbooks.

12.17.3 Generated raw data, reports, etc.

13.0 CORRECTIVE ACTION AND NON-CONFORMANCES

Deficiencies or non-conformances in analytical procedures, materials, components or methodology may lead to the release of incorrect analytical results to the customer. Once a deficiency or non-conformance has been identified, corrective actions must be implemented to insure proper data qualification and narration on the final client report and, when possible, prevent the deficiency being repeated. To document and track the non-conformance, a Corrective Action Report (CAR) is issued through the LIMS system. An example of a Corrective Action Report is contained in Appendix VI.

13.1 Standard Procedure for Defining, Implementing, and Closing a Corrective Action Report (CAR).

13.1.1 Non-conformance: A non-conformance is defined as any situation that is either outside acceptable limits (data) or does not comply with the procedure/method in some way (preservation, matrix, etc.). The following are examples of situations considered non-conformances for which the completion of a CAR report is required.

13.1.1.1 Contamination in the Blank: The presence of target analytes in the blank that are above the reporting limit or in some cases, the MDL.

13.1.1.2 Failing Laboratory Control Sample (LCS): When the percent recoveries of target analytes in an LCS fail to meet the acceptable limits for an analysis.

13.1.1.3 Failing Matrix Spike (MS): When the percent recovery of a target analyte in a MS fails to meet the acceptable limits of analysis.

13.1.1.4 Failing Duplicate: When the relative percent difference (RPD) of results between two aliquots of the sample exceed the maximum allowable RPD.

13.1.1.5 Improper sample preservation: When a sample does not have the correct preservation (usually this involves temperature or pH).

13.1.1.6 Exceeding EPA recommended holding time: When a sample is prepared (extracted or digested) and or analyzed after holding time has expired.

13.1.1.7 Sample integrity has been compromised: When a sample container is broken, is improperly sealed, is inappropriate for the analysis, or has headspace (volatiles).

13.1.1.8 Surrogates/Internal standards fail (organic analysis): When a surrogate(s) or internal standard fails to meet the acceptable quality control limits associated with the test method.

13.1.1.9 Dilution test (metals analysis): When the sample dilution test fails to meet the acceptable quality control limits associated with the test method.

13.1.1.10 Failure to meet batch requirements (insufficient sample volume for MS/MSD, etc.)

13.1.1.11 Poor chromatography or missing analytes.

13.1.1.12 Expired standards and reagents.

13.1.1.13 Failed Proficiency Test (PT) analyte.

13.1.2 Procedure for the issuing, completing, and closing of an analytical or technical related CAR.

13.1.2.1 When a non-conformance occurs, the employee performing the work, the initial data reviewer, a Project Manager, or the Department Manager must issue a CAR in the LIMS system as indicated below.

13.1.2.1.1 From the “Categories” menu select “Quality Control”. Then from the “Options” menu select “Corrective Action Reports”.

13.1.2.1.2 Click “Add” and the LIMS will create a new CAR and automatically number it. Fill in the fields for “Department”, “Instrument ID”, “Batch ID”, “Initiated By” and “Initiated On” as appropriate.

13.1.2.1.3 Fill in the “Summary” field with a brief description of the non-conformance.

13.1.2.1.4 Fill in the "Complete Description of Non-conformance" field with a detailed description of the non-conformance including batch numbers, affected samples by number, recoveries and control limits if applicable, etc.

13.1.2.1.5 The complete data file or log book is then forwarded to the Dept. Manager for review. This file must include raw data, prep information, review checklists, etc. and a reference to the CAR by number.

13.1.2.1.6 The Dept. Manager brings the Corrective Action Report to the Laboratory Manager, who determines whether the non-conformance is a "deficiency" or "anomaly". An anomaly is an occurrence that affects only the group of data in the associated batch or sequence. Human errors or mistakes are usually anomalies. A deficiency is an occurrence that is system related and may affect more than the batch and may require more extensive corrective actions which could include retraining, replacing equipment, revising SOPs, etc. If the CAR is anomaly, the Department Manager is instructed to document required corrective action in the "Corrective Action Required" field. If the CAR is a deficiency, enter a statement in the "Corrective Action Required" section that the CAR will be forwarded to the QA Manager for review. The QA Manager performs an investigation and documents the root cause investigation in the "Corrective Action Required" section of the CAR form. Monitoring requirements of actions and the need for additional audits are also documented in this section. If no root cause investigation is required, the QA Manager may instead comment with a "QA Statement". When the QA Manager completes the review, the CAR is closed or Laboratory Manager or Technical Director is notified to review the data and perform the required corrective action (which is documented in the "Corrective Action Required" field).

13.1.2.1.7 These corrective actions may include narrating the non-conformance to the affected jobs, sending affected samples to be re-prepped and/or reanalyzed, performing instrument maintenance, etc. Non-conformances may also be referred directly to the QA Dept. for more extensive action if necessary. The person filling in the "Corrective Action Required" field then fills in the "Completed By" and "Date" fields.

13.1.2.1.8 If the non-conformance is determined to be an anomaly, the Dept. Manager completes the "CAR Closed By" and "Date" fields at the end of the CAR form.

13.1.2.1.9 If the non-conformance is determined to be a deficiency, full QA review and documented corrective action to prevent recurrence is required. A root cause will be identified for deficiencies. Root cause analysis typically addresses those issues which historically have been addressed again and again with quick fixes but it may also be applied in those instances where a process or methodology is affected. Working harder and faster on the same items does not increase efficiency. Root cause analysis allows one to think through the problem and address the causes rather than its effects. By eliminating the root cause, time and money are saved.
Steps for a root cause analysis include:

1. Identifying the problem. You must define the problem accurately to address the true root cause.

2. Understand the problem. Check the data regarding the problem to gain a clear understanding of the underlying issues. This can be accomplished by using several root cause analysis techniques such as brainstorming, use of control charts, or the "5 Whys" technique.

a. With the Brainstorming technique, ideas are collected from people associated with problem. All ideas should be considered and more is better because of not knowing what might work. Brainstorming utilizes a set time limit. Discussion about the ideas takes place after brainstorming is complete. Those involved build on the ideas to resolve the root cause.
b. Control Charts can be used to study trends associated with data over time to draw conclusions as to whether a process is consistent (within defined limits) or is unpredictable (outside of defined limits). Where applicable, control charts can pinpoint when a problem started and/or stopped.
c. "5 Whys" refers to the practice of asking, 5 times, why the failure has occurred in order to get to the root cause of the problem. Each "Why" brings one closer and closer to the root cause. It should be noted that sometime more or less "Whys" are required to get to the root cause. The use of five is a guide.

3. Corrective Action. Determine the probable underlying cause(s) of the problem. Take corrective action(s) to eliminate the causes.

Root causes will be categorized as one of the following: personnel, (LIMS) database, Quality Control, procedure, or laboratory controls.

13.1.2.1.9.1 Personnel: Root causes attributed to personnel may require training or retraining to insure individuals understand their responsibilities in the process.

13.1.2.1.9.2 Database: A Root cause from a database issue primarily refers to the Laboratory Information Management System (LIMS). This type of nonconformance will require the database to be updated. This may include method information (test codes), client information, project information, login entries, calculations, audit trail, and reports among others. Database root cause will also include individual instrument databases and software (GCs, ICPs, AA, Lachat autoanalyzers, etc.)

13.1.2.1.9.3 Quality Control: QC root causes result from incorrect QC acceptance ranges in logbooks, LIMS or are the result of trend changes. These will be reviewed and updated as necessary.

13.1.2.1.9.4 Procedure: This root cause covers procedures, policies, checklists, standard operating procedures (SOPs) that will be reviewed for modifications.

13.1.2.1.9.5 Laboratory Controls: Root causes from instrumentation, software and equipment will be investigated. These may require maintenance, repair, or updates.

13.1.2.1.9.6 A deficiency may require halting analysis on the affected test, notifying clients when previous data may have been affected or other significant corrective actions.

13.1.2.1.10 Once the required corrective actions associated for a deficiency have been completed, fully documented and systems deemed back in control the QA Dept or Technical Director will close the CAR and affected procedure may again be used. The CAR is then printed out, signed by the Technical Director or QA Manager, placed with the data and scanned and posted to the portal server.

13.1.2.1.11 The Technical Director, QA Manager, or any employee may determine that a potential nonconformance requires a preventive action report. Preventive actions are potential sources of nonconformance and needed improvements. "Preventive Action

Report" can be initiated by an employee from the results of employee suggestions, data review, audits, etc. and then reviewed by the Technical Director or the QA Manager. Preventive actions are incorporated in the corrective action template (due to software limitations). When the corrective action template is to be used for a preventive action report, the phrase 'PREVENTIVE ACTION' is typed in the "QA Action" field. This distinguishes a preventive action template from a corrective action template. Where appropriate, action plans shall be developed; implemented and monitored that will reduce the likelihood of nonconformance. Action plans shall include the application of controls to ensure that actions taken are effective, and may involve the reanalysis of data, additional auditing, control charts and trends, additional proficiency or QC testing, and issuance of correspondence to clients.

13.1.2.2 The CAR must be prepared at the time the analytical batch has been calculated. Do not wait until all data from the batch is completed. This will lead to unnecessary delay in reprocessing the batch (if necessary) and informing laboratory management, project management, and the client.

13.1.2.3 When completing a CAR, include all accompanying data, information, etc in a "Data Package" along with the NCR and submit this to the Technical Director or Quality Assurance Manager for review. Data packages include the following information.

- Digestion or extraction bench sheets
- ICP and other instrument data such as LACHAT printouts
- All chromatograms within the analytical batch including CCVs
- GC/MS tune criteria
- Analytical "run logs"
- MB, LCS, MS, CCV, post dilution spikes, etc which clearly indicate the results and or percent recoveries (where applicable).
- Any other test specific quality control criteria such as surrogate recoveries and method of additions results

13.1.3 Circumstances for initiating a customer service or project management related CAR.

13.1.3.1 The following types of client complaints or problems will be referred to as Laboratory CARs and should be brought to the Business Unit Manager or the Laboratory Manager. These include but are not limited to:

13.1.3.1.1 Customer Service related complaints

13.1.3.1.2 Comments regarding laboratory services provided

13.1.3.1.3 Any requests after analyses have been completed and files archived

13.1.3.1.4 Client is questioning the results

13.1.3.1.5 Confirmation request

13.1.3.1.6 EDD or Data Package issue

13.1.3.1.7 H flags need to be removed

13.1.3.1.8 Question regarding method used

13.1.3.1.9 Carry over issue

13.1.3.1.10 Questions from regarding an unusual sample or matrix received

13.1.3.2 CARs are also required for internal issues. These must also be brought to the Business Unit Manager or the Lab Manager and will be referred to as Internal CARs:

13.1.3.2.1 Test code issue

13.1.3.2.2 Problem with LIMS

13.1.3.2.3 EDD Problem

13.1.3.3 Certain issues will be handled by the Executive Director of Customer Service. These will be referred to as Customer Service CARs.

13.1.3.3.1 Reporting limits are missing

13.1.3.3.2 Analyses times incorrectly entered (especially for short holding time tests)

13.1.3.3.3 Discrepancies and errors found in the QC report

13.1.3.3.4 Analytes reported twice or missing from the report

13.1.3.3.5 Pricing or invoice error

13.1.3.3.6 Login error

13.1.3.3.7 Client wishes to add an analyte or test

13.1.3.3.8 Incorrect bottle order

13.1.3.3.9 Shipping Issues

13.1.3.3.10 Courier issues

13.1.3.3.11 In certain instances, as determined by the Executive Director of Customer Service, a corrective action report will be initiated when jobs with 'Rush' turnaround times or some with routine turnaround times are 48 hours past due.

13.1.3.4 Summary of Procedure:

13.1.3.4.1 When any of the instances listed in the Scope and Application chapter of this SOP take place, corrective action should be initiated in LIMS (Laboratory Information Management System).

13.1.3.4.2 Each Corrective Action has unique control number automatically assigned by LIMS when form is initiated.

13.1.3.4.3 Project Manager initiates a corrective action. The CAR should include details of the issue, incident or client's request, and forwards report with all supporting documents to either the Business Unit Manager/Laboratory Manager or the Executive Director of Customer Service as outlined above. After decisions on how to handle the corrective action are made, information will be relayed to the client and necessary follow up are performed.

13.1.3.4.4 Corrective action number must be entered into the comments section of the appropriate work order number in LIMS.

13.1.3.5 Responsibilities: It is the responsibility of each project manager to ensure the following

13.1.3.5.1 Be pro-active and initiate CAR in a timely manner

13.1.3.5.2 Enter CAR number into the comment section of the work order number in LIMS. Initials of the project manager and the date should accompany it.

13.1.3.5.3 Gather all supporting information

13.1.3.5.4 Follow up on all open CARs to make sure all issues are resolved promptly

13.1.3.5.5 Once the Business Unit Manager or the Executive Director of Customer Service review the CAR and make their recommendations, write down these actions under "Corrective Action Required" area. Remember to mark the 'Notify Clients' box in the CAR and include the name of the individual who did so. There is also a space for a comment, if needed. If follow-up is required by the QA Manager or the Technical Director as instructed by the Business Unit Manager, enter a statement in the "Corrective Action Required" area that the CAR will be forwarded to the appropriate person, who will then address their portion and close the CAR and notify the Executive Director of Customer Service.

13.1.3.5.6 If no action is required by the QA Manager or Technical Director, the Project Manager will notify either the Business Unit Manager or Executive Director of Customer Service for review depending on what type of CAR it is. The Business Unit Manager or Laboratory Manager will close all Laboratory and Internal CARs while the Executive Director of Customer Service will close all Customer Service CARs.

13.1.3.6 It is the responsibility of the Business Unit Manager to ensure the following:

13.1.3.6.1 Review CARs and all supporting paperwork on a daily basis

13.1.3.6.2 As appropriate, come up with necessary decision/recommendations and document them in the Corrective Action Required field in LIMS.

13.1.3.6.3 Review "Corrective Action Required" completed by PM

13.1.3.6.4 Make sure CARs promptly closed upon resolution

13.1.3.6.5 Review all CARs on an ongoing basis to assure all CARs have been closed and necessary follow up took place (follow up with QA Manager and Technical Director, if needed)

13.1.3.7 Procedure to generate CAR in LIMS, follow the following steps:

13.1.3.7.1 From Main Menu go to Quality Assurance

13.1.3.7.2 Select Corrective Action Reports

13.1.3.7.3 Click "Add" and number will be automatically assigned through the LIMS

13.1.3.7.4 Enter PM under Department

13.1.3.7.5 Enter Client ID

13.1.3.7.6 Fill in the "Summary" field by writing short description of the CAR

13.1.3.7.7 Fill in the "Initiate By" and "Initiated On" fields

13.1.3.7.8 Write a complete and thorough description of the Nonconformance in the "Complete Description of the Non-Conformance" field. The following details must be included for all CARs:

13.1.3.7.8.1 Client's company name

13.1.3.7.8.2 Work order number and all sample number(s).

13.1.3.7.8.3 Date, time and name of all communications with client representative regarding this issue.

13.1.3.7.8.4 If the problem is internal, make sure to include laboratory department involved and names of laboratory analysts, etc.

13.1.3.7.8.5 If CAR is related to the bottle order or quote, please make sure to include bottle order or quote number

13.1.3.7.8.6 If a credit needs to be issued please make sure to include explanation why, prices used, new prices and documentation supporting new prices, such as quotes, or previous invoice, etc.

13.1.3.8 Once CAR number is assigned, this number must be entered in the comment section of LIMS under work order/work orders associated with the CAR! (please note that in some cases, no work order may be associated with the CAR)

13.1.3.9 Every CAR must be detailed and contain supporting documentation. This documentation must be present in order for the CAR to be closed. CAR that has missing info or details will be returned to the PMs and will not be closed until all the info is provided. Complete CAR must be forwarded to the Executive Director of Customer Service or Laboratory Manager in case of the Executive Director of Customer Service's absence. These are some of the examples for the supporting documentation required:

13.1.3.9.1 In case of CAR about additional analytes requested after final report has been mailed to the client, please do the following:

13.1.3.9.1.1 Describe client's request in the CAR and e-mail the Executive Director of Customer Service (when possible, forward the client's email).

13.1.3.9.1.2 the Executive Director of Customer Service will review the CAR and determine if EETSE Atlanta can fulfill the request

13.1.3.9.1.3 If EETSE Atlanta can fulfill the request, the Executive Director of Customer Service will e-mail to PM to make necessary changes in the log in

13.1.3.9.1.4 Executive Director of Customer Service will then email the appropriate lab manager referencing the CAR number, and the requested changes to be made.

13.1.3.9.1.5 After changes are made, necessary corrections will be made to the report.

13.1.3.9.1.6 Once corrections are made, the Executive Director of Customer Service will inform PM to proceed with report revision. Make sure to issue revision note on the cover letter. We are required by NELAC and other certifying / accrediting agencies to document any changes that were made after final copy of the report is mailed to the client.

13.1.3.9.1.7 If revision reflects in a price change, M invoice must be generated or old invoice amended, depending on the arrangements made with a client. It is PM's responsibility to list any additional charges when submitting CAR and provide a decision if new M invoice or changes to an old invoice are required.

13.1.3.10 In case of CAR about incorrect prices or invoice please make sure to provide the:

13.1.3.10.1 Old invoice

13.1.3.10.2 COCR

13.1.3.10.3 Copy of COC

13.1.3.10.4 Price quote (if any)

13.1.3.10.5 If invoice is being changed in the LIMS system please make sure to save as a revised invoice on portal. The revised invoice, and COCR are then email to Accounts Receivable, referencing the CAR number. Accounts receivable will then update Peachtree, COCR, and add comments to CAR indicating this.

13.1.3.11 For a CAR about bottle order or shipping, provide a copy of the bottle order tracking number and any other documentation that will support the CAR, such as client's fax, etc.

13.1.3.12 The Executive Director of Customer Service will address issues that involve pricing, inclusion of an additional analyte from the existing method, addition of another test to the work order, or a request for another report format (i.e. MDL Report). All other issues should initially be brought to the Business Unit Manager or Laboratory Manager for review. When the Business Unit Manager/Laboratory Manager has assessed the corrective action report, he will either give it back to the Project Manager with the action to resolve the issue or forward it to another person to continue the investigation. Typically, these CARs will go to the Department Directors, the Technical Director, or the QA Manager.

When CAR is completed by the laboratory personnel, the CAR file will be returned to the PM for client resolution (i.e. price changes, report reissued, etc.). The Executive Director of Customer Service must be notified about the completion of all PM CARs. All PM CARs that have not been closed by the QA Manager or Technical Director are closed by the Executive Director of Customer Service.

13.1.4 Instances when an expedited Corrective Action Report is Required

13.1.4.1 Missed hold times (in which the sample was received within hold)

13.1.4.2 Broken or spilled samples limiting analysis

13.1.4.3 Client submits what appears to be blind QC samples or spiked duplicates

13.1.4.4 Any time a sample exhibits peculiar behavior such as strong chemical odor, makes eyes water, sample steaming when lid removed, sample smoking, effervescing, or pressure release when opened (like a soda) etc.

13.1.4.5 A known hazardous sample received (PCB oil, jar of mercury, Hydrofluoric Acid, etc.)

13.1.4.6 When meeting the client/sample requirements involve OT or unscheduled weekend work

13.1.4.7 When incorrect sample preservation is noted

13.1.4.8 When litigation or public investigation (a news story) associated with sample is involved.

13.1.4.9 When a CAR has been initiated for reanalysis in order to reissue a new result.

13.1.5 Per AIHA LAP LQSR section 4.8, complaints about the quality of reported results may be referred to the accrediting body if such complaints cannot be resolved directly with the customer.

13.2 General Procedures and Responsibilities for Corrective Action Reports Involving Deficiencies.

13.2.1 When the QA Dept. or Technical Director issues a corrective action report (CAR) for a non-conformance classed as a deficiency, the Laboratory Manager, Executive Director of Customer Service or Technical Director will be informed immediately.

13.2.2 The QA Manager will track the completion of the corrective actions required to correct the deficiency. The assigned personnel are responsible for completing the corrective action within the specified time frame.

13.2.3 The chain of custody and the Sample Receipt Forms are used to document non-conformance during log-in.

13.3 Method Suspension or Restriction

13.3.1 In some cases, it may be necessary to suspend or restrict the use of a method that constitutes significant risk and or liability to EETSE Atlanta. Suspension or restriction procedures can be initiated by the Quality Assurance Manager, Technical Director, Laboratory Manager, or Business Unit Manager.

13.3.1.1 Prior to suspension or restriction, confidentiality is respected, the problem and the required corrective action is stated in writing on the associated CAR and presented to the Laboratory Manager.

13.3.1.2 The Laboratory Manager, Technical Director, Quality Assurance Manager, and the affected supervisor are notified.

13.3.1.3 The Laboratory Manager arranges for the operations people to speak with the Quality Assurance Manager or Technical Director the day of notification. This meeting is held to confirm that there is a problem and that suspension/restriction of the method is required.

13.3.2 The suspension or restriction meeting will conclude with a discussion of the steps necessary to bring the method or test fully back on line if the method is suspended or restricted. The Quality Assurance Manager will also specify any documentation necessary to verify that corrective action has occurred.

13.3.3 After suspension or restriction, the laboratory will hold all reports to clients pending review. No faxing, mailing or distributing through electronic means may occur. It is the responsibility of the Laboratory Manager to hold all reports. Clients will not generally be notified at this time. Analysis may proceed in some instances depending on the non-conformance issue.

13.3.4 Upon completion of the required corrective actions per the CAR, laboratory management will determine if the affected systems are back in control. Once documentation and data associated with the CAR have been reviewed and approved by upper management, the Business Unit Manager, Laboratory Manager, Quality Assurance Manager, or Technical Director will notify laboratory personnel to resume testing. At that time, reports can be released. If systems are still deemed out of control, further corrective actions are required. A team, with all principals involved can devise a startup plan to cover all steps from client notification through compliance of method and release of reports.

13.3.5 If the QA Dept. or Technical Director recommends client notification regarding effects on past or current data quality, all associated information is forwarded to the Laboratory Manager and Business Unit Manager. They will review the data and determine appropriate actions.

13.3.6 Client notifications are the responsibility of the Laboratory Manager and Business Unit Manager.

13.4 Procedure for the issuing, completing, and closing of a PM or Customer Service related CAR.

13.4.1 CAR should be opened for the following reasons:

a) Any client complaints regarding prices, customer and laboratory service provided, courier service, bottle orders, shipping, invoices, analyses, additional requests after reports have been issued and files archived, etc.

b) Any situation that might have occurred within the laboratory such as results not reported on time, missing information (i.e. reporting limits, analysis dates and times, missing samples, missing analytes, etc.).

13.4.2 CAR must be generated through LIMS as follows:

a) From Main Menu go to "Quality Assurance"
b) Select Corrective Action Reports
c) Click "Add" and number will be automatically assigned through the LIMS
d) Enter PM under Department
e) Enter Client ID
f) Fill in the "Summary" field by writing short description of the CAR
g) Fill in the "Initiate By" and "Initiated On" fields
h) Write a complete and thorough description of the Nonconformance in the "Complete Description of the Non-Conformance" field. For all CARs details must include: client's name, work order number, date, time and name of the person spoken to. If the problem is internal, make sure to include laboratory department involved and names of the laboratory analysts, etc. If CAR is related to the bottle order or quote, please make sure to include bottle order or quote number. If a credit needs to be issued please make sure to include explanation why, prices used, new prices and documentation supporting new prices, such as quotes, previous invoice, etc.

13.4.3 Once the CAR number is assigned, this number must be entered in the comment section of LIMS under Work order / Work orders associated with the CAR.

13.4.4 Every CAR must contain supporting documentation. This documentation must be present for the CAR to be closed. CARs that are missing information or details will be returned to the PM. Complete CARs must be forwarded to the Director of Project Management or Laboratory Manager if Director of Project Management is absent.

13.4.4.1 Examples of supporting documentation are as follows:

13.4.4.1.1 In case of NCR about incorrect prices or invoice please make sure to provide following info: old invoice; Chain of Custody Record (COCR), copy of COC, price quote. If invoice is being changed in the LIMS system please make sure to issue revision note on the cover letter. We are required by TNI and AIHA LAP to document any changes that were made after final copy of the report is mailed to the client. This cover letter is for in-house purposes only unless requested by client. All revised documents must be given to receptionist for rescanning.

13.4.4.1.2 In case of NCR about bottle order or shipping please provide a copy of the bottle order, tracking number and any other documentation that will support the NCR, such as client's fax, etc.

13.4.5 After all the facts and documents are gathered, they must be turned in to Director of Project

Management or the Laboratory Manager. They will review all the information and come up with the decision that will be recorded under "Description of the Corrective Action". QA Manager is notified, if QA Action is required. All Project Manager or Customer Service CARs must be closed by the Director of Project Management or his designee within 3 business days.

13.5 Exceptionally Permitted Departures from Documented Policies and Procedures

13.5.1 Due to the frequently unique nature of environmental samples, it may be necessary to depart from documented policies and procedures when dealing with the sample(s). When the analyst encounters this type of situation, he presents the problem to his supervisor for advice. The supervisor may elect to discuss it with the Technical Director or have a technical representative contact the client to decide on a logical course of action. Once an approach is agreed upon, the analyst notes it in the raw data folder. This information can then be supplied to the client in the form of a footnote or a case narrative with the report.

13.6 Addressing Complaints

13.6.1 Addressing complaints is a normal function of conducting business and a valuable tool to improve services to and relationships with clients. The goal of EETSE Atlanta is to provide expeditious resolution of complaints. At EETSE Atlanta, the supervisor and the management team handle complaints related to sample results. Client Services resolves specific complaints concerning container orders, shipping, expected report dates, and results. This information is documented in LIMS. The procedure used for addressing complaints follows the Corrective Action Report.

13.6.2 In the event that a complaint is related to the laboratory's compliance with its own policies and procedures, the rules of an accrediting agency, or the validity of data, the Quality Assurance Manager and or Technical Director initiate an internal audit of the areas involved. These personnel document the complaint, audit findings and recommendations.

13.7 Immediate and Long Term Corrective Action

Immediate corrective actions are necessary to correct or repair non-conforming equipment and systems. This type of corrective action is usually identified by the section supervisor through the use of calibration checks and QC sample analysis

13.7.1 Long term corrective actions are necessary to eliminate causes of non-conformance. The need for such actions may be identified by audits. Examples of this type of action include:

13.7.1.1 Staff training in technical skills or in implementing the quality assurance program.

13.7.1.2 Rescheduling of laboratory routines to ensure analyses are performed within holding times.

13.7.1.3 Identifying vendors to supply reagents of sufficient purity.

13.7.1.4 Revision of quality assurance system or replacement of personnel.

13.7.2 Various auditing authorities may also initiate a corrective action, when deemed necessary.

13.7.3 For either immediate or long term corrective actions, the steps comprising a closed loop corrective action system are as follows:

13.7.3.1 Define the problem.

13.7.3.2 Assign responsibility for investigating the problem.

13.7.3.3 Investigate and determine the cause of the problem.

13.7.3.4 Determine a corrective action plan to eliminate the problem.

13.7.3.5 Assign and accept responsibility for implementing the corrective action.

13.7.3.6 Establish effectiveness of the corrective action and implement the correction.

13.7.3.7 Verify that the corrective action has eliminated the problem.

13.7.3.8 Update risks and opportunities determined, if applicable

13.7.3.9 Make changes to the management system, if necessary

13.8 Responsibility for Document Control

The QA department is responsible for document control for the laboratory. Critical documents include the QA Manual, the SOPs, the Corrective Action forms and reports, internally used forms and information, the training files, the MDL studies, the retention time studies, safety training files, performance evaluation reports, certification correspondence and manuals, audit reports and responses, and traceability certificates.

14.0 PERFORMANCE AND SYSTEM AUDITS

14.1 Purpose

The purpose of conducting audits is to monitor and verify compliance and overall effectiveness of the QA Program. Communication of audit findings to management is required for timely consideration and implementation of corrective actions.

14.2 External Audits

14.2.1 External audits are performed when certifying agencies or clients conduct on-site inspections. It is EETSE Atlanta' policy to cooperate fully with certifying agencies. It is also EETSE Atlanta' policy to comply fully with system audits conducted by regulatory agencies and clients.

14.2.2 The laboratory is involved in external performance audits conducted semi-annually through the analysis of Performance Testing (PT) samples provided by a third party. EPA performance testing studies have been referred to as Water Pollution Study (WP) and Water Supply Study (WS). Additional PTs including soil studies are analyzed per the requirements of TNI and AIHA LAP.

14.2.3 During on-site audits, auditors may come into possession of information claimed as business confidential. A business confidentiality claim is defined as "a claim or allegation that business information is entitled to confidential treatment for reasons of business confidentiality or a request for a determination that such information is entitled to such treatment".

When information is claimed as business confidential, the laboratory must place on, or attach to, the information at the time it is submitted to the auditor, a cover sheet, stamped or typed legend, or other suitable form of notice, employing language such as "trade secret", "proprietary" or "company confidential". Confidential portions of documents must always be clearly identified. Confidential business considerations may be purged of references to client identity by the responsible laboratory official at the time of removal from the laboratory. Sample identifiers may not be obscured from the information.

14.3 System Audits

14.3.1 It is the responsibility of the QA Manager to plan and organize audits as required by a predetermined schedule and as requested by management. Such audits are carried out by trained and qualified personnel who are, whenever resources permit, independent of the activity to be audited.

Laboratory audits are split into smaller audits that are performed within the calendar year at the specified frequency. Audits are performed monthly, quarterly and annually by the Quality Assurance Manager, the Quality Assurance Officer, Department Managers, or an appointed representative. These audits are performed using the laboratory monthly, quarterly, and annual checklists along various regulatory program checklists.

These audits provide information on whether the management system:

- conforms to the laboratory's own requirements for its management system (including the laboratory activities)
- conforms to the requirements of ISO/IEC 17025:2017 and Assessment Checklists
- is effectively implemented and maintained

Additional audits may be necessary throughout the year to address specific project requirements or issues that arise from other audits. Findings of all audits and their associated corrective actions are presented in management reports and posted to the portal server.

14.3.2 Routine report audits are the responsibility of the laboratory Quality Assurance Manager. The Quality Assurance Manager performs an independent systems review of reports generated by the laboratory.

14.3.2.1 The reviewer is not expected to pursue the correctness of every reference in the file contents, but instead concentrates on the internal consistency of the data package.

14.3.2.2 Areas that are reviewed include the chain-of-custody, correspondence with the analytical request, batch QC status, completeness of any corrective action statements, calculations, format, holding time, sensibility and completeness of the project, and file contents. A list of reports reviewed is maintained in an audit file.

14.3.3 Internal audits are planned and conducted in accordance with a schedule developed by the QA Manager. Unscheduled audits or surveillance are also conducted when senior management deems it necessary. QA Department checklists, which are located on the portal server, are used during these in-house assessments.

14.3.4 The responsible management personnel are required to make all personnel, records, reports and documents available to the audit team.

14.3.5 Responsible management of the areas audited is required to provide prompt corrective action in accordance with the provisions of this manual.

14.3.6 Follow-up audits or surveillance is performed, as required, to verify the implementation of corrective action.

14.3.7 When the required corrective action is not implemented within the specified time period, the QA Manager notifies the Business Unit Manager. A Corrective Action Notice form is used for this purpose. The Business Unit Manager performs any required corrective actions.

14.3.8 Audit planning and findings are recorded and filed as part of the QA records.

14.3.9 At the discretion of the Business Unit Manager, impacted clients are notified in writing if the audit result findings indicate any reported data has been compromised.

14.4 Blind Sample Audits

14.4.1 Blind sample audits are performed through the submittal of QC samples to the analyst along with the sample true values, which are only made known to the analyst after the test is complete. Blind sample audits are carried out by the Quality Assurance Manager, Technical Director, clients and certifying agencies as necessary to assure the laboratory is capable of achieving success with a blind QC sample. For continuing TNI and AIHA LAP accreditation, the laboratory must, on a continuous basis, successfully complete two of the last three consecutive proficiency rounds for a given PT field of testing.

14.4.2 In addition to the PT samples submitted to the laboratory through third party vendors, the laboratory may also participate in a company-wide internal PT program to evaluate methods that are not commonly included in the semi-annual PT studies. These studies usually occur between January and February and more frequently if deemed necessary.

14.4.3 It is recognized that PT samples are often not representative of "real world" samples either in their form (e.g., vials), content (e.g., multiple target analyte hits), or documentation (e.g., no chain of custody) and, as such, present the laboratory with special challenges.

14.4.4 It is the policy of EETSE Atlanta that PT samples are treated as typical samples in the normal production process wherever possible. Further, if PT samples present special or unique problems in the normal production process, then they should be treated differently, as would any special or unique request submitted by any client. Holding time begins when the vial is opened. Full volume PT samples follow normal holding time procedures and storage requirements.

14.4.5 Login obtains the normal COC information from the documentation provided with the PT samples with review by QA or other designated staff.

14.4.6 Vials are prepared as required in the instruction set provided with the samples. After preparation to full volume, the samples may be spiked, digested, and or concentrated as necessary in a manner similar to normal samples received at the laboratory.

14.4.7 The following procedures may be required for the analysis/reporting of PT samples.

14.7.7.1 PT samples will not undergo multiple preparations, multiple runs, multiple methods (unless they are being used to evaluate multiple methods), or multiple dilutions, unless these are the procedures that are normally applied to typical client samples or if a corrective action is in progress for the instrument, batch QC, etc.

14.7.7.2 PT sample(s) will not be subjected to special reviews by operational staff or QA unless this would be normal laboratory practice. To the degree that special report forms or login procedures are required by the PT supplier, it is reasonable that the laboratory would apply special review procedures as would be performed for any client requesting unusual reporting or login processes.

14.4.8 Special QC samples can be included in any analytical run.

14.5 Quality Systems and LIMS Management Review

At least annually, the Business Unit Manager conducts a formal management review to evaluate the effectiveness of the laboratory's quality systems, management system, and LIMS to ensure their continuing suitability and effectiveness in meeting client and regulatory requirements and to introduce any necessary changes or improvements. During this process, the laboratory identifies opportunities for improvement and implements the necessary actions. Inputs to the management review and opportunities for improvement can be identified by suitability procedural and policy review, fulfilment of objectives, internal and external issues, actions from previous management reviews, internal and external audit findings, corrective actions, recurring issues, suggestions from personnel, feedback from Client Satisfaction Survey, complaints, changes in volume/type of work, adequacy of resources, effectiveness of improvements, training, risk assessment, and Proficiency Test results among others. Following the review, the Quality Assurance Manual or SOPs may be revised to reflect any significant changes made to the quality systems.

14.5.1 The quality systems and LIMS management review uses information generated during the preceding year to assess the total laboratory and ensures that routine quality actions taken and reviewed on a quarterly basis are not components of larger systematic concerns. The quarterly review (see section 15) is designed to keep the quality systems current and effective.

14.5.2 Significant issues from the following documentation are summarized by the Quality Assurance Manager prior to the review meeting:

14.5.3.1 Matters arising from the previous annual review.

14.5.3.2 Prior Quarterly Quality Assurance Reports.

14.5.3.3 Review of report reissue requests.

14.5.3.4 Minutes from prior management and staff meetings

14.5.3.5 Minutes from prior senior management meetings that discuss adequacy of staff, equipment and facility resources.

14.5.3.6 Prior customer service or business development meeting information.

14.5.3.7 Internal and external audits, including computer audits performed during the past year.

14.5.4 The annual review can occur anytime during the year. Based upon the annual review, a report is generated by the Quality Assurance Manager. This report includes the following information.

14.5.4.1 The date of the review and the names and titles of participants.

14.5.4.2 References to the existing documents and topics that were covered in the review process.

14.5.4.3 Quality system or LIMS changes/improvements that will be made as a result of the review.

14.5.4.4 Decisions and actions shall be documented.

14.5.4.5 The effectiveness of the management system and its processes will be included.

14.5.4.6 Provision for required resources.

14.5.4.7 Needs for change and a schedule including assigned responsibilities for the changes.

14.5.5 Following any review, the Quality Assurance Manual or SOPs may be revised to reflect any significant changes made to the quality systems.

14.6 Corrective Action

14.6.1 All deficiencies found during audits are reported to the Laboratory Manager, Quality Assurance Manager, and the Technical Director (see Section 15, “Quality Assurance Reports to Management”). The Laboratory Manager, Technical Director, and Quality Assurance Manager agree upon a time frame for correction. The laboratory's response and corrective action procedures are evaluated by the Quality Assurance Manager and when acceptable, are attached to each audit and filed. If issues arise that may require method suspension or restriction, the procedures outlined in Section 13, “Corrective Action,” are followed.

14.6.2 External audits often require written reports that include proof of correction. The Quality Assurance Manager coordinates the written response to the external auditing facility.

14.6.3 Written responses to PT results are required. The response must address the reason for any unacceptable or "Check for Error" result. In some cases it may be necessary for blind QC samples to be submitted to the laboratory to show a return to control.

14.6.4 Whenever a laboratory fails a study, it shall determine the root cause for the failure and take any necessary corrective action. If a laboratory fails two out of the three most recent studies for a given PT field of testing, its performance is considered unacceptable under the TNI and AIHA LAP standards for that field. The laboratory shall then need to meet the requirements of initial accreditation. For initial studies, the PT samples shall be analyzed at least 15 days apart. The laboratory must successfully complete two PT studies out of the most recent three rounds attempted for each requested PT field of testing.

15.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

15.1 Internal Reports

The Quality Assurance Manager submits quarterly reports regarding the status of QA/QC activities to the Business Unit Manager. Section 15.3 lists the minimum content of this report. The Quality Assurance Manager also submits an annual report to the Business Unit Manager.

15.2 External Reports

Certain projects under regulatory review require establishment of explicit quality assurance objectives and quarterly summaries of QA conformance and corrective action. The laboratory technical and quality assurance staffs provide the necessary information required to establish quality assurance objectives for particular projects. Once the QA deliverables options are selected for the project, sufficient quality control data will be provided in the individual analytical report to allow a periodic assessment of the overall progress of the project. Upon request, any information or reports needed are provided by laboratory management with review by the QA Manager.

15.3 Quarterly and Annual Reports

The quarterly or annual reports to management include the following information.

15.3.1 SOP. The report indicates any changes to existing SOPs or any new SOPs.

15.3.2 Corrective action reports. The report contains information about any corrective action reports that may have been written during the time period since the last QA report.

15.3.3 MDL. Any changes in MDL should be included in the QA report.

15.3.4 Audits. The QA report includes the results of any audits performed during the time period since the last report.

15.3.5 PE samples. The report includes the results of PE samples analyzed since the last report. The PE report indicates the status of performance as it relates to current laboratory accreditations.

15.3.6 Certifications. Changes or additions to the laboratory's certifications are addressed in the reports.

15.3.7 The annual report is reviewed and signed by the Business Unit Manager, Laboratory Manager, and the Technical Director. A copy of this report is kept for 5 years.

16.0 REAGENT STORAGE AND DOCUMENTATION

16.1 Safety and Shelf Life

Reagents are stored with consideration for safety and maximum shelf life. Storage conditions and documentation maintenance status for various classes of reagents are given in Table 16-1 and Table 16-2, and are discussed below.

16.1.1 All acids, except those poured into small marked containers for immediate use and those that are standardized for specific purposes, are stored in the original containers in acid storage cabinets.

16.1.2 All bases, except those poured into small containers for immediate use and those that are standardized for specific purposes, are stored in the original containers within designated areas or storage cabinets.

16.1.3 All flammable solvents, except those poured for immediate use, are stored in original containers in approved, vented, flammable storage cabinets, which are located indoors.

16.1.4 Dry reagents are stored in designated cabinets in cool, dry areas. Reactive chemicals, cyanides and sulfides are labeled and isolated from other chemicals.

16.1.5 All acids used for metal sample digestions and all solvents used for semi-volatile sample extraction may be tested prior to initial use. Lot numbers used for digestions or extractions are recorded in bound notebooks in the appropriate departments.

16.1.6 Reagent blanks are analyzed with each sample batch for all methods, validating the purity of all reagents. All reagent containers are dated when received, and dated and initialed when opened (except high use items consumed in less than one week). Documentation is maintained to provide traceability of the reagents used with the analysis of any batch to specific reagent lot numbers.

TABLE 16-1
STORAGE OF REAGENTS AND CHEMICALS

CHEMICAL REQUIREMENTS	STORAGE
Concentrated acids and bases	1
Standards for metals analysis	2
Standards for extractable organics	3
Standards for volatile organics	4
Bulk dry chemicals	5
Working solutions containing organic compounds	6
Working solutions containing only inorganics	7
Flammable solvents	8
Non-flammable solvents	9

Table 16-2
STORAGE REQUIREMENT KEY

1. Stored in the original containers in acid/base cabinets. All organics must be stored separately.
2. Stored at room temperature in the standards cabinet of the metals department.
3. Stored below 0° C in the department.
4. Neat standards are stored at room temperature in the standard cabinet in the department. Stock solutions and working solutions are stored in the freezer.
5. Bulk reagents are stored at room temperature in reagent storage cabinets located throughout the laboratory.
6. Stored refrigerated at 1-4° C in the department.
7. Stored at room temperature in the department; refrigeration is optional.
8. Stored in solvent cabinets in the organic extraction laboratory.
9. Stored separately from the flammable solvents in cabinets in the organic extraction laboratory.

17.0 WASTE DISPOSAL

17.1 EETSE Atlanta operates as a conditionally exempt, small quantity generator.

17.2 All waste disposal is carried out in accordance with EETSE Atlanta Waste Disposal SOP, HS-03005. These documents include procedures for identification, storage, personnel training, tracking forms, report forms and safety, as well as details of the disposal. Hazardous waste disposal procedures are discussed below.

17.3 Hazardous Waste Requirements:

17.3.1 Hazardous waste is stored in non-leaking containers that are in good condition with close-fitting lids. The lids are kept closed when wastes are not being added or removed.

17.3.2 Hazardous waste storage containers are labeled with waterproof labels. The labels specify the words “Hazardous Waste”, composition and physical state of the waste, hazardous properties of the waste (e.g., flammable, reactive, etc.), and the name and address of the generator.

17.3.3 Each hazardous waste container is clearly labeled with the date the period of accumulation began. The date is also documented on the Hazardous Waste Tracking Log Form (see Section 17.5.8).

17.3.4 All containers are handled in a way that minimizes the possibility of spills and escape of wastes into the environment.

17.3.5 Wastes are stored in an area that is regularly inspected for deteriorating or leaking containers.

17.3.6 All wastes are segregated during temporary accumulation, storage, and for disposal. Prior to disposal, waste materials are carefully combined into categories or waste streams based upon their compatibility.

17.3.7 The following three types of waste are stored in 55-gallon drums.

17.3.7.1 Halogenated solvents such as methylene chloride (closed cap metal drum)

17.3.7.2 Non-halogenated flammable solvents (closed cap metal drum).

17.3.7.3 Heavy metals or other aqueous wastes except cyanide (poly drum)

17.3.8 All other wastes are stored in the original container or 4-liter glass bottles and disposed of via a “lab pack” (i.e., packed by a disposal company in 55-gallon open top drums).

17.4 Sample Disposal (See also EETSE Atlanta SOP HS-03005)

17.4.1 After completion of the analysis, unused sample portions, extracts, or digests are transferred to a central secured storage area until they are disposed. Unless a client requests that the project manager save unused samples, digests, or extracts, disposal from the central storage occurs 30 days after submission for test results.

17.4.1.1 Summary of sample disposal procedure:

17.4.1.1.1 Samples are initially put into labeled bins in the walk-in cooler for 30 days in case client decides to add test(s) that require refrigerated storage. All bins must be labeled. Labels include storage location and date of disposal.

17.4.1.1.2 Sample reporting date is used to initiate the 30 day time period. Samples that were put on hold upon receipt should use the date associated with the earliest reported test result unless otherwise indicated by the client or noted by the project manager.

17.4.1.1.3 When attaching labels to the bin, use both the adhesive on the label as well as a piece of clear tape to ensure the label does not come off.

17.4.1.1.4 Sample Management Supervisor (a.k.a. Bottle Prep Supervisor) maintains a list of bin disposal dates. Supervisor must sign and date this sheet in order for bins to be disposed. No bins are to be disposed of by disposal technician without management approval.

17.4.2 Requests for extended sample, digest or extract storage must be provided by the client to the EETSE Atlanta project manager in writing (contract form) prior to sample receipt. Extended storage may result in the charging of additional fees by the EETSE Atlanta project manager prior to sample receipt. EETSE Atlanta is not responsible for evaporation or other deterioration of samples, extracts, or digests during extended storage periods.

17.4.3 Clients that want the return of samples may pick them up at the laboratory, request shipment by FedEx (at the client's expense for packaged shipping), or utilize any other legal means that they choose. Clients requesting the return of samples should provide detailed shipping instructions.

17.4.4 If a client, by contract, specifies sample disposal by a hazardous waste contractor, the client's name and EPA ID number will be used on the manifest and the client will be invoiced for all disposal-related costs.

17.4.5 Other excess sample portions are composited by the laboratory according to matrix (solids, soils or aqueous). Composited soils, sediments & other solid samples are sub-sampled and analyzed for hazardous waste characteristics (ignitability, reactivity, (releasable cyanide and sulfide), corrosivity (pH), toxicity (TCLP by SW-846 Method 1311) and PCBs). If the pooled sub-sample is characterized as hazardous by any of the hazardous waste characteristics or contains greater than 50 ppm PCBs, the excess sample is disposed of through the use of a hazardous waste contractor. If the pooled sub-sample is not deemed hazardous based upon the results of these tests, the composited excess material is disposed of in an industrial/municipal landfill.

17.4.6 Aqueous samples are neutralized and disposed of via the municipal sewer system, following all discharge requirements outlined in 40 CFR Part 261.3 (a)(2)(iv)(E).

17.5 Organic Waste Disposal (See also EETSE Atlanta SOP HS-03005)

17.5.1 Similar waste disposal procedures for samples from the volatile, semi-volatile and GC/HPLC pesticide laboratories are employed at EETSE Atlanta.

17.5.2 All personnel should be familiar with the SOP prior to the disposal of wastes in the laboratory.

17.5.3 EETSE Atlanta is considered as a Conditionally Exempt, Small Quantity Generator under 40 CFR Part 261.5 (a generator who generates no more than 100 kilograms of hazardous waste or 1 kilogram of acute hazardous waste in a calendar month and accumulates no greater than 1000 kilograms of hazardous waste). Hazardous waste storage is limited to quantity and/or accumulation and must comply with RCRA regulations as specified in 40 CFR. These wastes are packaged and separated according to compatible groups (e.g., solvents, acids, etc.)

17.5.4 The pH of the discharged waste MUST be between 5 and 10. If the pH of the discharged waste is out of this range, it is diluted with water or treated with the appropriate acid or base.

17.5.5 Apparatus and Equipment

17.5.5.1 Respirator and gloves

17.55.2 5-gallon plastic buckets with lids

17.5.6 Reagents and Chemicals.

17.5.6.1 Marble chips for neutralizing acid waste

17.5.7 Procedure

Prior to the disposal of any waste, the Health and Safety Officer provides a sample disposal list to the laboratory employee performing the task. Included in this list is the method of disposal and location of disposal for each sample. The Health and Safety Officer obtains this information from the EETSE Atlanta LIMS system and categorizes the samples as hazardous or non-hazardous.

17.5.7.1 The procedure for the collection and disposal of expired organic chemicals and solutions is outlined in the subsequent sections.

17.5.7.1.1 Neat standards are sealed and labeled.

17.5.7.1.2 Expired standards and reagents should be separated from others and stored in a box labeled "Expired". All stock standards, working standards and unused sample extracts are emptied into a properly labeled (contents are listed using the official waste storage labels) 4-L empty solvent bottle or flammable canister as applicable.

17.5.7.1.3 Waste standards or samples containing Silvex (2,4,5-TP), 2,4,5-T, or PCBs are stored separately from other waste standards. These compounds are potential dioxin wastes. All acid herbicide standards or sample waste are stored separately from other wastes.

17.5.7.1.4 HPLC/GC vials containing solvents, standards and extracts are stored in a labeled, 4-liter, empty solvent bottle.

17.5.7.1.5 Wastes are never allowed to accumulate in the laboratory for longer than 3 days. Wastes that are stored for longer time periods are stored in the waste storage room located at the back of the laboratory. All dated waste is disposed of in drums.

17.5.7.1.6 Each drum is labeled according to contents, i.e., chlorinated, non-chlorinated solvents, acid and mercury waste. Acid wastes are stored in the acid waste room that is separate from the solvent waste room.

17.5.7.1.7 All wastes are treated inside the fume hood using appropriate safety equipment such as a respirator, gloves, laboratory coat, and safety glasses.

17.5.7.1.8 The Safety Officer is notified in the event of any leaks or spills of hazardous wastes.

17.5.7.1.9 The waste drums available are:

Flammable Waste
Soil Waste
Acid Waste
Methylene Chloride Waste
Neutralized Waste

17.5.7.1.10 Autosampler vials full of sample waste are placed into an empty 4-liter solvent bottle, properly labeled, dated, and stored in waste room, where they are lab-packed.

17.5.7.1.11 High-level organic wastes are treated as hazardous substances and are placed in clearly labeled containers. Full containers are stored in the inorganic waste storage room.

17.5.7.1.12 Containers that have been used for the storage of high level wastes are not reused.

17.5.7.1.13 Soil samples are transferred to 55-gallon drums. When full, a composite sample is analyzed for TCLP and characterized for disposal through the use of a Hazardous Waste Contractor.

17.5.7.1.14 Contents of used VOC vials are neutralized prior to disposal into the sanitary sewer.

17.5.7.2 The neutralization of alkaline or acidic wastes is performed with the following procedure.

17.5.7.2.1 A 5-gallon bucket with a strainer bottom is placed directly into a sink.

17.5.7.2.2 The bucket is filled with 6 to 8 inches of marble chips.

17.5.7.2.3 Pass a generous flow of water through the bucket containing the marble chips.

17.5.7.2.4 The samples are added to the bucket at the same time that the water is flowing allowing the samples to drain through the chips and become neutralized.

17.5.8 The Waste Disposal Logbook is located in close proximity to each drum. The following information is added to the logbook:

EETSE Atlanta WORK ORDER Number
Client Sample I.D. Number
Employee(s) Name(s)
Nature of Disposal

17.5.9 The Health and Safety Officer maintains a separate waste disposal record file. These files contain the master list of samples that have been disposed, TCLP analytical results, raw data, and disposal manifest receipts.

17.6 Inorganic Waste Disposal (See also EETSE Atlanta SOP HS-03005)

The procedure for the collection and disposal of expired inorganic chemicals and solutions is outlined in the subsequent sections.

17.6.1 EETSE Atlanta is considered as a Conditionally Exempt, Small Quantity Generator under 40 CFR Part 261.5 (a generator who generates no more than 100 kilograms of hazardous waste or 1 kilogram of acute hazardous waste in a calendar month and accumulates no greater than 1000 kilograms of hazardous waste). Hazardous waste storage is limited to quantity and/or accumulation and must comply with RCRA regulations as specified in 40 CFR. These wastes should be packaged and separated according to compatible groups (e.g., solvents, acids, etc.). Waste water containing toxic waste from the laboratory that does not exceed 1% of total waste water flow can be disposed of into the sanitary sewer system as specified in 40 CFR part 261.3E.

17.6.2 The pH of the discharged waste MUST be between 5 and 10. If the pH of the discharged waste is out of this range, it is diluted with water or treated with the appropriate acid or base.

17.6.3 Apparatus and Equipment

17.6.3.1 Large polyethylene tank (250 gallon)

17.6.3.2 Latex gloves

17.6.3.3 Stirring rod (glass or wood)

17.6.4 Reagents and Chemicals

17.6.4.1 Soda Ash, sodium carbonate ($NaCO_3$)

17.6.5 Procedure

Prior to the disposal of any waste, the Health & Safety Officer provides a sample disposal list to the laboratory employee performing the task. Included in this list is the method of disposal and location of disposal for each sample. The Health and Safety Officer obtains this information from the EETSE Atlanta LIMS system and categorizes the samples as hazardous or non-hazardous.

17.6.5.1 All inorganic aqueous waste is poured into a 250 gallon tank in the disposal room by disposal personnel. When the tank is approximately half full, the solution can be neutralized.

17.6.5.2 Soda Ash is slowly added to the waste solution while it is stirred. The solution will effervesce as the Soda Ash neutralizes the acid in the solution.

17.6.5.3 When the pH of the liquid has been sufficiently neutralized, the waste is drained slowly. The tank is flushed with copious amounts of water.

17.6.5.4 Samples with observed concentrations of measured analyte above the calibration level of the various instruments are treated as hazardous waste. This includes the sample waste generated from the flame AA or ICP instrument. This waste is collected in a storage bottle and is disposed of as an acidic waste when the bottle is filled.

17.6.5.5 High-level inorganic wastes in organic solvents are treated in the following manner:

17.6.5.5.1 The high-level waste is placed into a clearly labeled container. When the container is full, the container is placed into the waste storage room.

17.6.5.5.2 Containers used for the storage of high-level wastes are not reused.

17.6.6 The Waste Disposal Logbook is located in close proximity to each drum. The following information is added to the logbook:

EETSE Atlanta WORK ORDER Number
Client Sample I.D. Number
Employee(s) Name(s)
Nature of Disposal

17.6.7 The Health and Safety Officer maintains a separate waste disposal record file. These files contain the master list of samples that have been disposed, TCLP analytical results, raw data, and disposal manifest receipts.

APPENDIX I

WASTE DISPOSAL PROCEDURES

Waste Type	Associated Analytical and Sample Prep Methods	Storage Procedures	Disposal Procedures
Halogenated Solvents Methylene Chloride	Pesticides, Herbicides, BNA, GPC, etc.	Store in glass bottles, then in drums.**	Reclaimed by HW contractor.
Freon	Oil & Grease, Petroleum Hydrocarbons	Store in glass bottles.	Reclaimed by laboratory.
Mixed Solvents (Flammable & non-halogenated)	VOC Standards, Herbicides, Pesticides	Store in glass bottles, then in drums.	Disposal by HW contractor.
All neat standards	All analyses	Store in original bottles of glass/plastic bottles, then lab pack.	Disposal by HW contractor (Packed by also)
Heavy Metals Solutions	Metals, COD, Chloride	Store in glass bottles, then in drums.	Disposal by HW contractor.
Acid Solutions	Metals, General Inorganics, Extractions	Store in glass bottles or add to neutralizing chambers.	Neutralize; sanitary sewer.
Alkaline Solutions	General Inorganics, Extractions	Store in glass bottles.	Neutralize; sanitary sewer.
All samples containing Organics or Inorganics exceeding hazardous waste standards*	All analytical groups	Store in original bottles or jars in sample custody storage area.	Return to client or disposal by HW contractor.

* Hazardous Waste Characteristics (D001-D017) (40 CFR Part 261), HCN>250 mg/kg, TCLP Toxicity Characteristics (Federal Register, 55FR 11798), March 29, 1990, or contains greater than 50 ppm PCBs.

** Bottles are kept in each laboratory and are periodically moved to the hazardous waste storage area.

APPENDIX II

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

	Service Interval							
EQUIPMENT ITEM	D	W	M	Q	SA	A	AN	SERVICE LEVEL
ICP-EETSE Atlanta and ICP-MS								
Pump Tubing				X				Change
Nebulizer			X					Clean
Filters			X				X	Inspect - clean or replace.
Spray Chamber			X					Clean
Quartz Torch					X			Clean and realign.
D-Shaped Mirrors			X				X	Inspect - clean or replace
MERCURY ANALYZER AND AUTOSAMPLER								
Pump Tubing	X						X	Inspect – replace
Standard Cups	X						X	Inspect – replace
Drying Tube	X							Repack
Mixing Coil		X						Inspect - clean or replace
Sample Probe			X					Inspect - clean or replace
Mercury Lamp							X	Clean or replace
CONDUCTIVITY METER								
Battery							X	Check or replace
Probe Contacts							X	Clean or replace
pH METER								
Probe(s)	X							Check fluid levels and fill
Connectors	X							Check for corrosion and clean if necessary
AUTOANALYZER (TRAACS/LACHAT)								
Pump Platen							X	Replace
Pump Tubes				X				Replace
Flow Cell				X				Inspect and clean.
Autosampler	X							Check alignment
Cobalt Column							X	Inspect for channeling and repack
BLOCK DIGESTER								
Heating Elements							X	Replace as needed
Thermostat					X			Check against calibrated thermometer for accuracy
UV/VIS SPECTROPHOTOMETER								
Light Source							X	Replace
Belt	X							Check for wear, replace if frayed
Cuvettes	X						X	Check for scratches and buildup - replace
ION SELECTIVE ELECTRODE								
fluid filled probe	X						X	Check fluid level - empty and replace if crystals form
solid probe	X							Check for salt build-up on tip, clean if necessary
BOMB CALORIMETER								
Thermometer						X		Calibrate Thermometer
Seals	X							Check for breaks in seals and replace if needed
GAS CHROMATOGRAPH – SEMIVOLATILES								
Autosampler System							X	Syringe and tubing cleaned – Needles/ tubing replaced
Septa		X						Replace
Column/Injector							X	Chance sleeve and cut front of guard column.
Gas Cylinder	X							Inspect - change when pressure reads <500 psi.
GAS CHROMATOGRAPH - MASS SPEC SEMIVOLATILES								

APPENDIX II

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

	Service Interval							
EQUIPMENT ITEM	D	W	M	Q	SA	A	AN	SERVICE LEVEL
Column/Injector		X						Chance sleeve and cut front of column.
Septum		X						Replace
Splitless Disc					X			Replace
Autosampler	X					X		Syringe and tubing cleaned Needles and tubing replaced
Rough Pump						X		Oil change by HP service
Mass Spectrometer							X	Clean
Gas Cylinder	X							Inspect - Change when pressure reads <500 psi.
Hard Drive		X						Archive
ATOMIC ABSORPTION								
Pump	X							check for leaks and corrosion
Lamps							X	If intensity drops, replace
Nebulizer		X						Clean, sonicate
Tubing	X							If leaking or weak, replace
Burner Head		X						Clean, sonicate
Bottled Gases	X							Replace if pressure reaches 500 psi.
Spray Chamber			X					Clean, sonicate
GAS CHROMATOGRAPH – VOLATILES								
Column							X	Replace
Septum			X					Replace
Gas Cylinder	X							Inspect - change when pressure reads <500 psi.
Hydrocarbon/Moisture Trap						X		Replace
GAS CHROMATOGRAPH - MASS SPEC VOLATILES								
Column							X	Replace
Rough Pump						X		Oil change by HP service
Gas Cylinder	X							Inspect - change when pressure reads <500 psi.
Septum			X					Replace
Transfer Line							X	Check for leaks
GAS CHROMATOGRAPH – ECD								
Autosampler	X					X		Syringe cleaned Needles and tubing replaced
Column							X	Replace
Septa							X	Replace
Glass Insert							X	Replace
Gold Disk							X	Replace
Gas Cylinder	X							Inspect - change when pressure reads <500 psi.
EC Detector(s)						X		Send off for replacement of radioactive nickel foil.
GAS CHROMATOGRAPH – FID								
Autosampler	X						X	Syringe and tubing cleaned Needles and tubing replaced
Column							X	Replace
Septa							X	Replace
Gas Cylinder								Inspect daily, change when pressure reads <500 psi.
Glow Plug								Determine if glow is enough to ignite Hydrogen

APPENDIX II

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

	Service Interval							
EQUIPMENT ITEM	D	W	M	Q	SA	A	AN	SERVICE LEVEL
Housing and chimney								Check for rust and corrosion that will cause a short, and clean if necessary.
Glass Insert							X	Replace
Column							X	Replace
PURGE AND TRAP								
Sorbent Trap					X			Change
Heater Pockets	X							Check, replace if defective
Transfer Lines							X	Inspect and replace if needed
Purge Flow					X			Inspect, adjust as needed
TCLP EQUIPMENT								
Volatile Rotator	X							Check rotation (± 30 rpms)
Semi-volatiles/Metals Rotator	X							Check rotation (± 30 rpms)
BALANCES								
Balances	X							Calibrate, service annually
Auto-Pipettors				X				Calibrate
BALANCE WEIGHTS – for daily balance checks								
Set “B” – 10 weights								Verified every 5 years by a body that can prove traceability to NIST
THERMOMETER (CERTIFIED) – for in-house thermometer calibrations								
HB #28199 (CMI #32478) –1 to 200ºC							X	Certified every 5 years by a body that can prove traceability to NIST
DISSOLVED OXYGEN METER								
Batteries	X							Check for strength, if < 13.20 replace
Membrane				X				Replace. Sooner if signal will not stabilize
Spill housing and stirrer	X							Clean

The service intervals listed in Appendix II are as follows: D = daily; W = weekly; M = monthly; Q = quarterly; SA = semi-annually; and AN = as needed.

APPENDIX III
LAB EQUIPMENT LIST

ID No.	Instrument	Type	Manufacturer	Model	Serial Number	Age
1002	MS-4	GC	HP	6890	430021BJ4	1999
1003	MS-4	MS	HP	5973	US82311468	1999
1006	MS-5	GC	Agilent	6850	US00001050	2001
1007	MS-5	MS	Agilent	5973	US94240080	2001
1010	MS-7	GC	Agilent	6850	US00001051	2001
1011	MS-7	MS	Agilent	5973 Network	US94240092	2001
1015	MS-8	MS	Agilent	5973	US94240107	2001
1032	MS-6	GC	HP	6890	US00021363	1999
1033	MS-6	MS	HP	5973	US80310957	1999
1034	MS-6	Auto Sampler	Agilent	G2614A	US00807551	1999
1040	HPLC-1	Degasser	HP	G1322A	JP73017078	1999
1043	HPLC-1	Colcom	HP	G1316A	DE91609970	1999
1046	HPLC-1	Interface	HP	35900E	CNDDQ1250	1999
1129	TurboVap	Concentrator	Zymark	TurboVap II	TV9909N8714	
1187	MS-9	GC	Agilent	6890N	US10133113	2000
1188	MS-9	MS	Agilent	5973 Network	US10441238	2000
1189	MS-9	Auto Sampler	Agilent	G2614A	US12419350	2000
1210	MS-10	GC/MS	Agilent	5973	US82311282	1998
1211	MS-10	GC/MS	Agilent	6890	US00024777	1998
1212	MS-10	Autosampler	Agilent	7683	US84302879	2001
1265	Microscope	M2 LabScope	LW Scientific	LW 200	301473	
1305	Microscope	Microscope	Nikon	Y52-T	159996	2002
1309	Microscope	Microscope	Olympus	BH2		
1313	Microscope	Microscope	Olympus	SZ30		
1503	MS-12	5973	HP	5973	US81221559	2003
1504	MS-12	6890/GC	HP	6890	DE00020822	2003
1505	MS-12	Sample Concentrator	OI Corporation	4660	A350466159	2003
1538	GC-7	GC (ECD)	Agilent	6890N	CN10427041	2004
1539	GC-7	Tower	Agilent	7683	CN42437159	2004
1602	MS-7	Concentrator	OI Analytical	Eclipse 4660	B421466132P	2004
1604	SPE	Speed-Vap III Evaporation Unit	Horizon Tech	Speed Vap III	42041	2004
1609	IC2	ICS 1000 Ion Chrom. Sys	Dionex	ICS-1000	5010499	2005
1620	MS-13	GC	Agilent	6850N	US10506012	2005
1621	MS-13	MS	Agilent	5973N	US52047399	2005
1674	GC-8	GC-8	Agilent	6890N	CN 10609020	2006
1675	Injector	Injector (Tower)	Agilent	7683B	CN603330862	2006
1676	ALS Sampling Tray	ALS Sampling Tray	Agilent	G2614A	CN60638448	2006
1695	MS-15	Sample Concentrator	OI Analytical	4660	D63646651P	2006
1700	Balance	#12 Analytical	Mettler	AL104	1227330378	2006
1707	MS-14	MS	Agilent	5975B VL MSD	US62714424	2006
1708	MS-14	GC	Agilent	6890 N	CN10631084	2006
1709	MS-14	Autosampler	Agilent	7683B	CN63835818	2006
1717	Balance	#13 Analytical	Mettler	AL104	1227300041	2007
1722	Stage Micrometer		Microscope Service, Inc.	L & W		
1728	MS-15	GC	Agilent	6850A	US10710001	2007
1729	MS-15	MS	Agilent	5973 Inert	US44610842	2007

ID No.	Instrument	Type	Manufacturer	Model	Serial Number	Age
1730	MS-5	Concentrator	OI Corporation	Eclipse 4660	D713466088P	2007
1837	Microscope	Meiji PLM Asbestos Microscope	MilesCo Scientific	ML6130	600091	2008
1838	MS-13	Concentrator	OI Analytical	Eclipse 4660	D807466325P	2008
1849	Hot Block	Hot Block	Environmental Express			2005
1888	Concentrator	TurboVap II	Zymark		TV0116N10262	2001
1900	Turbovap II	Concentration Workstation	Caliper Life Sciences	103187	TV0953N15641	2010
1924	MS-16	Sampler Concentrator	OI Corporation	Eclipse 4660	E008466762P	2010
1930	MS-16	GC	Agilent	7820A	CN10202030	2010
1931	MS-16	MS	Agilent	5975	US10200403	2010
1955	MS-8/GC-19	Autosampler	EST Analytical	Centurion	416080003183	2011
1988	ICP/MS-Agilent	ICPMS	Agilent	7700X Series (G3281A)	JP11391304	2013
1989	Autosampler	ICP/MS Autosampler	Agilent	ASX-500 Series (G3286A)	US10167A520	2013
1997	Sonicator	Ultrasonic	Bransonic	3510R-DTH	RMC060027670E	2000
1999	Balance	Toploader	Mettler-Toledo	PL3002	1227190170	2005
2003	Balance	Analytical	Mettler Toledo	AB104-S	1121311765	2003
2004	Balance	Toploader	Mettler Toledo	PM4800	M86379	2004
2005	Balance	Toploader	Setra	SI 2000S	2644872	2005
2006	COD Reactor	Block	HACH	#45600-00	9.512E+11	2002
2007	BOD Incubator	Refrigerator	VWR (Sheldon Mfg.)	#9110593	11055305	2002
2018	Oven	Drying	Quincy Labs	10GC	NG1-009030	2011
2020	Hot Block	Hot Block	Environmental Express	SC154	8826CECWC789	2013
2021	Simple Dist	Distillation Apparatus #1	Environmental Express	C6000	N/A	2013
2022	Simple Dist	Distillation Apparatus #2	Environmental Express	C6000	N/A	2013
2036	VOA Cooler	Walk-in	Commercial Refrig.	4G3	5605266	2000
2060	Electron Microscope	TEM	Philips	EM-420	943206007001	~1985
2063	BOD Incubator	Precision	Kenmore	MFU20F3GW7	699111788	2014
2065	Balance	Analytical	Fisher	Item # ALF64	N0588330030008P	2010
2067	Balance	Analytical	Mettler	AE160	0578	2002
2069	Lachat-3	Quick Chem QC8500	Lachat	Series 2	140600001703	2014
2070	Lachat-3 Pump	Reagent Pump RP-1500	Lachat	SM1135	549285-2	2014
2088	Water Bath		Thermo Electric	2866	201405	2008
2092	MS-17	GC	Agilent	7890B	CN14403051	2014
2093	MS-17	MS	Agilent	5977A	US1441M401	2014
2100	Turbidity Meter	Turbidimeter	Lovibond	Lot# 7374	3078	2014
2101	MS-17	Cleaning Module	Entech	3100D	1687	2014
2102	MS-17	Oven	Entech	09-0V6L-12	0135	2014
2103	MS-17	Diluter	Entech	4700	0026	2014
2105	MS-17	Autosampler	Entech	7650	0025	2014
2108	GC-9	GC	Agilent	7890B (G3440B)	CN14483265	2015
2109	GC-9	Auto Sampler Tray	Agilent	7693 (G4514A)	CN14380119	2015
2110	GC-9	Tower	Agilent	7693 (G4513A)	CN14490172	2015
2111	GC-9	ECD (Front)	Agilent	G2397A	U26039	2015
2112	GC-9	ECD (Back)	Agilent	G2397A	U26040	2015
2114	Autosampler	IC Autosampler	Dionex	AS40-1	96040432	1999
2120	MS-13	Autosampler	EST Analytical	Centurion	CentW502100614	2014
2131	GC-9	ECD Cell	Agilent	G2397-60610	U25762	2015
2143	Zero Air Generator	FID	Whatman	76-803	76-803	2013

ID No.	Instrument	Type	Manufacturer	Model	Serial Number	Age
2148	ICP-OES	OES-1	Agilent	5100	MY15120005	2015
2158	Oven	Drying	Quincy Lab, Inc.	S430`5	G4-007992	2015
2165	Oven	Drying Oven	Quincy Labs, Inc.	GC Series (Cat. S43015)	G4-008013	2015
2173	GC-10	6890 GC System	HP	6890 (G1530A)	US00006903	2015
2178	GC-10	6890 Injector	HP	6890 (18593B)	3042A23879	2015
2191	TKN Block Digestor	Block	Environmental Express	TKN100	2015TKNBC105	2015
2195	BOD Incubator	Refrigerator	Thermo Scientific	815	300033500	2015
2221	Oven	180L Ovn Gravity	Fisher	151030521	41880516	2016
2225	Oven	180L Ovn Grvty	Fisher	151030521	41921243	2016
2233	Spectrophotometer	SPEC-4	Hach	DR3900	1669679	2016
2246	Autosampler	for Lachat	Cetac Technologies	ASX-520	070570A520	2011
2247	Dilutor	for Lachat	Lachat	PDS 200	50700000344	2011
2249	Balance	Precision Advanced	OHAUS	GT 4100	8709	2007
2261	MS-19	Autosampler	EST Analytical	Centurion	462071416	2016
2282	Turbidimeter	White Light/Tungsten Lamp	Lovibond	194200	3463	2016
2285	GC-11	7890B GC System	Agilent	7890B (G3440B)	CN16473170	2016
2286	GC-11	7890B ALS Tray	Agilent	G4567A	CN15030021	2016
2291	Total Organic Carbon	TOC-3	Shimadzu	TOC-L CPN	H54315432055 CS	2017
2292	TOC Autosampler	40 mL	Shimadzu	ASI-L	H57415401560 SA	2017
2293	Mercury (Hg) Digest / Analyzer	HG-2 Soil Combustion	Nippon	MS-3000	15740318	2017
2294	Reagent Module		Nippon	RD-3	13420832	2017
2295	Liquid Sampler	Autosampler	Nippon	SC-3	13410578	2017
2296	Mercury (Hg) Digest / Analyzer	HG-1 CVAA	Nippon	RA-4500	15780180	2017
2298	MS-18	GC	Agilent	7890B GC	CN15173094	2017
2299	MS-18	MS	Agilent	5977B MSD	US1715M029	2017
2300	MS-18	Autosampler	Agilent	G4567A	CN15250014	2017
2301	MS-18	vacuum pump	Pfeiffer	DUO2.5	22032890	2017
2302	Station 1	PLM Hood	Plexiglass	with Hepa-Filter		1999
2303	Station 2	PLM Hood	Plexiglass	with Hepa-Filter		1999
2304	Station 3	PLM Hood	Plexiglass	with Hepa-Filter		1999
2305	Station 4	PLM Hood	Plexiglass	with Hepa-Filter		1999
2306	Thermo-Anemometer	Velometer	Extech	AN300	Z350828	2017
2307	Vulcan 84 Auto Metals Digestor	Automated Hot Block	Questron Technologies	V84-P	VU17-1027-V1.1.1	2017
2309	Flame Atomic Absorption (FAA)	240 AA	Agilent	G8431A	MY17220002	2017
2311	Soil TOC Analyzer	Soil Analyzer	Shimadzu	SSM-5000A	H52735400079 NK	2017
2317	Oven	Drying	Quincey Labs	40GC	G4-008938	2017
2318	Centrifuge	Clinical	IEC		42832385	2017
2320	MS-4	Concentrator	EST Analytical	Evolution	EV806012517	2017
2321	MS-19	Concentrator	EST Analytical	Evolution	EV850061517	2017
2322	MS-5	Autosampler	EST Analytical	Centurion	CENTW597072017	2017
2332	Balance	Analytical	U.S. Solid	USS-DBS5	USS-DBS1709029	2017
2334	Evaporator	Speed Vap IV	Horizon Technology	Speed Vap IV	17-0109	2017
2339	Zero Air Generator	3500cc	Peak Scientific	Precision Zero Air 3500cc	770004350	2017

ID No.	Instrument	Type	Manufacturer	Model	Serial Number	Age
2341	Compressed Air Generator	Compressor	Peak Scientific	Precision Compressed Air	770004231	2017
2345	Hydrogen Generator	Precision	Peak Scientific	Hydrogen Trace 500 cc	770005503	2017
2350	MS-19	GC	Agilent	7820A	CN1723204	2017
2351	MS-19	MS	Agilent	5977B MSD	US1741R002	2017
2360	Autosampler	ICP/MS Autosampler SPS 4	Agilent	G8410A	AU17092619	8/2017
2362	COD Reactor	Digital Reactor Block	Hach	DRB 200	17120C0305	2018
2363	Energy Dispersive Spectrometer	EDAX (TEM Detector)	EDAX (Amtek)	Octane-T-Plus	5480	2017
2364	High Vacuum Evaporator	Carbon Coater	Denton	DV-502A	19664	2017
2367	Microwave Extractor	Ethox X	Milestone	49380	17122726	2018
2368	Discrete Analyzer	DA-1 rAPID-T	Astoria-Pacific	4600	4660-1046	2018
2373	pH Meter		Fisher Scientific	accumet AE150	ae95002608	2018
2380	Discrete Analyzer	DA-2 rAPID-T	Astoria-Pacific	4600	4660-1053	2018
2381	Balance	Analytical	U.S. Solid	USS-DBS5	USS-DBS1803053	2018
2382	Balance	Analytical	U.S. Solid	USS-DBS5	USS-DBS1803045	2018
2394	Automated Hot Block	Vulcan 84 Auto Metals Digestor	Questron Technologies	V84-P	VN-1002	2018
2395	Automated Hot Block	Vulcan 84 Auto Metals Digestor	Questron Technologies	V42P	VU18-1005-V1.1.1	2018
2396	Water Bath	Coliform Incubator Water Bath	Thermo Scientific	TSCOL35	300209073	2018
2397	Mercury (Hg) Digest / Analyzer	HG-3 CVAA	Nippon	RA-4500	17780287	2018
2398	Pensky Marten Flashpoint Analyzer	Supplier: Lazar Scientific, inc	Stanhope-Seta	35000-0 U	1053813	2018
2400	ICP-OES	OES-2	Agilent	5100	MY15500001	2018
2401	Autosampler	CETAC	CETAC	ASX-520	101525A520	2018
2421	MS-17	Concentrator	Entech	7200CTS	1595	2014
2434	HPLC-1	ALS	HP	G1313A	DE65102508	2005
2439	Auto Titrator		Thermo Scientific	T910	T10147	2018
2440	Probe	ATC Probe	Thermo Scientific	927007MD	WT1-12782	2018
2441	Electrode	ROSS Ultra pH Electrode	Thermo Scientific	8102BNUWP		2018
2442	Sonicator	Dismembrator	Fisher Scientific	F550	F1768	2018
2444	Meter	pH Meter Digital Unit	Thermo Scientific	VSTAR10	V13409	2018
2450	Waterbath	KD Concentration	Fisher Scientific	FSGPD20	300207609	2018
2452	ICP/MS	ICP/MS - 2 / 7900	Agilent	7900	SG18404244	2018
2454	Autosampler	MS-12	OI Analytical	4100 Sample Processor	D833410620	2018
2455	MS-16/GC-19	Concentrator	OI Analytical	4760 Eclipse	A832447935	2018
2458	Microscope	PLM Stereomicroscope	LW Scientific (Thomas Sci)	Z4 Zoom Stereoscope	Z4H-BSF7-77SE	2019
2459	GC-12	6850A GC System	Agilent	6850A	US10540009	2004
2460	GC-12	6850A ALS Tray	Agilent	G2880A	CN53821085	2004
2462	Spectrophotometer	SPEC-6	Thermo Scientific	Genesys 30	9A1W264118	2018
2464	Concentrator	Turbovap II	Zymark		4373	2018
2469	GC-14	6850A GC System	Agilent	6850A	US10406012	2013
2470	GC-14 Autosampler	6850 Autosampler	Agilent	6850 (G2880A)	CN14520114	2013
2472	Centrifuge		International Equip Co	Model CL	428-18881	2009

ID No.	Instrument	Type	Manufacturer	Model	Serial Number	Age
2485	Balance	Top Loader	RADWAG	WTC 2000	485747	2010
2486	ZHE Tumbler	Tumbler	Bodine Electric Co	42R5BFC1-E3	068UU2038	2012
2487	Pump	GAST Pump	GAST	DQA-V751-FB	5KA84	2018
2488	Scale	Scale	Measure Tex	PS-102-200	101800034	2019
2490	Oven	Oven for Filtration #2	Quincy Lab Inc.	40GC	G4-009651	2019
2491	Spectrophotometer	SPEC-7	Shlmadzu	Biospec-1601	A1075	2019
2492	Centrifuge		Damon/IEC Division	IEC Clinical Centrifuge	AF0523	2015
2494	Discrete Analyzer	DA-3	rAPID-T	4600	4660-1061	2019
2495	Discrete Analyzer	DA-4	rAPID-T	4600	4660-1062	2019
2509	Pump	Sample Introduction Pump for FAA-240	Varian	VGA-77	95081021	2019
2512	Discrete Analyzer	DA-5	rAPID-T	4600	4660-1067	2019
2514	Balance	Top Loader	RADWAG	WTC 2000	607423	2019
2515	Balance	Top Loader	RADWAG	WTC 2000	607428	2019
2522	Balance	Analytical	Mettler Toledo	ML204	B110120209	2019
2526	Balance	Analytical	Mettler Toledo	AE240	G50492	1995
2527	Meter	Conductivity/pH Meter	Oakton	pH/Con 10 Series	101196	2010
2528	Meter	Conductivity/pH Meter	Oakton	pH/Con 10 Series	76106	2010
2530	Flow Meter	Flow Meter	Restek	Pro-Flow 6000	RE103967	2017
2531	Balance	Top Loader	Radwag	WTC2000	607498	2018
2532	Centrifuge	IEC Clinical Centrifuge	Damon/IEC	IEC Clinical Centrifuge 4-place	AF 2603	2010
2533	Flow Meter	Flow Meter	Pro-Flow	6000	RE107496	2019
2535	GC-15	GC Unit	Agilent	6850A	US10305001	2009
2536	GC-15 Autosampler	Autosampler	Agilent	G2880A	CN31220462	2009
2538	MS-7	Autosampler	EST Analytical	Centurion	CENTW687040219	2019
2539	MS-4	Autosampler	EST Analytical	Centurion	CENTS625040219	2019
2540	Pump	Hi Flow Sampler	Gilian	HFS 113A	850030	2010
2543	Titrator	Autotitrator	Thermo Fisher Orion	Orion T910	T10233	2019
2544	Probe	pH Electrode	Thermo Fisher	Ross Ultra	8102BNUWP	2019
2546	Dilutor	LaChat Dilutor		DRD	A89000-1192	2009
2548	Pump	Vacuum Pump	Allegro	D-2 Mold Lite	16286	2009
2549	Automated Soxlet Extractor	Soxtherm	Gerhardt	SOX 416	1/8465 19 0009	2019
2551	Meter	pH Meter	Mettler Toledo	SevenEasy pH	1231275091	2000
2555	TEM Digital Camera	Digital	SIA	SIA-L3C	ML0081508	2016
2557	Probe	Conductivity	Thermo Fisher Orion	013005MD	248910-A01	2019
2580	Bod Incubator	Incubator	Norlake	LR1201WWW/0	1502550	2020
2583	MS-15	Autosampler	EST Analytical	Centurion	CENTW1726012220	2020
2584	MS-16	Autosampler	EST Analytical	Centurion	CENTW727012220	2020
2585	SPS4 Autosampler	Metals Autosampler	Agilent	G8410A	AU18164857	2020
2588	Water Bath	Adjustable Temperature	Fisher	FSGPD20	3003855776	2020
2592	Probe	Redox (ORP)	Thermo Fisher Scientific	9180BNMD	248994-A01	2020
2593	Quanti-Tray Sealer	Tray Sealer	Idexx	89-10894-04	QT04545-06-073	2020
2603	IC-4	Ion Chromatograph	Thermo-Fisher (Dionex)	Integrion	20043128	2018
2604	IC-4 Autosampler	Autosampler	Thermo-Fisher (Dionex)	AS-AP (P/N 074922 no cooling)	20043210	2019
2607	Nitrogen Generator	Nitrogen Generator	Peak Scientific	Precision Nitrogen Trace 600cc	771053987	2020

ID No.	Instrument	Type	Manufacturer	Model	Serial Number	Age
2608	TOC-4	TOC Analyzer	Shlmadzu	TOC-L CPN	H54315332035 CS	2017
2609	KD Evaporator	Solvent Evaporator	Organomation	16165 (PN12018)	63500	2020
2611	Rotary Agitator	Agitator/Tumbler	EETSE Atlanta	EETSE Atlanta-3000	N/A	2020
2612	Rotary Agitator	Agitator/Tumbler	EETSE Atlanta	EETSE Atlanta-3000	N/A	2020
2613	Rotary Agitator	Agitator/Tumbler	Analytical Testing Corp	DC-20	5046XFCF0003	2020
2614	Hot Block	Hot Block	Environmental Express	SC154	2020CECW5369	2020
2616	Incubator	VWR Forced Air 6.3 CF (Type Code 51030020)	VWR	Cat# 89511-428	42586417	2020
2618	Sonicator	Ultrasonic Cleaner	Hardwarefactorystore.com	JPS-20A	None listed	2020
2619	Rotary Agitator	Agitator/Tumbler	Analytical Testing Corp	DC-20	5046XFCF0015	2020
2622	Microscope	LW i4 Infinity Microscope	LW	i4 Infinity	G2020015050	2020
2623	Microscope Camera	Mini Vid USB Microscope Camera	LW	TP 605100	C1803140389	2020
2624	Water Bath	Precision Shaking Water Bath	Thermo Scientific	GTTSSWB15	300433831	2020
2625	Rotary Agitator	Agitator/Tumbler	EETSE Atlanta	EETSE Atlanta-3000	N/A	2020
2626	Rotary Agitator	Agitator/Tumbler	EETSE Atlanta	EETSE Atlanta-3000	N/A	2020
2636	Discrete Analyzer	DA-6 rAPID-T	Astoria-Pacific	4600	4660-1091	2021
2639	SPS 4	Auto Sampler	Agilent	G8410A	AU17092619	2020
2640	Microscope	Zoom Stereo Scope	LW-Scientific	Z4M-BZM7-7LL3	20810047	2021
2656	Centrifuge	Clinical Centrifuge	International Equip Co	CL	AA0887	-
2657	Autosampler	Autosampler	Agilent	SPS 4	AU17494209	2021
2669	HPLC Variable Wave Detector	Detector	Agilent	G1314F	DE62974795	2021
2670	Dissolved O2 probe	Dissolved O2 probe	YSI	5905	59882	2021
2672	Flash Point Tester	Electrically-Heated Flash Point Tester	Koehler	K16203	K1620310276F	2021
2673	Analytical Balance	Analytical Balance	Mettler	AE163	FNR 38500	-
2677	TDS Manifold #4	Manifold	Environmental Express	M3026P	N/A	2021
2678	GC-16	GC System 6850	Agilent	6850A(G2630A)	US10309007	2021
2680	Shaking Incubator	Shaker	BEING	BIS-3	190412422	2021
2683	Incubator	Air Incubator 6.3 CF	VWR	89511-428	42758434	2021
2684	Oven	Oven (Sodium Sulfate)	Waring	WPO750	4H03 4020	2021
2686	pH Meter	Orion Versa Star Pro (VSTAR)	Thermo Scientific	VSTAR-10	V17182	2021
2687	Microscope Eyepiece Camera	Microscope Digital Camera	Amscope	MD500	2105171445	2021
2691	Shaking Incubator	Shaker	Scientific Industries	SI-G100 GTS-100	GTS10-1039	2021
2693	3180 Autosampler	Autosampler for FS 3700	OI Analytical	ASX-280	062118A280	2021
2694	FS 3700 Analyzer	Auto Analyzer (FSA)	OI Analytical	3700	21G103781	2021
2696	Mantech Autosampler	Autosampler Automax 73	Gilson	Automax 73	192E1172	2021
2697	Mantech Conductivity Meter	Conductivity Meter	Jenway by Cole-Parmer	4510	80713	2021
2699	Titration + Buret Modules	Titrator + Buret	Mantech	PC-1300-475 / PC-1000-1040	MT-2E1-1088 / MT-2D1-348	2021
2700	Interface Module + Stirrer Control	Interface Module + Stirrer	Mantech	PC-1000-102/4 / PC-1000-388	MT-2G1-882 / MT-2F1-414	2021

ID No.	Instrument	Type	Manufacturer	Model	Serial Number	Age
2701	pH Probe	Probe	Mantech	PCE-80-PH1200D	8679	2021
2704	ORP Probe	Probe	Mantech	PCE-80-OR1002	8769	2021
2705	Leak Detector	Leak Detector	Restek	28500	113070	2021
2706	ML BOD Analyzer	BOD Analyzer	SEAL Analytical	ML V3 200L 4BOD YSI	8629	2021
2707	Probe 1	Optical DO Probe - 1	YSI	ProOBOD Probe #626400	20K101767	2021
2708	Probe 2	Optical DO Probe - 2	YSI	ProOBOD Probe #626400	20K101765	2021
2710	Probe 4	Optical DO Probe - 4	YSI	ProOBOD Probe #626400	21D101959	2021
2711	Meter	DO Meter 1	YSI	ProDIGITAL / ProSolo #626650	21A103064	2021
2712	Meter	DO Meter 2	YSI	ProDIGITAL / ProSolo #626650	21A103063	2021
2713	Meter	DO Meter 3	YSI	ProDIGITAL / ProSolo #626650	21A103062	2021
2714	Meter	DO Meter 4	YSI	ProDIGITAL / ProSolo #626650	21A103066	2021
2719	Sonic Dismembrator	Sonicator	Fisher Scientific	FB505	123124AT-10-21	2021
2722	Microscope	Zoom Stereo Microcope	LW Scientific	Z4	Z4B-BSED-7LL3-B	2021
2727	GC Injector/Autosampler	GC Injector/Autosampler	Agilent	7683B	CN80647118	2021
2728	GC-17	6850 GC	Agilent Technologies	6850	CN11733003	2021
2729	GC-18	6850 GC	Agilent Technologies	6850	CN11734006	2021
2730	GC-19 (MS-8)	6850 GC	Agilent Technologies	6850	CN11734005	2021
2732	pH Probe	ROSS Ultra pH Electrode	Thermo Scientific	8302BNUMD	ZQ1-16773	2021
2736	Autosampler GC-17	6850 ALS	Agilent Technologies	G2880A	CN72900010	2021
2737	Autosampler GC-18	6850 ALS	Agilent Technologies	G2880A	CN73200010	2021
2741	Peristaltic Pump	Pump for FS 3700	Cole-Parmer, Ismatec	61010A-1/ ISM939E	M21006598	2022
2742	Enviornmental Express Manifold	Distillation	Enviornmental Express	C6018	N/A	2022
2746	Purge&Trap Autosampler	VOC Autosampler	EST Analytical	Centurion	CENTS844012522	2022
2747	Purge & Trap	Purge&Trap	EST Analytical	Evolution 2	EV20248012522	2022
2748	Air Sampling Pump	Pump	Gilian	5000	20220201001	2022
2754	Rotary Agitator	12-place agitator w/AC motor	Analytical Testing Corp	DC-20B	585YEBC0008	2022
2756	TurboVap	Evaporation System	Biotage	TurboVap II	212902440	2022
2757	Hotblock	Digestion System	Environmental Express	SC154 (150)	2022CECW5697	2022
2771	Leak Detector	Leak Detector	Restek	28500	114117	2022
2772	TKN Block Digestor	BD50 Block	SEAL Analytical	BD50	5146U01576	2022
2773	TKN Block Digestor Controller	BD50/28 Programmable Controller	SEAL Analytical	N/A	5146U01575	2022
2776	BOD Probe	BOD Probe	YSI	626400	21J101932	2022
2790	BOD Meter	DO Meter	YSI	ProSolo 626650	22C103798	2022
2793	pH probe	ROSS Ultra pH Electrode	Thermo Scientific	8302BNUMD	AX1-15606	2022
2795	Sonicator	Ultrasonic Cleaner	Cole-Parmer	8892R-DTH	QCC 97025417D	2022
2796	Oven	Drying for TS	Quincy Lab Inc.	40GC	G4-011511	2022
2804	GC-21	8890 GC	Agilent Technologies	8890 (G3540A)	CN2105A062	2022
2805	AS for GC-21	150 vials tray	Agilent Technologies	7693 (G4514A)	CN11090043	2022
2806	Injector for GC-21	Autoinjector	Agilent Technologies	7693A (G4513AR)	CN12090142	2022

ID No.	Instrument	Type	Manufacturer	Model	Serial Number	Age
2807	Analytical Balance	Analytical Balance 0.0001gx120g	Torbal	AGCN120	301201217	2022
2808	MiniRae Lite+PID	PID	Honeywell	MiniRae Lite+ PGM 7300	590-911302	2021
2810	pH probe	ROSS Ultra pH Electrode	Thermo Scientific	8302BNUMD	AX1-15591	2022
2813	Conductivity Probe	4-Electrode Cell	ThermoFisher	THERMO013005MD	AT1-20371	2022
2817	pH probe	Combination pH	Thermo Scientific	Orion 9104BNWP	AW1-16426	2022
2818	HPLC Pump	Pump	Agilent	G1311A	DE62957488	2022
2819	Conductivity Probe	MT-1 Probe	Mantech	PCE-96-CT1010	K10/5MM/141	2022
2820	Probe 3	Optical DO Probe - 3	YSI	ProOBOD Probe #626400	21D100775	2022
2821	Autoclave	Sterilizer	Market Forge	STM-EL	76369	2015
2826	MS-10 AS Tray	Autosampler Tray	Agilent	7683B, G2614A	CN31626009	2022
2828	Analytical Balance	Analytical Balance 0.0001gx120g	Torbal	AGCN220	302201254	2022
2833	MiniRAE 3000+PID	PID	Honeywell	MiniRAE 3000	592-602783	2022
2817	pH probe	Combination pH	Thermo Scientific	Orion 9104BNWP	AW1-16426	2022
2818	HPLC Pump	Pump	Agilent	G1311A	DE62957488	2022
2819	Conductivity Probe	MT-1 Probe	Mantech	PCE-96-CT1010	K10/5MM/141	2022
2820	Probe 3	Optical DO Probe - 3	YSI	ProOBOD Probe #626400	21D100775	2022
2821	Autoclave	Sterilizer	Market Forge	STM-EL	76369	2015
2826	MS-10 AS Tray	Autosampler Tray	Agilent	7683B, G2614A	CN31626009	2022
2828	Analytical Balance	Analytical Balance 0.0001gx120g	Torbal	AGCN220	302201254	2022
2833	MiniRAE 3000+PID	PID	Honeywell	MiniRAE 3000	592-602783	2022
2838	TurboVap	Evaporation System	Biotage	TurboVap II	222103043	2022
2839	FS 3700 Analyzer	Auto Analyzer	OI Analytical	3700	22E105406	2022
2840	Peristaltic Pump	Pump for FS 3700	Cole-Parmer, Ismatec	61010-1/ISM939E	N/A	2022
2841	3180 Autosampler	Autosampler for FS 3700	OI Analytical	ASX-280	072224A280	2022
2842	Distillation Module	In-line Distillation-Phenol	OI Analytical	A515000	N/A	2022
2843	Circulator	Chilled Water Circulator	Caron Products	2050-1-1	2050-1-1-093	2022
2844	Oven	180L Ovn Grvty	Fisher	151028874	43095254	2022
2857	Microwave Extractor	Ethos X	Milestone	Ethos X	22116946	2023
2858	Analytical Balance	Analytical Balance 0.0001gx120g	Torbal	AGCN220	302201282	2023
2863	Micro Lab 600 Autodiluter	Autodiluter	Hamilton & OI Analytical	ML 600 / 61502-01	ML600BL17908	2023
2864	FSA Autodiluter Valve	Valve	OI Analytical	EUH	EUA26842	2023
2865	COD Reactor	Digital Reactor Block	HACH Company	DRB 200	23010C0187	2023
2866	Fume Hood	6' Fisher American Chemical Fume Hood w/ Dual Sash	Fisher American	6-31-SWNXX-SS	002357031023	2023
2867	pH Meter	Orion Versa Star Pro (VSTAR)	Thermo Scientific	VSTAR10	V20393	2023
2869	pH Meter	Orion Versa Star Pro (VSTAR)	Thermo Scientific	VSTAR10	V20344	2023
2870	pH Probe	ROSS Ultra pH Electrode	Thermo Scientific	8302BNUMD	AP1-16325	2023
2871	pH Probe	ROSS Ultra pH Electrode	Mantech	PCE-80-PH1200D	9195	2023
2874	pH Probe	ROSS Ultra pH	Thermo Scientific	8302BNUMD	BY1-17167	2023

ID No.	Instrument	Type	Manufacturer	Model	Serial Number	Age
		Electrode				
2876	Auto-Sampler	IC-2 Auto Sampler	Dionex	AS-40	6060434	
2877	pH Probe	pH Electrode TitraPRO4	Mantech	PCE-80-PH1200D	10309	
2880	Sonicator	Ultrasonic Cleaner	Creworks	TH-20A	None Listed	
2882	Quanti-Tray Sealer	Tray Sealer	IDEXX Laboratories	2X, 89-10894-04	QT1125	
2884	BOD Probe	ProOBOD Optical BOD Probe	YSI	ProOBOD Probe #626400	23C105931	
2885	Chiller	Low Temperature Chiller	Vevor	DC-0506	230403098	
2890	BOD Incubator	Environmental Chamber	Powers Scientific, Inc.	IS70SD	C233538	
2891	Muffle Furnace	Muffle Furnace	SH Scientific	SH-FU-5MGE	230609FU-5MGE-1	
2893	GC-22 (MS-20)	GC	Agilent	6890N	US10648077	
2894	MS-20 (GC-22)	MS	Agilent	5975B	US63244774	

APPENDIX IV - Chain of Custody

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Eurofins Environment Testing Southeast-Atlanta, LLC
3080 Presidential Drive, Atlanta, GA 30340 Phone: (770) 457-8177

CHAIN OF CUSTODY

Work Order: _____
Page ___ of ___

COMPANY:	ADDRESS:	ANALYSIS REQUESTED	Visit our website www.EurofinsUS.com for downloadable COCs.	Number of Containers
PHONE:	EMAIL:			
SAMPLED BY:	SIGNATURE:			

#	SAMPLE ID	SAMPLED: DATE	SAMPLED: TIME	GRAB	COMPOSITE	MATRIX (see codes)	PRESERVATION (see codes)	REMARKS	Number of Containers
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									

RELINQUISHED BY: DATE/TIME:	RECEIVED BY: DATE/TIME:	PROJECT INFORMATION	RECEIPT
1.	1.	PROJECT NAME:	Total # of Containers
2.	2.	PROJECT #:	Turnaround Time (TAT) Request in Business Days
3.	3.	SITE ADDRESS:	☐ Standard ☐ 4-Day Rush* ☐ 3-Day Rush* ☐ 2-Day Rush* ☐ Next Day Rush* ☐ Other ___ ☐ Same-Day Rush* (auth req.)
SPECIAL INSTRUCTIONS/COMMENTS:	SHIPMENT METHOD	SEND REPORT TO:	* Surcharges apply for Rush TAT
	OUT: / / VIA:	INVOICE TO (IF DIFFERENT FROM ABOVE):	REGULATORY PROGRAM (if any):
	IN: / / VIA:		DATA PACKAGE: I ○ II ○ III ○ IV ○
	Client FedEx UPS US mail courier other:_____	QUOTE #:_____ PO#:_____	

Submission of samples to the laboratory constitutes acceptance of EETSE's Terms & Conditions. Client assumes sole responsibility for damage or loss of samples before we accept them. Samples received after 3PM or on Saturday are considered as received the following business day. If no TAT is marked on COC, EETSE-Atlanta will proceed with standard TAT. Samples are disposed of 30 days after completion of report unless other arrangements are made.

Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water ST=Stormwater WW = Waste Water W = Water (Blanks) DW = Drinking Water (Blanks) O = Other (specify)

Preservative Codes: H+I = Hydrochloric acid + ice I = Ice only N = Nitric acid S+I = Sulfuric acid + ice S/M+I = Sodium Bisulfate/Methanol + ice NaOH+SH O = Other (specify) NA = None

2.27.24_COC

APPENDIX V
QUALITY ASSURANCE MANUAL TRAINING SUMMARY (FORM 1)

Quality Assurance Manual Date and Revision Number:
Revision 30; March 27, 2024

Initial each section as reviewed. Please complete and return this form to Technical Director for placement in Employee's Training File:

_____ Section 3.0, Statement of Policy
_____ Section 4.0, Organization
_____ Section 5.0, Quality Assurance Program
_____ Section 6.0, Sample Bottle Preparation
_____ Section 7.0, Custody of Samples, Equipment and Supplies
_____ Section 8.0, Analytical Procedures
_____ Section 9.0, Calibration Procedures and Frequency
_____ Section 10.0, Preventative Maintenance
_____ Section 11.0, Quality Control Checks & Routines to Assess Precision, Accuracy & MDLs
_____ Section 12.0, Data Reduction, Review and Reporting
_____ Section 13.0, Corrective Action and Nonconformances
_____ Section 14.0, Performance and System Audits
_____ Section 15.0, Quality Assurance Reports to Management
_____ Section 16.0, Reagent Storage and Documentation
_____ Section 17.0, Waste Disposal
_____ Appendix I, Waste Disposal Procedures
_____ Appendix II, Lab Equipment Preventive Maintenance Schedule
_____ Appendix III, Lab Equipment List
_____ Appendix VI, Corrective Action Form
_____ Appendix VIII, List of all methods under which lab is Accredited
_____ Appendix X (Outside Reference Documents)

Comments:_____
_____
_____

Print Name: _____ Date:_____

Signature: _____ Date:_____

Supervisor:_____ Date:_____

Technical Director:_____ Date:_____

Quality Assurance Manager:_____ Date:_____

APPENDIX V

QUALITY ASSURANCE MANUAL TRAINING SUMMARY NON-TECHNICAL (FORM 2)

Quality Assurance Manual Date and Revision Number:
Revision 30; March 27, 2024

Initial each section as reviewed. Please complete and return this form to Technical Director for placement in Employee's Training File:

_____ Section 3.0, Statement of Policy
_____ Section 4.0, Organization
_____ Section 5.0, Quality Assurance Program
_____ Section 6.0, Sample Bottle Preparation
_____ Section 7.0, Custody of Samples, Equipment and Supplies
_____ Section 13.0, Corrective Action and Nonconformances
_____ Section 14.0, Performance and System Audits
_____ Section 16.0, Reagent Storage and Documentation
_____ Section 17.0, Waste Disposal
_____ Appendix I, Waste Disposal Procedures
_____ Appendix VI, Corrective Action Form
_____ Appendix VIII, List of all methods under which lab is Accredited

Comments:_____
_____
_____

Print Name: _____ Date:_____

Signature: _____ Date:_____

Supervisor:_____ Date:_____

Technical Director:_____ Date:_____

Quality Assurance Manager:_____ Date:_____

APPENDIX VI - CORRECTIVE ACTION FORM

Eurofins Atlanta

Corrective Action Report

Date Initiated: **Corrective Action Report ID:**

Initiated By: **Department:**

Corrective Action Description

CAR Summary:

Description of Nonconformance:

Description of Corrective Action:

Performed By: **Completion Date:**

Client Notification

Client Notification Required: **Notified By:**

Comment:

Quality Assurance Review

Nonconformance Type:

Further Action required by QA:

Approval and Closure

Technical Director / Deputy Tech. Dir.: _____ Close Date:

QA Officer Approval: _____ QA Date:

APPENDIX VII - SAMPLE RECEIPT CHECKLIST

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Clear | Save as

SAMPLE/COOLER RECEIPT CHECKLIST

1. Client Name: _____ Work Order Number: 2403
2. Carrier: FedEx ☐ UPS ☐ USPS ☐ Client ☐ Courier ☐ Other _____

		Yes	No	N/A	Details	Comments
3	Shipping container/cooler received in good condition?	○	○	○	damaged ☐ leaking ☐ other ☐	
4	Custody seals present on shipping container?	○	○	○		
5	Custody seals intact on shipping container?	○	○	○		
6	Cooler temperature(s) within limits of 0-6°C? [See item 12 for temperature recordings.]	○	○	○		
7	Chain of Custody (COC) present?	○	○	○		
8	Chain of Custody signed, dated, and timed when relinquished and received?	○	○	○		
9	Sampler name and/or signature on COC?	○	○	○		
10	Were all samples received within holding time?	○	○	○		
11	TAT marked on the COC?	○	○	○	If no TAT indicated, proceeded with standard TAT per Terms & Conditions	

12. Cooler 1 Temperature _____ °C Cooler 2 Temperature _____ °C Cooler 3 Temperature _____ °C Cooler 4 Temperature _____ °C
Cooler 5 Temperature _____ °C Cooler 6 Temperature _____ °C Cooler 7 Temperature _____ °C Cooler 8 Temperature _____ °C

13. Comments: _____

I certify that I have completed sections 1-13 (dated initials). _____

		Yes	No	N/A	Details	Comments
14	Temperature blanks present?	○	○	○		
15	Were sample containers intact upon receipt?	○	○	○		
16	Custody seals present on sample containers?	○	○	○		
17	Custody seals intact on sample containers?	○	○	○		
18	Do sample container labels match the COC?	○	○	○	incomplete info ☐ illegible ☐ no label ☐ other ☐	
19	Are analyses requested indicated on the COC?	○	○	○		
20	Were all of the samples listed on the COC received?	○	○	○	samples received but not listed on COC ☐ samples listed on COC not received ☐	
21	Was the sample collection date/time noted?	○	○	○		
22	Did we receive sufficient sample volume for indicated analyses?	○	○	○		
23	Were samples received in appropriate containers?	○	○	○		
24	Were VOA samples received without headspace (< 1/4" bubble)?	○	○	○		
25	Were trip blanks submitted?	○	○	○	listed on COC ☐ not listed on COC ☐	

26. Comments: _____

I certify that I have completed sections 14-26 (dated initials). _____

This section only applies to samples where pH can be checked at Sample Receipt.

		Yes	No	N/A	Details	Comments
27	Have containers needing chemical preservation been checked?*	○	○	○		
28	Containers meet preservation guidelines?	○	○	○		
29	Was pH adjusted at Sample Receipt?	○	○	○		

***Note: Certain analyses require chemical preservation but must be checked in the laboratory and not upon Sample Receipt such as Coliforms, VOCs and Oil & Grease/TPH. This also excludes metals by EPA 200.7, 200.8 and 245.1 which will be verified between 16 and 24 hours after preservation.**

I certify that I have completed sections 27-29(dated initials). _____

Checklist 7.24.23 Rev 4

Lock Checklist

APPENDIX VIII - List of all methods for which lab is Accredited

Potable or Drinking Water (Safe Drinking Water Act - SDWA)			
Matrix	Category	Method	Description
PW	Microbiology	SM9223B	Total Coliforms
PW	Microbiology	SM9221D	E. coli
PW	Metals	EPA 200.8	Metals

Non-Potable Water (Clean Water Act - CWA)			
Matrix	Category	Method	Description
NPW	Microbiology	SM9222B	Total Coliforms
NPW	Microbiology	SM9222D-2015	Fecal Coliforms
NPW	Microbiology	SM9223B-2016	E. coli
NPW	Gen Chem	EPA 1010	Ignitability
NPW	Gen Chem	EPA 120.1 and EPA 9050	Conductivity
NPW	Gen Chem	EPA 160.4	Residue-volatile
NPW	Gen Chem	EPA 1664B and EPA 9070	Oil & Grease
NPW	Gen Chem	EPA 180.1	Turbidity
NPW	Gen Chem	EPA 300.0	Ion Scan
NPW	Gen Chem	EPA 350.1	Ammonia as N
NPW	Gen Chem	EPA 351.2	Kjeldahl nitrogen - total
NPW	Gen Chem	NECi N07-0003	Nitrogen, Nitrate-Nitrite (as N)
NPW	Gen Chem	EPA 353.2	Nitrate as N and Nitrate-nitrite
NPW	Gen Chem	EPA 353.2	Nitrite as N
NPW	Gen Chem	EPA 365.1	Orthophosphate as P
NPW	Gen Chem	EPA 365.1	Phosphorus total
NPW	Gen Chem	EPA 410.4	Chemical oxygen demand
NPW	Gen Chem	EPA 420.1 and EPA 420.2	Total phenolics
NPW	Gen Chem	EPA 7196A	Chromium VI
NPW	Gen Chem	EPA 9010/9014	Total cyanide
NPW	Gen Chem	EPA 9030/9034	Sulfide
NPW	Gen Chem	EPA 9040	pH
NPW	Gen Chem	EPA 9056	Ion Scan
NPW	Gen Chem	EPA 9060	Total organic carbon
NPW	Gen Chem	EPA 9065	Total phenolics
NPW	Gen Chem	SM2310B-2011	Acidity as CaCO3
NPW	Gen Chem	SM10200H-2011	Chlorophylls
NPW	Gen Chem	SM2120B-2011	Color
NPW	Gen Chem	SM2120F-2011	Color ADMI
NPW	Gen Chem	SM2320B-2011	Alkalinity as CaCO3
NPW	Gen Chem	SM2340B-2011	Hardness
NPW	Gen Chem	SM2540B-2015	Residue-total
NPW	Gen Chem	SM2540C-2015	Residue-filterable (TDS)
NPW	Gen Chem	SM2540D-2015	Residue-nonfilterable (TSS)
NPW	Gen Chem	SM2540E-2015	Residue-Volatile
NPW	Gen Chem	SM2540E-2015	Fixed Residue
NPW	Gen Chem	SM2540G-2015	Total, fixed, and volatile residue
NPW	Gen Chem	SM2540F-2015	Residue-settleable
NPW	Gen Chem	SM3500Cr B-2011	Chromium VI
NPW	Gen Chem	SM3500-Fe B-2011	Ferrous Iron
NPW	Gen Chem	SM4500ClG-2011	Total residual chlorine

Non-Potable Water (Clean Water Act - CWA)			
Matrix	Category	Method	Description
NPW	Gen Chem	SM4500CN E-2016 Total Cyanide	Cyanide
NPW	Gen Chem	SM4500CN G-2016	Amenable cyanide
NPW	Gen Chem	SM4500H$^+$B-2011	pH
NPW	Gen Chem	SM4500O H-2016	Dissolved Oxygen
NPW	Gen Chem	SM4500S2 F-2011	Sulfide
NPW	Gen Chem	SM4500SO3 B-2011	Sulfite-SO3
NPW	Gen Chem	SM5210B-2016	Biochemical oxygen demand (BOD)
NPW	Gen Chem	SM5210B-2016	Carbonaceous BOD (CBOD)
NPW	Gen Chem	SM5310B TOC	Total organic carbon
NPW	Gen Chem	SM5540C MBAS Surfactants	Surfactants - MBAS
NPW	Gen Chem	TKN - AMMONIA	Organic nitrogen
NPW	Metals	EPA 200.7 and EPA 6010	Metals
NPW	Metals	EPA 200.7	Total Phosphorus
NPW	Metals	EPA 6010	Total Phosphorus
NPW	Metals	EPA 200.8 and EPA 6020	Metals
NPW	Metals	EPA 245.1 and EPA 7470	Mercury
NPW	Ext Organics	EPA 8015	Diesel range organics (DRO)
NPW	Ext Organics	FL-PRO	Total Petroleum Hydrocarbons (TPH)
NPW	Ext Organics	EPA 610 and EPA 8310	Polynuclear Aromatic Hydrocarbons (PAHs)
NPW	Ext Organics	EPA 8315	Formaldehyde and Acetaldehyde
NPW	Ext Organics	EPA 625.1 and EPA 8270	Semi-Volatile (Base-Neutral-Acid) Organics
NPW	Ext Organics	RSK-175	GC Analysis of Gaseous Samples
NPW	Pest-Herb-PCB	EPA 8081	Pesticides
NPW	Pest-Herb-PCB	EPA 8082	Polychlorinated Biphenyls
NPW	Pest-Herb-PCB	EPA 615 and EPA 8151	Herbicides
NPW	Vol Organics	EPA 8011	EDB & DBCP
NPW	Vol Organics	EPA 8015	Gasoline range organics (GRO)
NPW	Vol Organics	EPA 8015	Various Non-halogenated Volatile Compounds
NPW	Vol Organics	EPA 624.1 and EPA 8260	Volatile Organics

Solids & Hazardous Materials (Resource Conservation & Recovery Act - RCRA)			
Matrix	Category	Method	Description
Solids	Gen Chem	EPA 350.1 in Soil	Ammonia
Solids	Gen Chem	EPA 351.2 in Soil	Kjeldahl nitrogen - total
Solids	Gen Chem	EPA 365.1 in Soil	Total Phosphorus
Solids	Gen Chem	EPA 1010	Ignitability
Solids	Gen Chem	EPA 1030	Ignitability of Solids
Solids	Gen Chem	EPA 1311	TCLP
Solids	Gen Chem	EPA 1312	SPLP
Solids	Gen Chem	EPA 7196	Chromium VI
Solids	Gen Chem	EPA 9010/9014	Total cyanide
Solids	Gen Chem	EPA 9030/9034	Sulfide
Solids	Gen Chem	EPA 9040	pH
Solids	Gen Chem	EPA 9045	pH
Solids	Gen Chem	EPA 9050	Conductivity
Solids	Gen Chem	EPA 9056	Ion Scan
Solids	Gen Chem	EPA 9060	Total organic carbon
Solids	Gen Chem	EPA 9065	Total phenolics

Solids	Gen Chem	EPA 9071	Oil & Grease

Solids & Hazardous Materials (Resource Conservation & Recovery Act - RCRA)			
Matrix	Category	Method	Description
Solids	Gen Chem	EPA 9095	Paint Filter Liquids Test
Solids	Gen Chem	Sec. 7.3 SW-846	Reactive cyanide
Solids	Gen Chem	Sec. 7.3 SW-846	Reactive sulfide
Solids	Metals	EPA 6010	Metals
Solids	Metals	EPA 6020	Metals
Solids	Metals	EPA 7471	Mercury
Solids	Metals	EPA 7473	Mercury
Solids	Ext Organics	EPA 8015	Diesel range organics (DRO)
Solids	Ext Organics	FL-PRO	Total Petroleum Hydrocarbons (TPH)
Solids	Ext Organics	EPA 8310	Polynuclear Aromatic Hydrocarbons (PAHs)
Solids	Ext Organics	EPA 8315	Formaldehyde
Solids	Ext Organics	EPA 8270	Semi-Volatile (Base-Neutral-Acid) Organics
Solids	Pest-Herb-PCB	EPA 8081	Pesticides
Solids	Pest-Herb-PCB	EPA 8082	Polychlorinated Biphenyls
Solids	Pest-Herb-PCB	EPA 8151	Herbicides
Solids	Vol Organics	EPA 8015	Gasoline range organics (GRO)
Solids	Vol Organics	EPA 8015	Various Non-halogenated Volatile Compounds
Solids	Vol Organics	EPA 8260	Volatile Organics

Matrix	Category	Method	Description
Air & Emissions			
Air	Vol Organics	EPA TO-14A	Volatile Organics
Air	Vol Organics	EPA TO-15	Volatile Organics

AIHA LAP Methods			
Matrix	Category	Method	Description
Air	Metals	NIOSH 7300M/7303	Elements by ICP
Solids	Metals	NIOSH 7082	Lead in Paint
Solids	Metals	SW3050B/7000B	Total Lead in Solids
Air	Metals	NIOSH 7082	Lead on Wipes
Air	Asbestos	NIOSH 7400	PCM
Air	Microbiology	Fungal Air Direct Exam	MB - 15019, MB - 15022, MB - 15028
Air	Microbiology	Fungal Bulk Direct Exam	MB - 15020
Air	Microbiology	Fungal Surface Direct Exam	MB - 15020

Attachment 3

Quality Assurance Manual Acceptance Agreement

The information in this Quality Assurance Manual including its tables, appendices, figures, and / or attachments may be legally privileged and is confidential information intended for the use of reviewing Eurofins Environment Testing Southeast, LLC., Atlanta Quality System policies and procedures. You are hereby notified that any dissemination, distribution, or copy of this manual or information therein including tables, appendices, figures, and / or attachments is strictly prohibited without written permission from a representative of Eurofins Environment Testing Southeast, LLC, Atlanta Customer Service Department. If you have received this manual in error, please notify Eurofins Environment Testing Southeast, LLC, Atlanta Customer Service by telephone at (770) 457-8177 for instructions on returning the document. If an electronic copy has been received in error by email, contact Eurofins Environment Testing Southeast, LLC, Atlanta Customer Service Department and delete the message. Thank you.

SOP No. QA-01000

Date Revised	Revision No.
March 27, 2024	30

I have read, understood and agree to comply with the above statement.

_____ _____
Signature Date

_____
Printed Name

_____
Company

_____
Phone Number with extension

APPENDIX IX - Training Form 1

New Employee Initial Quality Assurance Manual Training

TRAINING: Initial Training on EETSE Atlanta SOP No. QA-01000, "SOP for the Quality Assurance Manual"

My signature confirms that I attended the initial training of the company's Quality Assurance Manual, which includes a discussion of the various sections contained within as well as responsibilities I have while performing my daily duties. I will be reading various sections of that document according to my job function. Upon completion I will sign-off on form 'Appendix V – Quality Assurance Manual Training Summary'.

Supervisor: _____

Section/area: _____

Print Name: _____

Employee Signature:

_____

Date: _____

APPENDIX IX - Training Form 2

Employee SOP / QA Manual Training & Retraining Form

SOP and/or Training Description: _____
_____
_____
_____
_____

My signature confirms that I was explained the reasons for this training/retraining and I have read/reviewed sections of the SOP, where applicable, along with other appropriate information including Interim Change Notices (ICNs), spreadsheets, logbook pages, sections in LIMS, calculations, and other forms as they apply. Further, I understand my responsibilities to follow the items presented in this training/retraining as they pertain to my job.

Supervisor: _____

Section/area: _____

Print Name: _____

Employee Signature:
_____

Date: _____

APPENDIX X

QUALITY ASSURANCE MANUAL
STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT

Name (Printed): _____

SOP Title: Quality Assurance Manual

SOP Number: QA-01000 **Rev. No. 30**

The laboratory analyst signature on this approved SOP signifies the following: The analyst has read the SOP in its entirety and has read the analytical methods referenced in the SOP.

The analyst understands that the SOP is to be followed explicitly. Any deviation from the SOP must be noted in writing. Furthermore, the deviation from the SOP must be approved in writing by the laboratory supervisor and the QA staff prior to the analyst's adoption of the deviation from the SOP.

The controlled electronic of this SOP is located on the portal server at: Documents: Quality Assurance: QA Manuals: QA Manual: 2024_QA_Manual_Rev_30.pdf. If a hard copy is desired, you may request one from the Supervisor.

Do not make a copy or print out the QA Manual yourself. Printed copies are uncontrolled documents.

Print Name: _____ Date: _____

Analyst's Signature: _____ Date: _____

Department Manager Signature: _____ Date: _____

Technical Director's Signature: _____ Date: _____

APPENDIX XI

Outside Reference Documents

The company's list of Outside Reference Documents is now identified as our Document Registry Excel file available on our company portal: \\192.0.0.190\l2\Technical_Mng2\Procedures\Registry.

APPENDIX XII

Environmental Microbiology Laboratory Accreditation Program (EMLAP) Specific Requirements

1.0 INTRODUCTION

Eurofins Environment Testing Southeast, LLC., Atlanta (EETSE Atlanta) is dedicated to providing quality analytical services. EETSE Atlanta specializes in the analysis of microorganisms commonly detected in air (e.g., spore trapping), surface (e.g., tape lifts, swabs, wipes), and bulk (e.g., wallboard, carpet, building materials) samples collected from schools, hospitals, offices, industrial, agricultural, and other work environments. EETSE Atlanta has implemented a quality assurance and quality control (QA/QC) program to establish quality control standards necessary for compliance to guidelines by The American Industrial Hygiene Association's Laboratory Accreditation Program (AIHA LAP) Environmental Microbiology Laboratory Accreditation Program (EMLAP). In order to consistently maintain high standards of precision and accuracy in analytical testing, EETSE Atlanta participates in AIHA LAP's Proficiency Analytical Testing (PAT) program.

This quality assurance plan will establish the procedures that will be followed to ensure accuracy, precision, completeness, and representation of data obtained from the analysis of environmental microbiology samples.

2.0 PURPOSE

EETSE Atlanta has implemented a quality assurance, quality control program for the purpose of providing a baseline of standards which will allow for a continuous surveillance quality performance for the benefit of AIHA LAP EMLAP compliance, client satisfaction, and minimization of liability.

3.0 SCOPE

This QA/QC program provides the necessary guidelines to secure and maintain:

- High level of quality work
- Comprehensive accountability of all activities relevant to laboratory services.
- Continuous compliance with ISO/IEC 17025 and AIHA LAP's EMLAP quality requirements.

This QA/QC program includes the following information:

- Comprehensive system of daily, weekly, monthly, and annual record keeping.
- Definition of routine monitoring activities.
- Sampling techniques for air, surface, and bulk collection.
- Sampling Equipment
- Calibration of Sampling Equipment
- Analysis of Air, Surface, and Bulk samples.
- Analytical Equipment

- Calibration of Analytical Equipment
- In-House training of analysts.
- QA/QC activities within lab.

4.0 FACILITIES

The laboratory has adequate facilities for the scope of services and meets the requirements for the most current and relative biosafety guidelines set forth by CDC, WHO, and AIHA LAP. The lab has a documented routine monitoring program for the verification of adequate contamination control. The laboratory has the proper facilities for biological and chemical storage and disposal of refuse.

5.0 EQUIPMENT

Microscope/Magnification System

- Microscope/Magnification System consisting of Compound optical microscope with a high magnification (100x) oil immersion objective having a numerical aperture (n.a.) of at least 1.25.
- Alignment of each microscope shall be documented with each day of use.
- Each microscope shall have an ocular micrometer that shall be checked annually with a NIST traceable stage micrometer.
- Field of View Diameter for each objective on the microscope shall be checked annually.

Class II Biological Safety Cabinet

- Performance certified annually according to NSF Standard 49.

Steam Sterilizer/Autoclave

- An autoclave with functioning temperature and pressure gauges for the disposal of potentially viable waste.
- Routine use of indicators to document successful sterilization with each use.
- Routine use of biological indicators to document the sterilization process.

Incubators and Refrigerators

- Temperature settings appropriate for the scope of testing.
- Temperatures recorded twice daily.

6.0 PERSONNEL

The laboratory conforms to the personnel requirements of the AIHA LAP EMLAP guidelines. In all cases training records for degreed laboratory staff shall include a copy of transcript or diploma from an accredited college/university.

Technical Manager

- The laboratory shall be under the overall direction of an onsite, qualified person, who for the purposes of this document, is designated as the Technical Manager, and has the responsibility for the function, administration, and day-to-day operation of the laboratory. The Technical Manager or designee shall serve as the approved signatory.
- The Technical Manager shall have an earned microbiology or life science degree, minimally at the baccalaureate level, with the required combination of semester hours in microbiology and/or non-academic work experience as listed below. All non-academic work experience and coursework must be documented in the employee's training and personnel files.

(a) Microbiology degree and a minimum of two (2) years of full time equivalent documented environmental microbiological work experience (bacteriology and/or mycology).

(b) Life Science degree and:

i. Twenty (20) semester hours in Microbiology and a minimum two (2) years of full time equivalent documented environmental microbiological work experience (bacteriology and/or mycology).

ii. Sixteen (16) semester hours in Microbiology and a minimum three (3) years of full time equivalent documented environmental microbiological work experience (bacteriology and/or mycology).

iii. Twelve (12) semester hours in Microbiology and a minimum four (4) years of full time equivalent documented environmental microbiological work experience (bacteriology and/or mycology).

iv. Eight (8) semester hours in microbiology and a minimum of five (5) years of full time equivalent documented environmental microbiological experience (bacteriology and/or mycology).

(c) Experience must reflect the scope of work of the laboratory.

- The Technical Manager shall be experienced in the selection and the use of bioaerosol, surface, fluid, and raw material sampling methods and in sample processing for the quantification and identification appropriate to the FoTs of mesophilic and thermophilic bacteria, and mesophilic, xerophilic, thermo tolerant fungi (molds and yeasts), and fungi identified by spore trap collection methods.

- Training records for the Technical Manager shall include documentation of ability to identify genus/group of fungi from spore trap analysis and genus/species of fungi that are reported.

Laboratory Analytical Staff
The environmental microbiological program distinguishes two titles for those conducting analytical procedures within the laboratory. An analyst is one who has a bachelor's degree and a technician is one who does not have a degree.

Laboratory Technicians

- These staff members shall have a high school diploma or General Education Development (GED) During this required training period, the trainee shall perform work (and have work reviewed prior to release) under the direct supervision of a qualified technician, analyst and/or the Technical Manager.

- Technicians may function in the same manner as analysts for Air – Direct Examination (spore trap) analysis after completion of six (6) months documented on the job training and demonstrated proficiency. For all other analyses, technicians may function in the same manner as analysts after one (1) year documented on the job training and demonstrated proficiency.

Laboratory Analysts

- These staff members shall have a bachelor's degree in a physical or biological science. Analysts shall have three (3) months of documented training for Air - Direct Examination (spore trap) and six (6) months of documented on-the-job training functioning for all other analyses as an analyst trainee. During the required analyst training period, the trainee shall be under the direct supervision of another qualified analyst and/or the Technical Manager. During this period, the trainee shall have all work reviewed prior to release by another qualified analyst and/or the Technical Manager. Training records for technicians and analysts shall include documentation of ability to identify genus/species of fungi and genus/group of fungi that are reported. Bacterial identification training records shall document training of relevant diagnostic procedures (e.g., gram stain, oxidase, biochemical reactions).

- All analysts and technicians shall have demonstrated ability to produce reliable results through accurate analysis of certified reference materials (CRMs), proficiency testing samples or in-house quality control samples. This demonstration shall be performed and documented at a minimum of every six (6) months. Laboratory Quality Assurance Coordinator

- This Quality Assurance Coordinator (QAC) of the laboratory shall possess a bachelor's degree in an applicable basic or applied science and have six (6) months of non-academic relevant and documented microbiological laboratory analysis experience. In lieu of bachelor's degree, four years of non-academic analytical experience is acceptable.

- The QAC shall have training in statistics. Additional training may consist of quality control procedures.

7.0 ANALYTICAL METHODS: See SOP's

8.0 QUALITY ASSURANCE/QUALITY CONTROL

- Routine QA/QC procedures shall be an integral part of the laboratory procedures and functions. The laboratory is in compliance with APHA-AWWA-WPCF guidelines in *Standard Methods for the Examination of Water and Wastewater*, current edition, for microbiology laboratories.

- Five (5) percent intra-analyst analysis shall be completed by each analyst to assess the precision of the analyst.

- Five (5) percent inter-analyst analysis shall be completed to assess the accuracy of the analysis performed within the laboratory.

- The laboratory shall use control charts or databases to compare intra- and inter-analyst analysis performance to established control charts.

- The laboratory shall ensure the quality control of culture media and analytical reagents per lot number for appropriate sterility, microbial growth, and/or analytical reactions. Records will be maintained and acceptance criteria will be documented.

- Acceptance Criteria on 5% replicate and duplicate analysis, daily reference slide analysis (spore traps) and monthly reference culture analysis will be documented and shall include the following:
  (a) Taxon identification acceptability
  (b) Taxon abundance ranking acceptability

(c) Count of concentration acceptability determined statistically with use of control charts or databases (Spore Traps only).

- Laboratory will maintain routine records of temperature documentation for refrigerators and incubators. Acceptance criteria will be documented.
- The laboratory maintains a microbial culture collection of common organisms relevant to the methods performed. Cultures will be from recognized sources including EMPAT rounds. The culture collection will include the source and date of acquisition.
- The culture collection will be used monthly to prepare blind cultures to be used as part of the routine QC program to monitor accuracy in culture identification.
- The laboratory has a reference slide collection with various count levels and genera/groups of spores which is maintained and used as part of total spore analysis quality control.
- Each day of analysis, at least one slide from the collection shall be reviewed by each analyst. Slides are viewed on a rotational schedule so a different slide is viewed each day until the entire slide collection is examined. Analysis of these slides is incorporated into the daily QC plan. Acceptance criteria documented.
- Statistically derived control charts with control limits are used to assess performance.
- The laboratory participates and has documentation of a round robin slide exchange of real samples consistent with AIHA LAP Policy 6A.3.2 *Requirements for Round Robin Programs*.
- Round robins include the participation of three (3) laboratories. Round robin program will consist of at least two (2) rounds per year, with each round completed within a 6-month timeframe.
- Each round will consist of four (4) samples at varying concentrations.
- Each analyst within the lab will analyze samples independently and each analyst's results will be reported.
- The round robin data will include raw counts and final concentrations for each fungal structure observed.
- Round Robin acceptance criteria shall include the organism identification, ranking, and quantification.
- A designated laboratory shall be responsible for data collection and distribution. The participating laboratories shall rotate this designation.
- A routine air monitoring program is used to verify adequate contamination control.

(a) Two (2) spore trap samples are collected each month. One (1) inside sample and One (1) outside sample are collected and compared. Acceptance criteria will be documented.

SAFETY, HEALTH, ENVIRONMENTAL AND TRANSPORTATION REGULATIONS

EETSE Atlanta adheres to all applicable federal, state, and local regulations regarding safety, health, environment or transportation. Potentially viable microbial waste shall be collected in properly designated biohazard containers and disposed of properly through autoclaving.

Attachment 4

EUROFINS ENVIRONMENT TESTING SOUTHEAST, LLC. Atlanta
ANNUAL MANAGEMENT REVIEW

REQUIRED PARTICIPANTS:

Business Unit Manager (BUMa)	Laboratory Manager
QA Manager	Technical Director
PCM Manager	Metals Lab Manager
Sample Rec. Manager	Semi-Volatile Lab Manager
Micro Bio Lab Manager	Customer Service Manager
Volatiles Lab Manage	IC Manager
Wet Chem Lab Manager	TEM Manager
PLM Manager	General Chemistry Manager
Filtration Manager	Volatile Air & Soil Manager

The review will be conducted by the BUMa with the assistance of the Quality Assurance Manager.

AGENDA

1. Follow Up-Actions from previous Management Review meetings.
    a. Changes in Policy and Procedures (QA)
    b. Facility Improvements (BUMa)

2. Quality Assurance Report:
    a. Accreditation Requirements (QA)
    b. Changes in Management Structure (Laboratory Manager)
    c. Changes/Expansion of laboratory Services (BUMa)
    d. New/Updates of Procedures/SOP's/Reference Materials (QA)
    e. Outcomes to the Assurance of the Validity of Results from
        i. Internal QC Samples; Certified or Second source Reference Materials
        ii. Proficiency Tests
        iii. Replicate Testing
        iv. Correlation of Results for different sample tests (e.g. COD / BOD ratio)
    f. Results of Risk Identification

3. Review of Performance in Quality Areas
    a. Handling of failed QC Data: Each Department Supervisor provide an overall statement of finding these errors and how they are being handled in their department as they relate to the items listed. How the lab control listed affected Quality Control Performance if relative (e.g. Pipettor EETSE Atlanta 1234 was received in April. Quarterly checks were noticeably tighter than the +/-2% acceptance criteria listed on the sheet.)
        i. General Quality Assurance (indicate ability of the equipment to meet verification frequency requirements)
            1. Balance Performance:
            2. Pipettor Performance:
            3. Hotblock Temperature Checks:

4. Thermometer Verifications:
5. Incubator Temperature Checks:
6. Annual QC Acceptance Limits Update:
7. Annual Reporting Limit Verification:
8. Annual MDL Studies (where applicable):
9. Other:

ii. Metals:

1. Balance Performance:
2. Pipettor Performance:
3. Annual QC Acceptance Limits Update:
4. Annual Reporting Limit Verification:
5. Annual MDL Studies (where applicable):
6. Linear Calibration Range Studies:
7. Quarterly Pb Contamination Checks:
8. New Personnel:
9. Other (Annual vs. Quarterly IDL Check):

iii. Metals Prep:

1. Balance Performance:
2. Pipettor Performance:
3. Hotblock Temperature Checks:
4. Annual Reporting Limit Verification:
5. Annual MDL Studies (where applicable):
6. New Personnel:
7. Other:

iv. Wet Chemistry:

1. Equipment Performance
2. Hotblock Temperature Checks:
3. Pipettor Performance:
4. Balance Performance:
5. Annual QC Acceptance Limits Update:
6. Annual Reporting Limit Verification:
7. Annual MDL Studies (where applicable):
8. Linear Calibration Range Studies (EPA 180.1):
9. New Personnel:
10. Other (Such as ongoing comparison studies):

v. IC:

1. Equipment Performance
2. Linear Range Calibration Study:
3. Hotblock Temperature Checks:
4. Pipettor Performance:
5. Balance Performance:
6. Annual QC Acceptance Limits Update (e.g. 365.1_S):

7. Annual Reporting Limit Verification:
8. Annual MDL Studies (where applicable):
9. Linear Calibration Range Studies:
10. New Personnel:
11. Other:

vi. Volatiles:

1. Equipment Performance
2. Balance Performance:
3. Annual QC Acceptance Limits Update:
4. Annual Reporting Limit Verification:
5. Annual MDL Studies (where applicable):
6. New Personnel:
7. Other (e.g. Quarterly GRO check):

vii. Semi-Volatiles/Semi-Prep:

1. Equipment Performance
2. Balance Performance:
3. Annual QC Acceptance Limits Update:
4. Annual Reporting Limit Verification:
5. Annual MDL Studies (where applicable):
6. New Personnel:
7. Other:

viii. Asbestos:

1. Microscope Performance
2. Balance Performance:
3. Microscope Alignment Calibration:
4. Monthly Air Contamination Checks:
5. New Personnel:
6. Other:

ix. Microbiology:

1. Microscope Performance
2. Balance Performance:
3. Microscope Alignment Calibration:
4. Monthly Air Contamination Checks:
5. New Personnel:
6. Other:

x. General Chemistry Manager

1. Equipment Performance
2. Balance Performance:
3. Annual QC Acceptance Limits Update:
4. Annual Reporting Limit Verification:
5. Annual MDL Studies (where applicable):
6. New Personnel:

7. Other:

xi. Filtration Manager
1. Equipment Performance
2. Balance Performance:
3. Annual QC Acceptance Limits Update:
4. Annual Reporting Limit Verification:
5. Annual MDL Studies (where applicable):
6. New Personnel:
7. Other:

xii. Volatile Air & Soil Manager
1. Equipment Performance
2. Balance Performance:
3. Annual QC Acceptance Limits Update:
4. Annual Reporting Limit Verification:
5. Annual MDL Studies (where applicable):
6. New Personnel:
7. Other:

b. Major PT Failure issues (QA)
c. Repeat and total number of deficiencies per department (Each Dept. Supervisor provide info. on repeat and total number of deficiencies related to a specific analysts or your dept. and how it is being handled, technical reprimands, etc.)
Metals:
Metals Prep:
Wet Chemistry:
IC:
Volatiles:
Semi-Volatiles:
Semi-Prep:
Asbestos:
Microbiology:
General Chemistry:
Filtration:
Volatile Air & Soil (VAS):
Sample Receiving:

4. Managerial Reports
a. Equipment Needs (Each Dept. Supervisor to provide info. on current equip./staff needs)
Metals:
Metals Prep:
Wet Chemistry:
IC:
Volatiles:

Semi-Volatiles:
Semi-Prep:
Asbestos:
Microbiology:
General Chemistry:
Filtration:
Volatile Air & Soil (VAS):
Sample Receiving:

b. Equipment Maintenance
   i. Calibration Information (Laboratory Manager)
   ii. Repair and maintenance data (Laboratory Manager)
   iii. Equipment downtime logs/review (Each Dept. Supervisor)
   Metals:
   Metals Prep:
   Wet Chemistry:
   IC:
   Volatiles:
   Semi-Volatiles:
   Semi-Prep:
   Asbestos:
   Microbiology:
   General Chemistry:
   Filtration:
   Volatile Air & Soil (VAS):
   Sample Receiving:
   iv. Resources
1. Staffing Needs (Each Dept. Supervisor/Laboratory Manager)
2. Department Training Needs (QA-Technical Director)
3. Facility and Equipment Needs (BUMa/Laboratory Manager)

5. Internal Auditing
   a. Audit Results (QA)
   b. Audit Schedule (QA)
   c. Nonconformance by Department (HR)
   d. Results of Inter-Laboratory comparisons or proficiency (QA)

6. Corrective Actions
   a. Type and source of issues (Each dept. Supervisor)
   Metals:
   Metals Prep:
   Wet Chemistry:
   IC:
   Volatiles:
   Semi-Volatiles:
   Semi-Prep:

Asbestos:
Microbiology:
General Chemistry:
Filtration:
Volatile Air & Soil (VAS):
Sample Receiving:

b. Areas most commonly having problems (QA)
c. Trends of root causes (QA)
d. Reoccurring problems (QA)
e. Summary and review of corrective action log (QA)

7. External Audit
    a. Performance Evaluation for Quality System and Technical Aspects (QA)
    b. Evaluation common weak areas from each auditing agency (QA)
8. Quality Planning
    a. Upcoming projects (Customer Service Manager)
    b. Status of ongoing projects (Customer Service Manager)
    c. Significant changes including staff/equipment/required accreditations (BUMa)
9. Customer Feedback (Customer Service Manager)
    a. Customer complaints
        i. Review of Customer Complaint Corrective Action Logs
            1. Repeated complaints
            2. Related/Unrelated issues
            3. Cause of issues identified and corrective measures followed
            4. Weekly meeting review
    b. Client satisfaction survey
10. Improvements (BUMa/Laboratory Manager)
    a. Review of Quality Policy/Objectives
    b. Review of Quality Systems effectiveness and improvement of system and services

Detail and assign responsible party time line for implementation of task.

EUROFINS ENVIRONMENT TESTING SOUTHEAST, LLC. Atlanta
ANNUAL MANAGEMENT REVIEW

My signature confirms that I participated in the Annual Management Review:

Name	Position	Date