APPENDIX A

QUALITY ASSURANCE MANUALS AND LABORATORY CERTIFICATIONS

APPENDIX A-1

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QUALITY ASSURANCE MANUAL

Quality Assurance/Quality Control Policies and Procedures

Pace Analytical Services, LLC

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1.0. INTRODUCTION AND ORGANIZATIONAL STRUCTURE

"Working together to protect our environment and improve our health"
Pace Analytical Services LLC - Mission Statement

1.1. Introduction to Pace

1.1.1. Pace Analytical Services, LLC (Pace) is a privately held, full-service analytical testing firm operating a nationwide system of laboratories. Pace offers extensive services beyond standard analytical testing, including: bioassay for aquatic toxicity, air toxics, dioxins and coplanar PCB's by high resolution mass spectrometry, radiochemical analyses, product testing, pharmaceutical testing, field services and mobile laboratory capabilities. This document defines the Quality System and Quality Assurance (QA)/Quality Control (QC) protocols.

1.1.2. Pace laboratories are capable of analyzing a full range of environmental samples from a variety of matrices, including air, surface water, wastewater, groundwater, soil, sediment, biota, and other waste products. Methods are applied from regulatory and professional sources including EPA, ASTM, USGS, NIOSH, Standard Methods, and State Agencies. Section 11 of this document is a representative listing of general analytical protocol references.

1.2. Statement of Purpose

1.2.1. To meet the business needs of our customers for high quality, cost-effective analytical measurements and services.

1.3. Quality Policy Statement and Goals of the Quality System

1.3.1. Pace management is committed to maintaining the highest possible standard of service and quality for our customers by following a documented quality system that is compliant with all current applicable state, federal, and industry standards, such as the NELAC Standard, the TNI Standard, and ISO standards and is in accordance with the stated methods and customer requirements. The overall objective of this quality system is to provide reliable data of known quality through adherence to rigorous quality assurance policies and quality control procedures as documented in this Quality Assurance Manual.

1.3.2. All personnel within the Pace network are required to be familiar with all facets of the quality system relevant to their position and implement these policies and procedures in their daily work.

1.4. Core Values

1.4.1. The following are the Pace Core Values:

- **Integrity**
- **Value Employees**
- **Know Our Customers**
- **Honor Commitments**
- **Flexible Response To Demand**
- **Pursue Opportunities**
- **Continuously Improve**

1.5. Code of Ethics and Standards of Conduct

1.5.1. **Code of Ethics**:

1.5.1.1. Each Pace employee is responsible for the propriety and consequences of his or her actions;

1.5.1.2. Each Pace employee must conduct all aspects of Company business in an ethical and strictly legal manner, and must obey the laws of the United States and of all localities, states and nations where Pace does business or seeks to do business;

1.5.1.3. Each Pace employee must reflect the highest standards of honesty, integrity and fairness on behalf of the Company with customers, suppliers, the public, and one another.

1.5.1.4. Each Pace employee must recognize and understand that our daily activities in environmental laboratories affect public health as well as the environment and that environmental laboratory analysts are a critical part of the system society depends upon to improve and guard our natural resources:

1.5.2. **Standards of Conduct:**

1.5.2.1. **Data Integrity**

1.5.2.1.1. The accuracy and integrity of the analytical results and its supporting documentation produced at Pace are the cornerstones of the company. Employees are to accurately prepare and maintain all technical records, scientific notebooks, calculations, and databases. Employees are prohibited from making false entries or misrepresentations of data for any reason.

1.5.2.1.2. Managerial staff must make every effort to ensure that personnel are free from any undue pressures that may affect the quality or integrity of their work including commercial, financial, over-scheduling, and working condition pressures.

1.5.2.1.3. The data integrity system includes in-depth, periodic monitoring of data integrity including peer data review and validation, internal raw data audits, proficiency testing studies, etc.

1.5.2.1.4. Any documentation related to data integrity issues, including any disciplinary actions involved, corrective actions taken, and notifications to customers must be retained for a minimum of five years.

1.5.2.2. **Confidentiality**

1.5.2.2.1. Pace employees must not use or disclose confidential or proprietary information except when in connection with their duties at Pace. This is effective over the course of employment and for an additional period of two years thereafter.

1.5.2.2.2. Confidential or proprietary information, belonging to either Pace and/or its customers, includes but is not limited to test results, trade secrets, research and development matters, procedures, methods, processes and standards, company-specific techniques and equipment, marketing and customer information, inventions, materials composition, etc.

1.5.2.3. **Conflict of Interest**

1.5.2.3.1. Pace employees must avoid situations that might involve a conflict of interest or could appear questionable to others. This includes participation in activities that conflict or appear to conflict with the employees' Pace responsibilities. This would also include offering or accepting anything that might influence the recipient or cause another person to

believe that the recipient may be influenced to behave or in a different manner than he would normally (such as bribes, gifts, kickbacks, or illegal payments).

1.5.2.3.2. Employees are not to engage in outside business or economic activity relating to a sale or purchase by the Company. Other problematic activities include service on the Board of Directors of a competing or supplier company, significant ownership in a competing or supplier company, employment for a competing or supplier company, or participation in any outside business during the employee's work hours.

1.5.3. Strict adherence by each Pace employee to this Code of Ethics and to the Standards of Conduct is essential to the continued vitality of Pace and to continue the pursuit of our common mission to protect our environment and improve our health.

1.5.4. Failure to comply with the Code of Ethics and Standards of Conduct will result in disciplinary action up to and including termination and referral for civil or criminal prosecution where appropriate. An employee will be notified of an infraction and given an opportunity to explain, as prescribed under current disciplinary procedures.

1.5.5. Compliance: all employees undergo annual Data Integrity/Ethics training which includes the concepts listed above. All employees also sign an annual Ethic Policy statement.

1.6. Anonymous Compliance Alertline

1.6.1. An ethical and safe workplace is important to the long-term success of Pace and the well-being of its employees. Pace has a responsibility to provide a work environment where employees feel safe and can report unethical or improper behavior in complete confidence. With this in mind, Pace has engaged Lighthouse Services, Inc. to provide all employees with access to an anonymous ethics and compliance alertline for reporting possible ethics and compliance violations. The purpose of this service is to ensure that any employee can report anonymously and without fear of retaliation.

1.6.2. Lighthouse Services provides a toll-free number along with several other reporting methods, all of which are available 24 hours a day, seven days a week for use by employees and staff.

1.6.3. Telephone: English speaking USA and Canada: (844)-970-0003.

1.6.4. Telephone: Spanish speaking North America: (800)-216-1288.

1.6.5. Website: www.lighthouse-services.com/pacelabs.

1.6.6. Email: reports@lighthouse-services.com (must include company name with report).

1.7. Laboratory Organization

1.7.1. Each laboratory within the system operates with local management, but all labs share common systems and receive support from the Corporate Office. See Attachment III for the Corporate Organizational structure.

1.7.2. A Senior General Manager (SGM) oversees all laboratories and service centers in their assigned region. Each laboratory or facility in the company is then directly managed by an SGM, a General Manager (GM), an Assistant General Manager (AGM), or an Operations Manager (OM). Quality Managers (QM) or Senior Quality Managers (SQM) at each laboratory report directly to the highest level of local laboratory management, however named, that routinely makes day-to-day decisions regarding that facility's operations. The QMs and SQMs will also receive guidance and direction from the corporate Director of Environmental Quality.

1.7.3. The SGM, GM, AGM or OM, or equivalent functionality in each facility, bears the responsibility for the laboratory operations and serves as the final, local authority in all matters. In the absence of these managers, the SQM/QM serves as the next in command, unless the manager in charge has assigned another designee. He or she assumes the responsibilities of the manager, however named, until the manager is available to resume the duties of their position. In the absence of both the manager and the SQM/QM, management responsibility of the laboratory is passed to the Technical Director, provided such a position is identified, and then to the most senior department manager until the return of the lab manager or SQM/QM. The most senior department manager in charge may include the Client Services Manager (CSM) or the Administrative Business Manager (ABM) at the discretion of the SGM/GM/AGM/OM.

1.7.4. A Technical Director who is absent for a period of time exceeding 15 consecutive calendar days shall designate another full-time staff member meeting the qualifications of the technical director to temporarily perform this function. The laboratory SGM/GM/AGM/OM or SQM/QM has the authority to make this designation in the event the existing Technical Director is unable to do so. If this absence exceeds 35 consecutive calendar days, the primary accrediting authority shall be notified in writing.

1.7.5. The SQM/QM has the responsibility and authority to ensure the Quality System is implemented and followed at all times. In circumstances where a laboratory is not meeting the established level of quality or following the policies set forth in this Quality Assurance Manual, the SQM/QM has the authority to halt laboratory operations should he or she deem such an action necessary. The SQM/QM will immediately communicate the halting of operations to the SGM/GM/AGM/OM and keep them posted on the progress of corrective actions. In the event the SGM/GM/AGM/OM and the SQM/QM are not in agreement as to the need for the suspension, the Chief Operating Officer (COO) and Director of Environmental Quality will be called in to mediate the situation.

1.7.6. The technical staff of the laboratory is generally organized into the following functional groups:

- Organic Extractions
- Wet Chemistry Analysis
- Metals Analysis
- Volatiles Analysis
- Semi-volatiles Analysis

1.7.7. The organizational structure for Pace – Indianapolis is listed in Attachment IIA and for Pace - Grand Rapids in Attachment IIB. In the event of a change in SGM/GM/AGM/OM, SQM/QM, or any Technical Director, the laboratory will notify its accrediting authorities per their individual required timeframes, not to exceed 30 days. The QAM will remain in effect until the next scheduled revision.

1.8. Laboratory Job Descriptions

1.8.1. **Senior General Manager**

- Oversees all functions of all the operations within their designated region;
- Oversees the development of local GMs/AGMs/OMs within their designated region;
- Oversees and authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Oversees the preparation of budgets and staffing plans for all operations within their designated region;
- Ensures compliance with all applicable state, federal and industry standards;
- Works closely with Regional Sales Management.

1.8.2. General Manager

- Oversees all functions of their assigned operations;
- Authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Prepares budgets and staffing plans;
- Monitors the Quality Systems of the laboratory and advises the SQM/QM accordingly;
- Presents the Ethics/Data Integrity training annually to all employees in their facilities as an instructor-led training.
- Ensures compliance with all applicable state, federal and industry standards.

1.8.4. Quality Manager

- Responsible for implementing, maintaining and improving the quality system while functioning independently from laboratory operations. Reports directly to the highest level of local laboratory facility management, however named, that routinely makes day-to-day decisions regarding laboratory operations, but receives direction and assistance from the Corporate Director of Environmental Quality;
- Ensures that communication takes place at all levels within the lab regarding the effectiveness of the quality system and that all personnel understand their contributions to the quality system;
- Monitors QA/QC activities to ensure that the laboratory achieves established standards of quality (as set forth by the Corporate Environmental Quality office). The QM is responsible for reporting the lab's level of compliance to these standards to the Corporate Director of Environmental Quality on a quarterly basis;
- Maintains records of quality control data and evaluates data quality;
- Conducts periodic internal audits and coordinates external audits performed by regulatory agencies or customer representatives;
- Reviews select laboratory data and final reports;
- Reviews tenders, contracts and QAPPs to ensure the laboratory can meet the data quality objectives for any given project;
- Reviews and maintains records of proficiency testing results;
- Maintains the document control system;
- Assists in development and implementation of appropriate training programs;
- Provides technical support to laboratory operations regarding methodology and project QA/QC requirements;
- Maintains certifications from federal and state programs;
- Ensures compliance with all applicable state, federal and industry standards;
- Maintains the laboratory training records, including those in the Learning Management System (LMS), and evaluates the effectiveness of training;
- Monitors corrective and preventive actions;
- Maintains calibration of support equipment such as balances and thermometers;
- Maintains the currency of the Quality Manual.

1.8.5. Laboratory Technical Director

- Monitors the standards of performance in quality assurance and quality control data;
- Monitors the validity of analyses performed and data generated;
- May review tenders, contracts and QAPPs to ensure the laboratory can meet the data quality objectives for any given project;

- Serves as the manager of the laboratory in the absence of the SGM/GM/AGM/OM and SQM/QM;
- Provides technical guidance in the review, development, and validation of new methodologies.

1.8.6. Administrative Business Manager

- Responsible for financial and administrative management for the entire facility;
- Provides input relative to tactical and strategic planning activities;
- Organizes financial information so that the facility is run as a fiscally responsible business;
- Works with staff to confirm that appropriate processes are put in place to track revenues and expenses;
- Provide ongoing financial information to the SGM/GM/AGM/OM and the management team so they can better manage their business;
- Utilizes historical information and trends to accurately forecast future financial positions;
- Works with management to ensure that key measurements are put in place to be utilized for trend analysis—this will include personnel and supply expenses, and key revenue and expense ratios;
- Works with SGM/GM/AGM/OM to develop accurate budget and track on an ongoing basis;
- Works with entire management team to submit complete and justified capital budget requests and to balance requests across departments;
- Works with project management team and administrative support staff to ensure timely and accurate invoicing.

1.8.7. Client Services Manager

- Oversees all the day to day activities of the Client Services Department which includes Project Management and, possibly, Sample Control;
- Responsible for staffing and all personnel management related issues for Client Services;
- Serves as the primary senior consultant to customers on all project related issues such as set up, initiation, execution and closure;
- Performs or is capable of performing all duties listed for that of Project Manager.

1.8.8. Project Manager

- Coordinates daily activities including taking orders, reporting data and analytical results;
- Serves as the primary technical and administrative liaison between customers and Pace;
- Communicates with operations staff to update and set project priorities;
- Provides results to customers in the requested format (verbal, hardcopy, electronic, etc.);
- Works with customers, laboratory staff, and other appropriate Pace staff to develop project statements of work or resolve problems of data quality;
- Responsible for solicitation of work requests, assisting with proposal preparation and project initiation with customers and maintain customer records;
- Mediation of project schedules and scope of work through communication with internal resources and management;
- Responsible for preparing routine and non-routine quotations, reports and technical papers;
- Interfaces between customers and management personnel to achieve customer satisfaction;
- Manages large-scale complex projects;
- Supervises less experienced project managers and provide guidance on management of complex projects;

- Arranges bottle orders and shipment of sample kits to customers;
- Verifies login information relative to project requirements and field sample Chains-of-Custody;
- Enters project and sample information in the Laboratory Information Management System (LIMS) for scheduling, tracking and reporting purposes.

1.8.9. **Project Coordinator**

- Enters project and sample information in the Laboratory Information Management System (LIMS) for scheduling, tracking and reporting purposes.

1.8.10. **Department Manager/Supervisor**

- Oversees the day-to-day production and quality activities of their assigned department;
- Ensures that quality assurance and quality control criteria of analytical methods and projects are satisfied;
- Assesses data quality and takes corrective action when necessary;
- Approves and releases technical and data management reports;
- Trains analysts or oversees training of analysts in laboratory operations and analytical procedures;
- Ensures compliance with all applicable state, federal and industry standards.

1.8.11. **Quality Assurance Analyst**

- Assists the SQM/QM in the performance of quality department responsibilities as delegated by the SQM/QM;
- Reviews select laboratory data and final reports;
- Generates and reviews QC data validation packages;
- Assists in monitoring QA/QC data;
- Assists in internal audits;
- Assists in maintaining training records;
- Assists in maintaining the document control system.

1.8.12. **Group Supervisor/Leader**

- Trains analysts in laboratory operations and analytical procedures;
- Organizes and schedules analyses with consideration for sample holding times;
- Implements data verification procedures by assigning data verification duties to appropriate personnel;
- Evaluates instrument performance and supervises instrument calibration and preventive maintenance programs;
- Reports non-compliance situations to laboratory management including the SQM/QM.

1.8.13. **Laboratory Analyst**

- Performs detailed preparation and analysis of samples according to published methods and laboratory procedures;
- Processes and evaluates raw data obtained from preparation and analysis steps;
- Generates final results from raw data, performing primary review against method criteria;

- Monitors quality control data associated with analysis and preparation. This includes examination of raw data such as chromatograms as well as an inspection of reduced data, calibration curves, and laboratory notebooks;
- Reports data in LIMS, authorizing for release pending secondary approval;
- Conducts routine and non-routine maintenance of equipment as required;
- Performs or is capable of performing all duties associated with that of Laboratory Technician.

1.8.14. **Laboratory Technician**

- Prepares standards and reagents according to published methods or in house procedures;
- Performs preparation and analytical steps for basic laboratory methods;
- Works under the direction of a Laboratory Analyst on complex methodologies;
- Assists Laboratory Analysts on preparation, analytical or data reduction steps for complex methodologies;
- Monitors quality control data as required or directed. This includes examination of raw data such as chromatograms as well as an inspection of reduced data, calibration curves, and laboratory notebooks.

1.8.15. **Field Technician**

- Prepares and samples according to published methods, PACE Quality Assurance Manual and/or customer directed sampling objectives;
- Capable of the collection of representative environmental or process samples;
- Reviews project documentation for completeness, method compliance and contract fulfillment;
- Train less experienced environmental technicians and provide guidance on sampling and analysis;
- Responsible for project initiation and contact follow-up;
- Develop sampling plans and prepare test plan documents.

1.8.16. **Sample Receiving Personnel**

- Signs for incoming samples and verifies the data entered on the Chain of custody forms;
- Stages samples according to EPA requirements;
- Assists Project Managers and Coordinators in filling bottle orders and sample shipments;
- May enter project and sample information in the Laboratory Information Management System (LIMS) for scheduling, tracking and reporting purposes;
- Manages sample storage areas and sample disposal procedures.

1.8.17. **Systems Administrator or Systems Manager**

- Assists with the creation and maintenance of electronic data deliverables (EDDs);
- Coordinates the installation and use of all hardware, software and operating systems;
- Performs troubleshooting on all aforementioned systems;
- Trains new and existing users on systems and system upgrades;
- Maintains all system security passwords;
- Maintains the electronic backups of all computer systems.

1.8.18. **Safety/Chemical Hygiene Officer**

- Maintains the laboratory Chemical Hygiene Plan;
- Plans and implements safety policies and procedures;
- Maintains safety records;
- Organizes and/or performs safety training;
- Performs safety inspections and provides corrective/preventative actions;
- Assists personnel with safety issues.

1.8.19. **Hazardous Waste Coordinator**

- Evaluates waste streams and helps to select appropriate waste transportation and disposal companies;
- Maintains complete records of waste disposal including waste manifests and state reports;
- Assists in training personnel on waste-related issues such as waste handling and storage, waste container labeling, proper satellite accumulation, secondary containment, etc.;
- Conducts a weekly inspection of the waste storage areas of the laboratory.

1.9. Training and Orientation

1.9.1. Training for Pace employees is managed through web-based training systems. Employees are provided with several training activities for their particular job description and scope of duties. These training activities may include:

- Hands-on training led by supervisors;
- Job-specific training checklists and worksheets;
- Lectures and instructor-led training sessions;
- Method-specific training;
- External conferences and seminars;
- Reading Standard Operating Procedures (SOPs);
- Reading the Quality Assurance Manual and Safety Manual/Chemical Hygiene Plan;
- Core training modules (basic lab skills, etc.);
- Quality system training modules (support equipment use, corrective actions/root causes, etc.);
- Data Integrity/Ethics training;
- Specialized training by instrument manufacturers;
- On-line courses.

1.9.2. All procedures and training records are maintained and available for review during laboratory audits. Additional information can be found in the *Training Procedures* SOP or its equivalent replacement.

1.10. Laboratory Safety and Waste

1.10.1. It is the policy of Pace to make safety and waste compliance an integral part of daily operations and to ensure that all employees are provided with safe working conditions, personal protective equipment, and requisite training to do their work without injury. Each employee is responsible for his/her own safety as well as those working in the immediate area by complying with established company rules and procedures. These rules and procedures as well as a more detailed

description of the employees' responsibilities are contained in the local Safety Manual/Chemical Hygiene Plan.

1.11. Security and Confidentiality

1.11.1. Security is maintained by controlled access to laboratory buildings. Exterior doors to laboratory buildings remain either locked or continuously monitored by Pace staff. Keyless door locks are accessible only to authorized personnel through the use of assigned key fobs. All visitors, including PACE staff from other facilities, must sign the Visitor's Logbook maintained by the receptionist. A staff member will accompany them during the duration of their stay on the premises unless the SGM/GM/AGM/OM, SQM/QM, or Technical Director specify otherwise. In this instance, the staff member will escort the visitor back to the reception area at the end of his/her visit where he/she signs out.

1.11.2. Additional security is provided where necessary, (e.g., specific secure areas for sample, data, and customer report storage), as requested by customers, or cases where national security is of concern. These areas are lockable within the facilities, or are securely offsite. Access is limited to specific individuals or their designees.

1.11.3. All information pertaining to a particular customer, including national security concerns will remain confidential. Data will be released to outside agencies only with written authorization from the customer or where federal or state law requires the company to do so.

1.12. Communications

1.12.1. Management within each lab bears the responsibility of ensuring that appropriate communication processes are established and that communication takes place regarding the effectiveness of the management/quality system. These communication processes may include email, regular staff meetings, senior management meetings, etc.

1.12.2. Corporate management bears the responsibility of ensuring that appropriate communication processes are established within the network of facilities and that communication takes place at a company-wide level regarding the effectiveness of the management/quality systems of all Pace facilities. These communication processes may include email, quarterly continuous improvement conference calls for all lab departments, and annual continuous improvement meetings for all department supervisors, quality managers, client services managers, and other support positions.

2.0. SAMPLE CUSTODY

2.1. Project Initiation

2.1.1. Prior to accepting new work, the laboratory reviews its performance capability. The laboratory confirms that sufficient personnel, equipment capacity, analytical method capability, etc., are available to complete the required work. Customer needs, certification requirements, and data quality objectives are defined and the appropriate sampling and analysis plan is developed to meet the project requirements by project managers or sales representatives. Members of the management staff review current instrument capacity, personnel availability and training, analytical procedures capability, and projected sample load. Management then informs the sales and client services personnel whether or not the laboratory can accept the new project via written correspondence, email, and/or daily operations meetings.

2.1.2. Additional information regarding specific procedures for reviewing new work requests can be found in the *Review of Analytical Requests* SOP or its equivalent replacement.

2.2. Sampling Materials and Support

2.2.1. Each individual Pace laboratory provides shipping containers, properly preserved sample containers, custody documents, and field quality control samples to support field-sampling events. Guidelines for sample container types, preservatives, and holding times for a variety of methods are listed in Attachment VIII. Note that all analyses listed are not necessarily performed at all Pace laboratories and there may be additional laboratory analyses performed that are not included in these tables. Customers are encouraged to contact their local Pace Project Manager for questions or clarifications regarding sample handling. Pace may provide pick-up and delivery services to their customers when needed.

2.2.2. Some Pace facilities provide sampling support through a Field Services department. Field Services operates under the Pace Corporate Quality System, with applicable and necessary provisions to address the activities, methods, and goals specific to Field Services. All procedures and methods used by Field Services are documented in SOPs and Procedure Manuals.

2.3. Chain of Custody

2.3.1. A chain of custody (COC) provides the legal documentation of samples from time of collection to completion of analysis.

2.3.2. Field personnel or client representatives must complete a COC for all samples that are received by the laboratory. Samplers are required to properly complete a COC. This is critical to efficient sample receipt and to ensure the requested methods are used to analyze the correct samples. If sample shipments are not accompanied by the correct documentation, the Sample Receiving department notifies a Project Manager. The Project Manager then obtains the correct documentation/information from the customer in order for analysis of samples to proceed.

2.3.3. The COC is filled out completely and legibly with indelible ink. Errors are corrected by drawing a single line through the initial entry and initialing and dating the change. All transfers of samples are recorded on the chain of custody in the "relinquished" and "received by" sections. All information except signatures is printed.

2.3.4. Additional information can be found in the *Sample Management* SOP or its equivalent replacement.

2.4. Sample Acceptance Policy

2.4.1. In accordance with regulatory guidelines, Pace complies with the following sample acceptance policy for all samples received.

2.4.2. If the samples do not meet the sample receipt acceptance criteria outlined below, the laboratory is required to document all non-compliances, contact the customer, and either reject the samples or fully document any decisions to proceed with analyses of samples which do not meet the criteria. Any results reported from samples not meeting these criteria are appropriately communicated to the client.

2.4.3. Sample Acceptance Policy requirements:

- Sample containers must have unique client identification designations that are clearly marked with indelible ink on durable, water-resistant labels. The client identifications must match those on the chain-of-custody (COC).
- There must be clear documentation on the COC, or related documents that lists the unique sample identification, sampling site location, date and time of sample collection, and name of the sample collector.
- There must be clear documentation on the COC, or related documents that lists the requested analyses, the preservatives used, and any special remarks concerning the samples (i.e., data deliverables, samples are for evidentiary purposes, field filtration, etc.).
- Samples must be in appropriate sample containers. If the sample containers show signs of damage (i.e., broken or leaking) or if the samples show signs of contamination, the samples will not be processed without prior client approval.
- Samples must be correctly preserved upon receipt, unless the method requested allows for laboratory preservation. If the samples are received with inadequate preservation, and the samples cannot be preserved by the lab appropriately, the samples will not be processed without prior client approval.
- Samples must be received within required holding time. Any samples with hold times that are exceeded will not be processed without prior client approval.
- Samples must be received with sufficient sample volume or weight to proceed with the analytical testing. If insufficient sample volume or weight is received, analysis will not proceed without client approval.
- All samples that require thermal preservation are considered acceptable if they are received at a temperature within 2°C of the required temperature, or within the method-specified range. For samples with a required temperature of 4°C, samples with a temperature ranging from just above freezing to 6°C are acceptable. Samples that are delivered to the lab on the same day they are collected are considered acceptable if the samples are received on ice. Any samples that are not received at the required temperature will not be processed without prior client approval.
- Samples for **drinking water compliance** analyses will be rejected at the time of receipt if they are not received in a secure manner, are received in inappropriate containers, are received outside the required temperature range, are received outside the recognized holding time, are received with inadequate identification on sample containers or COC, or are improperly preserved (with the exception of VOA samples- tested for pH at time of analysis and TOC- tested for pH in the field).
- Some specific clients may require custody seals. **For these clients**, samples or coolers that are not received with the proper custody seals will not be processed without prior client approval.

Note 1: Temperature will be read and recorded based on the precision of the measuring device. For example, temperatures obtained from a thermometer graduated to 0.1°C will be read and recorded to ± 0.1°C. Measurements obtained from a thermometer graduate to 0.5°C will be read to ± 0.5°C. Measurements read at the specified precision are not to be rounded down to meet the ≤ 6°C limit. Please reference the Support Equipment SOP for more information.

Note 2: Some microbiology methods allow sample receipt temperatures of up to 10°C. Consult the specific method for microbiology samples received above 6°C prior to initiating corrective action for out of temperature preservation conditions.

2.4.4. Upon sample receipt, the following items are also checked and recorded:

- Presence of custody seals or tapes on the shipping containers;
- Sample condition: Intact, broken/leaking, bubbles in VOA samples;
- Sample holding time;
- Sample pH and residual chlorine when required;
- Appropriate containers.

2.4.5. Additional information can be found in the *Sample Management* SOP or its equivalent replacement.

2.5. Sample Log-in

2.5.1. After sample inspection, all sample information on the COC is entered into the Laboratory Information Management System (LIMS). The lab's permanent records for samples received include the following information:

- Customer name and contact
- Customer number
- Pace Analytical project number
- Pace Analytical Project Manager
- Sample descriptions
- Due dates
- List of analyses requested
- Date and time of laboratory receipt
- Field ID code
- Date and time of collection
- Any comments resulting from inspection for sample rejection

2.5.2. If the time collected for any sample is unspecified and Pace is unable to obtain this information from the customer, the laboratory will use 08:00 as the time sampled. All hold times will be based on this sampling time and qualified accordingly if exceeded.

2.5.3. The LIMS automatically generates a unique identification number for each sample created in the system. The LIMS sample number follows the general convention of 50XXXXXX. This unique identification number is placed on the sample container as a durable label and becomes the link between the laboratory's sample management system and the customer's field identification; it will be a permanent reference number for all future interactions.

2.5.4. Sample labels are printed from the LIMS and affixed to each sample container.

2.5.5. Additional information can be found in the *Sample Management* SOP or its equivalent replacement.

2.6. Sample Storage

2.6.1. Additional information on sample storage can be found in the *Sample Management* SOP or its equivalent replacement and in the *Waste Handling and Management* SOP or its equivalent replacement.

2.6.2. **Storage Conditions**

2.6.2.1. Samples are stored away from all standards, reagents, or other potential sources of contamination. Samples are stored in a manner that prevents cross contamination. Volatile samples are stored separately from other samples. All sample fractions, extracts, leachates, and other sample preparation products are stored in the same manner as actual samples or as specified by the analytical method.

2.6.2.2. Storage blanks are stored with volatile samples and are used to measure cross-contamination acquired during storage. Laboratories must have documented procedures and criteria for evaluating storage blanks, appropriate to the types of samples being stored.

2.6.2.3. Additional information can be found in the *Monitoring Temperature Controlled Units* SOP or its equivalent replacement**.**

2.6.3. **Temperature Monitoring**

2.6.3.1. Samples are taken to the appropriate storage location immediately after sample receipt and check-in procedures are completed. All sample storage areas are located in limited access areas and are monitored to ensure sample integrity.

2.6.3.2. The temperature of each refrigerated storage area is maintained at $\leq 6^{\circ}C$ but above freezing unless state, method or program requirements differ. The temperature of each freezer storage area is maintained at $\leq -10^{\circ}C$ unless state, method or program requirements differ. The temperature of each storage area is checked and documented each day of use. If the temperature falls outside the acceptable limits, the following corrective actions are taken and appropriately documented:

- The temperature is rechecked after a period of time, usually two hours, to verify temperature exceedance. Corrective action is initiated and documented if necessary.
- The SQM/QM and/or laboratory management are notified if the problem persists.
- The samples are relocated to a proper environment if the temperature cannot be maintained after corrective actions are implemented.
- The affected customers are notified and/or documentation is provided on the final report, if necessary.

2.6.3.3. Additional information can be found in the *Monitoring Temperature Controlled Units* SOP or its equivalent replacement.

2.6.4. **Hazardous Materials**

2.6.4.1. Samples designated by clients upon receipt as pure product or potentially heavily contaminated samples, or samples found to be designated as such following analysis, must be labeled to indicate the hazard and stored separately from other samples.

2.6.5. **Foreign/Quarantined Soils**

2.6.5.1. Foreign soils and soils from domestic USDA quarantined areas must be adequately segregated to prevent cross-contamination and enable proper sample disposal. The USDA requires these samples and by-products to be properly identified and handled and to be treated by an approved procedure prior to disposal or as part of disposal.

2.6.5.2. Additional information regarding USDA regulations and sample handling can be found in the laboratory's *Regulated Soil Handling* SOP or its equivalent replacement.

2.7. Subcontracting Analytical Services

2.7.1. Every effort is made to perform all analyses for Pace customers within the laboratory that receives the samples. When subcontracting to a laboratory other than the receiving laboratory, whether inside or outside the Pace network becomes necessary, a preliminary verbal communication with that laboratory is undertaken. Customers are notified in writing of the laboratory's intention to subcontract any portion of the testing to another laboratory. Work performed under specific protocols may involve special considerations. When possible, subcontracting will be to a TNI-accredited laboratory.

2.7.2. Potential subcontract laboratories must be approved by Pace based on the criteria listed in SOP S-IN-C-003 *Subcontracting Samples* or its equivalent revision or replacement. All sample reports from the subcontracted labs are appended to the applicable Pace final reports.

2.7.3. Any Pace work sent to other labs within the Pace network is handled as inter-regional work and all final reports are labeled clearly with the name of the laboratory performing the work. Any non-TNI work is clearly identified. Pace will not be responsible for analytical data if the subcontract laboratory was designated by the customer.

2.7.4. Additional information can be found in the *Subcontracting Samples* SOP or its equivalent replacement.

2.8. Sample Retention and Disposal

2.8.1. Samples, extracts, digestates, and leachates must be retained by the laboratory for the period of time necessary to protect the interests of the laboratory and the customer.

2.8.2. The minimum sample retention time is 45 days from receipt of the samples. Samples requiring thermal preservation may be moved to ambient temperature storage when the hold time is expired, when the report has been delivered, and/or when allowed by the customer, program, or contract. Samples requiring storage beyond the minimum sample retention time due to special requests or contractual obligations may be stored at ambient temperature unless the laboratory has sufficient capacity and their presence does not compromise the integrity of other samples.

2.8.3. After this period expires, non-hazardous samples are properly disposed of as non-hazardous waste. The preferred method for disposal of **hazardous** samples is to return the excess sample to the customer. If it is not feasible to return samples, or the customer requires Pace to dispose of excess samples, proper arrangements will be made for disposal by an approved contractor.

2.8.4. Additional information can be found in the *Waste Handling and Management* SOP and the *Sample Management* SOP or their equivalent replacements.

3.0. QUALITY CONTROL PROCEDURES

3.1. Quality Control Samples

3.1.1. The quality control samples described in this section are analyzed per batch as applicable to the method used. Acceptance criteria must be established for all quality control samples and if the acceptance criteria are not met, corrective actions must be performed and samples reanalyzed, or the final report must be appropriately qualified.

3.1.2. Quality control samples must be processed in the same manner as associated client samples.

3.1.3. Please reference the glossary of this Quality Manual for definitions of all quality control samples mentioned in this section.

3.1.4. Any deviations to the policies and procedures governing quality control samples must be approved by the QM/SQM.

3.2. Method Blank

3.2.1. A method blank is a negative control used to assess the preparation/analysis system for possible contamination and is processed through all preparation and analytical steps with its associated client samples. The method blank is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples. Method blanks are not applicable for certain analyses (i.e., pH, flash point, temperature, etc.).

3.2.2. Each method blank is evaluated for contamination. Corrective actions for blank contamination may include the re-preparation and re-analysis of all samples (where possible) and quality control samples. Data qualifiers must be applied to results that are affected by contamination in a method blank.

3.2.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for method blanks.

3.3. Laboratory Control Sample

3.3.1. The Laboratory Control Sample (LCS) is a positive control used to assess the performance of the entire analytical system including preparation and analysis. The LCS is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples.

3.3.2. The LCS contains all analytes required by a specific method or by the customer or regulatory agency, which may not include the full list of target compounds. In the absence of specified components, the laboratory will spike the LCS with the following compounds:

- For multi-peak analytes (e.g. PCBs, technical chlordane, toxaphene), a representative standard will be processed.
- For methods with long lists of analytes, a representative number of target analytes may be chosen. The following criteria is used to determine the number of LCS compounds used:
    - For methods with 1-10 target compounds, the laboratory will spike with all compounds;
    - For methods with 11-20 target compounds, the laboratory will spike with at least 10 compounds or 80%, whichever is greater;
    - For methods with greater than 20 compounds, the laboratory will spike with at least 16 compounds.

3.3.3. The LCS is evaluated against the method default or laboratory-derived acceptance limits. Any compound that is outside of these limits is considered to be 'out of control' and must be qualified appropriately. Any sample containing a compound that was 'out-of-control' in the associated LCS must either be re-analyzed with a successful LCS or reported with the appropriate data qualifier. When the result of the LCS exceeds the upper control limit, indicating high bias, associated samples determined to be non-detect may be reported without qualification.

3.3.4. For LCSs containing a large number of analytes, it is statistically likely that a few recoveries will be outside of control limits. This does not necessarily mean that the system is out of control, and therefore no corrective action would be necessary other than proper documentation. TNI has allowed for a minimum number of marginal exceedances, defined as recoveries that are beyond the LCS control limits (3X the standard deviation) but within than the marginal exceedance limits (4X the standard deviation). The number of allowable exceedances depends on the number of compounds in the LCS. If more analyte recoveries exceed the LCS control limits than is allowed (see below) or if any one analyte exceeds the marginal exceedance limits, then the LCS is considered non-compliant and corrective actions are necessary. The number of allowable exceedances is as follows:

- >90 analytes in the LCS- 5 analytes
- 71-90 analytes in the LCS- 4 analytes
- 51-70 analytes in the LCS- 3 analytes
- 31-50 analytes in the LCS- 2 analytes
- 11-30 analytes in the LCS- 1 analyte
- <11 analytes in the LCS- no analytes allowed out)

3.3.5. A matrix spike (MS) can be used in place of a non-compliant LCS in a batch as long as the MS passes the LCS acceptance criteria. When this happens, full documentation must be made available to the data user. If this is not allowed by a customer or regulatory body, the associated samples must be rerun with a compliant LCS when possible or reported with appropriate data qualifiers.

3.3.6. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for LCSs.

3.4. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

3.4.1. A matrix spike (MS) is a positive control used to determine the effect of the sample matrix on compound recovery for a particular method. A matrix spike/matrix spike duplicate (MS/MSD) set or matrix spike/sample duplicate set is processed at a frequency specified in a particular method or as determined by a specific customer request. The MS and MSD consist of the sample matrix that is spiked with known concentrations of target analytes.

3.4.2. The MS and MSD contain all analytes required by a specific method or by the customer or regulatory agency. In the absence of specified components, the laboratory will spike the MS/MSD with the same number of compounds as previously discussed in the LCS section.

3.4.3. A matrix spike and sample duplicate will be performed instead of a matrix spike and matrix spike duplicate when specified by the customer or method or when limited sample volume or weight prohibits the analysis of an MS/MSD set.

3.4.4. The MS and MSD are evaluated against the method or laboratory derived limits. Any compound that is outside of these limits is considered to be 'out of control' and must be qualified appropriately. Batch acceptance; however, is based on method blank and LCS performance, not on

MS/MSD recoveries. The spike recoveries give the data user a better understanding of the final results based on their site-specific information.

3.4.5. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for MS/MSDs.

3.5. Sample Duplicate

3.5.1. A sample duplicate is a second portion of sample that is prepared and analyzed in the laboratory along with the first portion. It is used to measure the precision associated with preparation and analysis. A sample duplicate is processed at a frequency specified by the particular method or as determined by a specific customer.

3.5.2. The sample and duplicate are evaluated against the method or laboratory limits for relative percent difference (RPD). Any duplicate that is outside of these limits is considered to be 'out of control' and must be qualified appropriately.

3.5.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for sample duplicates.

3.6. Surrogates

3.6.1. Surrogates are compounds that reflect the chemistry of target analytes and are added to samples for most organic analyses to measure the extraction efficiency or purge efficiency and to monitor the effect of the sample matrix on surrogate compound recovery.

3.6.2. The surrogates are evaluated against the method or laboratory derived acceptance limits. Any surrogate compound that is outside of these limits is considered to be 'out of control' and must be qualified appropriately. Samples with surrogate failures are typically re-extracted and/or re-analyzed to confirm that the out-of-control value was caused by the matrix of the sample and not by some other systemic error. An exception to this would be samples that have surrogate recoveries that exceed the upper control limit but have no reportable hits for target compounds. These samples would be reported and qualified to indicate the implied high bias would not affect the final results.

3.6.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for surrogates.

3.7. Internal Standards

3.7.1. Internal Standards are method-specific analytes that are added, as applicable, to every standard, QC sample, and client sample at a known concentration, prior to analysis for the purpose of adjusting the response factor used in quantifying target analytes.

3.7.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for internal standards.

3.8. Limit of Detection (LOD)

3.8.1. Pace laboratories use a documented procedure to determine a limit of detection (LOD) for each analyte of concern in each matrix reported. Unless otherwise noted in a published method, the procedure used by Pace laboratories to determine LODs is based on the Method Detection Limit (MDL) procedure outlined in 40 CFR Part 136, Appendix B, August 28, 2017. All sample

processing steps of the preparation and analytical methods are included in the LOD determination including any clean ups.

3.8.2. Additional information can be found in the *Determination of Detection and Quantitation Limits* SOP or its equivalent replacement.

3.9. Limit of Quantitation (LOQ)

3.9.1. A limit of quantitation (LOQ) for every analyte of concern must be determined. For Pace laboratories, this LOQ is referred to as the RL, or Reporting Limit. The RL may or may not be based on the lowest calibration standard concentration used in the initial calibration. Results below the lowest calibration level may not be reported without qualification since the results would not be substantiated by a calibration standard. For methods with a determined LOD, results can be reported below the LOQ but above the LOD if they are properly qualified (e.g., J flag).

3.9.2. Additional information can be found in the *Determination of Detection and Quantitation Limits* SOP or its equivalent replacement.

3.10. Estimate of Analytical Uncertainty

3.10.1. Pace can provide an estimation of uncertainty for results generated by the laboratory. The estimate quantifies the error associated with any given result at a 95% confidence interval. This estimate does not include bias that may be associated with sampling or sample matrix. The laboratory has a procedure in place for making this estimation. In the absence of a regulatory or customer-specific procedure, Pace laboratories base this estimation on the recovery data obtained from the Laboratory Control Samples (LCS). The uncertainty is a function of the standard deviation of the recoveries multiplied by the appropriate Student's t Factor at 95% confidence. Additional information pertaining to the estimation of uncertainty and the exact manner in which it is derived are contained in the *Estimation of Measurement Uncertainty* SOP or its equivalent replacement.

3.10.2. The measurement of uncertainty is provided only on request by the customer, as required by specification or regulation and when the result is used to determine conformance within a specification limit.

3.11. Proficiency Testing (PT) Studies

3.11.1. Pace laboratories participate in a defined proficiency testing (PT) program. PT samples are obtained from NIST-approved providers and analyzed and reported a minimum of two times per year for the relevant fields of testing per matrix.

3.11.2. The laboratory initiates an investigation whenever PT results are determined to be "Not Acceptable" by the PT provider. All findings and corrective actions taken are reported to the SQM/QM or their designee. A corrective action plan is initiated and, when required, this report is sent to the appropriate state accreditation agencies for their review. Additional PTs will be analyzed and reported as needed for certification purposes.

3.11.3. Additional information can be found in the *Proficiency Testing Program* SOP or its equivalent replacement.

3.12. Rounding and Significant Figures

3.12.1. In general, Pace laboratories report data to no more than three significant figures. The rounding rules listed below are descriptive of the LIMS and not necessarily of any supporting program such as Excel.

3.12.2. **Rounding:** Pace - Indianapolis follows the odd / even guidelines for rounding numbers:

- If the figure following the one to be retained is less than five, that figure is dropped and the retained ones are not changed (with three significant figures, 2.544 is rounded to 2.54).
- If the figure following the ones to be retained is greater than five, that figure is dropped and the last retained one is rounded up (with three significant figures, 2.546 is rounded to 2.55).
- If the figure following the ones to be retained is five and if there are no figures other than zeros beyond that five, then the five is dropped and the last figure retained is unchanged if it is even and rounded up if it is odd (with three significant figures, 2.525 is rounded to 2.52 and 2.535 is rounded to 2.54).

3.12.3. **Significant Figures**

3.12.3.1. Pace - Indianapolis observes the following convention for reporting to a specified number of significant figures. Unless specified by federal, state, or local requirements or on specific request by a customer, the laboratory reports:

Values > 10 – Reported to 3 significant figures
Values ≤ 10 – Reported to 2 significant figures

3.13. Retention Time Windows

3.13.1. When chromatographic conditions are changed, retention times and analytical separations are often affected. As a result, two critical aspects of any chromatographic method are the determination and verification of retention times and analyte separation. Retention time windows must be established for the identification of target analytes. The retention times of all target analytes in all calibration verification standards must fall within appropriately determined retention time windows. If an analyte falls outside the retention time window in an ICV or CCV, new absolute retention time windows must be calculated, unless instrument maintenance fixes the problem. New retention time windows must be established when column geometry is affected by maintenance.

3.13.2. Please reference method-specific SOPs for the proper procedure for establishing retention time windows.

3.14. Analytical Method Validation and Instrument Validation

3.14.1. In some situations, Pace develops and validates methodologies that may be more applicable to a specific problem or objective. When non-standard methods are required for specific projects or analytes of interest, when the laboratory develops or modifies a method, or when the laboratory brings new instrumentation online, the laboratory validates the method and/or instrument prior to applying it to customer samples. Method validity is established by meeting criteria for precision and accuracy as established by the data quality objectives specified by the end user of the data. The laboratory records the validation procedure, the results obtained and a statement as to the usability of the method. The

minimum requirements for method or instrument validation include evaluation of sensitivity, quantitation, precision, bias, and selectivity of each analyte of interest.

3.15. Regulatory and Method Compliance

3.15.1. It is Pace policy to disclose in a forthright manner any detected noncompliance affecting the usability of data produced by our laboratories. The laboratory will notify customers within 30 days of fully characterizing the nature of the nonconformance, the scope of the nonconformance and the impact it may have on data usability.

4.0. DOCUMENT MANAGEMENT AND CHANGE CONTROL

4.1. Document Management

4.1.1. Additional information can be found in the *Document Control and Management* SOP or its equivalent replacement. Information on Pace's policy for electronic signatures can also be found in this SOP.

4.1.2. Pace has an established procedure for managing documents that are part of the quality system.

4.1.3. A master list of managed documents is maintained at each facility identifying the current revision status and distribution of any controlled documents.

4.1.4. Each managed document is uniquely identified to include the date of issue, the revision identification, page numbers, the total number of pages and the issuing authorities. For complete information on document numbering, refer to the *Document Numbering* SOP or its equivalent replacement.

4.1.5. **Quality Assurance Manual (QAM):** The Quality Assurance Manual is the company-wide document that describes all aspects of the quality system for Pace. The base QAM template is distributed by the Corporate Environmental Quality Department to each of the SQMs/QMs. The local management personnel modify the necessary and permissible sections of the base template then applicable lab staff will sign the Quality Assurance Manual. Each SQM/QM is then in charge of distribution to employees, external customers or regulatory agencies and maintaining a distribution list of controlled document copies. The Quality Assurance Manual template is reviewed on an annual basis and revised accordingly by the Corporate Quality office.

4.1.6. **Standard Operating Procedures (SOPs)**

4.1.6.1. SOPs are reviewed every two years at a minimum; although, a more frequent review may be required by some state or federal agencies, programs, or customers. If no revisions are made based on this review, documentation of the review itself is made by the addition of new signatures on the cover page. If revisions are made, documentation of the revisions is made in the revisions section of each SOP and a new revision number is applied to the SOP. This provides a historical record of all revisions.

4.1.6.2. All copies of superseded SOPs are removed from general use and the original copy of each SOP is archived for audit or knowledge preservation purposes. This ensures that all Pace employees use the most current version of each SOP and provides the SQM/QM with a historical record of each SOP.

4.1.6.3. Additional information can be found in the *Preparation of SOPs* SOP or its equivalent replacement.

4.2. Document Change Control

4.2.1. Additional information can be found in the *Document Control and Management* SOP or its equivalent replacement.

4.2.2. Changes to managed documents are reviewed and approved in the same manner as the original review. Any revision to a document requires the approval of the applicable signatories. After revisions are approved, a revision number is assigned and the previous version of the document is officially retired.

4.2.3. All copies of the previous document are replaced with copies of the revised document and the superseded copies are destroyed or archived. All affected personnel are advised that there has been a revision and any necessary training is scheduled.

5.0. EQUIPMENT AND MEASUREMENT TRACEABILITY

5.1. Standards and Traceability

5.1.1. Each Pace facility retains pertinent information for standards, reagents, and chemicals to assure traceability to a national standard. This includes documentation of purchase, receipt, preparation, and use.

5.1.2. Upon receipt, all purchased standard reference materials are recorded into a standard logbook or database and assigned a unique identification number. The entries include the facility's unique identification number, the chemical name, manufacturer name, manufacturer's identification numbers, receipt date, and expiration date. Vendor's certificates of analysis for all standards, reagents, or chemicals are retained for future reference.

5.1.3. Subsequent preparations of intermediate or working solutions are also documented in a standard logbook or database. These entries include the stock standard name and lot number, the manufacturer name, the solvents used for preparation, the solvent lot number and manufacturer, the preparation steps, preparation date, expiration dates, preparer's initials, and a unique Pace identification number. This number is used in any applicable sample preparation or analysis logs so the standard can be traced back to the standard preparation record. This process ensures traceability back to the national standard.

5.1.4. Prepared standard or reagent containers include the Pace identification number, the standard or chemical name, and expiration date. The date of preparation, concentration with units, and the preparer's initials can be determined by tracing the standard or reagent ID through the standard log database.

5.1.5. Initial calibrations must be verified with a standard obtained from a second manufacturer or a separate lot prepared independently by the same manufacturer, unless client-specific QAPP requirements state otherwise.

5.1.6. Reference standards and reference materials must be handled, stored, and maintained in a manner that prevents contamination and/or deterioration. Reference standards and reference materials must be stored per manufacturer's recommendations to avoid degradation and stored away from other materials that could contaminate them. Handle reference standards and reference materials with care to avoid evaporation, contamination, degradation or concentration of the material. If it is necessary to package and transport or ship any reference standard or reference material, consult with the manufacturer for proper packaging, labeling and shipping instructions to prevent damage, contamination or deterioration.

5.1.7. Additional information concerning the procurement of standards and reagent and their traceability can be found in the *Standard and Reagent Management and Traceability* SOP or its equivalent replacement.

5.2. General Analytical Instrument Calibration Procedures

5.2.1. Applicable instrumentation are calibrated or checked before use to ensure proper functioning and verify that laboratory, client and regulatory requirements are met. All calibrations are performed by, or under the supervision of, an experienced analyst at scheduled intervals against either certified standards traceable to recognized national standards or reference standards whose values have been statistically validated.

5.2.2. Calibration standards for each parameter are chosen to establish the linear range of the instrument and must bracket the concentrations of those parameters measured in the samples. The lowest

calibration standard is the lowest concentration for which quantitative data may be reported. Data reported below this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in a narrative. The highest calibration standard is the highest concentration for which quantitative data may be reported. Data reported above this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in the narrative.

5.2.3. Instrumentation or support equipment that cannot be calibrated to specification or is otherwise defective is clearly labeled as out-of-service until it has been repaired and tested to demonstrate it meets the laboratory's specifications. All repair and maintenance activities including service calls are documented in the maintenance log. Equipment sent off-site for calibration testing is packed and transported to prevent breakage and is in accordance with the vendor's recommendations.

5.2.4. In the event that recalibration of a piece of test equipment indicates the equipment may have been malfunctioning during the course of sample analysis, an investigation is performed. The results of the investigation along with a summary of the information reviewed are documented and maintained by the quality manager. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed. This allows for sufficient investigation and review of documentation to determine the impact on the analytical results. Instrumentation found to be consistently out of calibration is either repaired and positively verified or taken out of service and replaced.

5.2.5. Raw data records are retained to document equipment performance. Sufficient raw data is retained to reconstruct the instrument calibration and explicitly connect the continuing calibration verification to the initial calibration.

5.2.6. Please reference the *Calibration Procedures* SOP or its equivalent replacement and SOPs for specific methods for more detailed calibration information.

5.3. Support Equipment Calibration and Verification Procedures

5.3.1. All support equipment is calibrated or verified at least annually using NIST traceable references over the entire range of use, as applicable. The results of calibrations or verifications must be within the specifications required or the equipment will be removed from service until brought back into control. Additional information regarding calibration and maintenance of support equipment can be found in the *Support Equipment* SOP or its equivalent replacement.

5.3.2. On each day of use, balances, ovens, refrigerators, incubators, freezers and water baths are checked in the expected range of use with NIST traceable references in order to ensure the equipment meets laboratory specifications. These checks are documented appropriately.

5.3.3. **Analytical Balances**

5.3.3.1. Each analytical balance is calibrated or verified annually by a qualified service technician. The calibration of each balance is verified each day of use with weights traceable to NIST bracketing the range of use. Working calibration weights are ASTM Class 1 or other class weights that have been calibrated against a reference weight set that is re-certified every 5 years, at a minimum, by the manufacturer or other qualified vendor, against a NIST traceable reference. If balances are calibrated by an external vendor, verification of their weights must be available upon request. All information pertaining to balance maintenance and calibration is recorded on the balance's monitoring log and/or is maintained on file in the local Quality department.

5.3.4. **Thermometers**

5.3.4.1. Certified, or reference, thermometers are maintained for checking calibration of working thermometers. Reference thermometers are provided with NIST traceability for initial calibration and are re-certified every 3 years, at a minimum by the manufacturer or other qualified vendor with equipment directly traceable to NIST.

5.3.4.2. Working thermometers and temperature sensors that are electronic, digital or mechanical are verified against the reference thermometer annually, or more frequently if required by program, regulation or client, according to established metrology procedures. Working thermometers that are liquid-in-glass are verified against the reference thermometer annually according to established metrology procedures. Alternatively, working thermometers may be replaced with new thermometers in lieu of verification against the reference thermometer or may be verified by the manufacturer or other qualified vendor. Each working thermometer is individually numbered and assigned a correction factor, when applicable, based on comparison with the NIST reference source. In addition, working thermometers are visually inspected by laboratory personnel prior to use and when temperatures are documented.

5.3.4.3. Laboratory thermometer inventory and calibration data are maintained in the local Quality department.

5.3.5. **pH/Electrometers**

5.3.5.1. The meter is calibrated before use each day, at a minimum, using fresh buffer solutions.

5.3.5.2. The pH electrode is inspected daily and cleaned, filled or replaced as needed.

5.3.6. **Spectrophotometers**

5.3.6.1. During use, spectrophotometer performance is checked at established frequencies in analysis sequences against initial calibration verification (ICV) and continuing calibration verification (CCV) standards.

5.3.7. **Mechanical Volumetric Dispensing Devices**

5.3.7.1. Mechanical volumetric dispensing devices including bottle top dispensers dispensing critical volumes used to determine quantitative results, pipettes, and burettes, excluding Class A volumetric glassware, are checked for accuracy on a quarterly basis, at a minimum.

5.4. Instrument/Equipment Maintenance

5.4.1. The objectives of the Pace Analytical maintenance program are twofold: to establish a system of instrument care that maintains instrumentation and equipment at required levels of calibration and sensitivity, and to minimize loss of productivity due to repairs.

5.4.2. Department managers are responsible for providing technical leadership to evaluate new equipment, solve equipment problems, and coordinate instrument repair and maintenance. Analysts have the primary responsibility to perform routine maintenance.

5.4.3. To minimize downtime and interruption of analytical work, preventative maintenance may routinely performed on each analytical instrument. Up-to-date instructions on the use and maintenance of equipment are available to staff in the department where the equipment is used.

5.4.4. Department managers are responsible for maintaining an adequate inventory of spare parts required to minimize equipment downtime. This inventory includes parts and supplies that are subject to frequent failure, have limited lifetimes, or cannot be obtained in a timely manner should a failure occur.

5.4.5. All major equipment and instrumentation items are uniquely identified to allow for traceability. Equipment/instrumentation is, unless otherwise stated, identified as a system and not as individual pieces. The laboratory maintains equipment records that include the following:

- The name of the equipment and its software
- The manufacturer's name, type, and serial number
- Approximate date received and date placed into service
- Current location in the laboratory
- Copy of any manufacturer's manuals or instructions, if available
- Dates and results of calibrations and next scheduled calibration (as applicable)
- Details of past maintenance activities, both routine and non-routine
- Details of any damage, modification or major repairs

5.4.6. All instrument maintenance is documented in maintenance logbooks that are assigned to each particular instrument or system.

5.4.7. The maintenance log entry must include a summary of the problem encountered, the maintenance performed, and an indication that the instrument has been returned to an in-control status. In addition, each entry must include the initials of the analyst making the entry, the dates the maintenance actions were performed, and the date the entry was made in the maintenance logbook, if different from the date(s) of the maintenance.

5.4.8. Any equipment that has been subjected to overloading or mishandling, or that gives suspect results, or has been shown to be defective, is taken out of service and clearly identified. The equipment shall not be used to analyze customer samples until it has been repaired and shown to perform satisfactorily. In the event of instrumentation failure, to avoid hold time issues, the lab may subcontract the necessary samples to another Pace lab or to an outside subcontract lab if possible.

5.5. General Handling, Storage, Maintenance and Transport of Equipment

5.5.1. All support, measurement, and reference equipment must be handled, stored, and maintained in a manner that prevents contamination and/or deterioration. Balances, refrigerators, freezers, incubators, ovens, and hot blocks should be kept clean and free from debris inside and outside. Reference thermometers and reference weight sets must be controlled by the Quality Department, kept in pristine condition and inspected before each use. Working thermometers, weight sets, mechanical pipettes, and bottle top dispensers should be kept clean, inspected for damage before use, and handled properly. When it is necessary to package and transport or ship any support, measurement, or reference equipment to an external vendor for repair, maintenance, calibration, or certification, consult with the external vendor for proper packing, labeling and shipping to prevent damage, contamination, or deterioration.

6.0. CONTROL OF DATA

Analytical results processing, verification, and reporting are procedures employed that result in the delivery of defensible data. These processes include, but are not limited to, calculation of raw data into final concentration values, review of results for accuracy, evaluation of quality control criteria and assembly of technical reports for delivery to the data user.

All analytical data undergo a documented multi-tier review process prior to being reported to the customer. This section describes procedures used for translating raw analytical data into accurate final sample reports as well as Pace data storage policies.

When analytical data or field data is generated, it is documented appropriately. The resulting logbooks and other laboratory records are kept in accordance with each facility's SOP for documentation storage and archival. The laboratory must ensure that there are sufficient redundant copies of electronic data so that no data is lost due to unforeseen computer issues

6.1. Primary Data Review

6.1.1. The primary analyst is responsible for initial data reduction and data review. This includes confirming compliance with required methodology, verifying calculations, evaluating quality control data, noting observations or non-conformances in logbooks or as footnotes or narratives, and uploading analytical results into the LIMS. Data review checklists, either hardcopy or electronic, are used to document the primary data review process. The primary analyst must be clearly identified in all applicable logbooks, spreadsheets, LIMS fields, and data review checklists.

6.1.2. The primary analyst compiles the initial data for secondary data review. This compilation must include sufficient documentation for secondary data review.

6.1.3. Additional information regarding data review procedures can be found in the *Data Review Process* SOP or its equivalent replacement, as well as in the *Manual Integration* SOP or its equivalent replacement.

6.2. Secondary Data Review

6.2.1. Secondary data review is the process of examining data and accepting or rejecting it based on pre-defined criteria. This review step is designed to ensure that reported data are free from calculation and transcription errors, that quality control parameters are evaluated, and that any non-conformances are properly documented.

6.2.2. The completed data from the primary analyst is sent to a designated qualified secondary data reviewer, which must be someone other than the primary analyst. The secondary data reviewer provides an independent technical assessment of the data package and technical review for accuracy according to methods employed and laboratory protocols. This assessment involves a quality control review for use of the proper methodology and detection limits, compliance to quality control protocol and criteria, presence and completeness of required deliverables, and accuracy of calculations, data quantitation and applicable data qualifiers. The reviewer validates the data entered into the LIMS and documents review and approval of manual integrations. Data review checklists, either hardcopy or electronic, are used to document the secondary data review process.

6.2.3. Additional information regarding data review procedures can be found in the *Data Review Process* SOP or its equivalent replacement, as well as in the *Manual Integration* SOP or its equivalent replacement.

6.3. Data Reporting

6.3.1. Data for each analytical fraction pertaining to a particular Pace project number are released in the LIMS upon validation for assembly into the final report. Anomalies encountered during technical and QC reviews are included in data qualifiers on the final report or in a separate case narrative if there is potential for data to be impacted.

6.3.2. Final reports are prepared according to the level of reporting required by the customer and can be transmitted to the customer via hardcopy or electronic deliverable. A standard Pace final report consists of the following components:

6.3.2.1. A title which designates the report as "Report of Laboratory Analysis";

6.3.2.2. Name and address of laboratory and/or subcontractor laboratories, if used;

6.3.2.3. Phone number and name of laboratory contact to whom questions can be referred;

6.3.2.4. A unique identification number for the report. The pages of the report are numbered and a total number of pages is indicated;

6.3.2.5. Name and address of customer and name of project;

6.3.2.6. Unique laboratory identification of samples analyzed as well as customer sample IDs;

6.3.2.7. Date and time of sample collection, sample receipt and sample analysis;

6.3.2.8. Identification of the test methods used;

6.3.2.9. Qualifiers to the analytical data, if applicable;

6.3.2.10. Identification of whether results are reported on a dry-weight or wet-weight basis;

6.3.2.11. Reporting limits;

6.3.2.12. Final results or measurements;

6.3.2.13. A signature and title, electronic or otherwise, of person accepting responsibility for the content of the report;

6.3.2.14. Date report was issued;

6.3.2.15. A statement clarifying that the results of the report relate only to the samples tested or to the samples as they were received by the laboratory;

6.3.2.16. A statement indicating that the report must not be reproduced except in full, without the written approval of the laboratory;

6.3.3. Any changes made to a final report shall be designated as "Revised" or equivalent wording. The laboratory must keep sufficient archived records of all laboratory reports and revisions. For higher levels of data deliverables, a copy of all supporting raw data is sent to the customer along with a final report of results. Pace will provide electronic data deliverables (EDD) as required by contracts or upon customer request.

6.3.4. Customer data that requires transmission by telephone, telex, facsimile or other electronic means undergoes appropriate steps to preserve confidentiality.

6.3.5. The following positions are the only approved signatories for Pace final reports:

- Senior General Manager
- General Manager
- Quality Manager

- Client Services Manager
- Project Manager
- Project Coordinator

6.3.6. Additional information regarding final reports and data deliverables can be found in the *Final Report and Data Deliverable Contents* SOP or its equivalent replacement.

6.4. Data Security

6.4.1. All data including electronic files, logbooks, extraction/digestion/distillation worksheets, calculations, project files and reports, and any other information used to produce the technical report are maintained secured and retrievable by the Pace facility.

6.5. Data Archiving

6.5.1. All records compiled by Pace are archived in a suitable, limited-access environment to prevent loss, damage, or deterioration by fire, flood, vermin, theft, and/or environmental deterioration. Records are retained for a minimum of five years unless superseded by federal, state, contractual, and/or accreditation requirements. TNI-related records will be made readily available to accrediting authorities. Access to archived data is controlled by the Quality Department.

6.5.2. Records that are computer-generated have either a hard copy or electronic backup copy. Hardware and software necessary for the retrieval of electronic data is maintained with the applicable records. Archived electronic records are stored protected against electronic and/or magnetic sources.

6.5.3. In the event of a change in ownership, accountability or liability, reports of analyses performed pertaining to accreditation will be maintained per the purchase agreement. In the event of bankruptcy, laboratory reports and/or records will be transferred to the customer and/or the appropriate regulatory entity upon request.

6.6. Data Disposal

6.6.1. Data that has been archived for the facility's required storage time may be disposed of in a secure manner by shredding, returning to customer, or utilizing some other means that does not jeopardize data confidentiality. Records of data disposal will be archived for a minimum of five years unless superseded by federal, contractual, and/or accreditation requirements. Data disposal includes any preliminary or final reports, raw analytical data, logs or logbooks, and electronic files.

7.0. QUALITY SYSTEM AUDITS AND REVIEWS

7.1. Internal Audits

7.1.1. Responsibilities

7.1.1.1. The SQM/QM is responsible for managing, assigning and/or conducting internal audits in accordance with a predetermined schedule and procedure. Since internal audits represent an independent assessment of laboratory functions, the auditor must be independent from laboratory operations to ensure objectivity. The auditor must be trained, qualified, and familiar enough with the objectives, principles, and procedures of laboratory operations to be able to perform a thorough and effective evaluation. The SQM/QM evaluates audit observations and verifies the completion of corrective actions. In addition, a periodic corporate audit will be conducted. The corporate audits will focus on the effectiveness of the Quality System as outlined in this manual but may also include other quality programs applicable to an individual laboratory.

7.1.1.2. Additional information can be found in the *Internal and External Audits* SOP or its equivalent replacement.

7.1.2. Scope and Frequency of Internal Audits

7.1.2.1. The complete internal audit process consists of the following four sections, at a minimum:

- Raw Data Review audits- conducted according to a schedule per local SQM/QM. A certain number of these data review audits may be conducted per quarter to accomplish this yearly schedule;
- Quality System audits- considered the traditional internal audit function and includes analyst interviews to help determine whether practice matches method requirements and SOP language;
- Final Report reviews;
- Corrective Action Effectiveness Follow-up

7.1.2.2. Internal systems audits are conducted annually at a minimum. The scope of these audits includes evaluation of specific analytical departments or a specific quality related system as applied throughout the laboratory.

7.1.2.3. Where the identification of non-conformities or departures cast doubt on the laboratory's compliance with its own policies and procedures, the lab must ensure that the appropriate areas of activity are audited as soon as possible.

7.1.2.4. Certain projects may require an internal audit to ensure laboratory conformance to site work plans, sampling and analysis plans, QAPPs, etc.

7.1.2.5. The laboratory, as part of their overall internal audit program, ensures that a review is conducted with respect to any evidence of inappropriate actions or vulnerabilities related to data integrity. Discovery and reporting of potential data integrity issues are handled in a confidential manner. All investigations that result in findings of inappropriate activity are fully documented, including the source of the problem, the samples and customers affected the impact on the data, the corrective actions taken by the laboratory, and identification of final reports that were re-issued. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed.

7.1.3. Internal Audit Reports and Corrective Action Plans

7.1.3.1. A full description of the audit, including the identification of the operation audited, the date(s) on which the audit was conducted, the specific systems examined, and the observations noted are summarized in an internal audit report. The Quality Department auditor writes and issues the internal audit report identifying which audit observations are deficiencies that require corrective action.

7.1.3.2. When audit findings cast doubt on the effectiveness of the operations or on the correctness of validity of the laboratory's environmental test results, the laboratory will take timely corrective action and notify the customer in writing within three business days, if investigations show that the laboratory results may have been affected.

7.1.3.3. Additional information can be found in the *Internal and External Audits* SOP or its equivalent replacement.

7.2. External Audits

7.2.1. Pace laboratories are audited routinely by regulatory agencies to maintain laboratory certifications and by customers to maintain appropriate specific protocols.

7.2.2. External audit teams review the laboratory to assess the effectiveness of quality systems. The SQM/QM host the external audit team and assist in facilitation of the audit process. After the audit, the external auditors will prepare a formalized audit report listing deficiencies observed and follow-up requirements for the laboratory. The laboratory staff and supervisors develop corrective action plans to address any deficiencies with the guidance of the SQM/QM, who provides a written response to the external audit team. The SQM/QM follows-up with the laboratory staff to ensure corrective actions are implemented and that the corrective action was effective.

7.3. Annual Managerial Review

7.3.1. A managerial review of Management and Quality Systems is performed on an annual basis at a minimum. This allows for assessing program effectiveness and introducing changes and/or improvements. Additional information can be found in the *Review of Laboratory Management Systems* SOP or its equivalent replacement.

7.3.2. The managerial review must include the following topics of discussion:

- Suitability of policies and procedures
- Reports from managerial personnel
- Internal audit results
- Corrective and preventive actions
- External assessment results
- Proficiency testing studies
- Sample capacity and scope of work changes
- Customer feedback, including complaints
- Recommendations for improvement,
- Other relevant factors, such as quality control activities, resources, staffing, and safety/waste.

7.3.3. This managerial review must be documented for future reference by the SQM/QM and copies of the report are distributed to management. Report must include goals, objectives, and action plans for the coming year. The laboratory shall ensure that actions identified during the review are carried out within an appropriate and agreed upon timeframe, whenever possible.

8.0. CORRECTIVE ACTION

Additional information can be found in the *Corrective and Preventive Actions* SOP or its equivalent replacement.

During the process of sample handling, preparation, and analysis, during review of quality control records, or during reviews of non-technical portions of the lab, certain occurrences may warrant corrective actions. These occurrences may take the form of analyst errors, deficiencies in quality control, method deviations, or other unusual circumstances. The Quality System of Pace provides systematic procedures for the documentation, monitoring, completion of corrective actions, and follow-up verification of the effectiveness of these corrective actions. This can be done using Pace's LabTrack system or other system that lists at a minimum, the deficiency by issue number, the deficiency source, responsible party, root cause, resolution, due date, and date resolved.

8.1. Corrective and Preventive Action Documentation

8.1.1. The following items are examples of sources of laboratory deviations or non-conformances that may warrant some form of documented corrective action:

- Internal Laboratory Non-Conformance Trends
- Proficiency Testing Sample Results
- Internal and External Audits
- Data or Records Review
- Client Complaints
- Client Inquiries
- Holding Time violations

8.1.2. Documentation of corrective actions may be in the form of a comment or footnote on the final report that explains the deficiency or it may be a more formal documentation. This depends on the extent of the deficiency, the impact on the data, and the method or customer requirements for documentation.

8.1.3. The person who discovers the deficiency or non-conformance initiates the corrective action documentation within LabTrack. The documentation must include the affected projects and sample numbers, the name of the applicable Project Manager, the customer name, and any other pertinent information. The person initiating the corrective action documentation must also list the known causes of the deficiency or non-conformance as well as any corrective/preventative actions that they have taken. Preventive actions must be taken in order to prevent or minimize the occurrence of the situation.

8.1.4. **Root Cause Analysis**: Laboratory personnel and management staff will start a root cause analysis by going through an investigative process. During this process, the following general steps must be taken into account: defining the non-conformance, assigning responsibilities, determining if the condition is significant, and investigating the root cause of the nonconformance. General non-conformance investigative techniques follow the path of the sample through the process looking at each individual step in detail. The root cause must be documented within LabTrack.

8.1.5. Based on the determined root cause(s), the lab implements applicable corrective actions and verifies their effectiveness. In the event that analytical testing or results do not conform to documented laboratory policies or procedures Project Management will notify the customer of the situation and will advise of any affect to data quality, if applicable.

8.2. Corrective Action Completion

8.2.1. Internal Laboratory Non-Conformance Trends

8.2.1.1. There are several types of non-conformance trends that may occur in the laboratory that would require the initiation of a corrective action report. Laboratories may choose to initiate a corrective action for all instances of one or more of these categories; however, the intent is that each of these would be handled according to its severity; one time instances could be handled with a footnote or qualifier whereas a systemic problem with any of these categories may require an official corrective action process. These categories, as defined in the Corrective Action SOP are as follows:

- Login error
- Preparation Error
- Contamination
- Calibration Failure
- LCS Failure
- Calculation error
- Laboratory accident
- Instrument Failure
- Final Reporting/Data Entry error

8.2.2. PE/PT Sample Results

8.2.2.1. Any PT result assessed as "not acceptable" requires an investigation and applicable corrective actions. The operational staff is made aware of the PT failures and they are responsible for reviewing the applicable raw data and calibrations and list possible causes for error. The SQM/QM reviews their findings and initiates a replacement PT sample if required. Replacement PT results must be monitored by the SQM/QM and reported to the applicable regulatory authorities.

8.2.2.2. Additional information, such as requirements regarding time frames for reporting failures to states, makeup PTs, and notifications of investigations, can be found in the *Proficiency Testing Program* SOP or its equivalent replacement.

8.2.3. Internal and External Audits

8.2.3.1. The SQM/QM or designee is responsible for documenting all audit findings and their corrective actions. This documentation must include the initial finding, the persons responsible for the corrective action, the due date for responding to the auditing body, the root cause of the finding, and the corrective actions needed for resolution. The SQM/QM or designee is also responsible for providing any back-up documentation used to demonstrate that a corrective action has been completed.

8.2.4. Data Review

8.2.4.1. In the course of performing primary and secondary review of data or in the case of raw data review, errors may be found which require corrective actions. Any finding that affects the quality of the data requires some form of corrective action, which may include revising and re-issuing of final reports.

8.2.5. Client Complaints

8.2.5.1. Project Managers are responsible for issuing corrective action requests, when warranted, for customer complaints. As with other corrective actions, the appropriate analyst or supervisor begin an investigation to determine possible causes and corrective actions. After potential corrective actions have been determined, the Project Manager reviews the corrective action to ensure all customer needs or concerns are being adequately addressed.

8.2.6. Client Inquiries

8.2.6.1. When an error on the customer's final report is discovered, the Project Manager is responsible for initiating a formal corrective action form that describes the failure (e.g., incorrect analysis reported, reporting units are incorrect, or reporting limits do not meet objectives). The Project Manager is also responsible for revising the final report if necessary and submitting it to the customer.

8.2.7. Holding Time Violations

8.2.7.1. In the event that a holding time has been exceeded due to laboratory error, the analyst or supervisor must complete formal corrective action. The Project Manager and the SQM/QM must be made aware of all holding time violations due to laboratory error.

8.2.7.2. The Project Manager must contact the customer in order that appropriate decisions are made regarding the out-of-hold sample and the ultimate resolution is then documented and included in the customer project file.

9.0. GLOSSARY

The source of some of the definitions is indicated previous to the actual definition (e.g., TNI, DoD).

Terms and Definitions	
3P Program	The Pace continuous improvement program that focuses on Process, Productivity, and Performance. Best Practices are identified that can be used by all Pace labs.
Acceptance Criteria	TNI- Specified limits placed on characteristics of an item, process, or service defined in requirement documents.
Accreditation	TNI- The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory.
Accreditation Body (AB)	TNI- The organization having responsibility and accountability for environmental laboratory accreditation and which grants accreditation under this program.
Accuracy	TNI- The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator.
Activity, Absolute	TNI- Rate of nuclear decay occurring in a body of material, equal to the number of nuclear disintegrations per unit time. NOTE: Activity (absolute) may be expressed in becquerels (Bq), curies (Ci), or disintegrations per minute (dpm), and multiples or submultiples of these units.
Activity, Areic	TNI- Quotient of the activity of a body of material and its associated area.
Activity, Massic	TNI- Quotient of the activity of a body of material and its mass; also called specific activity.
Activity, Volumic	TNI- Quotient of the activity of a body of material and its volume; also called activity concentration. NOTE: In this module [TNI Volume 1, Module 6], unless otherwise stated, references to activity shall include absolute activity, areic activity, massic activity, and volumic activity.
Activity Reference Date	TNI- The date (and time, as appropriate to the half-life of the radionuclide) to which a reported activity result is calculated. NOTE: The sample collection date is most frequently used as the Activity Reference Date for environmental measurements, but different programs may specify other points in time for correction of results for decay and ingrowth.
Aliquot	A discrete, measured, representative portion of a sample taken for analysis.
American Society for Testing and Materials (ASTM)	An international standards organization that develops and publishes voluntary consensus standards for a wide range of materials, products, systems and services.
Analysis	A combination of sample preparation and instrument determination.
Analysis Code (Acode)	All the set parameters of a test, such as Analytes, Method, Detection Limits and Price.
Analysis Sequence	A compilation of all samples, standards and quality control samples run during a specific amount of time on a particular instrument in the order they are analyzed.
Analyst	TNI- The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

Analyte	TNI- A substance, organism, physical parameter, property, or chemical constituent(s) for which an environmental sample is being analyzed.
Analytical Method	A formal process that identifies and quantifies the chemical components of interest (target analytes) in a sample.
Analytical Uncertainty	TNI- A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis.
Annual (or Annually)	Defined by Pace as every 12 months ± 30 days.
Assessment	TNI - The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its system to defined criteria (to the standards and requirements of laboratory accreditation).
Atomic Absorption Spectrometer	Instrument used to measure concentration in metals samples.
Atomization	A process in which a sample is converted to free atoms.
Audit	TNI- A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.
Batch	TNI- Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same quality systems matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed 20 samples.
Batch, Radiation Measurements (RMB)	TNI- An RMB is composed of 1 to 20 environmental samples that are counted directly without preliminary physical or chemical processing that affects the outcome of the test (e.g., non-destructive gamma spectrometry, alpha/beta counting of air filters, or swipes on gas proportional detectors). The samples in an RMB share similar physical and chemical parameter, and analytical configurations (e.g., analytes, geometry, calibration, and background corrections). The maximum time between the start of processing of the first and last in an RMB is 14 calendar days.
Bias	TNI- The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).
Blank	TNI - A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results (See Method Blank).
Blind Sample	A sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.

BNA (Base Neutral Acid compounds)	A list of semi-volatile compounds typically analyzed by mass spectrometry methods. Named for the way they can be extracted out of environmental samples in an acidic, basic or neutral environment.
BOD (Biochemical Oxygen Demand)	Chemical procedure for determining how fast biological organisms use up oxygen in a body of water.
Calibration	TNI- A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. 1) In calibration of support equipment, the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI); 2) In calibration according to test methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.
Calibration Curve	TNI- The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.
Calibration Method	A defined technical procedure for performing a calibration.
Calibration Range	The range of values (concentrations) between the lowest and highest calibration standards of a multi-level calibration curve. For metals analysis with a single-point calibration, the low-level calibration check standard and the high standard establish the linear calibration range, which lies within the linear dynamic range.
Calibration Standard	TNI- A substance or reference material used for calibration.
Certified Reference Material (CRM)	TNI- Reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute.
Chain of Custody	An unbroken trail of accountability that verifies the physical security of samples, data, and records.
Chain of Custody Form (COC)	TNI- Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and type of containers; the mode of collection, the collector, time of collection; preservation; and requested analyses.
Chemical Oxygen Demand (COD)	A test commonly used to indirectly measure the amount of organic compounds in water.
Client (referred to by ISO as Customer)	Any individual or organization for whom items or services are furnished or work performed in response to defined requirements and expectations.
Code of Federal Regulations (CFR)	A codification of the general and permanent rules published in the Federal Register by agencies of the federal government.
Comparability	An assessment of the confidence with which one data set can be compared to another. Comparable data are produced through the use of standardized procedures and techniques.
Completeness	The percent of valid data obtained from a measurement system compared to the amount of valid data expected under normal conditions. The equation for completeness is: % Completeness = (Valid Data Points/Expected Data Points)*100

Confirmation	TNI- Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: second-column confirmation; alternate wavelength; derivatization; mass spectral interpretation; alternative detectors; or additional cleanup procedures.
Conformance	An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements.
Congener	A member of a class of related chemical compounds (e.g., PCBs, PCDDs).
Consensus Standard	A standard established by a group representing a cross-section of a particular industry or trade, or a part thereof.
Continuing Calibration Blank (CCB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method.
Continuing Calibration Check Compounds (CCC)	Compounds listed in mass spectrometry methods that are used to evaluate an instrument calibration from the standpoint of the integrity of the system. High variability would suggest leaks or active sites on the instrument column.
Continuing Calibration Verification	The verification of the initial calibration. Required prior to sample analysis and at periodic intervals. Continuing calibration verification applies to both external and internal standard calibration techniques, as well as to linear and non-linear calibration models.
Continuing Calibration Verification (CCV) Standard	Also referred to as a Calibration Verification Standard (CVS) in some methods, it is a standard used to verify the initial calibration of compounds in an analytical method. CCVs are analyzed at a frequency determined by the analytical method.
Continuous Emission Monitor (CEM)	A flue gas analyzer designed for fixed use in checking for environmental pollutants.
Continuous Improvement Plan (CIP)	The delineation of tasks for a given laboratory department or committee to achieve the goals of that department.
Contract Laboratory Program (CLP)	A national network of EPA personnel, commercial labs, and support contractors whose fundamental mission is to provide data of known and documented quality.
Contract Required Detection Limit (CRDL)	Detection limit that is required for EPA Contract Laboratory Program (CLP) contracts.
Contract Required Quantitation Limit (CRQL)	Quantitation limit (reporting limit) that is required for EPA Contract Laboratory Program (CLP) contracts.
Control Chart	A graphic representation of a series of test results, together with limits within which results are expected when the system is in a state of statistical control (see definition for Control Limit)
Control Limit	A range within which specified measurement results must fall to verify that the analytical system is in control. Control limit exceedances may require corrective action or require investigation and flagging of non-conforming data.
Correction	Action taken to eliminate a detected non-conformity.
Corrective Action	The action taken to eliminate the causes of an existing non-conformity, defect, or other undesirable situation in order to prevent recurrence. A root cause analysis may not be necessary in all cases.

Corrective and Preventative Action (CAPA)	The primary management tools for bringing improvements to the quality system, to the management of the quality system's collective processes, and to the products or services delivered which are an output of established systems and processes.
Critical Value	TNI- Value to which a measurement result is compared to make a detection decision (also known as critical level or decision level). NOTE: The Critical Value is designed to give a specified low probability α of false detection in an analyte-free sample, which implies that a result that exceeds the Critical Value, gives high confidence $(1 - \alpha)$ that the radionuclide is actually present in the material analyzed. For radiometric methods, α is often set at 0.05.
Customer	Any individual or organization for which products or services are furnished or work performed in response to defined requirements and expectations.
Data Integrity	TNI- The condition that exists when data are sound, correct, and complete, and accurately reflect activities and requirements.
Data Quality Objective (DQO)	Systematic strategic planning tool based on the scientific method that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use or end user.
Data Reduction	TNI- The process of transforming the number of data items by arithmetic or statistical calculation, standard curves, and concentration factors, and collating them into a more usable form.
Definitive Data	Analytical data of known quantity and quality. The levels of data quality on precision and bias meet the requirements for the decision to be made. Data that is suitable for final decision-making.
Demonstration of Capability (DOC)	TNI- A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision.
Detection Limit (DL)	The smallest analyte concentration that can be demonstrated to be different than zero or a blank concentration with 99% confidence. At the DL, the false positive rate (Type 1 error) is 1%. A DL may be used as the lowest concentration for reliably reporting a detection of a specific analyte in a specific matrix with a specific method with 99% confidence.
Detection Limit (DL) for Safe Drinking Water Act (SDWA) Compliance	TNI- Laboratories that analyze drinking-water samples for SDWA compliance monitoring must use methods that provide sufficient detection capability to meet the detection limit requirements established in 40 CFR 141. The SDWA DL for radioactivity is defined in 40 CFR Part 141.25.c as the radionuclide concentration, which can be counted with a precision of plus or minus 100% at the 95% confidence level (1.96σ where σ is the standard deviation of the net counting rate of the sample).
Deuterated Monitoring Compounds (DMCs)	Deuterated compounds used as surrogates for GC/MS analysis.
Diesel Range Organics (DRO)	A range of compounds that denote all the characteristic compounds that make up diesel fuel (range can be state or program specific).
Digestion	A process in which a sample is treated (usually in conjunction with heat and acid) to convert the target analytes in the sample to a more easily measured form.
Document Control	The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.

Documents	Written components of the laboratory management system (e.g., policies, procedures, and instructions).
Dry Weight	The weight after drying in an oven at a specified temperature.
Duplicate (also known as Replicate or Laboratory Duplicate)	The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results of duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory.
Electron Capture Detector (ECD)	Device used in GC methods to detect compounds that absorb electrons (e.g., PCB compounds).
Electronic Data Deliverable (EDD)	A summary of environmental data (usually in spreadsheet form) which clients request for ease of data review and comparison to historical results.
Eluent	A solvent used to carry the components of a mixture through a stationary phase.
Elute	To extract, specifically, to remove (absorbed material) from an absorbent by means of a solvent.
Elution	A process in which solutes are washed through a stationary phase by movement of a mobile phase.
Environmental Data	Any measurements or information that describe environmental processes, locations, or conditions; ecological or health effects and consequences; or the performance of environmental technology.
Environmental Monitoring	The process of measuring or collecting environmental data.
Environmental Protection Agency (EPA)	An agency of the federal government of the United States which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress.
Environmental Sample	A representative sample of any material (aqueous, non-aqueous, or multimedia) collected from any source for which determination of composition or contamination is requested or required. Environmental samples can generally be classified as follows: • Non Potable Water (Includes surface water, ground water, effluents, water treatment chemicals, and TCLP leachates or other extracts) • Drinking Water - Delivered (treated or untreated) water designated as potable water • Water/Wastewater - Raw source waters for public drinking water supplies, ground waters, municipal influents/effluents, and industrial influents/effluents • Sludge - Municipal sludges and industrial sludges. • Soil - Predominately inorganic matter ranging in classification from sands to clays. • Waste - Aqueous and non-aqueous liquid wastes, chemical solids, and industrial liquid and solid wastes
Equipment Blank	A sample of analyte-free media used to rinse common sampling equipment to check effectiveness of decontamination procedures.
Extracted Internal Standard Analyte	Isotopically labeled analogs of analytes of interest added to all standards, blanks and samples analyzed. Added to samples and batch QC samples prior to the first step of sample extraction and to standards and instrument blanks prior to analysis. Used for isotope dilution methods.
Facility	A distinct location within the company that has unique certifications, personnel and waste disposal identifications.

False Negative	A result that fails to identify (detect) an analyte or reporting an analyte to be present at or below a level of interest when the analyte is actually above the level of interest.
False Positive	A result that erroneously identifies (detects) an analyte or reporting an analyte to be present above a level of interest when the analyte is actually present at or below the level of interest.
Field Blank	A blank sample prepared in the field by filling a clean container with reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken.
Field Measurement	Determination of physical, biological, or radiological properties, or chemical constituents that are measured on-site, close in time and space to the matrices being sampled/measured, following accepted test methods. This testing is performed in the field outside of a fixed-laboratory or outside of an enclosed structure that meets the requirements of a mobile laboratory.
Field of Accreditation	TNI- Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.
Field of Proficiency Testing (FoPT)	TNI- Matrix, technology/method, analyte combinations for which the composition, spike concentration ranges and acceptance criteria have been established by the PTPEC.
Finding	TNI- An assessment conclusion referenced to a laboratory accreditation standard and supported by objective evidence that identifies a deviation from a laboratory accreditation standard requirement.
Flame Ionization Detector (FID)	A type of gas detector used in GC analysis where samples are passed through a flame which ionizes the sample so that various ions can be measured.
Gas Chromatography (GC)	Instrumentation which utilizes a mobile carrier gas to deliver an environmental sample across a stationary phase with the intent to separate compounds out and measure their retention times.
Gas Chromatograph/ Mass Spectrometry (GC/MS)	In conjunction with a GC, this instrumentation utilizes a mass spectrometer which measures fragments of compounds and determines their identity by their fragmentation patterns (mass spectra).
Gasoline Range Organics (GRO)	A range of compounds that denote all the characteristic compounds that make up gasoline (range can be state or program specific).
High Pressure Liquid Chromatography (HPLC)	Instrumentation used to separate, identify and quantitate compounds based on retention times which are dependent on interactions between a mobile phase and a stationary phase.
Holding Time	TNI- The maximum time that can elapse between two specified activities. 40 CFR Part 136- The maximum time that samples may be held prior to preparation and/or analysis as defined by the method and still be considered valid or not compromised.
Homogeneity	The degree to which a property or substance is uniformly distributed throughout a sample.
Homologue	One in a series of organic compounds in which each successive member has one more chemical group in its molecule than the next preceding member. For instance, methanol, ethanol, propanol, butanol, etc., form a homologous series.
Incremental Sampling Method (ISM)	Soil preparation for large volume (1 kg or greater) samples.

In-Depth Data Monitoring	TNI- When used in the context of data integrity activities, a review and evaluation of documentation related to all aspects of the data generation process that includes items such as preparation, equipment, software, calculations, and quality controls. Such monitoring shall determine if the laboratory uses appropriate data handling, data use and data reduction activities to support the laboratory's data integrity policies and procedures.
Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)	Analytical technique used for the detection of trace metals which uses plasma to produce excited atoms that emit radiation of characteristic wavelengths.
Inductively Coupled Plasma- Mass Spectrometry (ICP/MS)	An ICP that is used in conjunction with a mass spectrometer so that the instrument is not only capable of detecting trace amounts of metals and non-metals but is also capable of monitoring isotopic speciation for the ions of choice.
Infrared Spectrometer (IR)	An instrument that uses infrared light to identify compounds of interest.
Initial Calibration (ICAL)	The process of analyzing standards, prepared at specified concentrations, to define the quantitative response relationship of the instrument to the analytes of interest. Initial calibration is performed whenever the results of a calibration verification standard do not conform to the requirements of the method in use or at a frequency specified in the method.
Initial Calibration Blank (ICB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method. This blank is specifically run in conjunction with the Initial Calibration Verification (ICV) where applicable.
Initial Calibration Verification (ICV)	Verifies the initial calibration with a standard obtained or prepared from a source independent of the source of the initial calibration standards to avoid potential bias of the initial calibration.
Instrument Blank	A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination.
Instrument Detection Limits (IDLs)	Limits determined by analyzing a series of reagent blank analyses to obtain a calculated concentration. IDLs are determined by calculating the average of the standard deviations of three runs on three non-consecutive days from the analysis of a reagent blank solution with seven consecutive measurements per day.
Interference, spectral	Occurs when particulate matter from the atomization scatters incident radiation from the source or when the absorption or emission from an interfering species either overlaps or is so close to the analyte wavelength that resolution becomes impossible.
Interference, chemical	Results from the various chemical processes that occur during atomization and later the absorption characteristics of the analyte.
Internal Standard	TNI - A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.
International Organization for Standardization (ISO)	An international standard-setting body composed of representatives from various national standards organizations.
Intermediate Standard Solution	Reference solutions prepared by dilution of the stock solutions with an appropriate solvent.

International System of Units (SI)	The coherent system of units adopted and recommended by the General Conference on Weights and Measures.
Ion Chromatography (IC)	Instrumentation or process that allows the separation of ions and molecules based on the charge properties of the molecules.
Isomer	One of two or more compounds, radicals, or ions that contain the same number of atoms of the same element but differ in structural arrangement and properties. For example, hexane (C6H14) could be n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane.
Laboratory	A body that calibrates and/or tests.
Laboratory Control Sample (LCS)	TNI- (also known as laboratory fortified blank (LFB), spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes and taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst-specific precision and bias or to evaluate the performance of all or a portion of the measurement system.
Laboratory Duplicate	Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently.
Laboratory Information Management System (LIMS)	The entirety of an electronic data system (including hardware and software) that collects, analyzes, stores, and archives electronic records and documents.
LabTrack	Database used by Pace to store and track corrective actions and other laboratory issues.
Learning Management System (LMS)	A web-based database used by the laboratories to track and document training activities. The system is administered by the corporate training department and each laboratory's learn centers are maintained by a local administrator.
Legal Chain-of-Custody Protocols	TNI- Procedures employed to record the possession of samples from the time of sampling through the retention time specified by the client or program. These procedures are performed at the special request of the client and include the use of a Chain-of-Custody (COC) Form that documents the collection, transport, and receipt of compliance samples by the laboratory. In addition, these protocols document all handling of the samples within the laboratory.
Limit(s) of Detection (LOD)	TNI- The minimum result, which can be reliably discriminated from a blank with predetermined confidence level.
Limit(s) of Quantitation (LOQ)	TNI- The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence.
Linear Dynamic Range	Concentration range where the instrument provides a linear response.
Liquid chromatography/ tandem mass spectrometry (LC/MS/MS)	Instrumentation that combines the physical separation techniques of liquid chromatography with the mass analysis capabilities of mass spectrometry.
Lot	TNI- A definite amount of material produced during a single manufacturing cycle, and intended to have uniform character and quality.
Management	Those individuals directly responsible and accountable for planning, implementing, and assessing work.
Management System	System to establish policy and objectives and to achieve those objectives.

Manager (however named)	The individual designated as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual.
Matrix	TNI- The substrate of a test sample.
Matrix Duplicate	TNI- A replicate matrix prepared in the laboratory and analyzed to obtain a measure of precision.
Matrix Spike (MS) (spiked sample or fortified sample)	TNI- A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.
Matrix Spike Duplicate (MSD) (spiked sample or fortified sample duplicate)	TNI- A replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.
May	EPA – The word "may" is used to provide guidance on aspects of the method that are useful but not essential.
Measurement Quality Objective (MQO)	TNI- The analytical data requirements of the data quality objectives are project- or program-specific and can be quantitative or qualitative. MQOs are measurement performance criteria or objectives of the analytical process. Examples of quantitative MQOs include statements of required analyte detectability and the uncertainty of the analytical protocol at a specified radionuclide activity, such as the action level. Examples of qualitative MQOs include statements of the required specificity of the analytical protocol, e.g., the ability to analyze for the radionuclide of interest given the presence of interferences.
Measurement System	TNI- A method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s).
Measurement Uncertainty	An estimate of the error in a measurement often stated as a range of values that contain the true value within a certain confidence level. The uncertainty generally includes many components which may be evaluated from experimental standard deviations based on repeated observations or by standard deviations evaluated from assumed probability distributions based on experience or other information.
Method	TNI- A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.
Method Blank	TNI- A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.
Method Detection Limit (MDL)	TNI- One way to establish a Detection Limit; defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

Method of Standard Additions	A set of procedures adding one or more increments of a standard solution to sample aliquots of the same size in order to overcome inherent matrix effects. The procedures encompass the extrapolation back to obtain the sample concentration.
Minimum Detectable Activity (MDA)	TNI- Estimate of the smallest true activity that ensures a specified high confidence, 1 – β, of detection above the Critical Value, and a low probability β of false negatives below the Critical Value. For radiometric methods, β is often set at 0.05. NOTE 1: The MDS is a measure of the detection capability of a measurement process and as such, it is an a priori concept. It may be used in the selection of methods to meet specified MQOs. Laboratories may also calculate a "sample specific" MDA, which indicates how well the measurement process is performing under varying real-world measurement conditions, when sample-specific characteristics (e.g., interferences) may affect the detection capability. However, the MDA must never be used instead of the Critical Value as a detection threshold. NOTE 2: For the purpose of this Standard, the terms MDA and minimum detectable concentration (MDC) are equivalent.
MintMiner	Program used by Pace to review large amounts of chromatographic data to monitor for errors or data integrity issues.
Mobile Laboratory	TNI- A portable enclosed structure with necessary and appropriate accommodation and environmental conditions for a laboratory, within which testing is performed by analysts. Examples include but are not limited to trailers, vans, and skid-mounted structures configured to house testing equipment and personnel.
Must	EPA – The word "must" is used to indicate aspects of the method that are considered essential to its performance, based on sound analytical practices.
National Environmental Laboratory Accreditation Conference (NELAC)	See definition of The NELAC Institute (TNI).
National Institute of Occupational Safety and Health (NIOSH)	National institute charged with the provision of training, consultation and information in the area of occupational safety and health.
National Institute of Standards and Technology (NIST)	TNI- A federal agency of the US Department of Commerce's Technology Administration that is designed as the United States national metrology institute (or NMI).
National Pollutant Discharge Elimination System (NPDES)	A permit program that controls water pollution by regulating point sources that discharge pollutants into U.S. waters.
Negative Control	Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.
Nitrogen Phosphorus Detector (NPD)	A detector used in GC analyses that utilizes thermal energy to ionize an analyte. With this detector, nitrogen and phosphorus can be selectively detected with a higher sensitivity than carbon.
Nonconformance	An indication or judgment that a product or service has not met the requirement of the relevant specifications, contract, or regulation; also the state of failing to meet the requirements.
Not Detected (ND)	The result reported for a compound when the detected amount of that compound is less than the method reporting limit.

Performance Based Measurement System (PBMS)	An analytical system wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner.
Physical Parameter	TNI- A measurement of a physical characteristic or property of a sample as distinguished from the concentrations of chemical and biological components.
Photo-ionization Detector (PID)	An ion detector which uses high-energy photons, typically in the ultraviolet range, to break molecules into positively charged ions.
Polychlorinated Biphenyls (PCB)	A class of organic compounds that were used as coolants and insulating fluids for transformers and capacitors. The production of these compounds was banned in the 1970's due to their high toxicity.
Positive Control	Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.
Post-Digestion Spike	A sample prepared for metals analyses that has analytes spike added to determine if matrix effects may be a factor in the results.
Power of Hydrogen (pH)	The measure of acidity or alkalinity of a solution.
Practical Quantitation Limit (PQL)	Another term for a method reporting limit. The lowest reportable concentration of a compound based on parameters set up in an analytical method and the laboratory's ability to reproduce those conditions.
Precision	TNI- The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.
Preservation	TNI and DoD- Any conditions under which a sample must be kept in order to maintain chemical, physical, and/or biological integrity prior to analysis.
Primary Accreditation Body (Primary AB)	TNI- The accreditation body responsible for assessing a laboratory's total quality system, on-site assessment, and PT performance tracking for fields of accreditation.
Procedure	TNI- A specified way to carry out an activity or process. Procedures can be documented or not.
Proficiency Testing (PT)	TNI- A means to evaluate a laboratory's performance under controlled conditions relative to a given set of criteria, through analysis of unknown samples provided by an external source.
Proficiency Testing Program (PT Program)	TNI- The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories.
Proficiency Testing Provider (PT Provider)	TNI- A person or organization accredited by a TNI-approved Proficiency Testing Provider Accreditor to operate a TNI-compliant PT Program.
Proficiency Testing Provider Accreditor (PTPA)	TNI- An organization that is approved by TNI to accredit and monitor the performance of proficiency testing providers.
Proficiency Testing Reporting Limit (PTRL)	TNI- A statistically derived value that represents the lowest acceptable concentration for an analyte in a PT sample, if the analyte is spiked into the PT sample. The PTRLs are specified in the TNI FoPT tables.
Proficiency Testing Sample (PT)	TNI- A sample, the composition of which is unknown to the laboratory, and is provided to test whether the laboratory can produce analytical results within the specified acceptance criteria.

Proficiency Testing (PT) Study	TNI- a) Scheduled PT Study: A single complete sequence of circulation and scoring of PT samples to all participants in a PT program. The study must have the same pre-defined opening and closing dates for all participants; b) Supplemental PT Study: A PT sample that may be from a lot previously released by a PT Provider that meets the requirements for supplemental PT samples given in Volume 3 of this Standard [TNI] but that does not have a pre-determined opening date and closing date.
Proficiency Testing Study Closing Date	TNI- a) Scheduled PT Study: The calendar date by which all participating laboratories must submit analytical results for a PT sample to a PT Provider; b) Supplemental PT Study: The calendar date a laboratory submits the results for a PT sample to the PT Provider.
Proficiency Testing Study Opening Date	TNI- a) Scheduled PT Study: The calendar date that a PT sample is first made available to all participants of the study by a PT Provider; b) Supplemental PT Study: The calendar date the PT Provider ships the sample to a laboratory.
Protocol	TNI- A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) that must be strictly followed.
Qualitative Analysis	Analysis designed to identify the components of a substance or mixture.
Quality Assurance (QA)	TNI- An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.
Quality Assurance Manual (QAM)	A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality Assurance Project Plan (QAPP)	A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.
Quality Control (QC)	TNI- The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against “out of control” conditions and ensuring that the results are of acceptable quality.
Quality Control Sample (QCS)	TNI- A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control.
Quality Manual	TNI- A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.

Quality System	TNI - A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance and quality control activities.
Quantitation Range	The range of values (concentrations) in a calibration curve between the LOQ and the highest successively analyzed initial calibration standard used to relate instrument response to analyte concentration. The quantitation range (adjusted for initial sample volume/weight, concentration/dilution and final volume) lies within the calibration range.
Quantitative Analysis	Analysis designed to determine the amounts or proportions of the components of a substance.
Random Error	The EPA has established that there is a 5% probability that the results obtained for any one analyte will exceed the control limits established for the test due to random error. As the number of compounds measured increases in a given sample, the probability for statistical error also increases.
Raw Data	TNI- The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records.
Reagent Blank (method reagent blank)	A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps.
Reagent Grade	Analytical reagent (AR) grade, ACS reagent grade, and reagent grade are synonymous terms for reagents that conform to the current specifications of the Committee on Analytical Reagents of the American Chemical Society.
Records	The output of implementing and following management system documents (e.g., test data in electronic or hand-written forms, files, and logbooks).
Reference Material	TNI- Material or substance one or more of whose property values are sufficiently homogenized and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
Reference Method	TNI- A published method issued by an organization generally recognized as competent to do so. (When the ISO language refers to a “standard method”, that term is equivalent to “reference method”). When a laboratory is required to analyze by a specified method due to a regulatory requirement, the analyte/method combination is recognized as a reference method. If there is no regulatory requirement for the analyte/method combination, the analyte/method combination is recognized as a reference method if it can be analyzed by another reference method of the same matrix and technology.
Reference Standard	TNI- Standard used for the calibration of working measurement standards in a given organization or at a given location.
Relative Percent Difference (RPD)	A measure of precision defined as the difference between two measurements divided by the average concentration of the two measurements.

Reporting Limit (RL)	The lowest reportable concentration of a compound based on parameters set up in an analytical method and the laboratory's ability to reproduce those conditions. Reporting limits are corrected for sample amounts, including the dry weight of solids, unless otherwise specified. There must be a sufficient buffer between the Reporting Limit and the MDL.
Reporting Limit Verification Standard (RLVS)	A standard analyzed at the reporting limit for an analysis to verify the laboratory's ability to report to that level.
Representativeness	A quality element related to the ability to collect a sample reflecting the characteristics of the part of the environment to be assessed. Sample representativeness is dependent on the sampling techniques specified in the project work plan.
Requirement	Denotes a mandatory specification; often designated by the term "shall".
Retention Time	The time between sample injection and the appearance of a solute peak at the detector.
Revocation	TNI- The total or partial withdrawal of a laboratory's accreditation by an accreditation body.
Sample	Portion of material collected for analysis, identified by a single, unique alphanumeric code. A sample may consist of portions in multiple containers, if a single sample is submitted for multiple or repetitive analysis.
Sample Condition Upon Receipt Form (SCURF)	Form used by sample receiving personnel to document the condition of sample containers upon receipt to the laboratory (used in conjunction with a COC).
Sample Delivery Group (SDG)	A unit within a single project that is used to identify a group of samples for delivery. An SDG is a group of 20 or fewer field samples within a project, received over a period of up to 14 calendar days. Data from all samples in an SDG are reported concurrently.
Sample Receipt Form (SRF)	Letter sent to the client upon login to show the tests requested and pricing.
Sample Tracking	Procedures employed to record the possession of the samples from the time of sampling until analysis, reporting and archiving. These procedures include the use of a chain-of-custody form that documents the collection, transport, and receipt of compliance samples to the laboratory. In addition, access to the laboratory is limited and controlled to protect the integrity of the samples.
Sampling	TNI- Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.
Selected Ion Monitoring (SIM)	A mode of analysis in mass spectrometry where the detector is set to scan over a very small mass range, typically one mass unit. The narrower the range, the more sensitive the detector.
Selectivity	TNI- The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system.
Sensitivity	TNI- The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.
Serial Dilution	The stepwise dilution of a substance in a solution.
Shall	EPA – The word "shall" is used to indicate aspects of the method that are considered essential to its performance, based on sound analytical practices.

Should	EPA – The word "should" is used to provide guidance on aspects of the method that are useful but not essential.
Signal-to-Noise Ratio (S/N)	A measure of signal strength relative to background noise. The average strength of the noise of most measurements is constant and independent of the magnitude of the signal. Thus, as the quantity being measured (producing the signal) decreases in magnitude, S/N decreases and the effect of the noise on the relative error of a measurement increases.
Source Water	TNI- When sampled for drinking water compliance, untreated water from streams, rivers, lakes, or underground aquifers, which is used to supply private and public drinking water supplies.
Spike	A known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.
Standard (Document)	TNI- The document describing the elements of a laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies.
Standard (Chemical)	Standard samples are comprised of a known amount of standard reference material in the matrix undergoing analysis. A standard reference material is a certified reference material produced by US NIST and characterized for absolute content, independent of analytical test method.
Standard Blank (or Reagent Blank)	A calibration standard consisting of the same solvent/reagent matrix used to prepare the calibration standards without the analytes. It is used to construct the calibration curve by establishing instrument background.
Standard Method	A test method issued by an organization generally recognized as competent to do so.
Standard Operating Procedure (SOP)	TNI- A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks.
Standard Reference Material (SRM)	A certified reference material produced by the US NIST or other equivalent organization and characterized for absolute content, independent of analytical method.
Statement of Qualifications (SOQ)	A document that lists information about a company, typically the qualifications of that company to compete on a bid for services.
Stock Standard	A concentrated reference solution containing one or more analytes prepared in the laboratory using an assayed reference compound or purchased from a reputable commercial source.
Storage Blank	A sample of analyte-free media prepared by the laboratory and retained in the sample storage area of the laboratory. A storage blank is used to record contamination attributable to sample storage at the laboratory.
Supervisor	The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses.
Surrogate	A substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples and is added to them for quality control purposes.

Suspension	TNI- The temporary removal of a laboratory's accreditation for a defined period of time, which shall not exceed 6 months or the period of accreditation, whichever is longer, in order to allow the laboratory time to correct deficiencies or area of non-conformance with the Standard.
Systems Audit	An on-site inspection or assessment of a laboratory's quality system.
Target Analytes	Analytes or chemicals of primary concern identified by the customer on a project-specific basis.
Technical Director	Individual(s) who has overall responsibility for the technical operation of the environmental testing laboratory.
Technology	TNI- A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.
Test	A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate.
Test Method	A definitive procedure that determines one or more characteristics of a given substance or product.
Test Methods for Evaluating Solid Waste, Physical/ Chemical (SW-846)	EPA Waste's official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with RCRA regulations.
Test Source	TNI- A radioactive source that is tested, such as a sample, calibration standard, or performance check source. A Test Source may also be free of radioactivity, such as a Test Source counted to determine the subtraction background, or a short-term background check.
The NELAC Institute (TNI)	A non-profit organization whose mission is to foster the generation of environmental data of known and documented quality through an open, inclusive, and transparent process that is responsive to the needs of the community. Previously known as NELAC (National Environmental Laboratory Accreditation Conference).
Total Petroleum Hydrocarbons (TPH)	A term used to denote a large family of several hundred chemical compounds that originate from crude oil. Compounds may include gasoline components, jet fuel, volatile organics, etc.
Toxicity Characteristic Leaching Procedure (TCLP)	A solid sample extraction method for chemical analysis employed as an analytical method to simulate leaching of compounds through a landfill.
Traceability	TNI- The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical conditions or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.
Training Document	A training resource that provides detailed instructions to execute a specific method or job function.
Trip Blank	This blank sample is used to detect sample contamination from the container and preservative during transport and storage of the sample. A cleaned sample container is filled with laboratory reagent water and the blank is stored, shipped, and analyzed with its associated samples.

Tuning	A check and/or adjustment of instrument performance for mass spectrometry as required by the method.
Ultraviolet Spectrophotometer (UV)	Instrument routinely used in quantitative determination of solutions of transition metal ions and highly conjugated organic compounds.
Uncertainty, Counting	TNI- The component of Measurement Uncertainty attributable to the random nature of radioactive decay and radiation counting (often estimated as the square root of observed counts (MARLAP). Older references sometimes refer to this parameter as Error, Counting Error or Count Error (c.f., Total Uncertainty).
Uncertainty, Expanded	TNI- The product of the Standard Uncertainty and a coverage factor, k, which is chosen to produce an interval about the result that has a high probability of containing the value of the measurand (c.f., Standard Uncertainty). NOTE: Radiochemical results are generally reported in association with the Total Uncertainty. Either if these estimates of uncertainty can be reported as the Standard Uncertainty (one-sigma) or as an Expanded Uncertainty (k-sigma, where $k > 1$).
Uncertainty, Measurement	TNI- Parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand.
Uncertainty, Standard	TNI- An estimate of the Measurement Uncertainty expressed as a standard deviation (c.f., Expanded Uncertainty).
Uncertainty, Total	TNI- An estimate of the Measurement Uncertainty that accounts for contributions from all significant sources of uncertainty associated with the analytical preparation and measurement of a sample. Such estimates are also commonly referred to as Combined Standard Uncertainty or Total Propagated Uncertainty, and in some older references as the Total Propagated Error, among other similar items (c.f., Counting Uncertainty).
Unethical actions	Deliberate falsification of analytical or quality control results where failed method or contractual requirements are made to appear acceptable.
United States Department of Agriculture (USDA)	A department of the federal government that provides leadership on food, agriculture, natural resources, rural development, nutrition and related issues based on public policy, the best available science, and effective management.
United States Geological Survey (USGS)	Program of the federal government that develops new methods and tools to supply timely, relevant, and useful information about the Earth and its processes.
Unregulated Contaminant Monitoring Rule (UCMR)	EPA program to monitor unregulated contaminants in drinking water.
Validation	The confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.
Verification	TNI- Confirmation by examination and objective evidence that specified requirements have been met. In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.

Voluntary Action Program (VAP)	A program of the Ohio EPA that gives individuals a way to investigate possible environmental contamination, clean it up if necessary and receive a promise from the State of Ohio that no more cleanup is needed.
Whole Effluent Toxicity (WET)	The aggregate toxic effect to aquatic organisms from all pollutants contained in a facility's wastewater (effluent).

10.0. REFERENCES

10.1. "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act." Federal Register, 40 CFR Part 136, most current version.

10.2. "Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods." SW-846.

10.3. "Methods for Chemical Analysis of Water and Wastes", EPA 600-4-79-020, 1979 Revised 1983, U.S. EPA.

10.4. U.S. EPA Contract Laboratory Program Statement of Work for Organic Analysis.

10.5. U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analysis.

10.6. "Standard Methods for the Examination of Water and Wastewater." Current Edition APHA-AWWA-WPCF.

10.7. "Annual Book of ASTM Standards", Section 4: Construction, Volume 04.04: Soil and Rock; Building Stones, American Society of Testing and Materials.

10.8. "Annual Book of ASTM Standards", Section 11: Water and Environmental Technology, American Society of Testing and Materials.

10.9. "NIOSH Manual of Analytical Methods", U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, most current version.

10.10. "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water", U.S. EPA, Environmental Monitoring and Support Laboratory – Cincinnati (Sep 1986).

10.11. Quality Assurance of Chemical Measurements, Taylor, John K.; Lewis Publishers, Inc. 1987.

10.12. Methods for Non-conventional Pesticides Chemicals Analysis of Industrial and Municipal Wastewater, Test Methods, EPA-440/1-83/079C.

10.13. Environmental Measurements Laboratory (EML) Procedures Manual, HASL-300, US DOE, February, 1992.

10.14. Requirements for Quality Control of Analytical Data, HAZWRAP, DOE/HWP-65/R1, July, 1990.

10.15. Requirements for Quality Control of Analytical Data for the Environmental Restoration Program, Martin Marietta, ES/ER/TM-16, December, 1992.

10.16. Quality Assurance Manual for Industrial Hygiene Chemistry, AIHA, most current version.

10.17. National Environmental Laboratory Accreditation Conference (NELAC) Standard- most current version.

10.18. ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories- most current version.

10.19. Department of Defense Quality Systems Manual (QSM), most current version.

10.20. TNI (The NELAC Institute) Standard- 2003 and 2009.

10.21. UCMR Laboratory Approval Requirements and Information Document, most current version.

10.22. US EPA Drinking Water Manual, most current version.

11.0. REVISIONS

The Pace Corporate Environmental Quality Office files an electronic version of a Microsoft Word document with tracked changes detailing all revisions made to previous versions of the Quality Assurance Manual. This document is available upon request. All current revisions are summarized in the table below.

Document Number	Reason for Change	Date
Quality Assurance Manual 19.0	General: made administrative edits that do not affect the policies or procedures within the document (including revising company name to Pace Analytical Services, LLC). Cover page: removed corporate approval signature lines and revised document control format. Table of Contents: added Attachment VII – Pace COC Old Section 3: moved to other sections of the QAM as applicable and deleted entire section (All section references below reflect the new section numbers). Section 1.1.2: replaced with section 3.1.1. Sections 1.3, 1.4, 1.11: removed extraneous language. Sections 1.5: added language from old section 1.6. Section 1.6: revised anonymous reporting information. Section 1.8: removed job descriptions for non-applicable personnel. Section 1.8.4: added tasks to QM job description. Section 1.8.8: added tasks to PM job description. Section 1.11.1: added keyless entry using key fobs detail. Section 2: rearranged existing sections. Section 2.4: reworded to match existing Sample Acceptance policy document. Section 2.6.3.2: added some detail regarding temperature monitoring corrective action. Section 2.6.5.1: added by-products of USDA soils. Section 3.2.2: added basic evaluation criteria. Section 3.4.3: added MS and Dup as optional alternative to MS/MSD. Section 3.5.2: added basic evaluation criteria. Section 3.9.1: added that RL may be based on calibration standard. Section 3.14: added new instrumentation as requiring validation. Section 4: in general, for each QC type, removed language regarding frequency and corrective actions and referenced lab-specific SOPs. Section 5: in general, removed extraneous language and Management of Change section. Section 5.1, 5.2: reorganized into Primary and Secondary Review sections and removed extraneous language. Section 5.3.2: specified types of support equipment to be monitored daily. Section 5.3.3.1: specified “working” weights. Section 5.3.4.2: added temperature sensors and added alternatives to annual in-house verification. Section 5.3.5: added pH electrode inspection/maintenance. Section 6: removed extraneous language including Quarterly Report section. Section 8.2.3.1: added “or designee”. Section 9 (glossary): revised and added definitions based on 2016 TNI Standard. Added “may, must, shall and should” based on SW-846 definition. Section 10: Added EPA DW Manual and revised references as applicable. Attachment III: updated corporate organizational chart. Old Attachment IV: removed floor plan attachment. Old Attachment VII: removed COC (available in SOPs). Indy added back in.	22Mar2017
Quality Assurance Manual 19.1	Throughout the document, references to SOP numbers were removed leaving only SOP titles. Section 1.8.9: added for Project Coordinator position. Section 2.4.3: changed “drinking water” to “drinking water compliance” for clarity. Section 2.6.4.1: clarified hazardous sample labeling. Section 3.8.1: updated the 40 CFR Part 136 reference. Section 3.12.1: removed language that limits the use of 3 sig figs. Section 5.1.6: added section to generally cover handling, storage, and transport of reference	14Jun2018

Document Number	Reason for Change	Date
	standards and reference materials. Section 5.2: removed details and added reference to Calibration Procedures SOP. Section 5.3.4: updated to reflect quarterly digital/mechanical thermometer calibration. Section 5.5: added section to generally cover handling, storage, maintenance and transport of measurement equipment. Section 6.3.1: clarified data review anomalies will be qualified or narrated. Section 6.3.2.1: updated to include the actual name of the final report. Section 8.2.2.1: added "calculation error" as a possible type of non-conformance. Glossary: updated definition of Deuterated Monitoring Compounds, removed DoD references, and updated the definition of Reporting Limit (RL). Attachment II: updated Attachment III: updated Attachment VI: updated Attachment V: updated Attachment VI: updated	
ENV-MAN-IND1-0001-rev.01 ENV-MAN-GRAP-0001-rev.01	Removed cover page and headers for use in Master Control. Table of Contents: added Grand Rapids address to header. Section 5.3.4.2: revised verification timeframe for thermometers to apply to both labs. Section 5.3.7: added clarification of the term critical volume. Attachment IIB: added Grand Rapids organizational chart. Attachment IV: updated and added Grand Rapids equipment. Attachment VI: updated and added Grand Rapids certifications. Attachment VII: updated to current form. Attachment VIII: added OIA 1677 and corrected soil holding time for OP Pest by 8141.	18Apr2019

ATTACHMENT I- QUALITY CONTROL CALCULATIONS

PERCENT RECOVERY (%REC)

$$\%REC = \frac{(MSConc - SampleConc)}{TrueValue} * 100$$

NOTE: The SampleConc is zero (0) for the LCS and Surrogate Calculations

PERCENT DIFFERENCE (%D)

$$\%D = \frac{MeasuredValue - TrueValue}{TrueValue} * 100$$

where:
TrueValue = Amount spiked (can also be the $\overline{CF}$ or $\overline{RF}$ of the ICAL Standards)
Measured Value = Amount measured (can also be the CF or RF of the CCV)

PERCENT DRIFT

$$\%Drift = \frac{CalculatedConcentration - TheoreticalConcentration}{TheoreticalConcentrtion} * 100$$

RELATIVE PERCENT DIFFERENCE (RPD)

$$RPD = \frac{|(R1 - R2)|}{(R1 + R2)/2} * 100$$

where:
R1 = Result Sample 1
R2 = Result Sample 2

CORRELATION COEFFICIENT (R)

$$CorrCoeff = \frac{\sum_{i=1}^{N} W_i * (X_i - \overline{X}) * (Y_i - \overline{Y})}{\sqrt{\left(\sum_{i=1}^{N} W_i * (X_i - \overline{X})^2\right) * \left(\sum_{i=1}^{N} W_i * (Y_i - \overline{Y})^2\right)}}$$

With:	N	Number of standard samples involved in the calibration
	i	Index for standard samples
	Wi	Weight factor of the standard sample no. i
	Xi	X-value of the standard sample no. i
	X(bar)	Average value of all x-values
	Yi	Y-value of the standard sample no. i
	Y(bar)	Average value of all y-values

ATTACHMENT I- QUALITY CONTROL CALCULATIONS (CONTINUED)

STANDARD DEVIATION (S)

$$S = \sqrt{\sum_{i=1}^{n} \frac{(X_i - \overline{X})^2}{(n-1)}}$$

where:
n = number of data points
X_i = individual data point
$\overline{X}$ = average of all data points

AVERAGE ($\overline{X}$)

$$\overline{X} = \frac{\sum_{n=1}^{i} X_i}{n}$$

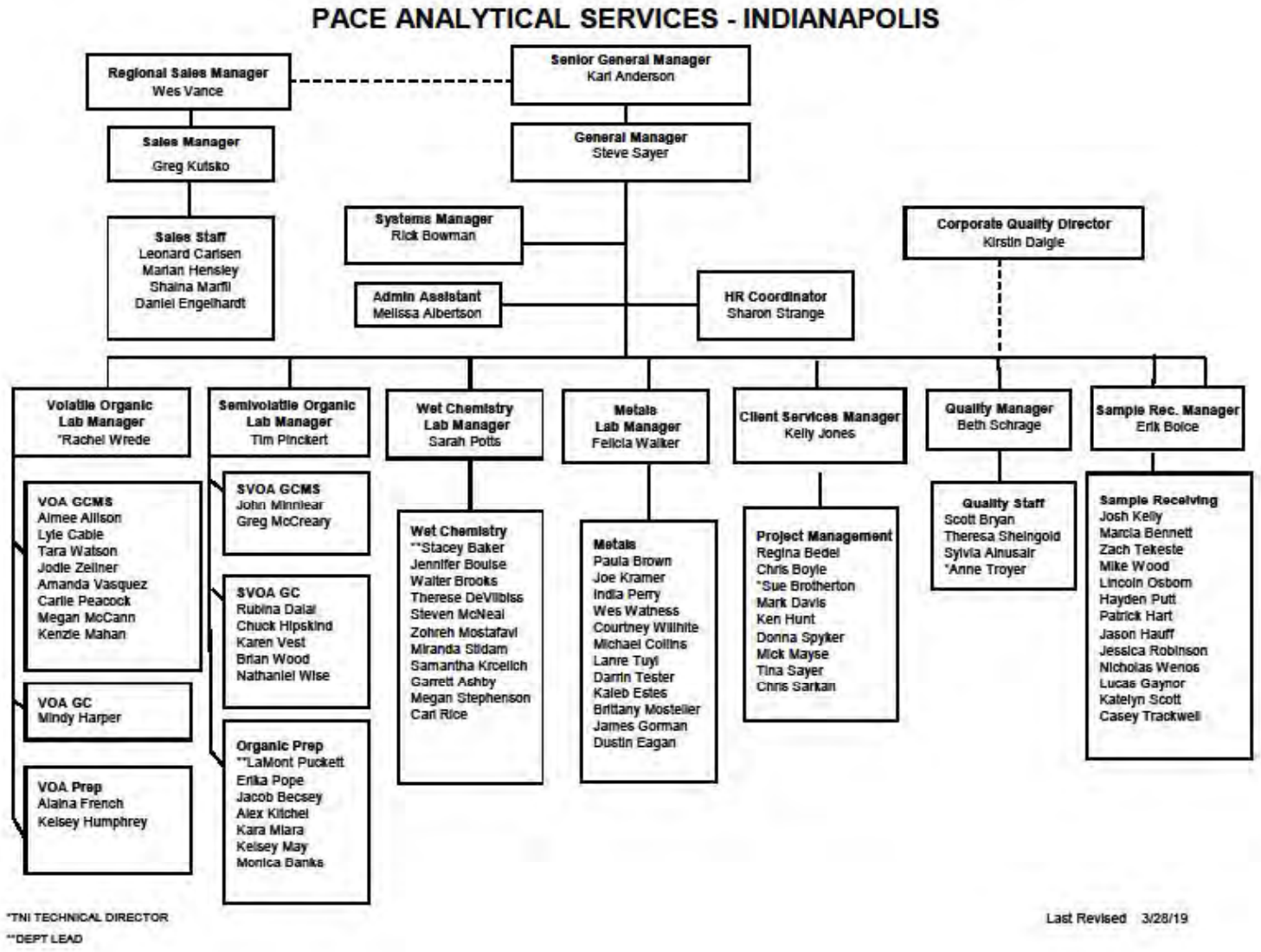
where:
n = number of data points
X_i = individual data point

RELATIVE STANDARD DEVIATION (RSD)

$$RSD = \frac{S}{\overline{X}} * 100$$

where:
S = Standard Deviation of the data points
$\overline{X}$ = average of all data points

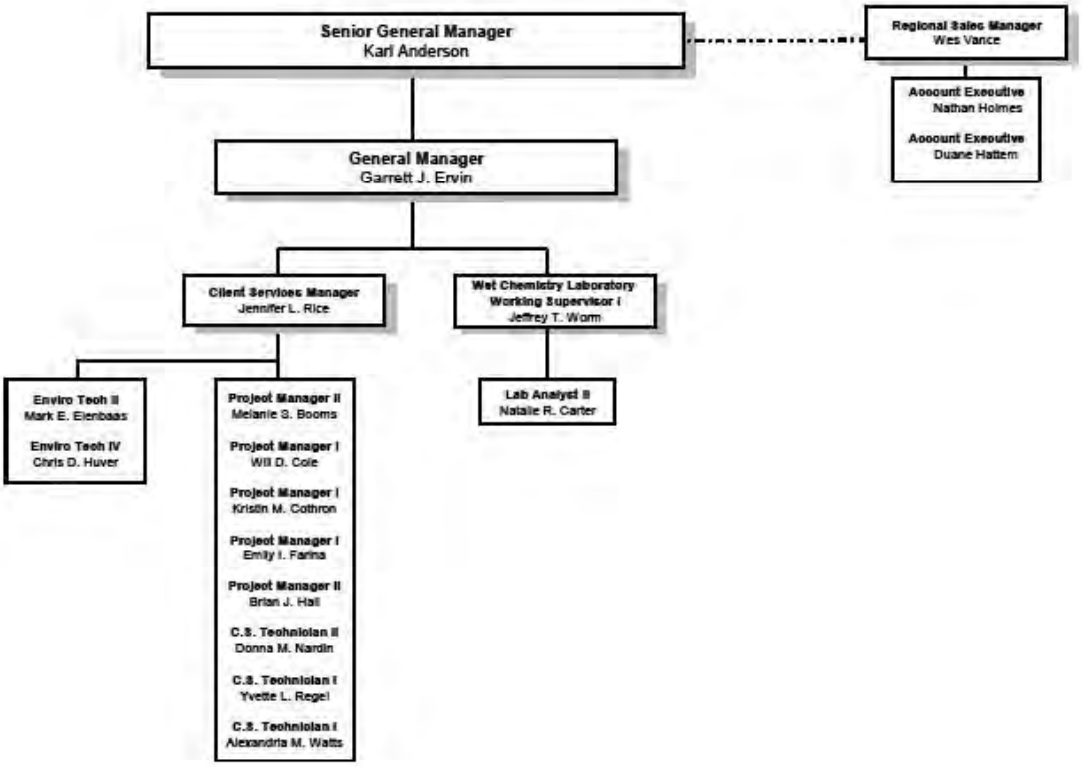
ATTACHMENT IIA- LABORATORY ORGANIZATIONAL CHARTS (CURRENT AS OF ISSUE DATE)



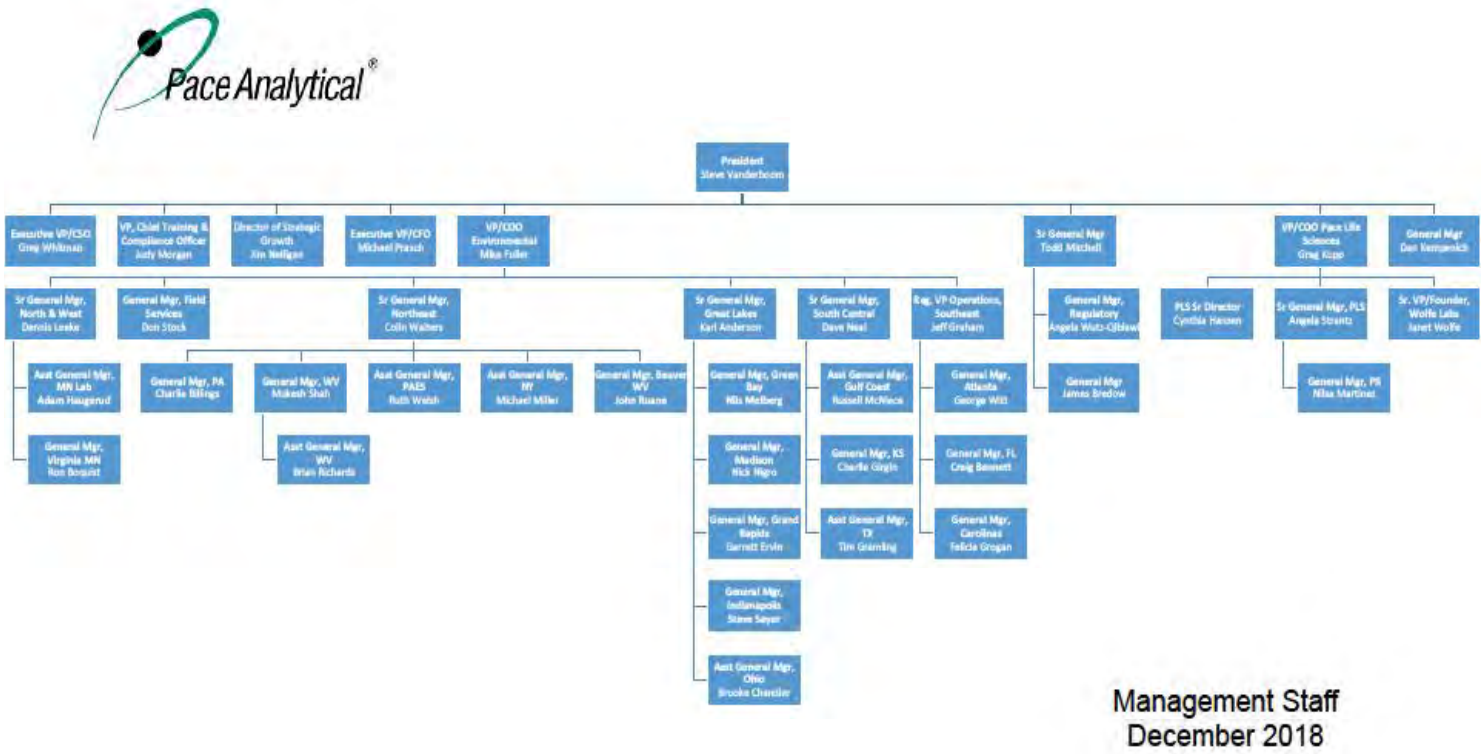
ATTACHMENT IIB- LABORATORY ORGANIZATIONAL CHARTS (CURRENT AS OF ISSUE DATE)

Pace Analytical

Pace Analytical Services, LLC. Grand Rapids, MI Service Center
January 2019



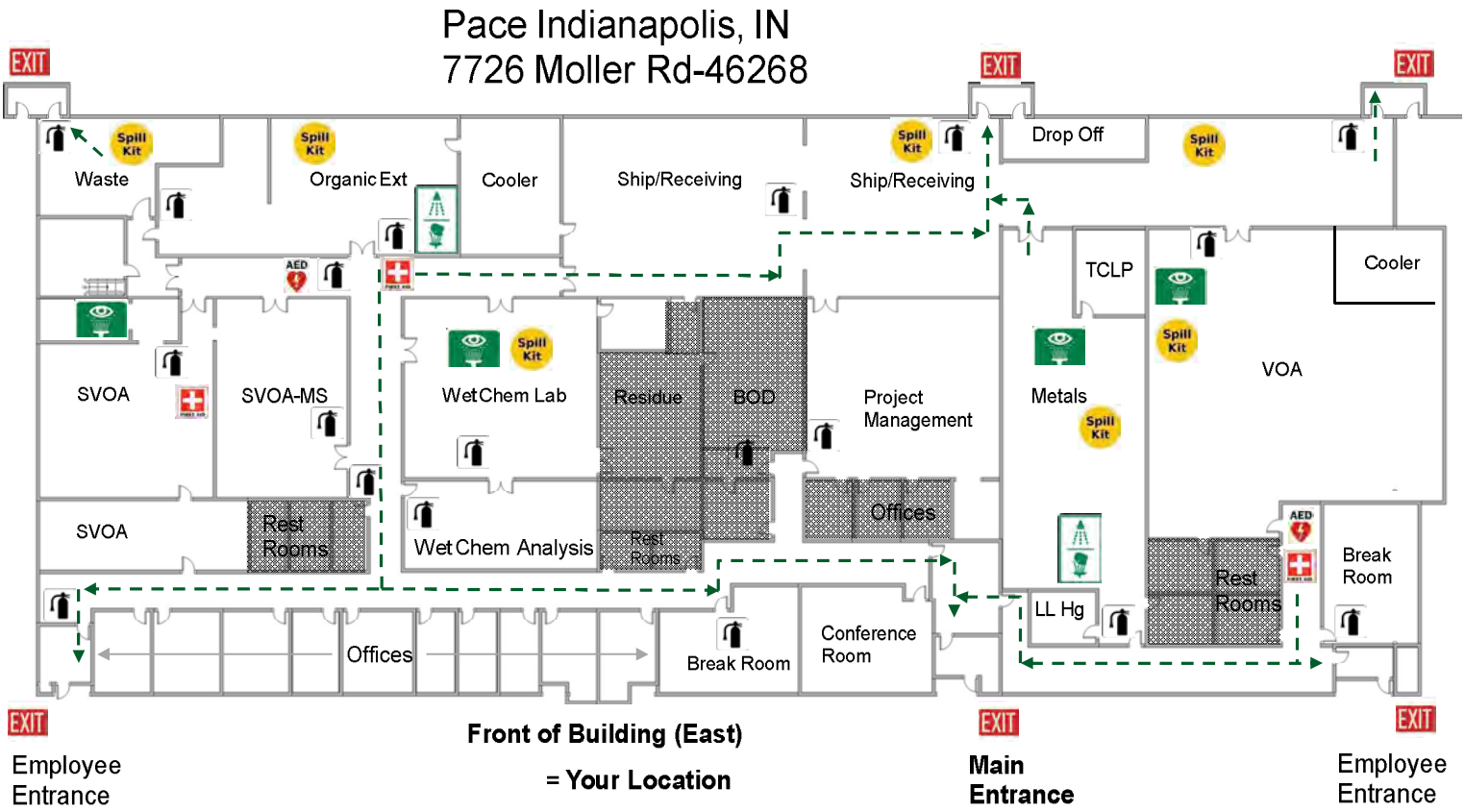
ATTACHMENT III- CORPORATE ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



ATTACHMENT IV- EQUIPMENT LIST (CURRENT AS OF ISSUE DATE)

Pace Analytical - Indianapolis Equipment/Instrumentation List						
INSTRUMENT	MANUFACTURER	MODEL NUMBER	DETECTOR	AUTOSAMPLER	SERVICE ANALYSIS	YEAR
GC/MS	Agilent	6890	MS 5973	Centurion W/S	8260/624 VOC	2003
GC/MS	Agilent	6890	MS 5973	Centurion	8260/624/524.2 VOC	2007
GC/MS	Agilent	6890	MS 5973	Centurion W/S	8260/624 VOC	2003
GC/MS	Agilent	6850N	MS 5975	Centurion	8260/624/524.2 VOC	2007
GC/MS	Agilent	6890	MS 5973	Centurion W/S	8260/624 VOC	2004
GC/MS	Agilent	6850N	MS 5975	Centurion	8260/624 VOC	2010
GC/MS	Agilent	6890	MS 5973	Archon	8260/624 VOC	2010
GC/MS	Agilent	6890N	MS 5975	Centurion	8260/624/524.2 VOC	2010
GC/MS	Hewlett-Packard	6890	MS 5973	7683	8270 PAH SIM	2000
GC/MS (2)	Agilent	7890	MS 5975	7683	8270/625 BNA	2008
GC/MS (2)	Agilent	6890	MS 5975	7683	8270 PAH SIM	2009
GC/MS (3)	Agilent	6890	MS 5973	7683	8270/625 BNA	2008
GC/MS	Agilent	7890	MS 5975	7683	8270 PAH SIM	2009
GC/MS (2)	Hewlett-Packard	5890	MS 5971	7673	Solvent Screen	2007
GC/MS	Agilent	7890B	MS 5977	7693	8270/PAH SIM	2017
GC/MS	Agilent	7890B	MS 5977	7693	8270/PAH SIM	2018
Gas Chromatograph	Agilent	6890	FID	7683	8015 Alcohols	2006
Gas Chromatograph	Hewlett-Packard	6890	FID	6890	8015 Glycols	2008
Gas Chromatograph	Agilent	7890A	FID	7693	8015 DRO/ERO	2009
Gas Chromatograph	Agilent	7890A	Dual ECD	7693	8082/608 PCBs/8011 EDB/DBCP	2009/2013
Gas Chromatograph	Hewlett-Packard	5890	FID	6890	Benzene	2006
Gas Chromatograph	Hewlett-Packard	5890	FID	8100	8015 GRO	2011
Gas Chromatograph	Hewlett-Packard	5890	FID	EST LGX50	RSK175 Dissolved gases	2006
Gas Chromatograph	Agilent	6890N	FID	Archon	8015 GRO	2008
Gas Chromatograph	Agilent	6890	Dual NPD	7683	Pesticides	2008
Gas Chromatograph (2)	Agilent	6890	Dual ECD	7683	PCBs	2008
Gas Chromatograph	Hewlett-Packard	6890	Dual ECD	7683	Herbicides	2008
Gas Chromatograph	Agilent	7890	Dual ECD	7693	Pesticides	2010
Microwave Extractors (2)	CEM	230/60	n/a	n/a	soil extraction	2008/2011
Spe-Dex	Horizon	4790	n/a	n/a	1664A Oil & Grease	2008
Trace ICP (2)	Thermo Scientific	ICAP 6500	n/a	ASX520	6010/200.7 Metals	2008/2011
Trace ICP	Thermo Scientific	ICAP 6500	n/a	ESI SC-4 FAST	6010/200.7 Metals	2011
ICP/MS	Agilent	7700	n/a	ASX520	6020/200.8 Metals	2012
ICP/MS	Agilent	7800	n/a	ASX520	6020/200.8 Metals	2018
Mercury Analyzer	CETAC	M-6100	n/a	ASX520	7470/7471/245 Mercury	2012/2010
Mercury Analyzer	Teledyne Leeman	M-7600	n/a	ASX520	7470/7471/245 Mercury	2016
Low-Level Mercury Analyzer (2)	CETAC	M-8000	n/a	ASX520/ASX560	Low-Level Mercury	2015/2018
Auto Analyzer (2)	Lachat	Quick Chem	n/a	n/a	NO3,Cl,Phenol, NH3,TKN	2010/2012
Titrosampler	Metrohm	855	n/a	n/a	Alkalinity, Acidity	2014
Automated Flash Point	Tanaka	APM-8	n/a	n/a	flash point	2010
Spectrophotometer	Hach	DR5000	n/a	n/a	Sulfate,Cr6+,Fe2+, PO4	2007
Spectrophotometer	Thermo	AquaMatePlus	n/a	n/a	Surfactants, COD	2005
Turbidimeter	Hach	2100P	n/a	n/a	Turbidity	2006
pH/ISE Meter (2)	Accumet	AR25/XL25	n/a	n/a	pH, Fluoride, Redox	2003/2010
pH/ISE Meter	Thermo Orion Star	A214	n/a	n/a	pH, Fluoride, Redox	2013
Conductivity Meter	Oakton	CON 700	n/a	n/a	Conductivity	2016
Dissolved Oxygen/pH Meter	Hach	HQ440d	n/a	n/a	BOD, cBOD	2014
BOD Analyzer	Thermo	AutoEz	n/a	n/a	BOD, cBOD	2013
TOC Analyzer	Shimadzu	TOC-Vwp	n/a	n/a	TOC, DOC	2008
Discrete Analyzer	Smart Chem	200	n/a	n/a	Cyanide, Phosphorus	2006
Flow Analyzer	OIA	FS3100	n/a	n/a	Free and Available Cyanide	2018
Ion Chromatogram	Dionex	ICS2100	n/a	AS-AP	Cl-, F-, SO4-, Br-, NO3/NO2	2013
Pace Analytical - Grand Rapids Equipment/Instrumentation List						
pH/ISE Meter (2)	Accumet	AB150	n/a	n/a	pH	2017
BOD Meter and Probe	Hach	HQ40d	n/a	n/a	BOD, cBOD	2017
FIA Analyzer	OIA	FS-3100	n/a	n/a	Nitrate and Nitrite	2017
Spectrophotometer	Shimadzu	UV-1800	n/a	n/a	Cr6+,Fe2+, PO4, Color	2017
Turbidimeter	Hach	2100N	n/a	n/a	Turbidity	2017

ATTACHMENT V- LABORATORY FLOOR PLAN - INDIANAPOLIS (CURRENT AS OF ISSUE DATE)



= Automated External defibrillator

= First Aid Station

= Spill Kits

= Shower/Eyewash Combo

= Eyewash/Drench Hose Available

= ABC Extinguisher Location

= Severe Weather Shelters

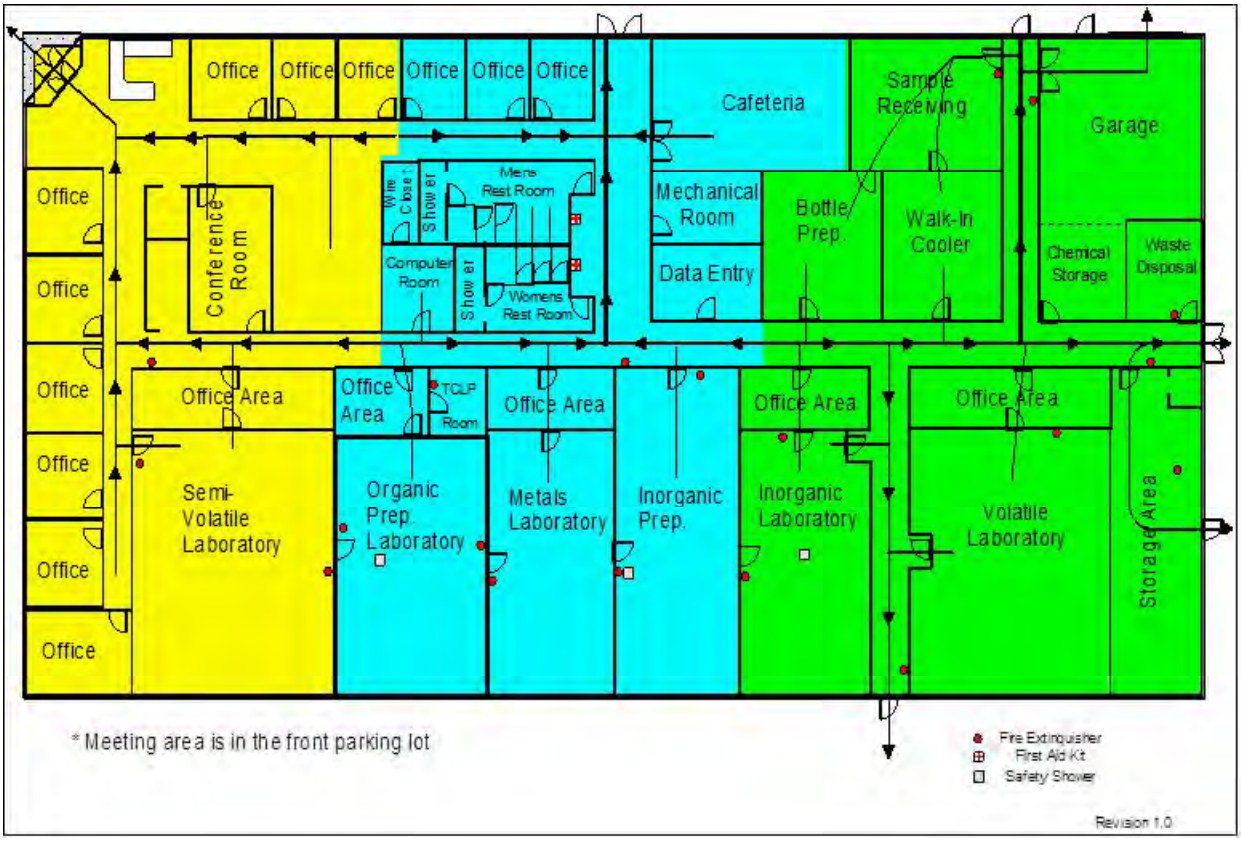
Fire Evacuation Meeting Place
(Front Parking lot. Greenway by road between main entrance and south entrance)

Effective:
3/26/18

ATTACHMENT VI- LABORATORY FLOOR PLAN – GRAND RAPIDS (CURRENT AS OF ISSUE DATE)

PACE GRAND RAPIDS

5560 Corporate Exchange Court SE



ATTACHMENT VII- LABORATORY CERTIFICATION LIST (CURRENT AS OF ISSUE DATE)

Pace Analytical Services, LLC

Indianapolis Laboratory Certifications

Accrediting Authority	Program Category	Accrediting Agency	Accreditation #	Expiration Date
Alaska	CSLAP	AK DEC	18-007	04/30/2019
Illinois (Secondary TNI)	Hazardous Waste	IL-EPA	200074	10/12/2019
Illinois (Secondary TNI)	Non-Potable Water	IL-EPA	200074	10/12/2019
Indiana	Drinking Water	ISDH	C-49-06	12/31/2021
Kansas (Primary TNI)	Hazardous Waste	KDHE	E-10177	04/30/2019
Kansas (Primary TNI)	Non-Potable Water	KDHE	E-10177	04/30/2019
Kentucky	UST	KDEP	80226	04/30/2019
Kentucky	Wastewater	KDEP	KY98019	12/31/2019
Michigan	Drinking Water	MDEQ	9050	12/31/2021
Ohio VAP	Hazardous Waste	OH-EPA	CL0065	01/10/2020
Ohio VAP	Non-Potable Water	OH-EPA	CL0065	01/10/2020
Oklahoma	Non-Potable Water	OK DEQ	9204	08/31/2019
Oklahoma	Solids	OK DEQ	9204	08/31/2019
Texas (Secondary TNI)	Non-Potable Water	TX CEQ	T104704355	01/31/2020
Texas (Secondary TNI)	Solid Chemical Mat.	TX CEQ	T104704355	01/31/2020
USDA	Compliance Agreement	USDA	IN-16-SL-FR-002	08/19/2019
USDA	Foreign Soil Permit	USDA	P330-16-00257	08/19/2019
West Virginia	Hazardous Waste	WV-DEP	330	10/31/2019
West Virginia	Non-Potable Water	WV-DEP	330	10/31/2019
Wisconsin	Non-Potable Water	WI DNR	999788130	08/31/2019
Wisconsin	Waste, Soil, Tissue	WI DNR	999788130	08/31/2019

Grand Rapids Laboratory Certifications

Accrediting Authority	Program Category	Accrediting Agency	Accreditation #	Expiration Date
Minnesota (Primary TNI)	Non-Potable Water	MDH	026-999-161	12/31/2019
Michigan	Drinking Water	MDEQ	0034	6/12/19

ATTACHMENT VIII- PACE CHAIN-OF-CUSTODY (CURRENT AS OF ISSUE DATE)

Pace Analytical

CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevant fields

LAB USE ONLY- Affix Workorder/Login Label Here or List Pace Workorder Number or MTJL Log-in Number Here

ALL SHADED AREAS are for LAB USE ONLY

Company:

Billing Information:

Address:

Container Preservative Type **

Lab Project Manager:

Report To:

Email To:

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other: _____

Copy To:

Site Collection Info/Address:

Analyses

Lab Profile/Line:

Customer Project Name/Number:

State: / County/City: Time Zone Collected: [ ] PT [ ] MT [ ] CT [ ] ET

Lab sample receipt checklist:

custody seals present/intact Y N NA
custody signatures present Y N NA
collector signature present Y N NA
bottles intact Y N NA
correct bottles Y N NA
sufficient volume Y N NA
samples received on ice Y N NA
VOA - headspace acceptable Y N NA
USDA Regulated soils Y N NA
samples in holding time Y N NA
residual chlorine present Y N NA
Cl strips: _____
sample pH acceptable Y N NA
pH strips: _____
sulfide present Y N NA
Lead Acetate strips: _____

LAB USE ONLY:
Lab sample # / comments:

Phone:
Email:

Site/Facility ID #:

Compliance Monitoring?
[ ] Yes [ ] No

Collected By (print):

Purchase Order #:
Quote #:

DW PWS ID #:
DW Location Code:

Collected By (signature):

Turnaround Date Required:

Immediately Packed on Ice:
[ ] Yes [ ] No

Sample Disposal:
[ ] Dispose as appropriate [ ] Return
[ ] Archive: _____
[ ] Hold: _____

Rush:
[ ] Same Day [ ] Next Day
[ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day
(Expedite Charges Apply)

Field Filtered (if applicable):
[ ] Yes [ ] No
Analysis: _____

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Collected (or Composite Start) Time	Composite End Date	Composite End Time	Res Cl	# of Ctns

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: Wet Blue Dry None

Packing Material Used:

Radchem sample(s) screened (<300 cpm): Y N NA

SHORT HOLDS PRESENT (<72 hours): Y N N/A

Lab Tracking #:

Samples received via: FEDEX UPS Client Courier Pace Courier

Lab Sample Temperature Info:
Temp Blank Received: Y N NA
Therm ID#: _____
Cooler 1 Temp Upon Receipt: _____ oC
Cooler 1 Therm Corr. Factor: _____ oC
Cooler 1 Corrected Temp: _____ oC
Comments:

Trip Blank Received: Y N NA
HCL MeOH TSP Other

Non Conformance(s): YES / NO

Page: _____ of: _____

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
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ATTACHMENT IX- METHOD HOLD TIME, CONTAINER AND PRESERVATION GUIDE (CURRENT AS OF ISSUE DATE)

THE HOLDING TIME INDICATED IN THE CHART BELOW IS THE MAXIMUM ALLOWABLE TIME FROM COLLECTION TO EXTRACTION AND/OR ANALYSIS PER THE ANALYTICAL METHOD. FOR METHODS THAT REQUIRE PROCESSING PRIOR TO ANALYSIS, THE HOLDING TIME IS DESIGNATED AS 'PREPARATION HOLDING TIME/ANALYSIS HOLDING TIME'.

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Acid Base Accounting	Sobek	Solid	Plastic/Glass	None	N/A
Acidity	SM2310B	Water	Plastic/Glass	$\leq 6^{o}C$	14 Days
Acid Volatile Sulfide	Draft EPA 1629	Solid	8oz Glass	$\leq 6^{o}C$	14 Days
Actinides	HASL-300	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Actinides	HASL-300	Solid	Plastic/Glass	None	180 Days
Alkalinity	SM2320B/310.2	Water	Plastic/Glass (NY requires separate bottle filled to the exclusion of air)	$\leq 6^{o}C$	14 Days
Alkylated PAHs		Water	1L Amber Glass	$\leq 6^{o}C$; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved
Alkylated PAHs		Solid	8oz Glass	$\leq 10^{o}C$	1 Year/40 Days
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0/300.1/SM4110B	Water	Plastic/Glass	$\leq 6^{o}C$; EDA if bromate or chlorite run	All analytes 28 days except: NO_2, NO_3, o-Phos (48 Hours); chlorite (immediately for 300.0; 14 Days for 300.1). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0	Solid	Plastic/Glass	$\leq 6^{o}C$	All analytes 28 days except: NO_2, NO_3, o-Phos (48 hours); chlorite (immediately). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4	9056	Water/ Solid	Plastic/Glass	$\leq 6^{o}C$	48 hours

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Aromatic and Halogenated Volatiles (see note 1)	8021	Solid	5035 vial kit	See note 1	14 days
Aromatic and Halogenated Volatiles	602/8021	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present	14 Days (7 Days for aromatics if unpreserved)
Asbestos	EPA 600/R-93/116	Solid	Plastic/Glass; bulk- 2" square; popcorn ceiling- 2tbsp; soil- 4oz	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Bacteria, Total Plate Count	SM9221D	Water	Plastic/WK	≤ 6°C; $Na_2S_2O_3$	24 Hours
Base/Neutrals and Acids	8270	Solid	8oz Glass	≤ 6°C	14/40 Days
Base/Neutrals and Acids	625/8270	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Base/Neutrals, Acids & Pesticides	525.2	Water	1L Amber Glass	pH<2 HCl; ≤ 6°C; Na sulfite if Cl present	14/30 Days
Biomarkers		Water	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	≤ 6°C; pH<2 1:1 HCl (optional)
Biomarkers		Solid	≤ 10°C	1 Year/40 Days	≤ 10°C
BOD/cBOD	SM5210B	Water	Plastic/Glass	≤ 6°C	48 hours
Boiling Range Distribution of Petroleum Fractions	ASTM D2887-98	Product	10mL glass vials	≤ 6°C	N/A
BTEX/Total Hydrocarbons	TO-3	Air	Summa Canister	None	28 Days
BTEX/Total Hydrocarbons	TO-3	Air	Tedlar Bag or equivalent	None	72 Hours
Carbamates	531.1	Water	Glass	$Na_2S_2O_3$, Monochloroacetic acid pH <3; ≤ 6°C	28 Days
Carbamates	8318	Water	Glass	Monochloroacetic acid pH 4-5; ≤ 6°C	7/40 Days
Carbamates	8318	Solid	Glass	≤ 6°C	7/40 Days
Carbon Specific Isoptope Analysis (CSIA)	AM24	Water	40mL clear VOA vial with TLS	≤ 6°C, trisodium phosphate or HCl	N/A
Cation/Anion Balance	SM1030E	Water	Plastic/Glass	None	None

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Cation Exchange	9081	Solid	8oz Glass	None	unknown
Cations (Ferrous Iron, Ferric Iron, Divalent Manganese)	7199 modified	Water	40mL clear VOA vials with mylar septum	≤ 6°C; HCl	48 Hours
Chloride	SM4500Cl-C,E	Water	Plastic/Glass	None	28 Days
Chlorinated Hydrocarbons in Vapor	AM4.02	Vapor	20cc vapor vial with flat septum	None	N/A
Chlorine, Residual	SM4500Cl-D,E,G/330.5/Hach 8167	Water	Plastic/Glass	None	15 minutes
Chlorophyll	SM10200H	Water	Opaque bottle or aluminum foil	≤ 6°C	48 Hours to filtration
COD	SM5220C, D/410.4/Hach 8000	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Coliform, Fecal	SM9222D	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9222D	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	24 Hours
Coliform, Fecal	SM9221E	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9221E	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	24 Hours
Coliform, Total	SM9222B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total	SM9221B	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total, Fecal and E. coli	Colilert/ Quanti-tray	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total and E. coli	SM9223B	Drinking Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	30 Hours
Color	SM2120B,E	Water	Covered Plastic/Acid Washed Amber Glass	≤ 6°C	48 Hours
Condensable Particulate Emissions	EPA 202	Air	Solutions	None	180 Days
Cyanide, Reactive	SW846 chap.7	Water	Plastic/Glass	None	28 Days
Cyanide, Reactive	SW846 chap.7	Solid	Plastic/Glass	None	28 Days
Cyanide, Total and Amenable	SM4500CN-A,B,C,D,E,G,I,N/9010/ 9012/335.4	Water	Plastic/Glass	pH≥12 NaOH; ≤ 6°C; ascorbic acid if Cl present	14 Days (24 Hours if sulfide present-applies to SM4500CN only)

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Cyanide, Available and Free	EPA OIA 1677-09	Water	250mL Amber Glass	pH 11-12 NaOH; ≤ 6°C	14 Days
Cyanide, Available and Free	9013A extraction / EPA OIA 1677-09	Solid	4oz Glass Jar	≤ 6°C	14/14 Days
Diesel Range Organics- Alaska DRO	AK102	Solid	8oz Glass	≤ 6°C	14/40 Days
Diesel Range Organics- Alaska DRO	AK102	Water	1L Glass	pH<2 HCl; ≤ 6°C	14/40 Days
Diesel Range Organics- TPH DRO	8015	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Diesel Range Organics- TPH DRO	8015	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Diesel Range Organics- TPH DRO	8015	Tissue	1L Amber Glass	≤ - 10°C	1 Year if frozen/40 Days
Diesel Range Organics- TPH DRO	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Diesel Range Organics- NwTPH-Dx	Nw-TPH-Dx	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Diesel Range Organics- NwTPH-Dx	Nw-TPH-Dx	Water	1L Amber Glass	pH <2 HCl; ≤ 6°C	14/40 Days; 7 Days from collection to extraction if unpreserved
Diesel Range Organics- Wisconsin DRO	WI MOD DRO	Solid	Tared 4oz Glass Jar	≤ 6°C	10/47 Days
Diesel Range Organics- Wisconsin DRO	WI MOD DRO	Water	1L Amber Glass	≤ 6°C; pH <2 HCl	14/40 Days
Dioxins and Furans	1613B	Solid	8oz Glass	≤ 6°C	1 year
Dioxins and Furans	1613B	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	1 year
Dioxins and Furans	1613B	Fish/ Tissue	Aluminum foil	≤ 6°C	1 year
Dioxins and Furans	8290	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	30/45 Days
Dioxins and Furans	8290	Solid	8oz Glass	≤ 6°C	30/45 Days
Dioxins and Furans	8290	Fish/ Tissue	Not specified	< -10°C	30/45 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Dioxins and Furans	TO-9	Air	PUF	None	7/40 Days
Diquat/Paraquat	549.2	Water	Amber Plastic	≤ 6°C; $Na_2S_2O_3$	7/21 Days
EDB/DBCP (8011) EDB/DBCP/1,2,3-TCP (504.1)	504.1/8011	Water	40mL vials	≤ 6°C; $Na_2S_2O_3$ if Cl present	14 Days
Endothall	548.1	Water	Amber Glass	≤ 6°C; $Na_2S_2O_3$	7/14 Days
Enterococci	EPA 1600	Water	100mL Plastic	≤ 10°C	8 Hours
Enterococci	Enterolert	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Explosives	8330/8332	Water	1L Amber Glass	≤ 6°C	7/40 Days
Explosives	8330/8332	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Water	1L Amber Glass	pH < 2 HCl; ≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Solid	4oz Glass Jar	≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	MA-EPH	Water	1L Amber Glass	pH<2 HCl; ≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	MA-EPH	Solid	4oz Glass Jar	≤ 6°C	7/40 Days
Fecal Streptococci	SM9230B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Ferrous Iron	SN3500Fe-D; Hach 8146	Water	Glass	None	Immediate
Flashpoint/ Ignitability	1010	Liquid	Plastic/Glass	None	28 Days
Florida PRO	FL PRO DEP (11/1/95)	Liquid	Glass, PTFE lined cap	≤ 6°C; pH <2 H_2SO_4 or HCl	7/40 Days
Fluoride	SM4500Fl-C,D	Water	Plastic	None	28 Days
Gamma Emitting Radionuclides	901.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Gasoline Range Organics	8015	Water	40mL vials	pH<2 HCl	14 Days
Gasoline Range Organics	8015	Solid	5035 vial kit	See note 1	14 days
Gasoline Range Organics (C3-C10)	8260B modified	Water	40mL vials	≤ 6°C; HCl	14 Days
Gasoline Range Organics (C3-C10)	8260B modified	Solid	4oz Glass Jar	≤ 6°C	14 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Gasoline Range Organics- Alaska GRO	AK101	Solid	5035 vial kit	See 5035 note*	28 Days if GRO only (14 Days with BTEX)
Gasoline Range Organics- Alaska GRO	AK101	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Water	40mL vials	pH<2 HCl; ≤ 6°C	7 Days unpreserved; 14 Days preserved
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Solid	40mL vials	≤ 6°C; packed jars with no headspace	14 Days
Gasoline Range Organics- Wisconsin GRO	WI MOD GRO	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days
Gasoline Range Organics- Wisconsin GRO	WI MOD GRO	Solid	40mL MeOH vials	≤ 6°C in MeOH	21 Days
Glyphosate	547	Water	Glass	≤ 6°C; $Na_2S_2O_3$	14 Days (18 Months frozen)
Grain Size	ASTM D422	Solid	Not specified	Ambient	N/A
Gross Alpha (NJ 48Hr Method)	NJAC 7:18-6	Water	Plastic/Glass	pH<2 HNO_3	48 Hrs
Gross Alpha and Gross Beta	9310/900.0	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Gross Alpha and Gross Beta	9310	Solid	Glass	None	180 Days
Haloacetic Acids	552.1/552.2	Water	40mL Amber vials	NH_4Cl; ≤ 6°C	14/7 Days if extracts stored ≤ 6°C or 14/14 Days if extracts stored at ≤ -10°C
Hardness, Total ($CaCO_3$)	SM2340B,C/130.1	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Heterotrophic Plate Count (SPC/HPC)	SM9215B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Heterotrophic Plate Count (SPC/HPC)	SimPlate	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Herbicides, Chlorinated	8151	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Herbicides, Chlorinated	8151	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Herbicides, Chlorinated	515.1/515.3	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	14/28 Days
Hexavalent Chromium	7196/218.6/ SM3500Cr-B, C	Water	Plastic/Glass	≤ 6°C	24 Hours (see note 4)
Hexavalent Chromium	218.6/SM3500Cr-B, C	Water	Plastic/Glass	Ammonium Buffer pH 9.3-9.7	28 Days (see note 4)
Hexavalent Chromium	218.6/218.7	Drinking Water	Plastic/Glass	Ammonium Buffer pH >8	14 Days (see note 4)

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Hexavalent Chromium	7196 (with 3060A)	Solid	Glass	≤ 6°C	30 Days from collection to extraction and 7 days from extraction to analysis
Hydrocarbons in Vapor	AM4.02	Vapor	20cc vapor vial with flat septum	None	N/A
Hydrogen by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Hydrogen Halide and Halogen Emissions	EPA 26	Air	Solutions	None	6 Months
Ignitability of Solids	1030	Non-liquid Waste	Plastic/Glass	None	28 Days
Lead Emissions	EPA 12	Air	Filter/Solutions	None	6 Months
Light Hydrocarbons by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Light Hydrocarbons in Vapor	AM20GAx	Vapor	20cc vapor vial with flat septum	None	14 Days
Lipids	Pace Lipids	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen
Mercury, Low-Level	1631E	Solid	Glass	None	28 Days
Mercury, Low-Level	1631E	Water	Fluoropolymer bottles (Glass if Hg is only analyte being tested)	12N HCl or BrCl	48 Hours for preservation or analysis; 28 Days to preservation if sample oxidized in bottle; 90 Days for analysis if preserved
Mercury, Low-Level	1631E	Tissue	Plastic/Glass	≤ - 10°C	28 Days if frozen
Mercury	7471	Solid	8oz Glass Jar	≤ 6°C	28 Days
Mercury	7470/245.1/245.2	Water	Plastic/Glass	pH<2 HNO_3	28 Days
Mercury	7471/245.6	Tissue	Plastic/Glass	≤ - 10°C	28 Days if frozen
Metals (GFAA)	7000/200.9	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP)	NIOSH 7300A/7303	Air	Filters	None	180 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Metals (ICP/ICPMS)	6010/6020	Solid	8oz Glass Jar	None	180 Days
Metals (ICP/ICPMS)	6010/6020/200.7/200.8	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP/ICPMS)	6020	Tissue	Plastic/Glass	≤ -10°C	180 Days if frozen
Methane, Ethane, Ethene	8015 modified	Water	40mL vials	HCl	14 Days
Methane, Ethane, Ethene	RSK-175; PM01/AM20GAx	Water	20mL vials	HCl; or trisodium phosphate or benzalkonium chloride and ≤ 6°C	14 Days; 7 Days unpreserved
Methane, Ethane, Ethene	EPA 3C	Air	Summa Canister	None	28 Days
Methane, Ethane, Ethene	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
Methanol, Ethanol	8015 modified	Water	40mL vials	≤ 6°C	14 Days
Methanol, Ethanol	8015 modified	Solid	2oz Glass	≤ 6°C	14 Days
Methyl Mercury	1630	Water	Teflon/ fluoropolymer	Fresh water- 4mL/L HCl; Saline water- 2mL/L H_2SO_4 (must be preserved within 48 hours of collection)	6 months
Methyl Mercury	1630	Tissue	2-4oz glass jar	≤ 0°C	28 Days; ethylated distillate 48 hours
Nitrogen, Ammonia	SM4500NH3/350.1	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Total Kjeldahl (TKN)	351.2	Solid	Plastic/Glass	≤ 6°C	28 Days
Nitrogen, Total Kjeldahl (TKN)	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Nitrate	SM4500-NO3/352.1	Water	Plastic/Glass	≤ 6°C	24 Hours preferred
Nitrogen, Nitrate & Nitrite combination	353.2	Solid	Plastic/Glass	≤ 6°C	28 Days
Nitrogen, Nitrate & Nitrite combination	SM4500-NO3/353.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Nitrite or Nitrate separately	SM4500-NO2/353.2	Water	Plastic/Glass	≤ 6°C	48 Hours
Nitrogen, Organic	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Non-Methane Organics	EPA 25C	Air	Summa Canister	None	28 Days
Non-Methane Organics	EPA 25C	Air	Tedlar Bag or equivalent	None	72 Hours

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Odor	SM2150B	Water	Glass	≤ 6°C	24 Hours
Oil and Grease/HEM	1664A/SM5520B/9070	Water	Glass	pH<2 H_2SO_4 or HCl; ≤ 6°C	28 Days
Oil and Grease/HEM	9071	Solid	Glass	≤ 6°C	28 Days
Oil Range Organics	8015	Solid	Glass	≤ 6°C	14/40 Days
Oil Range Organics	8015	Water	Glass	≤ 6°C	7/40 Days
Organic Matter	ASA 29-3.5.2	Solid	Plastic/Glass	None; samples air-dried and processed prior to analysis	N/A
Oxygen, Dissolved (Probe)	SM4500-O	Water	Glass	None	15 minutes
Oxygenates on Product (GCMS SIM)	1625 modified	Product	10mL glass vial	≤ 6°C	14 Days (7 Days from extraction)
PBDEs	1614	Water	1L Amber Glass	≤ 6°C	1 Year/1 Year
PBDEs	1614	Solid	Wide Mouth Jar	≤ 6°C	1 Year/1 Year
PBDEs	1614	Tissue	Aluminum Foil	≤ -10°C	1 Year/1 Year
PCBs and Pesticides, Organochlorine (OC)	TO-4/TO-10	Air	PUF	None	7/40 Days
PCBs and Pesticides, Organochlorine (OC)	608	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	Pest: 7/40 Days; PCB: 1 Year/1 Year
PCBs, Pesticides (OC), Herbicides	508.1	Water	Glass	Na2SO3; pH<2 HCl; ≤ 6°C	14/30 Days
PCBs, total as Decachlorobiphenyl	508A	Water	1L Glass, TFE lined cap	≤ 6°C	14/30 Days
Perchlorate	331	Water	Plastic/Glass	≥0-6°C, field filtered with headspace	28 Days
Permanent Gases (O2, N2, CO2)	RSK-175; PM01/AM20GAx	Water	40mL vials	benzalkonium chloride and ≤ 6°C	14 Days
Permanent Gases by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Permanent Gases in Vapor	AM20GAx	Vapor	20cc vapor vial with flat septum	None	14 Days
Pesticides, Organochlorine (OC)	8081	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Pesticides, Organochlorine (OC)	8081	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Pesticides, Organochlorine (OC)	8081	Tissue	8oz Glass Jar	≤ -10°C	1 Year if frozen/40 Days
Pesticides, Organophosphorous (OP)	8141	Solid	8oz Glass Jar	≤ 6°C	7/40 Days
Pesticides, Organophosphorous (OP)	8141	Water	1L Amber Glass	pH 5-8 with NaOH or H_2SO_4; ≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
PCBs (Aroclors)	8082	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	1 Year/1 Year
PCBs (Aroclors)	8082	Solid	8oz Glass Jar	≤ 6°C	1 Year/1 Year
PCBs (Aroclors)	8082	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen/1 Year
PCB Congeners	1668A	Water	1L Amber Glass	≤ 6°C but above freezing	1 Year/1 Year
PCB Congeners	1668A	Solid	4-8oz Glass Jar	≤ 6°C but above freezing	1 Year/1 Year
PCB Congeners	1668A	Tissue	4-8oz Glass Jar	≤ -10°C	1 Year/1 Year
Paint Filter Liquid Test	9095	Water	Plastic/Glass	None	N/A
Particle Size	ASA 15-5 modified	Solid	Plastic/Glass (100g sample)	None	N/A
Particulates	PM-10	Air	Filters	None	180 Days
Permanent Gases	EPA 3C	Air	Summa Canister	None	28 Days
Permanent Gases	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
pH	SM4500H+B/9040	Water	Plastic/Glass	None	15 minutes
pH	9045	Solid	Plastic/Glass	None	7 Days
Phenol, Total	420.1/420.4/9065/9066	Water	Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Phosphorus, Orthophosphate	SM4500P/365.1/365.3	Water	Plastic	≤ 6°C	Filter within 15 minutes, Analyze within 48 Hours
Phosphorus, Total	SM4500P/ 365.1/365.3/365.4	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Phosphorus, Total	365.4	Solid	Plastic/Glass	≤ 6°C	28 Days
Polynuclear Aromatic Hydrocarbons (PAH)	TO-13	Air	PUF	None	7/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen/40 Days
Purgeable Organic Halides (POX)	9021	Water	Glass; no headspace	≤ 6°C	14 Days
Radioactive Strontium	905.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-226	903.0/903.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note 3)	9320/904.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note 3)	9320	Solid	Plastic/Glass		
Residual Range Organics- Alaska RRO	AK103	Solid	8oz Glass	≤ 6°C	14/40 Days
Saturated Hydrocarbons		Water	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	≤ 6°C; pH<2 1:1 HCl (optional)
Saturated Hydrocarbons		Solid	≤ 10°C	1 Year/40 Days	≤ 10°C
Silica, Dissolved	SM4500Si-D	Water	Plastic	≤ 6°C	28 Days
Solids, Settleable	SM2540F	Water	Glass	≤ 6°C	48 Hours
Solids, Total	SM2540B	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total	SM2540G	Solid	Plastic/Glass	≤ 6°C	7 Days
Solids, Total (FOC, OM, Ash)	ASTM D2974	Solid	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Dissolved	SM2540C	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Suspended	SM2540D/USGS I-3765-85	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Volatile	160.4/SM2540E	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Volatile	160.4	Solid	Plastic/Glass	≤ 6°C	7 Days
Specific Conductance	SM2510B/9050/120.1	Water	Plastic/Glass	≤ 6°C	28 Days
Stationary Source Dioxins and Furans	EPA 23	Air	XAD Trap	None	30/45 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Stationary Source Mercury	EPA 101	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source Metals	EPA 29	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source PM10	EPA 201A	Air	Filters	None	180 Days
Stationary Source Particulates	EPA 5	Air	Filter/Solutions	None	180 Days
Sulfate	SM4500SO4/9036/ 9038/375.2/ASTM D516	Water	Plastic/Glass	$\leq 6^{o}C$	28 Days
Sulfide, Reactive	SW-846 Chap.7	Water	Plastic/Glass	None	28 Days
Sulfide, Reactive	SW-846 Chap.7	Solid	Plastic/Glass	None	28 Days
Sulfide, Total	SM4500S/9030	Water	Plastic/Glass	pH>9 NaOH; ZnOAc; $\leq 6^{o}C$	7 Days
Sulfite	SM4500SO3	Water	Plastic/Glass	None	15 minutes
Surfactants (MBAS)	SM5540C	Water	Plastic/Glass	$\leq 6^{o}C$	48 Hours
Total Alpha Radium (see note 3)	9315/903.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Total Alpha Radium (see note 3)	9315	Solid	Plastic/Glass	None	180 days
Total Inorganic Carbon (TIC)	PM01/AM20GAx	Water	40mL VOA vial with mylar septum	$\leq 6^{o}C$	14 Days
Total Organic Carbon (TOC)	SM5310B,C,D/9060	Water	Glass	pH<2 H_2SO_4 or HCl; $\leq 6^{o}C$	28 Days
Total Organic Carbon (TOC)	9060/Walkley Black/Lloyd Kahn	Solid	Glass	$\leq 6^{o}C$	14 Days
Total Organic Halogen (TOX)	SM5320/9020	Water	Glass; no headspace	$\leq 6^{o}C$	14 Days
Total Petroleum Hydrocarbons (aliphatic and aromatic)	TPHCWG	Water	40mL vials	pH<2 HCl, no headspace, $\leq 6^{o}C$	7 Days
Total Petroleum Hydrocarbons (aliphatic and aromatic)	TPHCWG	Solid	Glass	$\leq 6^{o}C$	14 days
Tritium	906.0	Water	Glass	None	180 days
Turbidity	SM2130B/180.1	Water	Plastic/Glass	$\leq 6^{o}C$	48 Hours
Total Uranium	908.0/ASTM D5174-97	Water	Plastic/Glass	pH<2 HNO_3	180 days
UCMR Metals	200.8	Water	Plastic or glass	pH<2 HNO_3	28 Days
UCMR Hexavalent Chromium	218.7	Water	HDPE or propylene	Na_2CO_3/$NaHCO_3$/ $(NH_4)_2SO_4$; pH>8	14 Days
UCMR Chlorate	300.1	Water	Plastic or glass	EDA	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
UCMR Perfluorinated Compounds	537	Water	Polypropylene	Trizma	14 Days
UCMR 1, 4 Dioxane	522	Water	Glass	Na_2SO_3, $NaHSO_4$; pH<4	28 Days
UV254	SM5910B	Water	Glass	≤ 6°C	48 Hours
Vermiculite	EPA 600/R-93/116	Solid	Plastic/Glass	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Volatile Fatty Acids	AM21G	Water	40mL clear VOA vials	≤ 6°C	21 Days
Volatile Fatty Acids (low level)	AM23G	Water	40mL clear VOA vials	≤ 6°C with benzalkonium chloride	14 Days
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days preserved
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Solid	4-8oz Glass Jar	≤ 6°C; packed jars with no headspace	7/28 Days
Volatiles	TO-14	Air	Summa Canister	None	28 Days
Volatiles	TO-14	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	TO-15	Air	Summa Canister or Tedlar Bag	None	28 Days
Volatiles	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Volatiles	TO-18/8260	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	8260	Solid	5035 vial kit	See note 1 (analyze for acrolein and acrylonitrile per local requirements)	14 days
Volatiles	8260	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Volatiles	8260	Conc. Waste	5035 vial kit or 40mL vials	≤ 6°C	14 Days
Volatiles	624	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present (or unpreserved if run within 7 days of collection) (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days (7 Days for aromatics if unpreserved)
Volatiles (see note 2)	524.2	Water	40mL vials (in duplicate)	pH<2 HCl; ≤ 6°C; Ascorbic acid or $Na_2S_2O_3$ if Cl present[2]	14 Days
Whole Oil	ASTM D3328 (prep); ASTM D5739	Product	10mL glass vials	≤ 6°C	N/A

[1] **5035/5035A Note**: 5035 vial kit typically contains 2 vials water, preserved by freezing **or**, 2 vials aqueous sodium bisulfate preserved at 4°C, **and** one vial methanol preserved at ≤6°C **and** one container of unpreserved sample stored at ≤6°C.

[2] Method 524.2 lists ascorbic acid as the preservative when residual chlorine is suspected, unless gases or Table 7 compounds are NOT compounds of interest and then sodium thiosulfate is the preservative recommended.

[3] Methods 9315 and 9320 both state that if samples are unpreserved, the samples should be brought to the lab within 5 days of collection, preserved in the lab, and then allowed to sit for a minimum of 16 hours before sample preparation/analysis.

[4] The holding time for hexavalent chromium may be extended by the addition of the ammonium buffer listed in EPA 218.6 per the 2012 EPA Method Update Rule. Although Method 218.6 stipulates a different pH range (9.0 to 9.5) for buffering, this method requirement was modified in the Method Update Rule to a pH range of 9.3 to 9.7. For non-potable waters, adjust the pH of the sample to 9.3 to 9.7 during collection with the method required ammonium sulfate buffer to extend the holding time to 28 days. For potable waters, addition of the buffer during collection will extend the holding time for 14 days per EPA 218.7 and the EPA UCMR program.

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Laura Kelly, Governor

The Kansas Department of Health and Environment encourages all clients and data users to verify the most current scope of accreditation for certification number E-10177

The analytes tested and the corresponding matrix and method which a laboratory is authorized to perform at any given time will be those indicated in the most recently issued scope of accreditation. The most recent scope of accreditation supersedes all previously issued scopes of accreditation. It is the certified laboratory's responsibility to review this document for any discrepancies. This scope of accreditation will be recalled in the event that your laboratory's certification is revoked.

Accreditation Start: 7/25/2019 Accreditation End: 4/30/2020

EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number: E-10177**

Pace Analytical Services, Inc - Indianapolis IN

	Primary AB
Program/Matrix: ***CWA (Non Potable Water)***	
Method ASTM D516-07	
Sulfate	KS
Method ASTM D516-11	
Sulfate	KS
Method EPA 120.1	
Conductivity	KS
Method EPA 1631E	
Mercury	KS
Method EPA 1664A	
Oil & Grease	KS
Method EPA 180.1	
Turbidity	KS
Method EPA 200.7	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Boron	KS
Cadmium	KS
Calcium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Iron	KS
Lead	KS

Program/Matrix: ***CWA (Non Potable Water)***

Magnesium	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Potassium	KS
Selenium	KS
Silver	KS
Sodium	KS
Strontium	KS
Thallium	KS
Tin	KS
Titanium	KS
Vanadium	KS
Zinc	KS

Method EPA 200.8

Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Boron	KS
Cadmium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Lead	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Selenium	KS
Silver	KS
Thallium	KS
Tin	KS
Titanium	KS
Vanadium	KS
Zinc	KS

Method EPA 245.1

Mercury	KS

Method EPA 300.0

Bromide	KS
Chloride	KS
Fluoride	KS
Nitrate	KS
Nitrate-nitrite	KS
Nitrite	KS
Sulfate	KS

Program/Matrix: *CWA (Non Potable Water)*

Method EPA 335.4	
Amenable cyanide	KS
Cyanide	KS
Method EPA 350.1	
Ammonia as N	KS
Method EPA 351.2	
Total Kjeldahl Nitrogen (TKN)	KS
Method EPA 351.2 minus EPA 350.1	
Organic nitrogen	KS
Method EPA 353.2	
Nitrate	KS
Nitrate-nitrite	KS
Nitrite	KS
Method EPA 365.1	
Phosphorus	KS
Method EPA 410.4	
Chemical oxygen demand	KS
Method EPA 420.4	
Total phenolics	KS
Method EPA 6010B	
Arsenic	KS
Cadmium	KS
Copper	KS
Lead	KS
Lithium	KS
Molybdenum	KS
Nickel	KS
Selenium	KS
Strontium	KS
Total chromium	KS
Zinc	KS
Method EPA 6020	
Arsenic	KS
Cadmium	KS
Copper	KS
Lead	KS
Molybdenum	KS
Nickel	KS
Selenium	KS
Total chromium	KS
Zinc	KS
Method EPA 608.3 GC-ECD	
4,4'-DDD	KS
4,4'-DDE	KS

Program/Matrix: ***CWA (Non Potable Water)***

4,4'-DDT	KS
Aldrin	KS
alpha-BHC (alpha-Hexachlorocyclohexane)	KS
Aroclor-1016 (PCB-1016)	KS
Aroclor-1221 (PCB-1221)	KS
Aroclor-1232 (PCB-1232)	KS
Aroclor-1242 (PCB-1242)	KS
Aroclor-1248 (PCB-1248)	KS
Aroclor-1254 (PCB-1254)	KS
Aroclor-1260 (PCB-1260)	KS
beta-BHC (beta-Hexachlorocyclohexane)	KS
Chlordane (tech.)(N.O.S.)	KS
delta-BHC	KS
Dieldrin	KS
Endosulfan I	KS
Endosulfan II	KS
Endosulfan sulfate	KS
Endrin	KS
Endrin aldehyde	KS
gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	KS
Heptachlor	KS
Heptachlor epoxide	KS
Methoxychlor	KS
Toxaphene (Chlorinated camphene)	KS

Method EPA 624.1

1,1,1-Trichloroethane	KS
1,1,2,2-Tetrachloroethane	KS
1,1,2-Trichloroethane	KS
1,1-Dichloroethane	KS
1,1-Dichloroethylene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Dichloroethane (Ethylene dichloride)	KS
1,2-Dichloropropane	KS
1,3-Dichlorobenzene	KS
1,4-Dichlorobenzene	KS
2-Chloroethyl vinyl ether	KS
Acrolein (Propenal)	KS
Acrylonitrile	KS
Benzene	KS
Bromodichloromethane	KS
Bromoform	KS
Carbon tetrachloride	KS
Chlorobenzene	KS
Chlorodibromomethane	KS
Chloroethane (Ethyl chloride)	KS
Chloroform	KS

Program/Matrix: ***CWA (Non Potable Water)***

cis-1,3-Dichloropropene	KS
Ethylbenzene	KS
Methyl bromide (Bromomethane)	KS
Methyl chloride (Chloromethane)	KS
Methylene chloride (Dichloromethane)	KS
Naphthalene	KS
Tetrachloroethylene (Perchloroethylene)	KS
Toluene	KS
trans-1,2-Dichloroethylene	KS
trans-1,3-Dichloropropylene	KS
Trichloroethene (Trichloroethylene)	KS
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	KS
Vinyl chloride	KS
Xylene (total)	KS

Method EPA 625.1

1,2,4-Trichlorobenzene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,3-Dichlorobenzene	KS
1,4-Dichlorobenzene	KS
2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	KS
2,4,6-Trichlorophenol	KS
2,4-Dichlorophenol	KS
2,4-Dimethylphenol	KS
2,4-Dinitrophenol	KS
2,4-Dinitrotoluene (2,4-DNT)	KS
2,6-Dinitrotoluene (2,6-DNT)	KS
2-Chloronaphthalene	KS
2-Chlorophenol	KS
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	KS
2-Nitrophenol	KS
3,3'-Dichlorobenzidine	KS
4-Bromophenyl phenyl ether	KS
4-Chloro-3-methylphenol	KS
4-Chlorophenyl phenylether	KS
4-Nitrophenol	KS
Acenaphthene	KS
Acenaphthylene	KS
Anthracene	KS
Benzidine	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
bis(2-Chloroethoxy)methane	KS
bis(2-Chloroethyl) ether	KS

Program/Matrix: ***CWA (Non Potable Water)***

Butyl benzyl phthalate	KS
Chrysene	KS
Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	KS
Dibenz(a,h) anthracene	KS
Diethyl phthalate	KS
Dimethyl phthalate	KS
Di-n-butyl phthalate	KS
Di-n-octyl phthalate	KS
Fluoranthene	KS
Fluorene	KS
Hexachlorobenzene	KS
Hexachlorobutadiene	KS
Hexachloroethane	KS
Indeno(1,2,3-cd) pyrene	KS
Isophorone	KS
Naphthalene	KS
Nitrobenzene	KS
n-Nitrosodimethylamine	KS
n-Nitrosodi-n-propylamine	KS
n-Nitrosodiphenylamine	KS
Pentachlorophenol	KS
Phenanthrene	KS
Phenol	KS
Pyrene	KS
Method EPA 7470A	
Mercury	KS
Method EPA 7471A	
Mercury	KS
Method EPA 8015D	
Propylene glycol	KS
Method EPA 8260C	
1,1,2-Trichloro-1,2,2-trifluoroethane	KS
1,3,5-Trichlorobenzene	KS
Method EPA 8270C	
1-Methylnaphthalene	KS
Carbazole	KS
Method EPA RSK-175 (GC/FID)	
Ethane	KS
Ethene	KS
Methane	KS
Method OIA 1677-09	
Available Cyanide	KS
Free cyanide	KS
Method SM 2310 B-2011	
Acidity, as CaCO3	KS

Program/Matrix: ***CWA (Non Potable Water)***

Method SM 2320 B-2011
Alkalinity as CaCO3 KS

Method SM 2340 B-2011
Hardness KS

Method SM 2510 B-2011
Conductivity KS

Method SM 2540 B-2011
Residue-total KS

Method SM 2540 C-2011
Residue-filterable (TDS) KS

Method SM 2540 D-2011
Residue-nonfilterable (TSS) KS

Method SM 2540 F-2011
Residue-settleable KS

Method SM 3500-Cr B-2011
Chromium VI KS

Method SM 4500-Cl G-2011
Total residual chlorine KS

Method SM 4500-Cl^- E-2011
Chloride KS

Method SM 4500-CN^- C-2011
Cyanide KS

Method SM 4500-CN^- E-2011
Cyanide KS

Method SM 4500-CN^- G-2011
Amenable cyanide KS

Method SM 4500-F^- C-2011
Fluoride KS

Method SM 4500-H+ B-2011
pH KS

Method SM 4500-NH3 G-2011
Ammonia as N KS

Method SM 4500-P E-2011
Orthophosphate as P KS

Method SM 4500-$S2^-$ D-2000
Sulfide KS

Method SM 4500-$S2^-$ D-2011
Sulfide KS

Method SM 5210 B-2011
Biochemical oxygen demand KS
Carbonaceous BOD, CBOD KS

Method SM 5310 C-2011

Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: ***CWA (Non Potable Water)***

Total organic carbon	KS
Method SM 5540 C-2011	
Surfactants - MBAS	KS
Method TKN-NH3-CAL	
Organic nitrogen	KS

Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: ***RCRA (Non Potable Water)***

Method EPA 1010A	
Ignitability	KS
Method EPA 1311	
Toxicity Characteristic Leaching Procedure (TCLP)	KS
Method EPA 1312	
Synthetic Precipitation Leaching Procedure (SPLP)	KS
Method EPA 6010B	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Boron	KS
Cadmium	KS
Calcium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Iron	KS
Lead	KS
Magnesium	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Potassium	KS
Selenium	KS
Silver	KS
Sodium	KS
Strontium	KS
Thallium	KS
Tin	KS
Titanium	KS
Vanadium	KS
Zinc	KS
Method EPA 6020	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Cadmium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Lead	KS
Manganese	KS

Program/Matrix: ***RCRA (Non Potable Water)***

Nickel	KS
Selenium	KS
Silver	KS
Thallium	KS
Vanadium	KS
Zinc	KS
Method EPA 7196A	
Chromium VI	KS
Method EPA 7470A	
Mercury	KS
Method EPA 7471A	
Mercury	KS
Method EPA 8011	
1,2-Dibromo-3-chloropropane (DBCP)	KS
1,2-Dibromoethane (EDB, Ethylene dibromide)	KS
Method EPA 8015D	
Diesel range organics (DRO)	KS
Ethanol	KS
Ethylene glycol	KS
Gasoline range organics (GRO)	KS
Isobutyl alcohol (2-Methyl-1-propanol)	KS
Isopropyl alcohol (2-Propanol, Isopropanol)	KS
Methanol	KS
n-Butyl alcohol (1-Butanol, n-Butanol)	KS
n-Propanol (1-Propanol)	KS
Propylene glycol	KS
Method EPA 8081B	
4,4'-DDD	KS
4,4'-DDE	KS
4,4'-DDT	KS
Aldrin	KS
alpha-BHC (alpha-Hexachlorocyclohexane)	KS
alpha-Chlordane, cis-Chlordane	KS
beta-BHC (beta-Hexachlorocyclohexane)	KS
Chlordane (tech.)(N.O.S.)	KS
delta-BHC	KS
Dieldrin	KS
Endosulfan I	KS
Endosulfan II	KS
Endosulfan sulfate	KS
Endrin	KS
Endrin aldehyde	KS
Endrin ketone	KS
gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	KS
gamma-Chlordane	KS

Program/Matrix: ***RCRA (Non Potable Water)***

Heptachlor	KS
Heptachlor epoxide	KS
Methoxychlor	KS
Toxaphene (Chlorinated camphene)	KS

Method EPA 8082A

Aroclor-1016 (PCB-1016)	KS
Aroclor-1221 (PCB-1221)	KS
Aroclor-1232 (PCB-1232)	KS
Aroclor-1242 (PCB-1242)	KS
Aroclor-1248 (PCB-1248)	KS
Aroclor-1254 (PCB-1254)	KS
Aroclor-1260 (PCB-1260)	KS

Method EPA 8141B

Atrazine	KS
Azinphos-methyl (Guthion)	KS
Chlorpyrifos	KS
Chlorpyrifos-methyl	KS
Demeton-o	KS
Demeton-s	KS
Diazinon	KS
Dichlorovos (DDVP, Dichlorvos)	KS
Dimethoate	KS
Disulfoton	KS
Famphur	KS
Malathion	KS
Merphos	KS
Methyl parathion (Parathion, methyl)	KS
Naled	KS
Parathion, ethyl	KS
Phorate	KS
Ronnel	KS
Simazine	KS
Terbufos	KS
Tetrachlorvinphos (Stirophos, Gardona) E-isomer	KS

Method EPA 8151A

2,4,5-T	KS
2,4-D	KS
2,4-DB	KS
3,5-Dichlorobenzoic acid	KS
Acifluorfen	KS
Bentazon	KS
Chloramben	KS
Dalapon	KS
DCPA di acid degradate	KS
Dicamba	KS
Dichloroprop (Dichlorprop)	KS

Program/Matrix: ***RCRA (Non Potable Water)***

Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	KS
MCPA	KS
MCPP	KS
Pentachlorophenol	KS
Picloram	KS
Silvex (2,4,5-TP)	KS

Method EPA 8260C

1,1,1,2-Tetrachloroethane	KS
1,1,1-Trichloroethane	KS
1,1,2,2-Tetrachloroethane	KS
1,1,2-Trichloro-1,2,2-trifluoroethane	KS
1,1,2-Trichloroethane	KS
1,1-Dichloroethane	KS
1,1-Dichloroethylene	KS
1,1-Dichloropropene	KS
1,2,3-Trichlorobenzene	KS
1,2,3-Trichloropropane	KS
1,2,4-Trichlorobenzene	KS
1,2,4-Trimethylbenzene	KS
1,2-Dibromo-3-chloropropane (DBCP)	KS
1,2-Dibromoethane (EDB, Ethylene dibromide)	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Dichloroethane (Ethylene dichloride)	KS
1,2-Dichloropropane	KS
1,3,5-Trichlorobenzene	KS
1,3,5-Trimethylbenzene	KS
1,3-Dichlorobenzene	KS
1,3-Dichloropropane	KS
1,4-Dichlorobenzene	KS
1,4-Dioxane (1,4- Diethyleneoxide)	KS
2,2-Dichloropropane	KS
2-Butanone (Methyl ethyl ketone, MEK)	KS
2-Chloroethyl vinyl ether	KS
2-Chlorotoluene	KS
2-Hexanone	KS
4-Chlorotoluene	KS
4-Isopropyltoluene (p-Cymene,p-Isopropyltoluene)	KS
4-Methyl-2-pentanone (MIBK)	KS
Acetone	KS
Acetonitrile	KS
Acrolein (Propenal)	KS
Acrylonitrile	KS
Allyl chloride (3-Chloropropene)	KS
Benzene	KS
Bromobenzene	KS
Bromochloromethane	KS

Program/Matrix: ***RCRA (Non Potable Water)***

Bromodichloromethane	KS
Bromoform	KS
Carbon disulfide	KS
Carbon tetrachloride	KS
Chlorobenzene	KS
Chlorodibromomethane	KS
Chloroethane (Ethyl chloride)	KS
Chloroform	KS
cis-1,2-Dichloroethylene	KS
cis-1,3-Dichloropropene	KS
Dibromomethane (Methylene bromide)	KS
Dichlorodifluoromethane (Freon-12)	KS
Diethyl ether	KS
Ethyl acetate	KS
Ethyl methacrylate	KS
Ethylbenzene	KS
Hexachlorobutadiene	KS
Iodomethane (Methyl iodide)	KS
Isopropylbenzene	KS
Methacrylonitrile	KS
Methyl bromide (Bromomethane)	KS
Methyl chloride (Chloromethane)	KS
Methyl methacrylate	KS
Methyl tert-butyl ether (MTBE)	KS
Methylene chloride (Dichloromethane)	KS
m-Xylene	KS
Naphthalene	KS
n-Butyl alcohol (1-Butanol, n-Butanol)	KS
n-Butylbenzene	KS
n-Propylbenzene	KS
o-Xylene	KS
Propionitrile (Ethyl cyanide)	KS
p-Xylene	KS
sec-Butylbenzene	KS
Styrene	KS
tert-Butyl alcohol	KS
tert-Butylbenzene	KS
Tetrachloroethylene (Perchloroethylene)	KS
Toluene	KS
trans-1,2-Dichloroethylene	KS
trans-1,3-Dichloropropylene	KS
trans-1,4-Dichloro-2-butene	KS
Trichloroethene (Trichloroethylene)	KS
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	KS
Vinyl acetate	KS
Vinyl chloride	KS
Xylene (total)	KS

Program/Matrix: ***RCRA (Non Potable Water)***

Method EPA 8270C

1,2,4,5-Tetrachlorobenzene	KS
1,2,4-Trichlorobenzene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Diphenylhydrazine	KS
1,3-Dichlorobenzene	KS
1,3-Dinitrobenzene (1,3-DNB)	KS
1,4-Dichlorobenzene	KS
1,4-Naphthoquinone	KS
1,4-Phenylenediamine	KS
1-Methylnaphthalene	KS
1-Naphthylamine	KS
2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	KS
2,3,4,6-Tetrachlorophenol	KS
2,4,5-Trichlorophenol	KS
2,4,6-Trichlorophenol	KS
2,4-Dichlorophenol	KS
2,4-Dimethylphenol	KS
2,4-Dinitrophenol	KS
2,4-Dinitrotoluene (2,4-DNT)	KS
2,6-Dichlorophenol	KS
2,6-Dinitrotoluene (2,6-DNT)	KS
2-Acetylaminofluorene	KS
2-Chloronaphthalene	KS
2-Chlorophenol	KS
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	KS
2-Methylaniline (o-Toluidine)	KS
2-Methylnaphthalene	KS
2-Methylphenol (o-Cresol)	KS
2-Naphthylamine	KS
2-Nitroaniline	KS
2-Nitrophenol	KS
2-Picoline (2-Methylpyridine)	KS
3,3'-Dichlorobenzidine	KS
3,3'-Dimethylbenzidine	KS
3-Methylcholanthrene	KS
3-Methylphenol (m-Cresol)	KS
3-Nitroaniline	KS
4-Aminobiphenyl	KS
4-Bromophenyl phenyl ether	KS
4-Chloro-3-methylphenol	KS
4-Chloroaniline	KS
4-Chlorophenyl phenylether	KS
4-Dimethyl aminoazobenzene	KS
4-Methylphenol (p-Cresol)	KS
4-Nitroaniline	KS

Program/Matrix: ***RCRA (Non Potable Water)***

4-Nitrophenol	KS
4-Nitroquinoline 1-oxide	KS
5-Nitro-o-toluidine	KS
7,12-Dimethylbenz(a) anthracene	KS
a-a-Dimethylphenethylamine	KS
Acenaphthene	KS
Acenaphthylene	KS
Acetophenone	KS
Aniline	KS
Anthracene	KS
Aramite	KS
Benzidine	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
Benzoic acid	KS
Benzyl alcohol	KS
bis(2-Chloroethoxy)methane	KS
bis(2-Chloroethyl) ether	KS
Butyl benzyl phthalate	KS
Carbazole	KS
Chlorobenzilate	KS
Chrysene	KS
Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	KS
Diallate	KS
Dibenz(a,h) anthracene	KS
Dibenzofuran	KS
Diethyl phthalate	KS
Dimethoate	KS
Dimethyl phthalate	KS
Di-n-butyl phthalate	KS
Di-n-octyl phthalate	KS
Diphenylamine	KS
Disulfoton	KS
Ethyl methanesulfonate	KS
Famphur	KS
Fluoranthene	KS
Fluorene	KS
Hexachlorobenzene	KS
Hexachlorobutadiene	KS
Hexachlorocyclopentadiene	KS
Hexachloroethane	KS
Hexachlorophene	KS
Hexachloropropene	KS
Indeno(1,2,3-cd) pyrene	KS

Program/Matrix: ***RCRA (Non Potable Water)***

Isodrin	KS
Isophorone	KS
Isosafrole	KS
Kepone	KS
Methapyrilene	KS
Methyl methanesulfonate	KS
Methyl parathion (Parathion, methyl)	KS
Naphthalene	KS
Nitrobenzene	KS
n-Nitrosodiethylamine	KS
n-Nitrosodimethylamine	KS
n-Nitroso-di-n-butylamine	KS
n-Nitrosodi-n-propylamine	KS
n-Nitrosodiphenylamine	KS
n-Nitrosomethylethalamine	KS
n-Nitrosomorpholine	KS
n-Nitrosopiperidine	KS
n-Nitrosopyrrolidine	KS
o,o,o-Triethyl phosphorothioate	KS
Parathion, ethyl	KS
Pentachlorobenzene	KS
Pentachloronitrobenzene	KS
Pentachlorophenol	KS
Phenacetin	KS
Phenanthrene	KS
Phenol	KS
Phorate	KS
Pronamide (Kerb)	KS
Pyrene	KS
Pyridine	KS
Safrole	KS
Sulfotep (Tetraethyl dithiopyrophosphate)	KS
Thionazin (Zinophos)	KS

Method EPA 8270C SIM

1-Methylnaphthalene	KS
2-Methylnaphthalene	KS
Acenaphthene	KS
Acenaphthylene	KS
Anthracene	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
Chrysene	KS
Dibenz(a,h) anthracene	KS

Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: ***RCRA (Non Potable Water)***

Fluoranthene	KS
Fluorene	KS
Indeno(1,2,3-cd) pyrene	KS
Naphthalene	KS
Phenanthrene	KS
Pyrene	KS
Method EPA 9012A	
Amenable cyanide	KS
Cyanide	KS
Method EPA 9038	
Sulfate	KS
Method EPA 9056A	
Bromide	KS
Chloride	KS
Fluoride	KS
Nitrate	KS
Nitrite	KS
Sulfate	KS
Method EPA 9066	
Total phenolics	KS
Method EPA 9095B	
Paint Filter Test	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Method EPA 1010A	
Ignitability	KS
Method EPA 1311	
Toxicity Characteristic Leaching Procedure (TCLP)	KS
Method EPA 1312	
Synthetic Precipitation Leaching Procedure (SPLP)	KS
Method EPA 6010B	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Boron	KS
Cadmium	KS
Calcium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Iron	KS
Lead	KS
Magnesium	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Potassium	KS
Selenium	KS
Silver	KS
Sodium	KS
Strontium	KS
Thallium	KS
Tin	KS
Titanium	KS
Vanadium	KS
Zinc	KS
Method EPA 6020	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Cadmium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Lead	KS
Manganese	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Nickel	KS
Selenium	KS
Silver	KS
Thallium	KS
Vanadium	KS
Zinc	KS
Method EPA 7196A	
Chromium VI	KS
Method EPA 7470A	
Mercury	KS
Method EPA 7471A	
Mercury	KS
Method EPA 8015D	
Diesel range organics (DRO)	KS
Ethanol	KS
Ethylene glycol	KS
Gasoline range organics (GRO)	KS
Isobutyl alcohol (2-Methyl-1-propanol)	KS
Isopropyl alcohol (2-Propanol, Isopropanol)	KS
Methanol	KS
n-Butyl alcohol (1-Butanol, n-Butanol)	KS
n-Propanol (1-Propanol)	KS
Propylene glycol	KS
Method EPA 8081B	
4,4'-DDD	KS
4,4'-DDE	KS
4,4'-DDT	KS
Aldrin	KS
alpha-BHC (alpha-Hexachlorocyclohexane)	KS
alpha-Chlordane, cis-Chlordane	KS
beta-BHC (beta-Hexachlorocyclohexane)	KS
Chlordane (tech.)(N.O.S.)	KS
delta-BHC	KS
Dieldrin	KS
Endosulfan I	KS
Endosulfan II	KS
Endosulfan sulfate	KS
Endrin	KS
Endrin aldehyde	KS
Endrin ketone	KS
gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	KS
gamma-Chlordane	KS
Heptachlor	KS
Heptachlor epoxide	KS
Methoxychlor	KS
Toxaphene (Chlorinated camphene)	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Method EPA 8082A

Aroclor-1016 (PCB-1016)	KS
Aroclor-1221 (PCB-1221)	KS
Aroclor-1232 (PCB-1232)	KS
Aroclor-1242 (PCB-1242)	KS
Aroclor-1248 (PCB-1248)	KS
Aroclor-1254 (PCB-1254)	KS
Aroclor-1260 (PCB-1260)	KS

Method EPA 8141B

Atrazine	KS
Azinphos-methyl (Guthion)	KS
Chlorpyrifos	KS
Chlorpyrifos-methyl	KS
Demeton-o	KS
Demeton-s	KS
Diazinon	KS
Dichlorovos (DDVP, Dichlorvos)	KS
Dimethoate	KS
Disulfoton	KS
Famphur	KS
Malathion	KS
Merphos	KS
Methyl parathion (Parathion, methyl)	KS
Naled	KS
Parathion, ethyl	KS
Phorate	KS
Ronnel	KS
Simazine	KS
Terbufos	KS
Tetrachlorvinphos (Stirophos, Gardona) E-isomer	KS

Method EPA 8151A

2,4,5-T	KS
2,4-D	KS
2,4-DB	KS
3,5-Dichlorobenzoic acid	KS
Acifluorfen	KS
Bentazon	KS
Dalapon	KS
DCPA di acid degradate	KS
Dicamba	KS
Dichloroprop (Dichlorprop)	KS
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	KS
MCPA	KS
MCPP	KS
Pentachlorophenol	KS
Picloram	KS

Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Silvex (2,4,5-TP)	KS
Method EPA 8260C	
1,1,1,2-Tetrachloroethane	KS
1,1,1-Trichloroethane	KS
1,1,2,2-Tetrachloroethane	KS
1,1,2-Trichloro-1,2,2-trifluoroethane	KS
1,1,2-Trichloroethane	KS
1,1-Dichloroethane	KS
1,1-Dichloroethylene	KS
1,1-Dichloropropene	KS
1,2,3-Trichlorobenzene	KS
1,2,3-Trichloropropane	KS
1,2,4-Trichlorobenzene	KS
1,2,4-Trimethylbenzene	KS
1,2-Dibromo-3-chloropropane (DBCP)	KS
1,2-Dibromoethane (EDB, Ethylene dibromide)	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Dichloroethane (Ethylene dichloride)	KS
1,2-Dichloropropane	KS
1,3,5-Trichlorobenzene	KS
1,3,5-Trimethylbenzene	KS
1,3-Dichlorobenzene	KS
1,3-Dichloropropane	KS
1,4-Dichlorobenzene	KS
1,4-Dioxane (1,4- Diethyleneoxide)	KS
2,2-Dichloropropane	KS
2-Butanone (Methyl ethyl ketone, MEK)	KS
2-Chloroethyl vinyl ether	KS
2-Chlorotoluene	KS
2-Hexanone	KS
4-Chlorotoluene	KS
4-Isopropyltoluene (p-Cymene,p-Isopropyltoluene)	KS
4-Methyl-2-pentanone (MIBK)	KS
Acetone	KS
Acetonitrile	KS
Acrolein (Propenal)	KS
Acrylonitrile	KS
Allyl chloride (3-Chloropropene)	KS
Benzene	KS
Bromobenzene	KS
Bromochloromethane	KS
Bromodichloromethane	KS
Bromoform	KS
Carbon disulfide	KS
Carbon tetrachloride	KS
Chlorobenzene	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Chlorodibromomethane	KS
Chloroethane (Ethyl chloride)	KS
Chloroform	KS
cis-1,2-Dichloroethylene	KS
cis-1,3-Dichloropropene	KS
Dibromomethane (Methylene bromide)	KS
Dichlorodifluoromethane (Freon-12)	KS
Diethyl ether	KS
Ethyl acetate	KS
Ethyl methacrylate	KS
Ethylbenzene	KS
Hexachlorobutadiene	KS
Iodomethane (Methyl iodide)	KS
Isopropylbenzene	KS
Methacrylonitrile	KS
Methyl bromide (Bromomethane)	KS
Methyl chloride (Chloromethane)	KS
Methyl methacrylate	KS
Methyl tert-butyl ether (MTBE)	KS
Methylene chloride (Dichloromethane)	KS
m-Xylene	KS
Naphthalene	KS
n-Butyl alcohol (1-Butanol, n-Butanol)	KS
n-Butylbenzene	KS
n-Propylbenzene	KS
o-Xylene	KS
Propionitrile (Ethyl cyanide)	KS
p-Xylene	KS
sec-Butylbenzene	KS
Styrene	KS
tert-Butyl alcohol	KS
tert-Butylbenzene	KS
Tetrachloroethylene (Perchloroethylene)	KS
Toluene	KS
trans-1,2-Dichloroethylene	KS
trans-1,3-Dichloropropylene	KS
trans-1,4-Dichloro-2-butene	KS
Trichloroethene (Trichloroethylene)	KS
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	KS
Vinyl acetate	KS
Vinyl chloride	KS
Xylene (total)	KS

Method EPA 8270C

1,2,4,5-Tetrachlorobenzene	KS
1,2,4-Trichlorobenzene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

1,2-Diphenylhydrazine	KS
1,3-Dichlorobenzene	KS
1,3-Dinitrobenzene (1,3-DNB)	KS
1,4-Dichlorobenzene	KS
1,4-Naphthoquinone	KS
1,4-Phenylenediamine	KS
1-Methylnaphthalene	KS
1-Naphthylamine	KS
2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	KS
2,3,4,6-Tetrachlorophenol	KS
2,4,5-Trichlorophenol	KS
2,4,6-Trichlorophenol	KS
2,4-Dichlorophenol	KS
2,4-Dimethylphenol	KS
2,4-Dinitrophenol	KS
2,4-Dinitrotoluene (2,4-DNT)	KS
2,6-Dichlorophenol	KS
2,6-Dinitrotoluene (2,6-DNT)	KS
2-Acetylaminofluorene	KS
2-Chloronaphthalene	KS
2-Chlorophenol	KS
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	KS
2-Methylaniline (o-Toluidine)	KS
2-Methylnaphthalene	KS
2-Methylphenol (o-Cresol)	KS
2-Naphthylamine	KS
2-Nitroaniline	KS
2-Nitrophenol	KS
2-Picoline (2-Methylpyridine)	KS
3,3'-Dichlorobenzidine	KS
3,3'-Dimethylbenzidine	KS
3-Methylcholanthrene	KS
3-Methylphenol (m-Cresol)	KS
3-Nitroaniline	KS
4-Aminobiphenyl	KS
4-Bromophenyl phenyl ether	KS
4-Chloro-3-methylphenol	KS
4-Chloroaniline	KS
4-Chlorophenyl phenylether	KS
4-Dimethyl aminoazobenzene	KS
4-Methylphenol (p-Cresol)	KS
4-Nitroaniline	KS
4-Nitrophenol	KS
4-Nitroquinoline 1-oxide	KS
5-Nitro-o-toluidine	KS
7,12-Dimethylbenz(a) anthracene	KS
a-a-Dimethylphenethylamine	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Acenaphthene	KS
Acenaphthylene	KS
Acetophenone	KS
Aniline	KS
Anthracene	KS
Aramite	KS
Benzidine	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
Benzoic acid	KS
Benzyl alcohol	KS
bis(2-Chloroethoxy)methane	KS
bis(2-Chloroethyl) ether	KS
Butyl benzyl phthalate	KS
Carbazole	KS
Chlorobenzilate	KS
Chrysene	KS
Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	KS
Diallate	KS
Dibenz(a,h) anthracene	KS
Dibenzofuran	KS
Diethyl phthalate	KS
Dimethoate	KS
Dimethyl phthalate	KS
Di-n-butyl phthalate	KS
Di-n-octyl phthalate	KS
Diphenylamine	KS
Disulfoton	KS
Ethyl methanesulfonate	KS
Famphur	KS
Fluoranthene	KS
Fluorene	KS
Hexachlorobenzene	KS
Hexachlorobutadiene	KS
Hexachlorocyclopentadiene	KS
Hexachloroethane	KS
Hexachlorophene	KS
Hexachloropropene	KS
Indeno(1,2,3-cd) pyrene	KS
Isodrin	KS
Isophorone	KS
Isosafrole	KS
Kepone	KS
Methapyrilene	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Methyl methanesulfonate	KS
Methyl parathion (Parathion, methyl)	KS
Naphthalene	KS
Nitrobenzene	KS
n-Nitrosodiethylamine	KS
n-Nitrosodimethylamine	KS
n-Nitroso-di-n-butylamine	KS
n-Nitrosodi-n-propylamine	KS
n-Nitrosodiphenylamine	KS
n-Nitrosomethylethalamine	KS
n-Nitrosomorpholine	KS
n-Nitrosopiperidine	KS
n-Nitrosopyrrolidine	KS
o,o,o-Triethyl phosphorothioate	KS
Parathion, ethyl	KS
Pentachlorobenzene	KS
Pentachloronitrobenzene	KS
Pentachlorophenol	KS
Phenacetin	KS
Phenanthrene	KS
Phenol	KS
Phorate	KS
Pronamide (Kerb)	KS
Pyrene	KS
Pyridine	KS
Safrole	KS
Sulfotep (Tetraethyl dithiopyrophosphate)	KS
Thionazin (Zinophos)	KS

Method EPA 8270C SIM

1-Methylnaphthalene	KS
2-Methylnaphthalene	KS
Acenaphthene	KS
Acenaphthylene	KS
Anthracene	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
Chrysene	KS
Dibenz(a,h) anthracene	KS
Fluoranthene	KS
Fluorene	KS
Indeno(1,2,3-cd) pyrene	KS
Naphthalene	KS
Phenanthrene	KS

Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Pyrene	KS
Method EPA 9012A	
Amenable cyanide	KS
Cyanide	KS
Method EPA 9045C	
pH	KS
Method EPA 9066	
Total phenolics	KS
Method EPA 9095B	
Paint Filter Test	KS

End of Scope of Accreditation

APPENDIX A-2

PACE PITTSBURGH, PENNSYLVANIA

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QUALITY ASSURANCE MANUAL

Quality Assurance/Quality Control Policies and Procedures
Pace Analytical Services, LLC – Pittsburgh
1638 Roseytown Road, Suites 2, 3 and 4, Greensburg, Pennsylvania 15601
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Table of Contents

1.0. INTRODUCTION AND ORGANIZATIONAL STRUCTURE

"Working together to protect our environment and improve our health"
Pace Analytical Services LLC - Mission Statement

1.1. Introduction to Pace

1.1.1. Pace Analytical Services, LLC is a privately held, full-service analytical testing firm operating a nationwide system of laboratories. Pace offers extensive services beyond standard analytical testing, including: bioassay for aquatic toxicity, air toxics, dioxins and coplanar PCB's by high resolution mass spectroscopy , radiochemical analyses, product testing, pharmaceutical testing, field services and mobile laboratory capabilities. This document defines the Quality System and Quality Assurance (QA)/Quality Control (QC) protocols.

1.1.2. Pace laboratories are capable of analyzing a full range of environmental samples from a variety of matrices, including air, surface water, wastewater, groundwater, soil, sediment, biota, and other waste products. Methods are applied from regulatory and professional sources including EPA, ASTM, USGS, NIOSH, Standard Methods, and State Agencies. Section 11 of this document is a representative listing of general analytical protocol references.

1.2. Statement of Purpose

1.2.1. To meet the business needs of our customers for high quality, cost-effective analytical measurements and services.

1.3. Quality Policy Statement and Goals of the Quality System

1.3.1. Pace management is committed to maintaining the highest possible standard of service and quality for our customers by following a documented quality system that is compliant with all current applicable state, federal, and industry standards, such as the NELAC Standard, the TNI Standard, and ISO standards and is in accordance with the stated methods and customer requirements. The overall objective of this quality system is to provide reliable data of known quality through adherence to rigorous quality assurance policies and quality control procedures as documented in this Quality Assurance Manual.

1.3.2. All personnel within the Pace network are required to be familiar with all facets of the quality system relevant to their position and implement these policies and procedures in their daily work.

1.3.3. All personnel must comply with all current applicable state, federal, and industry standards (e.g., 2003 NELAC Standard, 2009 TNI Standards, ISO/IEC 17025 standard, DOD, etc.), and are required to perform all tests in accordance with stated methods and customer requirements. When required, lab shall also comply with the program requirements for 10CFR50, Appendix B when performing safety related tests on materials used for nuclear facilities.

1.4. Core Values

1.4.1. The following are the Pace Core Values:

- **Integrity**
- **Value Employees**

- **Know Our Customers**
- **Honor Commitments**
- **Flexible Response To Demand**
- **Pursue Opportunities**
- **Continuously Improve**

1.5. Code of Ethics and Standards of Conduct

1.5.1. **Code of Ethics**:

1.5.1.1. Each Pace employee is responsible for the propriety and consequences of his or her actions;

1.5.1.2. Each Pace employee must conduct all aspects of Company business in an ethical and strictly legal manner, and must obey the laws of the United States and of all localities, states and nations where Pace does business or seeks to do business;

1.5.1.3. Each Pace employee must reflect the highest standards of honesty, integrity and fairness on behalf of the Company with customers, suppliers, the public, and one another.

1.5.1.4. Each Pace employee must recognize and understand that our daily activities in environmental laboratories affect public health as well as the environment and that environmental laboratory analysts are a critical part of the system society depends upon to improve and guard our natural resources:

1.5.2. **Standards of Conduct:**

1.5.2.1. **Data Integrity**

1.5.2.1.1. The accuracy and integrity of the analytical results and its supporting documentation produced at Pace are the cornerstones of the company. Employees are to accurately prepare and maintain all technical records, scientific notebooks, calculations, and databases. Employees are prohibited from making false entries or misrepresentations of data for any reason.

1.5.2.1.2. Managerial staff must make every effort to ensure that personnel are free from any undue pressures that may affect the quality or integrity of their work including commercial, financial, over-scheduling, and working condition pressures.

1.5.2.1.3. The data integrity system includes in-depth, periodic monitoring of data integrity including peer data review and validation, internal raw data audits, proficiency testing studies, etc.

1.5.2.1.4. Any documentation related to data integrity issues, including any disciplinary actions involved, corrective actions taken, and notifications to customers must be retained for a minimum of five years.

1.5.2.2. **Confidentiality**

1.5.2.2.1. Pace employees must not use or disclose confidential or proprietary information except when in connection with their duties at Pace. This is effective over the course of employment and for an additional period of two years thereafter.

1.5.2.2.2. Confidential or proprietary information, belonging to either Pace and/or its customers, includes but is not limited to test results, trade secrets, research and development matters, procedures, methods, processes and standards, company-specific techniques and equipment, marketing and customer information, inventions, materials composition, etc.

1.5.2.3. **Conflict of Interest**

1.5.2.3.1. Pace employees must avoid situations that might involve a conflict of interest or could appear questionable to others. This includes participation in activities that conflict or appear to conflict with the employees' Pace responsibilities. This would also include offering or accepting anything that might influence the recipient or cause another person to believe that the recipient may be influenced to behave or in a different manner than he would normally (such as bribes, gifts, kickbacks, or illegal payments).

1.5.2.3.2. Employees are not to engage in outside business or economic activity relating to a sale or purchase by the Company. Other problematic activities include service on the Board of Directors of a competing or supplier company, significant ownership in a competing or supplier company, employment for a competing or supplier company, or participation in any outside business during the employee's work hours.

1.5.3. Strict adherence by each Pace employee to this Code of Ethics and to the Standards of Conduct is essential to the continued vitality of Pace and to continue the pursuit of our common mission to protect our environment and improve our health.

1.5.4. Failure to comply with the Code of Ethics and Standards of Conduct will result in disciplinary action up to and including termination and referral for civil or criminal prosecution where appropriate. An employee will be notified of an infraction and given an opportunity to explain, as prescribed under current disciplinary procedures.

1.5.5. Compliance: all employees undergo annual Data Integrity/Ethics training which includes the concepts listed above. All employees also sign an annual Ethic Policy statement.

1.6. Anonymous Compliance Alertline

1.6.1. An ethical and safe workplace is important to the long-term success of Pace and the well-being of its employees. Pace has a responsibility to provide a work environmental where employees feel safe and can report unethical or improper behavior in complete confidence. With this in mind, Pace has engaged Lighthouse Services, Inc. to provide all employees with access to an anonymous ethics and compliance alertline for reporting possible ethics and compliance violations. The purpose of this service is to ensure that any employee can report anonymously and without fear of retaliation.

1.6.2. Lighthouse Services provides a toll-free number along with several other reporting methods, all of which are available 24 hours a day, seven days a week for use by employees and staff.

1.6.3. Telephone: English speaking USA and Canada: (844)-970-0003.

1.6.4. Telephone: Spanish speaking North America: (800)-216-1288.

1.6.5. Website: www.lighthouse-services.com/pacelabs.

1.6.6. Email: reports@lighthouse-services.com (must include company name with report).

1.7. Laboratory Organization

1.7.1. Each laboratory within the system operates with local management, but all labs share common systems and receive support from the Corporate Office. See Attachment III for the Corporate Organizational structure.

1.7.2. A Senior General Manager (SGM) oversees all laboratories and service centers in their assigned region. Each laboratory or facility in the company is then directly managed by an SGM, a General Manager (GM), an Assistant General Manager (AGM), or an Operations Manager (OM). Quality Managers (QM) or Senior Quality Managers (SQM) at each laboratory report directly to the highest level of local laboratory management, however named, that routinely makes day-to-day decisions regarding that facility's operations. The QMs and SQMs will also receive guidance and direction from the corporate Director of Environmental Quality.

1.7.3. The SGM, GM, AGM or OM, or equivalent functionality in each facility, bears the responsibility for the laboratory operations and serves as the final, local authority in all matters. In the absence of these managers, the SQM/QM serves as the next in command, unless the manager in charge has assigned another designee. He or she assumes the responsibilities of the manager, however named, until the manager is available to resume the duties of their position. In the absence of both the manager and the SQM/QM, management responsibility of the laboratory is passed to the Technical Director, provided such a position is identified, and then to the most senior department manager until the return of the lab manager or SQM/QM. The most senior department manager in charge may include the Client Services Manager (CSM) or the Administrative Business Manager (ABM) at the discretion of the SGM/GM/AGM/OM.

1.7.4. A Technical Director who is absent for a period of time exceeding 15 consecutive calendar days shall designate another full-time staff member meeting the qualifications of the technical director to temporarily perform this function. The laboratory SGM/GM/AGM/OM or SQM/QM has the authority to make this designation in the event the existing Technical Director is unable to do so. If this absence exceeds 35 consecutive calendar days, the primary accrediting authority shall be notified in writing.

1.7.5. The SQM/QM has the responsibility and authority to ensure the Quality System is implemented and followed at all times. In circumstances where a laboratory is not meeting the established level of quality or following the policies set forth in this Quality Assurance Manual, the SQM/QM has the authority to halt laboratory operations should he or she deem such an action necessary. The SQM/QM will immediately communicate the halting of operations to the SGM/GM/AGM/OM and keep them posted on the progress of corrective actions. In the event the SGM/GM/AGM/OM and the SQM/QM are not in agreement as to the need for the suspension, the Chief Operating Officer (COO) and Director of Environmental Quality will be called in to mediate the situation.

1.7.6. The lab is required to appoint deputies for key managerial personnel. These deputies must be documented for auditing purposes. The deputies, by position, are the following:

1.7.6.1. Deputy for General Manager is Customer Service Manager.

1.7.6.2. Deputy for Organics Technical Director is GC and GCMS Supervisor

1.7.6.3. Deputy for Inorganics Technical Director is senior chemist in the department.

1.7.6.4. Deputy for senior Quality Manager is the Quality Assurance Analyst.

1.7.6.5. Deputy for Client Services Manager is a senior Project Manager.

1.7.6.6. Deputy for Administrative Business Manager is designated department personnel.

1.7.6.7. Deputies for Project Managers are designated Project Managers.

1.7.7. The technical staff of the laboratory is generally organized into the following functional groups:

- Organic Sample Preparation
- Wet Chemistry Analysis
- Metals Analysis
- Volatiles Analysis
- Semi-volatiles Analysis
- Radiochemical Analysis
- Microbiological Analysis
- Bioassay Analysis

1.7.8. The organizational structure for Pace – Pittsburgh is listed in Attachment II. In the event of a change in SGM/GM/AGM/OM, SQM/QM, or any Technical Director, the laboratory will notify its accrediting authorities per their individual required timeframes, not to exceed 30 days. The QAM will remain in effect until the next scheduled revision.

1.8. Laboratory Job Descriptions

1.8.1. Senior General Manager

- Oversees all functions of all the operations within their designated region;
- Oversees the development of local GMs/AGMs/OMs within their designated region;
- Oversees and authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Oversees the preparation of budgets and staffing plans for all operations within their designated region;
- Ensures compliance with all applicable state, federal and industry standards;
- Works closely with Regional Sales Management.

1.8.2. General Manager

- Oversees all functions of their assigned operations;
- Authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Prepares budgets and staffing plans;
- Monitors the Quality Systems of the laboratory and advises the SQM/QM accordingly;
- Presents the Ethics/Data Integrity training annually to all employees in their facilities as an instructor-led training.
- Ensures compliance with all applicable state, federal and industry standards.

1.8.4. Senior Quality Manager

- Provides quality oversight for multiple laboratories where there is not a local quality manager or for labs where there are multiple and separately distinct quality systems in the same facility;

- Responsible for implementing, maintaining and improving the quality system while functioning independently from laboratory operations. Reports directly to the highest level of local laboratory facility management, however named, that routinely makes day-to-day decisions regarding laboratory operations, but receives direction and assistance from the Corporate Director of Environmental Quality;
- Ensures that communication takes place at all levels within the lab regarding the effectiveness of the quality system and that all personnel understand their contributions to the quality system;
- Monitors QA/QC activities to ensure that the laboratory achieves established standards of quality (as set forth by the Corporate Environmental Quality office). The SQM is responsible for reporting the lab's level of compliance to these standards to the Corporate Director of Environmental Quality on a quarterly basis;
- Maintains records of quality control data and evaluates data quality;
- Conducts periodic internal audits and coordinates external audits performed by regulatory agencies or customer representatives;
- Reviews and maintains records of proficiency testing results;
- Maintains the document control system;
- Assists in development and implementation of appropriate training programs;
- Provides technical support to laboratory operations regarding methodology and project QA/QC requirements;
- Maintains certifications from federal and state programs;
- Ensures compliance with all applicable state, federal and industry standards;
- Maintains the laboratory training records, including those in the Learning Management System (LMS), and evaluates the effectiveness of training;
- Monitors corrective and preventive actions;
- Maintains the currency of the Quality Manual.

1.8.5. Technical Director

- Monitors the standards of performance in quality assurance and quality control data;
- Monitors the validity of analyses performed and data generated;
- Reviews tenders, contracts and QAPPs to ensure the laboratory can meet the data quality objectives for any given project;
- Serves as the manager of the laboratory in the absence of the SGM/GM/AGM/OM and SQM/QM;
- Provides technical guidance in the review, development, and validation of new methodologies.

1.8.6. Administrative Business Manager

- Responsible for financial and administrative management for the entire facility;
- Provides input relative to tactical and strategic planning activities;
- Organizes financial information so that the facility is run as a fiscally responsible business;
- Works with staff to confirm that appropriate processes are put in place to track revenues and expenses;
- Provide ongoing financial information to the SGM/GM/AGM/OM and the management team so they can better manage their business;
- Utilizes historical information and trends to accurately forecast future financial positions;

- Works with management to ensure that key measurements are put in place to be utilized for trend analysis—this will include personnel and supply expenses, and key revenue and expense ratios;
- Works with SGM/GM/AGM/OM to develop accurate budget and track on an ongoing basis;
- Works with entire management team to submit complete and justified capital budget requests and to balance requests across departments;
- Works with project management team and administrative support staff to ensure timely and accurate invoicing.

1.8.7. Client Services Manager

- Oversees all the day to day activities of the Client Services Department which includes Project Management and, possibly, Sample Control;
- Responsible for staffing and all personnel management related issues for Client Services;
- Serves as the primary senior consultant to customers on all project related issues such as set up, initiation, execution and closure;
- Performs or is capable of performing all duties listed for that of Project Manager.

1.8.8. Project Manager

- Coordinates daily activities including taking orders, reporting data and analytical results;
- Serves as the primary technical and administrative liaison between customers and Pace;
- Communicates with operations staff to update and set project priorities;
- Provides results to customers in the requested format (verbal, hardcopy, electronic, etc.);
- Works with customers, laboratory staff, and other appropriate Pace staff to develop project statements of work or resolve problems of data quality;
- Responsible for solicitation of work requests, assisting with proposal preparation and project initiation with customers and maintain customer records;
- Mediation of project schedules and scope of work through communication with internal resources and management;
- Responsible for preparing routine and non-routine quotations, reports and technical papers;
- Interfaces between customers and management personnel to achieve customer satisfaction;
- Manages large-scale complex projects;
- Supervises less experienced project managers and provide guidance on management of complex projects;
- Arranges bottle orders and shipment of sample kits to customers;
- Verifies login information relative to project requirements and field sample Chains-of-Custody.

1.8.9. Department Manager/Supervisor

- Oversees the day-to-day production and quality activities of their assigned department;
- Ensures that quality assurance and quality control criteria of analytical methods and projects are satisfied;
- Assesses data quality and takes corrective action when necessary;
- Approves and releases technical and data management reports;
- Ensures compliance with all applicable state, federal and industry standards.

1.8.10. Laboratory Analyst

- Performs detailed preparation and analysis of samples according to published methods and laboratory procedures;
- Processes and evaluates raw data obtained from preparation and analysis steps;
- Generates final results from raw data, performing primary review against method criteria;
- Monitors quality control data associated with analysis and preparation. This includes examination of raw data such as chromatograms as well as an inspection of reduced data, calibration curves, and laboratory notebooks;
- Reports data in LIMS, authorizing for release pending secondary approval;
- Conducts routine and non-routine maintenance of equipment as required;
- Performs or is capable of performing all duties associated with that of Laboratory Technician.

1.8.11. Laboratory Technician

- Prepares standards and reagents according to published methods or in house procedures;
- Performs preparation and analytical steps for basic laboratory methods;
- Works under the direction of a Laboratory Analyst on complex methodologies;
- Assists Laboratory Analysts on preparation, analytical or data reduction steps for complex methodologies;
- Monitors quality control data as required or directed. This includes examination of raw data such as chromatograms as well as an inspection of reduced data, calibration curves, and laboratory notebooks.

1.8.12. Field Technician

- Prepares and samples according to published methods, PASI Quality Assurance Manual and/or customer directed sampling objectives;
- Capable of the collection of representative environmental or process related air samples;
- Use computer software to compile, organize, create tables, create graphics and write test reports;
- Reviews project documentation for completeness, method compliance and contract fulfillment;
- Train less experienced environmental technicians and provide guidance on sampling and analysis;
- Responsible for project initiation and contact follow-up;
- Develop sampling plans and prepare test plan documents.

1.8.13. Field Analyst

- Analyzes field samples according to published methods, PASI Quality Assurance Manual and/or customer directed sampling objectives,
- Capable of the collection and analysis of representative environmental or process related air samples,
- Proficient in a variety of analytical tests; specifically on-site gas-phase organic and inorganic compounds by extractive fourier transform infrared spectroscopy (FTIR),
- Train less experienced staff and provide guidance on FTIR sampling and analysis,
- Assist in reporting tasks and project management responsibilities, and
- Perform back-up support for manager tasks such as reporting needs and customer concerns.

1.8.14. Sample Management Personnel

- Signs for incoming samples and verifies the data entered on the Chain of custody forms;
- Enters the sample information into the Laboratory Information Management System (LIMS) for tracking and reporting;
- Stages samples according to EPA requirements;
- Assists Project Managers and Coordinators in filling bottle orders and sample shipments.

1.8.15. Systems Administrator or Systems Manager

- Assists with the creation and maintenance of electronic data deliverables (EDDs);
- Coordinates the installation and use of all hardware, software and operating systems;
- Performs troubleshooting on all aforementioned systems;
- Trains new and existing users on systems and system upgrades;
- Maintains all system security passwords;
- Maintains the electronic backups of all computer systems.

1.8.16. Radiation Safety/Chemical Hygiene Officer

- Maintains the laboratory Radiation Safety Manual;
- Maintains the laboratory Chemical Hygiene Plan;
- Plans and implements safety policies and procedures;
- Maintains safety records;
- Organizes and/or performs safety training;
- Performs safety inspections and provides corrective/preventative actions;
- Assists personnel with safety issues.

1.8.17. Program Director/Hazardous Waste Coordinator (or otherwise named)

- Evaluates waste streams and helps to select appropriate waste transportation and disposal companies;
- Maintains complete records of waste disposal including waste manifests and state reports;
- Assists in training personnel on waste-related issues such as waste handling and storage, waste container labeling, proper satellite accumulation, secondary containment, etc.; Conducts a weekly inspection of the waste storage areas of the laboratory.

1.9. Training and Orientation

1.9.1. Training for Pace employees is managed through a web-based training system. Employees are provided with several training activities for their particular job description and scope of duties. These training activities may include:

- Hands-on training led by supervisors;
- Job-specific training checklists and worksheets;
- Lectures and instructor-led training sessions;
- Method-specific training;
- External conferences and seminars;
- Reading Standard Operating Procedures (SOPs);
- Reading the Quality Assurance Manual and Safety Manual/Chemical Hygiene Plan;
- Core training modules (basic lab skills, etc.);
- Quality system training modules (support equipment use, corrective actions/root causes, etc.);
- Data Integrity/Ethics training;

- Specialized training by instrument manufacturers;
- On-line courses.

1.9.2. All procedures and training records are maintained and available for review during laboratory audits. Additional information can be found in SOP S-ALL-Q-020 **Training and Employee Orientation** or its equivalent revision or replacement.

1.10. Laboratory Safety and Waste

1.10.1. It is the policy of Pace to make safety and waste compliance an integral part of daily operations and to ensure that all employees are provided with safe working conditions, personal protective equipment, and requisite training to do their work without injury. Each employee is responsible for his/her own safety as well as those working in the immediate area by complying with established company rules and procedures. These rules and procedures as well as a more detailed description of the employees' responsibilities are contained in the local Safety Manual/Chemical Hygiene Plan.

1.11. Security and Confidentiality

1.11.1. Security is maintained by controlled access to laboratory buildings. Exterior doors to laboratory buildings remain either locked or continuously monitored by Pace staff.

1.11.2. Additional security is provided where necessary, (e.g., specific secure areas for sample, data, and customer report storage), as requested by customers, or cases where national security is of concern. These areas are lockable within the facilities, or are securely offsite. Access is limited to specific individuals or their designees.

1.11.3. All information pertaining to a particular customer, including national security concerns will remain confidential. Data will be released to outside agencies only with written authorization from the customer or where federal or state law requires the company to do so.

1.12. Communications

1.12.1. Management within each lab bears the responsibility of ensuring that appropriate communication processes are established and that communication takes place regarding the effectiveness of the management/quality system. These communication processes may include email, regular staff meetings, senior management meetings, etc.

1.12.2. Corporate management bears the responsibility of ensuring that appropriate communication processes are established within the network of facilities and that communication takes place at a company-wide level regarding the effectiveness of the management/quality systems of all Pace facilities. These communication processes may include email, quarterly continuous improvement conference calls for all lab departments, and annual continuous improvement meetings for all department supervisors, quality managers, client services managers, and other support positions.

2.0. SAMPLE CUSTODY

2.1. Project Initiation

2.1.1. Prior to accepting new work, the laboratory reviews its performance capability. The laboratory confirms that sufficient personnel, equipment capacity, analytical method capability, etc., are available to complete the required work. Customer needs, certification requirements, and data quality objectives are defined and the appropriate sampling and analysis plan is developed to meet the project requirements by project managers or sales representatives. Members of the management staff review current instrument capacity, personnel availability and training, analytical procedures capability, and projected sample load. Management then informs the sales and client services personnel whether or not the laboratory can accept the new project via written correspondence, email, and/or daily operations meetings.

2.1.2. Additional information regarding specific procedures for reviewing new work requests can be found in SOP PGH-C-033 **Review of Analytical Requests** or its equivalent revision or replacement.

2.2. Sampling Materials and Support

Each individual Pace laboratory provides shipping containers, properly preserved sample containers, custody documents, and field quality control samples to support field-sampling events. Guidelines for sample container types, preservatives, and holding times for a variety of methods are listed in Attachment VII. Note that all analyses listed are not necessarily performed at all Pace laboratories and there may be additional laboratory analyses performed that are not included in these tables. Customers are encouraged to contact their local Pace Project Manager for questions or clarifications regarding sample handling. Pace may provide pick-up and delivery services to their customers when needed Some Pace facilities provide sampling support through a Field Services department. Field Services operates under the Pace Corporate Quality System, with applicable and necessary provisions to address the activities, methods, and goals specific to Field Services. All procedures and methods used by Field Services are documented in SOPs and Procedure Manuals.

2.3. Chain of Custody

2.3.1. A chain of custody (COC) provides the legal documentation of samples from time of collection to completion of analysis.

2.3.2. Field personnel or client representatives must complete a COC for all samples that are received by the laboratory. Samplers are required to properly complete a COC. This is critical to efficient sample receipt and to ensure the requested methods are used to analyze the correct samples. If sample shipments are not accompanied by the correct documentation, the Sample Receiving department notifies a Project Manager. The Project Manager then obtains the correct documentation/information from the customer in order for analysis of samples to proceed.

2.3.3. The COC is filled out completely and legibly with indelible ink. Errors are corrected by drawing a single line through the initial entry and initialing and dating the change. All transfers of samples are recorded on the chain of custody in the "relinquished" and "received by" sections. All information except signatures is printed.

2.3.4. Additional information can be found in SOP S-PGH-C-001 **Sample Management** or its equivalent revision or replacement.

2.4. Sample Acceptance Policy

2.4.1. In accordance with regulatory guidelines, Pace complies with the following sample acceptance policy for all samples received.

2.4.2. If the samples do not meet the sample receipt acceptance criteria outlined below, the laboratory is required to document all non-compliances, contact the customer, and either reject the samples or fully document any decisions to proceed with analyses of samples which do not meet the criteria. Any results reported from samples not meeting these criteria are appropriately communicated to the client.

2.4.3. Sample Acceptance Policy requirements:

- Sample containers must have unique client identification designations that are clearly marked with indelible ink on durable, water-resistant labels. The client identifications must match those on the chain-of-custody (COC).
- There must be clear documentation on the COC, or related documents, that lists the unique sample identification, sampling site location, date and time of sample collection, and name of the sample collector.
- There must be clear documentation on the COC, or related documents, that lists the requested analyses, the preservatives used, and any special remarks concerning the samples (i.e., data deliverables, samples are for evidentiary purposes, field filtration, etc.).
- Samples must be in appropriate sample containers. If the sample containers show signs of damage (i.e., broken or leaking) or if the samples show signs of contamination, the samples will not be processed without prior client approval.
- Samples must be correctly preserved upon receipt, unless the method requested allows for laboratory preservation. If the samples are received with inadequate preservation, and the samples cannot be preserved by the lab appropriately, the samples will not be processed without prior client approval.
- Samples must be received within required holding time. Any samples with hold times that are exceeded will not be processed without prior client approval.
- Samples must be received with sufficient sample volume or weight to proceed with the analytical testing. If insufficient sample volume or weight is received, analysis will not proceed without client approval.
- All samples that require thermal preservation are considered acceptable if they are received at a temperature within 2°C of the required temperature, or within the method-specified range. For samples with a required temperature of 4°C, samples with a temperature ranging from just above freezing to 6°C are acceptable. Samples that are delivered to the lab on the same day they are collected are considered acceptable if the samples are received on ice. Any samples that are not received at the required temperature will not be processed without prior client approval.
- Samples for **drinking water** analyses will be rejected at the time of receipt if they are not received in a secure manner, are received in inappropriate containers, are received outside the required temperature range, are received outside the recognized holding time, are received with inadequate identification on sample containers or COC, or are improperly preserved (with the exception of VOA samples- tested for pH at time of analysis and TOC- tested for pH in the field).

- Some specific clients may require custody seals. **For these clients**, samples or coolers that are not received with the proper custody seals will not be processed without prior client approval.

Note 1: Temperature will be read and recorded based on the precision of the measuring device. For example, temperatures obtained from a thermometer graduated to 0.1°C will be read and recorded to ± 0.1°C. Measurements obtained from a thermometer graduate to 0.5°C will be read to ± 0.5°C. Measurements read at the specified precision are not to be rounded down to meet the ≤ 6°C limit. Please reference the Support Equipment SOP for more information.

Note 2: Some microbiology methods allow sample receipt temperatures of up to 10°C. Consult the specific method for microbiology samples received above 6°C prior to initiating corrective action for out of temperature preservation conditions.

Note 3: Biological Tissue Samples must be received at the following temperature based on program and contract: cooled to ≤ 6°C during the first 24 hours after collection; then samples must be kept frozen at ≤ - 10°C. TNI rules also apply if the samples are brought straight from the field; they are acceptable if evidence of cooling is present (i.e., received on ice).

2.4.4. Upon sample receipt, the following items are also checked and recorded:

- Presence of custody seals or tapes on the shipping containers;
- Sample condition: Intact, broken/leaking, bubbles in VOA samples;
- Sample holding time;
- Sample pH and residual chlorine when required;
- Appropriate containers.

2.4.5. Additional information can be found in SOP S-PGH-C-001 **Sample Management** or its equivalent revision or replacement.

2.5. Sample Log-in

2.5.1. After sample inspection, all sample information on the COC is entered into the Laboratory Information Management System (LIMS). The lab's permanent records for samples received include the following information:

- Customer name and contact
- Customer number
- Pace Analytical project number
- Pace Analytical Project Manager
- Sample descriptions
- Due dates
- List of analyses requested
- Date and time of laboratory receipt
- Field ID code
- Date and time of collection
- Any comments resulting from inspection for sample rejection

2.5.2. If the time collected for any sample is unspecified and Pace is unable to obtain this information from the customer, the laboratory will use 12:01am as the time sampled. All hold times will be based on this sampling time and qualified accordingly if exceeded.

2.5.3. For DoD work, if the time of the sample collection is not provided, the laboratory must assume the most conservative time of day. This is defined as 12:01am.

2.5.4. The Laboratory Information Management System automatically generates a unique identification number for each sample created in the system. The LIMS sample number follows the general convention of 30XXXXX-YYY. The first two numbers (30) designates the project as a PASI-Pittsburgh project, the last three digits (YYY) are used to designate the individual sample numbers, and the digits XXXXX (Where the "X's" are sequential numbers generated by the LIMS) identify the project number. This unique identification number is placed on each sample container as a durable label and becomes the link between the laboratory's sample management system and the customer's field identification; and will be a permanent reference number for all future interactions.

2.5.5. Sample labels are printed from the LIMS and affixed to each sample container.

2.5.6. Additional information can be found in SOP S-PGH-C-001 **Sample Management** or its equivalent revision or replacement.

2.6. Sample Storage

2.6.1. Additional information on sample storage can be found in SOP S-PGH-C-001 **Sample Management** or its equivalent revision or replacement and in SOP PGH-C-017 **Waste Handling and Management** or its equivalent revision or replacement.

2.6.2. **Storage Conditions**

2.6.2.1. Samples are stored away from all standards, reagents, or other potential sources of contamination. Samples are stored in a manner that prevents cross contamination. Volatile samples are stored separately from other samples. All sample fractions, extracts, leachates, and other sample preparation products are stored in the same manner as actual samples or as specified by the analytical method.

2.6.2.2. Storage blanks are stored with volatile samples and are used to measure cross-contamination acquired during storage. Laboratories must have documented procedures and criteria for evaluating storage blanks, appropriate to the types of samples being stored.

2.6.2.3. Additional information can be found in SOP PGH-Q-044 **Monitoring Temperature Controlled Units.**

2.6.3. **Temperature Monitoring**

2.6.3.1. Samples are taken to the appropriate storage location immediately after sample receipt and check-in procedures are completed.

2.6.3.2. The temperature of each refrigerated storage area is maintained at $\leq 6^{\circ}C$ (but above freezing) unless state, method or program requirements differ. The temperature of each freezer storage area is maintained at $\leq -10^{\circ}C$ unless state, method or program requirements differ. The temperature of each storage area is checked and documented each day of use (each calendar day). Additional information, including corrective actions for temperatures outside of acceptance limits, can be found in SOP PGH-Q-044, **Monitoring Temperature Controlled Units**.

2.6.4. **Hazardous Materials**

2.6.4.1. Samples designated by clients upon receipt as pure product or potentially heavily contaminated samples, or samples found to be designated as such following analysis, must be tagged as "hazardous" or "lab pack" and stored separately from other samples.

2.6.4.2. Clients must properly label all samples that contain radioactivity. These samples are screened by the Radiation Safety Officer and if noted to be of concern this information is communicated to the necessary laboratory personnel. Any samples with levels of radiation that are noted to be of concern will be placed into a separate storage area of the laboratory to prevent cross-contamination.

2.6.5. **Foreign/Quarantined Soils**

2.6.5.1. Foreign soils and soils from USDA regulated areas must be adequately segregated to enable proper sample disposal. The USDA requires these samples to be treated by an approved procedure. Additional information regarding USDA regulations and sample handling can be found in the laboratory's SOP for Waste Handling PGH-C-017, or its equivalent revision or replacement.

2.7. Subcontracting Analytical Services

2.7.1. Every effort is made to perform all analyses for Pace customers within the laboratory that receives the samples. When subcontracting to a laboratory other than the receiving laboratory, whether inside or outside the Pace network, becomes necessary, a preliminary verbal communication with that laboratory is undertaken. Customers are notified in writing of the laboratory's intention to subcontract any portion of the testing to another laboratory. Work performed under specific protocols may involve special considerations. When possible, subcontracting will be to a TNI-accredited laboratory.

2.7.2. Potential subcontract laboratories must be approved by Pace based on the criteria listed in SOP S-PGH-C-008 **Subcontracting Samples** or its equivalent revision or replacement. All sample reports from the subcontracted labs are appended to the applicable Pace final reports.

2.7.3. Any Pace Analytical work sent to other labs within the Pace network is handled as inter-regional work and all final reports are labeled clearly with the name of the laboratory performing the work. Any non-TNI work is clearly identified. Pace will not be responsible for analytical data if the subcontract laboratory was designated by the customer.

2.7.4. Additional information can be found in SOP S-PGH-C-008 **Subcontracting Samples** or its equivalent revision or replacement.

2.7.5. Subcontracted labs used for DoD work must be accredited by DoD or its designated representatives. Subcontracted labs must receive project specific approval from the DoD client before any samples are analyzed. These requirements also apply to the use of any laboratory under the same corporate umbrella, but at a different facility or location.

2.8. Sample Retention and Disposal

2.8.1. Samples, extracts, digestates, and leachates must be retained by the laboratory for the period of time necessary to protect the interests of the laboratory and the customer.

2.8.2. The minimum sample retention time is 45 days from receipt of the samples. Samples requiring thermal preservation may be stored at ambient temperature when the hold time is expired, the report has been delivered, and/or allowed by the customer, program, or contract. Samples

requiring storage beyond the minimum sample retention time due to special requests or contractual obligations may be stored at ambient temperature unless the laboratory has sufficient capacity and their presence does not compromise the integrity of other samples.

2.8.3. After this period expires, non-hazardous samples are properly disposed of as non-hazardous waste. The preferred method for disposition of **hazardous** samples is to return the excess sample to the customer. If it is not feasible to return samples, or the customer requires Pace to dispose of excess samples, proper arrangements will be made for disposal by an approved contractor.

2.8.4. Additional information can be found in SOP PGH-C-017 **Waste Handling and Management** and SOP S-PGH-C-001 **Sample Management** or their equivalent revisions or replacements.

3.0. QUALITY CONTROL PROCEDURES

3.1. Quality Control Samples

3.1.1. The quality control samples described in this section are analyzed per batch as applicable to the method used. Acceptance criteria must be established for all quality control samples and if the acceptance criteria are not met, corrective actions must be performed and samples reanalyzed, or final reports must be appropriately qualified.

3.1.2. Quality control samples must be processed in the same manner as associated client samples.

3.1.3. Please reference the glossary of this Quality Manual for definitions of all quality control samples mentioned in this section.

3.1.4. Any deviations to the policies and procedures governing quality control samples must be approved by the QM/SQM.

3.2. Method Blank

3.2.1. A method blank is a negative control used to assess the preparation/analysis system for possible contamination and is processed through all preparation and analytical steps with its associated client samples. The method blank is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples. Method blanks are not applicable for certain analyses (i.e., pH, flash point, temperature, etc.).

3.2.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for method blanks.

3.2.3. For DoD samples, the method blank will be considered to be contaminated if: 1) The concentration of any target analyte in the blank exceeds 1/2 the reporting limit and is greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit whichever is greater; 2) The concentration of any common laboratory contaminant in the blank exceeds the reporting limit and is greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit whichever is greater or 3) The blank result otherwise affects the sample results as per the test method requirements or the project-specific objectives. If the method blank is contaminated as described above, then the laboratory shall reprocess affected samples in a subsequent preparation batch, except when sample results are below the LOD. If insufficient sample volume remains for reprocessing, the results shall be reported with appropriate data qualifiers.

3.3. Laboratory Control Sample

3.3.1. The Laboratory Control Sample (LCS) is a positive control used to assess the performance of the entire analytical system including preparation and analysis. The LCS is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples.

3.3.2. The LCS contains **all** analytes required by a specific method or by the customer or regulatory agency, which may include full list of target compounds, with certain exceptions. The lab must ensure that all target components are included in the spike mixture for the LCS over a two (2) year

period. In the absence of specified components, the laboratory will spike the LCS with the following compounds:

- For multi-peak analytes (e.g. PCBs, technical chlordane, toxaphene), a representative standard will be processed.
- For methods with long lists of analytes, a representative number of target analytes may be chosen. The following criteria is used to determine the number of LCS compounds used:
  - For methods with 1-10 target compounds, the laboratory will spike with all compounds;
  - For methods with 11-20 target compounds, the laboratory will spike with at least 10 compounds or 80%, whichever is greater;
  - For methods with greater than 20 compounds, the laboratory will spike with at least 16 compounds.

3.3.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for LCSs.

3.3.4. For LCSs containing a large number of analytes, it is statistically likely that a few recoveries will be outside of control limits. This does not necessarily mean that the system is out of control, and therefore no corrective action would be necessary (except for proper documentation). TNI has allowed for a minimum number of marginal exceedances, defined as recoveries that are beyond the LCS control limits (3X the standard deviation) but within than the marginal exceedance limits (4X the standard deviation). The number of allowable exceedances depends on the number of compounds in the LCS. If more analyte recoveries exceed the LCS control limits than is allowed (see below) or if any one analyte exceeds the marginal exceedance limits, then the LCS is considered non-compliant and corrective actions are necessary. The number of allowable exceedances is as follows:

- >90 analytes in the LCS- 5 analytes
- 71-90 analytes in the LCS- 4 analytes
- 51-70 analytes in the LCS- 3 analytes
- 31-50 analytes in the LCS- 2 analytes
- 11-30 analytes in the LCS- 1 analyte
- <11 analytes in the LCS- no analytes allowed out)

Note: the use of marginal exceedances is not approved for work from the state of South Carolina.

3.3.5. A matrix spike (MS) can be used in place of a non-compliant LCS in a batch as long as the MS passes the LCS acceptance criteria (this is a TNI allowance). Note: the use of the MS to replace a non-compliant LCS is not approved for work from the state of South Carolina. When this happens, full documentation must be made available to the data user. If this is not allowed by a customer or regulatory body, the associated samples must be rerun with a compliant LCS (if possible) or reported with appropriate data qualifiers.

3.3.6. For DoD projects, the laboratory is not allowed to have any target analytes that exceed DoD LCS control limits. In the case of LCS failures, the laboratory is required to reanalyze the associated samples with an acceptable LCS for all target compounds if there is sufficient sample remaining. The laboratory must make every effort to take the appropriate corrective actions and resolve any anomalies regarding LCSs for DoD projects. All LCS failures must be accounted for in project case narratives. See applicable method SOPs for further corrective action.

3.4. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

3.4.1. A matrix spike (MS) is a positive control used to determine the effect of the sample matrix on compound recovery for a particular method. A matrix spike/matrix spike duplicate (MS/MSD) set or matrix spike/sample duplicate set is processed at a frequency specified in a particular method or as determined by a specific customer request. The MS and MSD consist of the sample matrix that is spiked with known concentrations of target analytes.

3.4.2. The MS and MSD contain all analytes required by a specific method or by the customer or regulatory agency. In the absence of specified components, the laboratory will spike the MS/MSD with the same number of compounds as previously discussed in the LCS section. However, the lab must ensure that all targeted components are included in the spike mixture for the MS/MSD over a two (2) year period.

3.4.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for MS/MSDs.

3.4.4. For DoD work, each non-radiochemistry preparation batch of samples must contain an associated MS and MSD (or sample duplicate) using the same matrix collected for the specific DoD project. For radiochemical analyses, tests that do not incorporate the use of a carrier or tracer for yield assessment must contain an associated MS and MSD (or sample duplicate) using the same matrix collected for the specific DOD project. Gamma spectroscopy analyses are excluded from the MS/MSD requirement as the test does not require chemical processing of samples for analysis. If adequate sample material is not available, then the lack of MS/MSDs shall be noted in the case narrative. Additional MS/MSDs may be required on a project-specific basis. The MS/MSD must be spiked with all target analytes. The concentration of the spiked compounds shall be at or below the midpoint of the calibration range or at the appropriate concentration of concern. Multiple spiked samples may need to be prepared to avoid interferences.

3.5. Sample Duplicate

3.5.1. A sample duplicate is a second portion of sample that is prepared and analyzed in the laboratory along with the first portion. It is used to measure the precision associated with preparation and analysis. A sample duplicate is processed at a frequency specified by the particular method or as determined by a specific customer.

3.5.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for sample duplicates.

3.6. Surrogates

3.6.1. Surrogates are compounds that reflect the chemistry of target analytes and are typically added to samples for organic analyses to measure the extraction or purge efficiency and to monitor the effect of the sample matrix on compound recovery.

3.6.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for surrogates.

3.7. Internal Standards

3.7.1. Internal Standards are method-specific analytes that are added, as applicable, to every standard, QC sample, and client sample at a known concentration, prior to analysis for the purpose of adjusting the response factor used in quantifying target analytes..

3.7.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for internal standards.

3.8. Limit of Detection (LOD)

3.8.1. Pace laboratories use a documented procedure to determine a limit of detection (LOD) for each analyte of concern in each matrix reported. Unless otherwise noted in a published method, the procedure used by Pace laboratories to determine LODs is based on the Method Detection Limit (MDL) procedure outlined in 40 CFR Part 136, Appendix B. All sample processing steps of the preparation and analytical methods are included in the LOD determination including any clean ups.

3.8.2. DoD definition for LOD- The smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%). At the LOD, the false negative rate is 1%.

3.8.3. Additional information can be found in SOP S-PGH-Q-035 **Determination of LOD and LOQ** or its equivalent revision or replacement.

3.9. Limit of Quantitation (LOQ)

3.9.1. A limit of quantitation (LOQ) for every analyte of concern must be determined. For Pace laboratories, this LOQ is referred to as the RL, or Reporting Limit. Results reported below the reporting limit are not allowed to be reported without qualification. For methods with a determined LOD, results can be reported out below the LOQ but above the LOD if they are properly qualified (e.g., J flag).

3.9.2. For DoD approved methods, the LOQ and LOD shall be verified quarterly and valid LOQ must be in place prior to sample analysis.

3.9.3. Additional information can be found in SOP S-PGH-Q-035 **Determination of LOD and LOQ** or its equivalent revision or replacement.

3.10. Estimate of Analytical Uncertainty

3.10.1. Pace laboratories can provide an estimation of uncertainty for results generated by the laboratory. The estimate quantifies the error associated with any given result at a 95% confidence interval. This estimate does not include bias that may be associated with sampling. The laboratory has a procedure in place for making this estimation. In the absence of a regulatory or customer-specific procedure, Pace laboratories base this estimation on the recovery data obtained from the Laboratory Control Samples. The uncertainty is a function of the standard deviation of the recoveries multiplied by the appropriate Student's t Factor at 95% confidence. Additional information pertaining to the estimation of uncertainty and the exact manner in which it is derived are contained in the SOP PGH-Q-046 **Estimation of Measurement Uncertainty** or its equivalent revision or replacement.

3.10.2. The measurement of uncertainty is provided only on request by the customer, as required by specification or regulation and when the result is used to determine conformance within a specification limit.

3.10.3. Radiological tests often report uncertainty and the manner in which it is derived are in accordance with Multi-Agency Radiological Laboratories Analytical Protocols Manual (MARLAP)

and Evaluation of Measurement Data – Guide to the Expression of Uncertainty in Measurement (GUM). The means by which these criteria are applied can be found in the method SOPs.

3.11. Proficiency Testing (PT) Studies

3.11.1. Pace laboratories participate in a defined proficiency testing (PT) program. PT samples are obtained from NIST approved providers and analyzed and reported at a minimum of two times per year for the relevant fields of testing per matrix.

3.11.2. Additional information can be found in SOP PGH-C-031 **Proficiency Testing Program** or its equivalent revision or replacement.

3.12. Rounding and Significant Figures

3.12.1. In general, the Pace laboratories report data to no more than three significant figures. Therefore, all measurements made in the analytical process must reflect this level of precision. In the event that a parameter that contributes to the final result has less than three significant figures of precision, the final result must be reported with no more significant figures than that of the parameter in question. The rounding rules listed below are descriptive of the LIMS and not necessarily of any supporting program such as Excel.

3.12.2. **Rounding:** Pace-Pittsburgh follows the odd / even guidelines for rounding numbers:

- If the figure following the one to be retained is less than five, that figure is dropped and the retained ones are not changed (with three significant figures, 2.544 is rounded to 2.54).
- If the figure following the ones to be retained is greater than five, that figure is dropped and the last retained one is rounded up (with three significant figures, 2.546 is rounded to 2.55).
- If the figure following the ones to be retained is five and if there are no figures other than zeros beyond that five, then the five is dropped and the last figure retained is unchanged if it is even and rounded up if it is odd (with three significant figures, 2.525 is rounded to 2.52 and 2.535 is rounded to 2.54).

3.12.3. **Significant Figures**

3.12.3.1. Pace-Pittsburgh follows the following convention for reporting to a specified number of significant figures. Unless specified by federal, state, or local requirements or on specific request by a customer, the laboratory reports:

Values > 10 – Reported to 3 significant figures

Values ≤ 10 – Reported to 2 significant figures

3.13. Retention Time Windows

3.13.1. When chromatographic conditions are changed, retention times and analytical separations are often affected. As a result, two critical aspects of any chromatographic method are the determination and verification of retention times and analyte separation. Retention time windows must be established for the identification of target analytes. The retention times of all target analytes in all calibration verification standards must fall within the retention time windows. If an analyte falls outside the retention time window in an ICV or CCV, new absolute retention time windows

must be calculated, unless instrument maintenance fixes the problem. When a new column is installed, a new retention time window study must be performed.

3.13.2. Please reference method-specific SOPs for the proper procedure for establishing retention time windows.

3.14. Analytical Method Validation and Instrument Validation

3.14.1. In some situations, Pace develops and validates methodologies that may be more applicable to a specific problem or objective. When non-standard methods are required for specific projects or analytes of interest, or when the laboratory develops or modifies a method, the laboratory validates the method prior to applying it to customer samples. Method validity is established by meeting criteria for precision and accuracy as established by the data quality objectives specified by the end user of the data. The laboratory records the validation procedure, the results obtained and a statement as to the usability of the method. The minimum requirements for method validation include evaluation of sensitivity, quantitation, precision, bias, and selectivity of each analyte of interest.

3.15. Regulatory and Method Compliance

3.15.1. It is Pace policy to disclose in a forthright manner any detected noncompliance affecting the usability of data produced by our laboratories. The laboratory will notify customers within 30 days of fully characterizing the nature of the nonconformance, the scope of the nonconformance and the impact it may have on data usability.

3.15.2. For DoD QSM the laboratory shall upon discovery, notify all affected customers of potential data quality issues resulting from nonconforming work within 15 business days. Notification shall be performed according to a written procedure. Records of corrections taken or proposed corrective actions to resolve the nonconformance shall be submitted to the customer(s) within 30 business days of discovery.

4.0. DOCUMENT MANAGEMENT AND CHANGE CONTROL

4.1. Document Management

4.1.1. Additional information can be found in SOP S-PGH-Q-043 **Document Control and Management** or its equivalent revision or replacement. Information on Pace's policy for electronic signatures can also be found in this SOP.

4.1.2. Pace has an established procedure for managing documents that are part of the quality system.

4.1.3. A master list of all managed documents is maintained at each facility identifying the current revision status and distribution of the controlled documents. Copies of all quality systems documentation provided to DoD for review must be in English.

4.1.4. Each managed document is uniquely identified to include the date of issue, the revision identification, page numbers, the total number of pages and the issuing authorities. For complete information on document numbering, refer to SOP S-ALL-Q-003 **Document Numbering**.

4.1.5. **Quality Assurance Manual (QAM):** The Quality Assurance Manual is the company-wide document that describes all aspects of the quality system for Pace. The base QAM template is distributed by the Corporate Environmental Quality Department to each of the SQMs/QMs. The local management personnel modify the necessary and permissible sections of the base template and submit those modifications to the Corporate Director of Environmental Quality for review. Once approved, all applicable lab staff sign the Quality Assurance Manual. Each SQM/QM is then in charge of distribution to employees, external customers or regulatory agencies and maintaining a distribution list of controlled document copies. The Quality Assurance Manual template is reviewed on an annual basis and revised accordingly by the Corporate Quality office.

4.1.6. **Standard Operating Procedures (SOPs)**

4.1.6.1. SOPs are reviewed every two years at a minimum although a more frequent review may be required by some state or federal agencies or customers. If no revisions are made based on this review, documentation of the review itself is made by the addition of new signatures on the cover page. If revisions are made, documentation of the revisions is made in the revisions section of each SOP and a new revision number is applied to the SOP. This provides a historical record of all revisions.

4.1.6.2. All copies of superseded SOPs are removed from general use and the original copy of each SOP is archived for audit or knowledge preservation purposes. This ensures that all Pace employees use the most current version of each SOP and provides the SQM/QM with a historical record of each SOP.

4.1.6.3. Additional information can be found in SOP S-PGH-Q-001 **Preparation of SOPs** or its equivalent revision or replacement.

4.1.6.4. For DoD approval, all technical SOPs are reviewed for accuracy and adequacy annually and whenever method procedures change and updated as appropriate. All such reviews are documented and made available for assessment. Non-technical SOPs that are not required elements of the quality system are considered administrative SOPs and are not required to be reviewed annually.

4.2. Document Change Control

4.2.1. Additional information can be found in SOP S-PGH-Q-043 **Document Control and Management** or its equivalent revision or replacement.

4.2.2. Changes to managed documents are reviewed and approved in the same manner as the original review. Any revision to a document requires the approval of the applicable signatories. After revisions are approved, a revision number is assigned and the previous version of the document is officially retired.

4.2.3. All copies of the previous document are replaced with copies of the revised document and the superseded copies are destroyed or archived. All affected personnel are advised that there has been a revision and any necessary training is scheduled.

5.0. EQUIPMENT AND MEASUREMENT TRACEABILITY

5.1. Standards and Traceability

5.1.1. Each Pace facility retains pertinent information for standards, reagents, and chemicals to assure traceability to a national standard. This includes documentation of purchase, receipt, preparation, and use.

5.1.2. Upon receipt, all purchased standard reference materials are recorded into a standard logbook or database and assigned a unique identification number. The entries include the facility's unique identification number, the chemical name, manufacturer name, manufacturer's identification numbers, receipt date, and expiration date. Vendor's certificates of analysis for all standards, reagents, or chemicals are retained for future reference.

5.1.3. Subsequent preparations of intermediate or working solutions are also documented in a standard logbook or database. These entries include the stock standard name and lot number, the manufacturer name, the solvents used for preparation, the solvent lot number and manufacturer, the preparation steps, preparation date, expiration dates, preparer's initials, and a unique Pace identification number. This number is used in any applicable sample preparation or analysis logbook so the standard can be traced back to the standard preparation record. This process ensures traceability back to the national standard.

5.1.4. All prepared standard or reagent containers include the Pace identification number, the standard or chemical name, the date of preparation, the date of expiration, the concentration with units, and the preparer's initials, unless the container is too small to hold all of this information. This ensures traceability back to the standard preparation logbook or database.

5.1.5. All initial calibrations must be verified with a standard obtained from a second manufacturer or a separate lot prepared independently by the same manufacturer, unless client-specific QAPP requirements state otherwise.

5.1.6. Additional information concerning the procurement of standards and reagent and their traceability can be found in the SOP PGH-C-037 **Standard and Reagent Management and Traceability** or its equivalent revision or replacement.

5.2. General Analytical Instrument Calibration Procedures

5.2.1. All applicable instrumentation are calibrated or checked before use to ensure proper functioning and verify that laboratory, client and regulatory requirements are met. All calibrations are performed by, or under the supervision of, an experienced analyst at scheduled intervals against either certified standards traceable to recognized national standards or reference standards whose values have been statistically validated.

5.2.2. Calibration standards for each parameter are chosen to establish the linear range of the instrument and must bracket the concentrations of those parameters measured in the samples. The lowest calibration standard is the lowest concentration for which quantitative data may be reported. Data reported below this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in a narrative. The highest calibration standard is the highest concentration for which quantitative data may be reported. Data reported above this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in the narrative.

5.2.3. Radiological calibrations may follow one of several methodologies based on technology of the counting; these can include efficiency curves, energy calibrations and quench curves. The various calibrations should ensure that the range chosen encompasses the activities expected in the client samples.

5.2.4. Instrumentation or support equipment that cannot be calibrated to specification or is otherwise defective is clearly labeled as out-of-service until it has been repaired and tested to demonstrate it meets the laboratory's specifications. All repair and maintenance activities including service calls are documented in the maintenance log. Equipment sent off-site for calibration testing is packed and transported to prevent breakage and is in accordance with the calibration laboratory's recommendations.

5.2.5. In the event that recalibration of a piece of test equipment indicates the equipment may have been malfunctioning during the course of sample analysis, an investigation is performed. The results of the investigation along with a summary of the information reviewed are documented and maintained by the quality manager. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed. This allows for sufficient investigation and review of documentation to determine the impact on the analytical results. Instrumentation found to be consistently out of calibration is either repaired and positively verified or taken out of service and replaced.

5.2.5.1. For DoD QSM, the laboratory shall upon discovery, notify all affected customers of potential data quality issues resulting from nonconforming work within 15 business days. Notification shall be performed according to a written procedure. Records of corrections taken or proposed corrective actions to resolve the nonconformance shall be submitted to the customer(s) within 30 business days of discovery Raw data records are retained to document equipment performance. Sufficient raw data is retained to reconstruct the instrument calibration and explicitly connect the continuing calibration verification to the initial calibration.

5.2.6. Radiological Equipment Calibration

5.2.6.1. Radiological Equipment should be calibrated at the appropriate frequency and whenever the equipment undergoes maintenance. In the case of liquid scintillation counters the equipment shall be recalibrated when a significant move has taken place.

5.2.6.2. Calibrations can vary with equipment; in the case of gas flow proportional counters standards that range the expected residue range for gross alpha and beta shall be used, with efficiency curves developed to encompass the range of client sample residues. Any samples outside of this range shall be evaluated and the aliquot changed to accommodate the curve if necessary. Beta emitters, or isotopes that are shown to have less than a 2% efficiency change with residue that are known to not experience self attenuation may be calibrated by using a least 3 standards of known activity and comparing the efficiency results to ensure all agree to a relative standard deviation of less than 5%.

5.2.6.3. Quench factors for liquid scintillation counters shall be prepared by adding varied amounts of quenching agent. Any sample displaying a quench factor outside of the curve shall be evaluated. If the quench factors are shown to not vary in efficiency by greater than 2% then an efficiency calibration can be established using at least 3 standards of known activity and comparing the efficiency results to ensure all agree to a relative standard deviation of less than 5%.

5.2.6.4. Cross talk factors must also be evaluated when samples are known to contain more than one beta or an alpha and beta emitter.

5.2.6.5. All detectors must pass various daily tests depending upon the technology. The criteria of these various tests should be known to the analyst. Any detector that does not pass the daily check must be re-checked. If the daily test fails a second time the detector must be taken out of service for that day. Any detector that fails two daily checks must be evaluated and serviced if required. In most instances two passing daily checks are required to put a detector back into service.

5.3. Support Equipment Calibration and Verification Procedures

5.3.1. All support equipment is calibrated or verified at least annually using NIST traceable references over the entire range of use, as applicable. The results of calibrations or verifications must be within the specifications required or the equipment will be removed from service until brought back into control. Additional information regarding calibration and maintenance of support equipment can be found in SOP PGH-C-032 **Support Equipment** or its equivalent revision or replacement.

5.3.2. On each day the support equipment is used, it is verified, as applicable, in the expected range of use with NIST traceable references in order to ensure the equipment meets laboratory specifications. These checks are documented appropriately. This applies mainly to thermometers within temperature-controlled units and balances.

5.3.3. Analytical Balances

5.3.3.1. Each analytical balance is calibrated or verified at least annually by a qualified service technician. The calibration of each balance is verified each day of use with weights traceable to NIST bracketing the range of use. Calibration weights are ASTM Class 1 or other class weights that have been calibrated against a NIST standard weight and are re-certified every 5 years at a minimum against a NIST traceable reference. Some accrediting agencies may require more frequent checks. If balances are calibrated by an external agency, verification of their weights must be provided. All information pertaining to balance maintenance and calibration is recorded in the individual balance logbook and/or is maintained on file in the local Quality department.

5.3.4. Thermometers

5.3.4.1. Certified, or reference, thermometers are maintained for checking calibration of working thermometers. Reference thermometers are provided with NIST traceability for initial calibration and are re-certified, at a minimum, every 5 years with equipment directly traceable to NIST.

5.3.4.2. Working thermometers are compared with the reference thermometers annually according to corporate metrology procedures (working digital thermometers are calibrated quarterly). Each thermometer is individually numbered and assigned a correction factor based on the NIST reference source. In addition, working thermometers are visually inspected by laboratory personnel prior to use and temperatures are documented.

5.3.4.3. Laboratory thermometer inventory and calibration data are maintained in the local Quality department.

5.3.5. pH/Electrometers

5.3.5.1. The meter is calibrated before use each day, using fresh buffer solutions. The range of pH that is used for calibration should bracket the pH measurements of the samples analyzed.

5.3.6. Spectrophotometers

5.3.6.1. During use, spectrophotometer performance is checked at established frequencies in analysis sequences against initial calibration verification (ICV) and continuing calibration verification (CCV) standards.

5.3.7. Mechanical Volumetric Dispensing Devices

5.3.7.1. Mechanical volumetric dispensing devices including bottle top dispensers (those that are critical in measuring a required amount of reagent), pipettes, and burettes, excluding Class A volumetric glassware, are checked for accuracy on a quarterly basis.

5.3.7.2. Additional information regarding calibration and maintenance of laboratory support equipment can be found in SOP PGH-C-032 **Support Equipment** or its equivalent revision or replacement.

5.4. Instrument/Equipment Maintenance

5.4.1. The objectives of the Pace Analytical maintenance program are twofold: to establish a system of instrument care that maintains instrumentation and equipment at required levels of calibration and sensitivity, and to minimize loss of productivity due to repairs. Further details can be found in SOP S-PGH-Q-038 **Laboratory Equipment** or its equivalent revision or replacement.

5.4.2. The Operations Manager and/or department manager/supervisors are responsible for providing technical leadership to evaluate new equipment, solve equipment problems, and coordinate instrument repair and maintenance. Analysts have the primary responsibility to perform routine maintenance.

5.4.3. To minimize downtime and interruption of analytical work, preventative maintenance may routinely performed on each analytical instrument. Up-to-date instructions on the use and maintenance of equipment are available to staff in the department where the equipment is used.

5.4.4. Department manager/supervisors are responsible for maintaining an adequate inventory of spare parts required to minimize equipment downtime. This inventory includes parts and supplies that are subject to frequent failure, have limited lifetimes, or cannot be obtained in a timely manner should a failure occur.

5.4.5. All major equipment and instrumentation items are uniquely identified to allow for traceability. Equipment/instrumentation is, unless otherwise stated, identified as a system and not as individual pieces. The laboratory maintains equipment records that include the following:

- The name of the equipment and its software
- The manufacturer's name, type, and serial number
- Approximate date received and date placed into service
- Current location in the laboratory
- Condition when received (new, used, etc.)
- Copy of any manufacturer's manuals or instructions
- Dates and results of calibrations and next scheduled calibration (if known)
- Details of past maintenance activities, both routine and non-routine
- Details of any damage, modification or major repairs

5.4.6. All instrument maintenance is documented in maintenance logbooks that are assigned to each particular instrument or system.

5.4.7. The maintenance log entry must include a summary of the results of that analysis and verification by the analyst that the instrument has been returned to an in-control status. In addition, each entry must include the initials of the analyst making the entry, the dates the maintenance actions were performed, and the date the entry was made in the maintenance logbook, if different from the date(s) of the maintenance.

5.4.8. Any equipment that has been subjected to overloading or mishandling, or that gives suspect results, or has been shown to be defective, is taken out of service and clearly identified. The equipment shall not be used to analyze customer samples until it has been repaired and shown to perform satisfactorily. In the event of instrumentation failure, to avoid hold time issues, the lab may subcontract the necessary samples to another Pace lab or to an outside subcontract lab if possible.

6.0. CONTROL OF DATA

Analytical results processing, verification, and reporting are procedures employed that result in the delivery of defensible data. These processes include, but are not limited to, calculation of raw data into final concentration values, review of results for accuracy, evaluation of quality control criteria and assembly of technical reports for delivery to the data user.

All analytical data undergo a documented multi-tier review process prior to being reported to the customer. This section describes procedures used for translating raw analytical data into accurate final sample reports as well as Pace data storage policies.

When analytical, field, or product testing data is generated, it is documented appropriately. These logbooks and other laboratory records are kept in accordance with each facility's SOP for documentation storage and archival In this case, the laboratory must ensure that there are sufficient redundant electronic copies so no data is lost due to unforeseen computer issues.

6.1. Primary Data Review

6.1.1. The primary analyst is responsible for initial data reduction and data review. This includes confirming compliance with required methodology, verifying calculations, evaluating quality control data, noting non-conformances in logbooks or as footnotes or narratives, and uploading analytical results into the LIMS. Data review checklists, either hardcopy or electronic, are used to document the primary data review process. The primary analyst must be clearly identified in all applicable logbooks, spreadsheets, LIMS fields, and data review checklists.

6.1.2. The primary analyst compiles the initial data for secondary data review. This compilation must include sufficient documentation for secondary data review.

6.1.3. Additional information regarding data review procedures can be found in SOP PGH-Q-037 **Data Review** or its equivalent revision or replacement, as well as in SOP S-ALL-Q-016 **Manual Integration** or its equivalent revision or replacement.

6.2. Secondary Data Review

6.2.1. Secondary data review is the process of examining data and accepting or rejecting it based on pre-defined criteria. This review step is designed to ensure that reported data are free from calculation and transcription errors, that quality control parameters are evaluated, and that any non-conformances are properly documented.

6.2.2. The completed data from the primary analyst is sent to a designated qualified secondary data reviewer (this cannot be the primary analyst). The secondary data reviewer provides an independent technical assessment of the data package and technical review for accuracy according to methods employed and laboratory protocols. This assessment involves a quality control review for use of the proper methodology and detection limits, compliance to quality control protocol and criteria, presence and completeness of required deliverables, and accuracy of calculations and data quantitation. The reviewer validates the data entered into the LIMS and documents approval of manual integrations. Data review checklists, either hardcopy or electronic, are used to document the secondary data review process.

6.2.3. Additional information regarding data review procedures can be found in SOP PGH-Q-037 **Data Review** or its equivalent revision or replacement, as well as in SOP S-All-Q-016 **Manual Integration** or its equivalent revision or replacement.

6.2.4. Some reports and/or data packages may be reviewed by the QM or SQM or designee based on program requirements (e.g., DoD) or client requirements. In this case a thorough review for completeness and accuracy may include a compilation of raw data and QC summaries in addition to the final report to produce a full deliverable package. In the case of DoD, 100% of all packages must have a final administrative review (to confirm that primary and secondary reviews were completed and documented and that data packages are complete) and 10% of all data packages must be reviewed by the Quality Manager for technical completeness/accuracy. This 10% review can be done after the data packages have been submitted to the clients. See SOP PGH-Q-040 **Internal and External Audits**, for full Quality department final report and raw data review requirements.

6.3. Data Reporting

6.3.1. Data for each analytical fraction pertaining to a particular Pace project number are delivered to the Project Manager for assembly into the final report. All points mentioned during technical and QC reviews are included in data qualifiers on the final report or in a separate case narrative if there is potential for data to be impacted.

6.3.2. Final reports are prepared according to the level of reporting required by the customer and can be transmitted to the customer via hardcopy or electronic deliverable.

6.3.3. For DoD labs, both date and time of preparation and analysis are considered essential information, regardless of the length of the holding time, and shall be included as part of the laboratory report.

6.3.4. Any changes made to a final report shall be designated as "Revised" or equivalent wording. The laboratory must keep sufficient archived records of all laboratory reports and revisions. For higher levels of data deliverables, a copy of all supporting raw data is sent to the customer along with a final report of results. Pace will provide electronic data deliverables (EDD) as required by contracts or upon customer request.

6.3.5. Customer data that requires transmission by telephone, telex, facsimile or other electronic means undergoes appropriate steps to preserve confidentiality.

6.3.6. The following positions are the only approved signatories for Pace final reports:

- Senior General Manager
- General Manager
- Assistant General Manager
- Senior Quality Manager
- Quality Manager
- Client Services Manager
- Project Manager
- Project Coordinator

6.4. Data Security

6.4.1. All data including electronic files, logbooks, extraction/digestion/distillation worksheets, calculations, project files and reports, and any other information used to produce the technical report are maintained secured and retrievable by the Pace facility.

6.5. Data Archiving

6.5.1. All records compiled by Pace are archived in a suitable, limited-access environment to prevent loss, damage, or deterioration by fire, flood, vermin, theft, and/or environmental deterioration. Records are retained for a minimum of five years unless superseded by federal, state, contractual, and/or accreditation requirements. TNI-related records will be made readily available to accrediting authorities. Access to archived data is documented and controlled by the SQM/QM or a designated Data Archivist.

6.5.2. Records that are computer-generated have either a hard copy or electronic backup copy. Hardware and software necessary for the retrieval of electronic data is maintained with the applicable records. Archived electronic records are stored protected against electronic and/or magnetic sources.

6.5.3. In the event of a change in ownership, accountability or liability, reports of analyses performed pertaining to accreditation will be maintained per the purchase agreement. In the event of bankruptcy, laboratory reports and/or records will be transferred to the customer and/or the appropriate regulatory entity upon request.

6.6. Data Disposal

6.6.1. Data that has been archived for the facility's required storage time may be disposed of in a secure manner by shredding, returning to customer, or utilizing some other means that does not jeopardize data confidentiality. Records of data disposal will be archived for a minimum of five years unless superseded by federal, contractual, and/or accreditation requirements. Data disposal includes any preliminary or final reports that are disposed.

7.0. QUALITY SYSTEM AUDITS AND REVIEWS

7.1. Internal Audits

7.1.1. Responsibilities

7.1.1.1. The SQM/QM is responsible for managing and/or conducting internal audits in accordance with a predetermined schedule and procedure. Since internal audits represent an independent assessment of laboratory functions, the auditor must be independent from laboratory operations to ensure objectivity. The auditor must be trained, qualified, and familiar enough with the objectives, principles, and procedures of laboratory operations to be able to perform a thorough and effective evaluation. The SQM/QM evaluates audit observations and verifies the completion of corrective actions. In addition, a periodic corporate audit will be conducted. The corporate audits will focus on the effectiveness of the Quality System as outlined in this manual but may also include other quality programs applicable to an individual laboratory.

7.1.1.2. Additional information can be found in SOP PGH-Q-040 **Internal and External Audits** or its equivalent revision or replacement.

7.1.2. Scope and Frequency of Internal Audits

7.1.2.1. The complete internal audit process consists of the following four sections: 1) Raw Data Reviews, 2) traditional Quality Systems internal audits (including SOP and method compliance), 3) Final Report Reviews, and 4) Corrective Action Effectiveness Follow-up.

7.1.2.2. Internal systems audits are conducted yearly at a minimum. The scope of these audits includes evaluation of specific analytical departments or a specific quality related system as applied throughout the laboratory.

7.1.2.3. Where the identification of non-conformities or departures cast doubt on the laboratory's compliance with its own policies and procedures, the lab must ensure that the appropriate areas of activity are audited as soon as possible.

7.1.2.4. Certain projects may require an internal audit to ensure laboratory conformance to site work plans, sampling and analysis plans, QAPPs, etc.

7.1.2.5. The laboratory, as part of their overall internal audit program, ensures that a review is conducted with respect to any evidence of inappropriate actions or vulnerabilities related to data integrity. Discovery and reporting of potential data integrity issues are handled in a confidential manner. All investigations that result in findings of inappropriate activity are fully documented, including the source of the problem, the samples and customers affected the impact on the data, the corrective actions taken by the laboratory, and which final reports had to be re-issued. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed.

7.1.2.5.1. For DoD QSM the laboratory shall upon discovery, notify all affected customers of potential data quality issues resulting from nonconforming work within 15 business days. Notification shall be performed according to a written procedure. Records of corrections taken or proposed corrective actions to resolve the nonconformance shall be submitted to the customer(s) within 30 business days of discovery.

7.1.3. Internal Audit Reports and Corrective Action Plans

7.1.3.1. A full description of the audit, including the identification of the operation audited, the date(s) on which the audit was conducted, the specific systems examined, and the observations noted are summarized in an internal audit report. Although other personnel may assist with the performance of the audit, the SQM/QM writes and issues the internal audit report identifying which audit observations are deficiencies that require corrective action.

7.1.3.2. When audit findings cast doubt on the effectiveness of the operations or on the correctness of validity of the laboratory's environmental test results, the laboratory will take timely corrective action and notify the customer in writing within three business days, if investigations show that the laboratory results may have been affected.

7.1.3.3. Additional information can be found in SOP PGH-Q-040 **Internal and External Audits** or its equivalent revision or replacement.

7.2. External Audits

7.2.1. Pace laboratories are audited regularly by regulatory agencies to maintain laboratory certifications and by customers to maintain appropriate specific protocols.

7.2.2. External audit teams review the laboratory to assess the effectiveness of quality systems. The SQM/QM host the external audit team and assist in facilitation of the audit process. After the audit, the external auditors will prepare a formalized audit report listing deficiencies observed and follow-up requirements for the laboratory. The laboratory staff and supervisors develop corrective action plans to address any deficiencies with the guidance of the SQM/QM, who provides a written response to the external audit team. The SQM/QM follows-up with the laboratory staff to ensure corrective actions are implemented and that the corrective action was effective.

7.3. Annual Managerial Review

7.3.1. A managerial review of Management and Quality Systems is performed on an annual basis at a minimum. This allows for assessing program effectiveness and introducing changes and/or improvements. Additional information can be found in SOP S-ALL-Q-015 **Review of Laboratory Management System** or its equivalent revision or replacement.

7.3.2. The managerial review must include the following topics of discussion:

- Suitability of quality management policies and procedures
- Manager/Supervisor reports
- Internal audit results
- Corrective and preventive actions
- External assessment results
- Proficiency testing studies
- Sample capacity and scope of work changes
- Customer feedback, including complaints
- Recommendations for improvement,
- Other relevant factors, such as quality control activities, resources, and staffing.

7.3.3. This managerial review must be documented for future reference by the SQM/QM and copies of the report are distributed to laboratory staff. Results must feed into the laboratory planning system and must include goals, objectives, and action plans for the coming year. The laboratory shall ensure

that any actions identified during the review are carried out within an appropriate and agreed upon timescale.

8.0. CORRECTIVE ACTION

Additional information can be found in SOP PGH-Q-039 **Corrective and Preventive Actions** or its equivalent revision or replacement.

During the process of sample handling, preparation, and analysis, or during review of quality control records, or during reviews of non-technical portions of the lab, certain occurrences may warrant the necessity of corrective actions. These occurrences may take the form of analyst errors, deficiencies in quality control, method deviations, or other unusual circumstances. The Quality System of Pace provides systematic procedures for the documentation, monitoring, completion of corrective actions, and follow-up verification of the effectiveness of these corrective actions. This can be done using Pace's LabTrack system or other system that lists at a minimum, the deficiency by issue number, the deficiency source, responsible party, root cause, resolution, due date, and date resolved.

8.1. Corrective and Preventive Action Documentation

8.1.1. The following items are examples of sources of laboratory deviations or non-conformances that may warrant some form of documented corrective action:

- Internal Laboratory Non-Conformance Trends
- Proficiency Testing Sample Results
- Internal and External Audits
- Data or Records Review
- Client Complaints
- Client Inquiries
- Holding Time violations

8.1.2. Documentation of corrective actions may be in the form of a comment or footnote on the final report that explains the deficiency (e.g., matrix spike recoveries outside of acceptance criteria) or it may be a more formal documentation (either paper system or computerized spreadsheet). This depends on the extent of the deficiency, the impact on the data, and the method or customer requirements for documentation.

8.1.3. The person who discovers the deficiency or non-conformance initiates the corrective action documentation within the lab's corrective action system. The documentation must include (as applicable): the affected projects and sample numbers, the name of the applicable Project Manager, the customer name, and the sample matrix involved. The person initiating the corrective action documentation must also list the known causes of the deficiency or non-conformance as well as any corrective/preventative actions that they have taken. Preventive actions must be taken in order to prevent or minimize the occurrence of the situation.

8.1.4. **Root Cause Analysis**: Laboratory personnel and management staff will start a root cause analysis by going through an investigative process. During this process, the following general steps must be taken into account: defining the non-conformance, assigning responsibilities, determining if

the condition is significant, and investigating the root cause of the nonconformance. General non-conformance investigative techniques follow the path of the sample through the process looking at each individual step in detail. The root cause must be documented within the lab's corrective action system.

8.1.5. Based on the root cause(s) determined, the lab implements applicable corrective actions and verifies their effectiveness. In the event that analytical testing or results do not conform to documented laboratory policies or procedures Project Management will notify the customer of the situation and will advise of any ramifications to data quality if impacted (with the possibility of work being recalled).

8.2. Corrective Action Completion

8.2.1. Internal Laboratory Non-Conformance Trends

8.2.1.1. There are several types of non-conformance trends that may occur in the laboratory that would require the initiation of a corrective action report. Laboratories may choose to initiate a corrective action for all instances of one or more of these categories if they so choose, however the intent is that each of these would be handled according to its severity; one time instances could be handled with a footnote or qualifier whereas a systemic problem with any of these categories may require an official corrective action process. These categories, as defined in the Corrective Action SOP are as follows:

- Login error
- Preparation Error
- Contamination
- Calibration Failure
- Internal Standard Failure
- LCS Failure
- Laboratory accident
- Spike Failure
- Instrument Failure
- Final Reporting error

8.2.2. PE/PT Sample Results

8.2.2.1. Any PT result assessed as "not acceptable" requires an investigation and applicable corrective actions. The operational staff is made aware of the PT failures and they are responsible for reviewing the applicable raw data and calibrations and list possible causes for error. The SQM/QM reviews their findings and initiates another external PT sample or an internal PT sample to try and correct the previous failure. Replacement PT results must be monitored by the SQM/QM and reported to the applicable regulatory authorities.

8.2.2.2. Additional information, such as requirements regarding time frames for reporting failures to states, makeup PTs, and notifications of investigations, can be found in SOP PGH-C-031 **Proficiency Testing Program** or its equivalent revision or replacement.

8.2.3. Internal and External Audits

8.2.3.1. The SQM/QM is responsible for documenting all audit findings and their corrective actions. This documentation must include the initial finding, the persons responsible for the corrective action, the due date for responding to the auditing body, the root cause of the finding, and the corrective actions needed for resolution. The SQM/QM is also responsible for providing any back-up documentation used to demonstrate that a corrective action has been completed.

8.2.4. **Data Review**

8.2.4.1. In the course of performing primary and secondary review of data or in the case of raw data reviews (e.g., by the SQM/QM), errors may be found which require corrective actions. Any finding that affects the quality of the data requires some form of corrective action, which may include revising and re-issuing of final reports.

8.2.5. **Client Complaints**

8.2.5.1. Project Managers are responsible for issuing corrective action forms, when warranted, for customer complaints. As with other corrective actions, the possible causes of the problem are listed and the form is passed to the appropriate analyst or supervisor for investigation. After potential corrective actions have been determined, the Project Manager reviews the corrective action form to ensure all customer needs or concerns are being adequately addressed.

8.2.6. **Client Inquiries**

8.2.6.1. When an error on the customer report is discovered, the Project Manager is responsible for initiating a formal corrective action form that describes the failure (e.g., incorrect analysis reported, reporting units are incorrect, or reporting limits do not meet objectives). The Project Manager is also responsible for revising the final report if necessary and submitting it to the customer.

8.2.7. **Holding Time Violations**

8.2.7.1. In the event that a holding time has been missed, the analyst or supervisor must complete a formal corrective action form. The Project Manager and the SQM/QM must be made aware of all holding time violations.

8.2.7.2. The Project Manager must contact the customer in order that appropriate decisions are made regarding the hold time excursion and the ultimate resolution is then documented and included in the customer project file.

9.0. GLOSSARY

The source of some of the definitions is indicated previous to the actual definition (e.g., TNI, DoD).

Terms and Definitions	
3P Program	The Pace continuous improvement program that focuses on Process, Productivity, and Performance. Best Practices are identified that can be used by all Pace labs.
Acceptance Criteria	TNI- Specified limits placed on characteristics of an item, process, or service defined in requirement documents.
Accreditation	TNI- The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. DoD- Refers to accreditation in accordance with the DoD ELAP.
Accreditation Body (AB)	TNI- The organization having responsibility and accountability for environmental laboratory accreditation and which grants accreditation under this program. DoD- Entities recognized in accordance with the DoD-ELAP that are required to operate in accordance with ISO/IEC 17011, *Conformity assessment: General requirements for accreditation bodies accrediting conformity assessment bodies*. The AB must be a signatory, in good standing, to the International Laboratory Accreditation Cooperation (ILAC) mutual recognition arrangement (MRA) that verifies, by evaluation and peer assessment, that its signatory members are in full compliance with ISO/IEC 17011 and that its accredited laboratories comply with ISO/IEC 17025.
Accuracy	TNI- The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator.
Activity, Absolute	TNI- Rate of nuclear decay occurring in a body of material, equal to the number of nuclear disintegrations per unit time. NOTE: Activity (absolute) may be expressed in becquerels (Bq), curies (Ci), or disintegrations per minute (dpm), and multiples or submultiples of these units.
Activity, Areic	TNI- Quotient of the activity of a body of material and its associated area.
Activity, Massic	TNI- Quotient of the activity of a body of material and its mass; also called specific activity.
Activity, Volumic	TNI- Quotient of the activity of a body of material and its volume; also called activity concentration. NOTE: In this module [TNI Volume 1, Module 6], unless otherwise stated, references to activity shall include absolute activity, areic activity, massic activity, and volumic activity.
Activity Reference Date	TNI- The date (and time, as appropriate to the half-life of the radionuclide) to which a reported activity result is calculated. NOTE: The sample collection date is most frequently used as the Activity Reference Date for environmental measurements, but different programs may specify other points in time for correction of results for decay and ingrowth.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.

Terms and Definitions	
American Society for Testing and Materials (ASTM)	An international standards organization that develops and publishes voluntary consensus standards for a wide range of materials, products, systems and services.
Analysis	DoD- A combination of sample preparation and instrument determination.
Analysis Code (Acode)	All the set parameters of a test, such as Analytes, Method, Detection Limits and Price.
Analysis Sequence	A compilation of all samples, standards and quality control samples run during a specific amount of time on a particular instrument in the order they are analyzed.
Analyst	TNI- The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.
Analyte	TNI- A substance, organism, physical parameter, property, or chemical constituent(s) for which an environmental sample is being analyzed. DoD- The specific chemicals or components for which a sample is analyzed; it may be a group of chemicals that belong to the same chemical family and are analyzed together.
Analytical Method	DoD- A formal process that identifies and quantifies the chemical components of interest (target analytes) in a sample.
Analytical Uncertainty	TNI- A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.
Annual (or Annually)	Defined by Pace as every 12 months ± 30 days.
Assessment	TNI - The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its system to defined criteria (to the standards and requirements of laboratory accreditation). DoD- An all-inclusive term used to denote any of the following: audit, performance evaluation, peer review, inspection, or surveillance conducted on-site.
Atomic Absorption Spectrometer	Instrument used to measure concentration in metals samples.
Atomization	A process in which a sample is converted to free atoms.
Audit	TNI- A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.

Terms and Definitions	
Batch	TNI- Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same quality systems matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed 20 samples.
Batch, Radiation Measurements (RMB)	TNI- An RMB is composed of 1 to 20 environmental samples that are counted directly without preliminary physical or chemical processing that affects the outcome of the test (e.g., non-destructive gamma spectrometry, alpha/beta counting of air filters, or swipes on gas proportional detectors). The samples in an RMB share similar physical and chemical parameter, and analytical configurations (e.g., analytes, geometry, calibration, and background corrections). The maximum time between the start of processing of the first and last in an RMB is 14 calendar days.
Bias	TNI- The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).
Blank	TNI and DoD- A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results (See Method Blank). DoD- Blank samples are negative control samples, which typically include field blank samples (e.g., trip blank, equipment (rinsate) blank, and temperature blank) and laboratory blank samples (e.g., method blank, reagent blank, instrument blank, calibration blank, and storage blank).
Blind Sample	A sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.
BNA (Base Neutral Acid compounds)	A list of semi-volatile compounds typically analyzed by mass spectrometry methods. Named for the way they can be extracted out of environmental samples in an acidic, basic or neutral environment.
BOD (Biochemical Oxygen Demand)	Chemical procedure for determining how fast biological organisms use up oxygen in a body of water.

Terms and Definitions	
Calibration	TNI- A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. 1) In calibration of support equipment, the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI); 2) In calibration according to test methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.
Calibration Curve	TNI- The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.
Calibration Method	A defined technical procedure for performing a calibration.
Calibration Range	DoD- The range of values (concentrations) between the lowest and highest calibration standards of a multi-level calibration curve. For metals analysis with a single-point calibration, the low-level calibration check standard and the high standard establish the linear calibration range, which lies within the linear dynamic range.
Calibration Standard	TNI- A substance or reference material used for calibration.
Certified Reference Material (CRM)	TNI- Reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute.
Chain of Custody	An unbroken trail of accountability that verifies the physical security of samples, data, and records.
Chain of Custody Form (COC)	TNI- Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and type of containers; the mode of collection, the collector, time of collection; preservation; and requested analyses.
Chemical Oxygen Demand (COD)	A test commonly used to indirectly measure the amount of organic compounds in water.
Client (referred to by ISO as Customer)	Any individual or organization for whom items or services are furnished or work performed in response to defined requirements and expectations.
Code of Federal Regulations (CFR)	A codification of the general and permanent rules published in the Federal Register by agencies of the federal government.
Comparability	An assessment of the confidence with which one data set can be compared to another. Comparable data are produced through the use of standardized procedures and techniques.
Completeness	The percent of valid data obtained from a measurement system compared to the amount of valid data expected under normal conditions. The equation for completeness is: % Completeness = (Valid Data Points/Expected Data Points)*100

Terms and Definitions	
Confirmation	TNI- Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: second-column confirmation; alternate wavelength; derivatization; mass spectral interpretation; alternative detectors; or additional cleanup procedures. DoD- Includes verification of the identity and quantity of the analyte being measured by another means (e.g., by another determinative method, technology, or column). Additional cleanup procedures alone are not considered confirmation techniques.
Conformance	An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements.
Congener	A member of a class of related chemical compounds (e.g., PCBs, PCDDs).
Consensus Standard	DoD- A standard established by a group representing a cross-section of a particular industry or trade, or a part thereof.
Continuing Calibration Blank (CCB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method.
Continuing Calibration Check Compounds (CCC)	Compounds listed in mass spectrometry methods that are used to evaluate an instrument calibration from the standpoint of the integrity of the system. High variability would suggest leaks or active sites on the instrument column.
Continuing Calibration Verification	DoD- The verification of the initial calibration. Required prior to sample analysis and at periodic intervals. Continuing calibration verification applies to both external and internal standard calibration techniques, as well as to linear and non-linear calibration models.
Continuing Calibration Verification (CCV) Standard	Also referred to as a Calibration Verification Standard (CVS) in some methods, it is a standard used to verify the initial calibration of compounds in an analytical method. CCVs are analyzed at a frequency determined by the analytical method.
Continuous Emission Monitor (CEM)	A flue gas analyzer designed for fixed use in checking for environmental pollutants.
Continuous Improvement Plan (CIP)	The delineation of tasks for a given laboratory department or committee to achieve the goals of that department.
Contract Laboratory Program (CLP)	A national network of EPA personnel, commercial labs, and support contractors whose fundamental mission is to provide data of known and documented quality.
Contract Required Detection Limit (CRDL)	Detection limit that is required for EPA Contract Laboratory Program (CLP) contracts.
Contract Required Quantitation Limit (CRQL)	Quantitation limit (reporting limit) that is required for EPA Contract Laboratory Program (CLP) contracts.
Control Chart	A graphic representation of a series of test results, together with limits within which results are expected when the system is in a state of statistical control (see definition for Control Limit)

Terms and Definitions	
Control Limit	A range within which specified measurement results must fall to verify that the analytical system is in control. Control limit exceedances may require corrective action or require investigation and flagging of non-conforming data.
Correction	DoD- Action taken to eliminate a detected non-conformity.
Corrective Action	DoD- The action taken to eliminate the causes of an existing non-conformity, defect, or other undesirable situation in order to prevent recurrence. A root cause analysis may not be necessary in all cases.
Corrective and Preventative Action (CAPA)	The primary management tools for bringing improvements to the quality system, to the management of the quality system's collective processes, and to the products or services delivered which are an output of established systems and processes.
Critical Value	TNI- Value to which a measurement result is compared to make a detection decision (also known as critical level or decision level). NOTE: The Critical Value is designed to give a specified low probability α of false detection in an analyte-free sample, which implies that a result that exceeds the Critical Value, gives high confidence $(1 - \alpha)$ that the radionuclide is actually present in the material analyzed. For radiometric methods, α is often set at 0.05.
Customer	DoD- Any individual or organization for which products or services are furnished or work performed in response to defined requirements and expectations.
Data Integrity	TNI- The condition that exists when data are sound, correct, and complete, and accurately reflect activities and requirements.
Data Quality Objective (DQO)	Systematic strategic planning tool based on the scientific method that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use or end user.
Data Reduction	TNI- The process of transforming the number of data items by arithmetic or statistical calculation, standard curves, and concentration factors, and collating them into a more usable form.
Definitive Data	DoD- Analytical data of known quantity and quality. The levels of data quality on precision and bias meet the requirements for the decision to be made. Data that is suitable for final decision-making.
Demonstration of Capability (DOC)	TNI- A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. DoD- A procedure to establish the ability of the analyst to generate analytical results by a specific method that meet measurement quality objectives (e.g., for precision and bias).
Department of Defense (DoD)	An executive branch department of the federal government of the United States charged with coordinating and supervising all agencies and functions of the government concerned directly with national security.
Detection Limit (DL)	DoD- The smallest analyte concentration that can be demonstrated to be different than zero or a blank concentration with 99% confidence. At the DL, the false positive rate (Type 1 error) is 1%. A DL may be used as the lowest concentration for reliably reporting a detection of a specific analyte in a specific matrix with a specific method with 99% confidence.

Terms and Definitions	
Detection Limit (DL) for Safe Drinking Water Act (SDWA) Compliance	TNI- Laboratories that analyze drinking-water samples for SDWA compliance monitoring must use methods that provide sufficient detection capability to meet the detection limit requirements established in 40 CFR 141. The SDWA DL for radioactivity is defined in 40 CFR Part 141.25.c as the radionuclide concentration, which can be counted with a precision of plus or minus 100% at the 95% confidence level (1.96σ where σ is the standard deviation of the net counting rate of the sample).
Deuterated Monitoring Compounds (DMCs)	DoD- SIM specific surrogates as specified for GC/MS SIM analysis.
Diesel Range Organics (DRO)	A range of compounds that denote all the characteristic compounds that make up diesel fuel (range can be state or program specific).
Digestion	DoD- A process in which a sample is treated (usually in conjunction with heat and acid) to convert the target analytes in the sample to a more easily measured form.
Document Control	The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.
Documents	DoD- Written components of the laboratory management system (e.g., policies, procedures, and instructions).
Dry Weight	The weight after drying in an oven at a specified temperature.
Duplicate (also known as Replicate or Laboratory Duplicate)	The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results of duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory.
Electron Capture Detector (ECD)	Device used in GC methods to detect compounds that absorb electrons (e.g., PCB compounds).
Electronic Data Deliverable (EDD)	A summary of environmental data (usually in spreadsheet form) which clients request for ease of data review and comparison to historical results.
Eluent	A solvent used to carry the components of a mixture through a stationary phase.
Elute	To extract, specifically, to remove (absorbed material) from an absorbent by means of a solvent.
Elution	A process in which solutes are washed through a stationary phase by movement of a mobile phase.
Environmental Data	DoD- Any measurements or information that describe environmental processes, locations, or conditions; ecological or health effects and consequences; or the performance of environmental technology.
Environmental Monitoring	The process of measuring or collecting environmental data.
Environmental Protection Agency (EPA)	An agency of the federal government of the United States which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress.

Terms and Definitions	
Environmental Sample	A representative sample of any material (aqueous, non-aqueous, or multimedia) collected from any source for which determination of composition or contamination is requested or required. Environmental samples can generally be classified as follows: • Non Potable Water (Includes surface water, ground water, effluents, water treatment chemicals, and TCLP leachates or other extracts) • Drinking Water - Delivered (treated or untreated) water designated as potable water • Water/Wastewater - Raw source waters for public drinking water supplies, ground waters, municipal influents/effluents, and industrial influents/effluents • Sludge - Municipal sludges and industrial sludges. • Soil - Predominately inorganic matter ranging in classification from sands to clays. • Waste - Aqueous and non-aqueous liquid wastes, chemical solids, and industrial liquid and solid wastes
Equipment Blank	A sample of analyte-free media used to rinse common sampling equipment to check effectiveness of decontamination procedures.
Extracted Internal Standard Analyte	Isotopically labeled analogs of analytes of interest added to all standards, blanks and samples analyzed. Added to samples and batch QC samples prior to the first step of sample extraction and to standards and instrument blanks prior to analysis. Used for isotope dilution methods.
Facility	A distinct location within the company that has unique certifications, personnel and waste disposal identifications.
False Negative	DoD- A result that fails to identify (detect) an analyte or reporting an analyte to be present at or below a level of interest when the analyte is actually above the level of interest.
False Positive	DoD- A result that erroneously identifies (detects) an analyte or reporting an analyte to be present above a level of interest when the analyte is actually present at or below the level of interest.
Field Blank	A blank sample prepared in the field by filling a clean container with reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken.
Field Measurement	Determination of physical, biological, or radiological properties, or chemical constituents that are measured on-site, close in time and space to the matrices being sampled/measured, following accepted test methods. This testing is performed in the field outside of a fixed-laboratory or outside of an enclosed structure that meets the requirements of a mobile laboratory.
Field of Accreditation	TNI- Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.
Field of Proficiency Testing (FoPT)	TNI- Matrix, technology/method, analyte combinations for which the composition, spike concentration ranges and acceptance criteria have been established by the PTPEC.

Terms and Definitions	
Finding	TNI- An assessment conclusion referenced to a laboratory accreditation standard and supported by objective evidence that identifies a deviation from a laboratory accreditation standard requirement. DoD- An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive, negative, or neutral and is normally accompanied by specific examples of the observed condition. The finding must be linked to a specific requirement (e.g., this standard, ISO requirements, analytical methods, contract specifications, or laboratory management systems requirements).
Flame Atomic Absorption Spectrometer (FAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the fact that ground state metals absorb light at different wavelengths. Metals in a solution are converted to the atomic state by use of a flame.
Flame Ionization Detector (FID)	A type of gas detector used in GC analysis where samples are passed through a flame which ionizes the sample so that various ions can be measured.
Gas Chromatography (GC)	Instrumentation which utilizes a mobile carrier gas to deliver an environmental sample across a stationary phase with the intent to separate compounds out and measure their retention times.
Gas Chromatograph/ Mass Spectrometry (GC/MS)	In conjunction with a GC, this instrumentation utilizes a mass spectrometer which measures fragments of compounds and determines their identity by their fragmentation patterns (mass spectra).
Gasoline Range Organics (GRO)	A range of compounds that denote all the characteristic compounds that make up gasoline (range can be state or program specific).
Graphite Furnace Atomic Absorption Spectrometry (GFAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the absorption of light at different wavelengths that are characteristic of different analytes.
High Pressure Liquid Chromatography (HPLC)	Instrumentation used to separate, identify and quantitate compounds based on retention times which are dependent on interactions between a mobile phase and a stationary phase.
Holding Time	TNI- The maximum time that can elapse between two specified activities. 40 CFR Part 136- The maximum time that samples may be held prior to preparation and/or analysis as defined by the method and still be considered valid or not compromised. For sample prep purposes, hold times are calculated using the time of the start of the preparation procedure. DoD- The maximum time that may elapse from the time of sampling to the time of preparation or analysis, or from preparation to analysis, as appropriate.
Homogeneity	The degree to which a property or substance is uniformly distributed throughout a sample.
Homologue	One in a series of organic compounds in which each successive member has one more chemical group in its molecule than the next preceding member. For instance, methanol, ethanol, propanol, butanol, etc., form a homologous series.
Improper Actions	DoD- Intentional or unintentional deviations from contract-specified or method-specified analytical practices that have not been authorized by the customer (e.g., DoD or DOE).

Terms and Definitions	
Incremental Sampling Method (ISM)	Soil preparation for large volume (1 kg or greater) samples.
In-Depth Data Monitoring	TNI- When used in the context of data integrity activities, a review and evaluation of documentation related to all aspects of the data generation process that includes items such as preparation, equipment, software, calculations, and quality controls. Such monitoring shall determine if the laboratory uses appropriate data handling, data use and data reduction activities to support the laboratory's data integrity policies and procedures.
Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)	Analytical technique used for the detection of trace metals which uses plasma to produce excited atoms that emit radiation of characteristic wavelengths.
Inductively Coupled Plasma- Mass Spectrometry (ICP/MS)	An ICP that is used in conjunction with a mass spectrometer so that the instrument is not only capable of detecting trace amounts of metals and non-metals but is also capable of monitoring isotopic speciation for the ions of choice.
Infrared Spectrometer (IR)	An instrument that uses infrared light to identify compounds of interest.
Initial Calibration (ICAL)	The process of analyzing standards, prepared at specified concentrations, to define the quantitative response relationship of the instrument to the analytes of interest. Initial calibration is performed whenever the results of a calibration verification standard do not conform to the requirements of the method in use or at a frequency specified in the method.
Initial Calibration Blank (ICB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method. This blank is specifically run in conjunction with the Initial Calibration Verification (ICV) where applicable.
Initial Calibration Verification (ICV)	DoD- Verifies the initial calibration with a standard obtained or prepared from a source independent of the source of the initial calibration standards to avoid potential bias of the initial calibration.
Injection Internal Standard Analyte	Isotopically labeled analogs of analytes of interest (or similar in physiochemical properties to the target analytes but with a distinct response) to be quantitated. Added to all blanks, standards, samples and batch QC after extraction and prior to analysis.
Instrument Blank	A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination.
Instrument Detection Limits (IDLs)	Limits determined by analyzing a series of reagent blank analyses to obtain a calculated concentration. IDLs are determined by calculating the average of the standard deviations of three runs on three non-consecutive days from the analysis of a reagent blank solution with seven consecutive measurements per day.
Interference, spectral	Occurs when particulate matter from the atomization scatters incident radiation from the source or when the absorption or emission from an interfering species either overlaps or is so close to the analyte wavelength that resolution becomes impossible.
Interference, chemical	Results from the various chemical processes that occur during atomization and later the absorption characteristics of the analyte.

Terms and Definitions	
Internal Standard	TNI and DoD- A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.
International Organization for Standardization (ISO)	An international standard-setting body composed of representatives from various national standards organizations.
Intermediate Standard Solution	Reference solutions prepared by dilution of the stock solutions with an appropriate solvent.
International System of Units (SI)	The coherent system of units adopted and recommended by the General Conference on Weights and Measures.
Ion Chromatography (IC)	Instrumentation or process that allows the separation of ions and molecules based on the charge properties of the molecules.
Isomer	One of two or more compounds, radicals, or ions that contain the same number of atoms of the same element but differ in structural arrangement and properties. For example, hexane (C6H14) could be n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane.
Laboratory	A body that calibrates and/or tests.
Laboratory Control Sample (LCS)	TNI- (also known as laboratory fortified blank (LFB), spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes and taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst-specific precision and bias or to evaluate the performance of all or a portion of the measurement system.
Laboratory Duplicate	Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently.
Laboratory Information Management System (LIMS)	DoD- The entirety of an electronic data system (including hardware and software) that collects, analyzes, stores, and archives electronic records and documents.
LabTrack	Database used by Pace to store and track corrective actions and other laboratory issues.
Learning Management System (LMS)	A web-based database used by the laboratories to track and document training activities. The system is administered by the corporate training department and each laboratory's learn centers are maintained by a local administrator.
Legal Chain-of-Custody Protocols	TNI- Procedures employed to record the possession of samples from the time of sampling through the retention time specified by the client or program. These procedures are performed at the special request of the client and include the use of a Chain-of-Custody (COC) Form that documents the collection, transport, and receipt of compliance samples by the laboratory. In addition, these protocols document all handling of the samples within the laboratory.

Terms and Definitions	
Limit(s) of Detection (LOD)	TNI- The minimum result, which can be reliably discriminated from a blank with predetermined confidence level. DoD- The smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence. At the LOD, the false negative rate (Type II error) is 1%. A LOD may be used as the lowest concentration for reliably reporting a non-detect of a specific analyte in a specific matrix with a specific method at 99% confidence.
Limit(s) of Quantitation (LOQ)	TNI- The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. DoD- The smallest concentration that produces a quantitative result with known and recorded precision and bias. For DoD/DOE projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard and within the calibration range.
Linear Dynamic Range	DoD- Concentration range where the instrument provides a linear response.
Liquid chromatography/ tandem mass spectrometry (LC/MS/MS)	Instrumentation that combines the physical separation techniques of liquid chromatography with the mass analysis capabilities of mass spectrometry.
Lot	TNI- A definite amount of material produced during a single manufacturing cycle, and intended to have uniform character and quality.
Management	Those individuals directly responsible and accountable for planning, implementing, and assessing work.
Management System	System to establish policy and objectives and to achieve those objectives.
Manager (however named)	The individual designated as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual.
Matrix	TNI- The substrate of a test sample.
Matrix Duplicate	TNI- A replicate matrix prepared in the laboratory and analyzed to obtain a measure of precision.
Matrix Spike (MS) (spiked sample or fortified sample)	TNI- A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.
Matrix Spike Duplicate (MSD) (spiked sample or fortified sample duplicate)	TNI- A replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.
Measurement Performance Criteria (MPC)	DoD- Criteria that may be general (such as completion of all tests) or specific (such as QC method acceptance limits) that are used by a project to judge whether a laboratory can perform a specified activity to the defined criteria.

Terms and Definitions	
Measurement Quality Objective (MQO)	TNI- The analytical data requirements of the data quality objectives are project- or program-specific and can be quantitative or qualitative. MQOs are measurement performance criteria or objectives of the analytical process. Examples of quantitative MQOs include statements of required analyte detectability and the uncertainty of the analytical protocol at a specified radionuclide activity, such as the action level. Examples of qualitative MQOs include statements of the required specificity of the analytical protocol, e.g., the ability to analyze for the radionuclide of interest given the presence of interferences.
Measurement System	TNI- A method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s). DoD- A test method, as implemented at a particular laboratory, and which includes the equipment used to perform the sample preparation and test and the operator(s).
Measurement Uncertainty	DoD- An estimate of the error in a measurement often stated as a range of values that contain the true value within a certain confidence level. The uncertainty generally includes many components which may be evaluated from experimental standard deviations based on repeated observations or by standard deviations evaluated from assumed probability distributions based on experience or other information. For DoD/DOE, a laboratory's Analytical Uncertainty (such as use of LCS control limits) can be reported as the minimum uncertainty.
Method	TNI- A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.
Method Blank	TNI- A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.
Method Detection Limit (MDL)	TNI- One way to establish a Detection Limit; defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.
Method of Standard Additions	A set of procedures adding one or more increments of a standard solution to sample aliquots of the same size in order to overcome inherent matrix effects. The procedures encompass the extrapolation back to obtain the sample concentration.

Terms and Definitions	
Minimum Detectable Activity (MDA)	TNI- Estimate of the smallest true activity that ensures a specified high confidence, $1 - \beta$, of detection above the Critical Value, and a low probability β of false negatives below the Critical Value. For radiometric methods, β is often set at 0.05. NOTE 1: The MDS is a measure of the detection capability of a measurement process and as such, it is an a priori concept. It may be used in the selection of methods to meet specified MQOs. Laboratories may also calculate a "sample specific" MDA, which indicates how well the measurement process is performing under varying real-world measurement conditions, when sample-specific characteristics (e.g., interferences) may affect the detection capability. However, the MDA must never be used instead of the Critical Value as a detection threshold. NOTE 2: For the purpose of this Standard, the terms MDA and minimum detectable concentration (MDC) are equivalent.
MintMiner	Program used by Pace to review large amounts of chromatographic data to monitor for errors or data integrity issues.
Mobile Laboratory	TNI- A portable enclosed structure with necessary and appropriate accommodation and environmental conditions for a laboratory, within which testing is performed by analysts. Examples include but are not limited to trailers, vans, and skid-mounted structures configured to house testing equipment and personnel.
National Environmental Laboratory Accreditation Conference (NELAC)	See definition of The NELAC Institute (TNI).
National Institute of Occupational Safety and Health (NIOSH)	National institute charged with the provision of training, consultation and information in the area of occupational safety and health.
National Institute of Standards and Technology (NIST)	TNI- A federal agency of the US Department of Commerce's Technology Administration that is designed as the United States national metrology institute (or NMI).
National Pollutant Discharge Elimination System (NPDES)	A permit program that controls water pollution by regulating point sources that discharge pollutants into U.S. waters.
Negative Control	Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.
Nitrogen Phosphorus Detector (NPD)	A detector used in GC analyses that utilizes thermal energy to ionize an analyte. With this detector, nitrogen and phosphorus can be selectively detected with a higher sensitivity than carbon.
Nonconformance	An indication or judgment that a product or service has not met the requirement of the relevant specifications, contract, or regulation; also the state of failing to meet the requirements.
Not Detected (ND)	The result reported for a compound when the detected amount of that compound is less than the method reporting limit.
Operator Aid	DoD- A technical posting (such as poster, operating manual, or notepad) that assists workers in performing routine tasks. All operator aids must be controlled documents (i.e., a part of the laboratory management system).

Terms and Definitions	
Performance Based Measurement System (PBMS)	An analytical system wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner.
Physical Parameter	TNI- A measurement of a physical characteristic or property of a sample as distinguished from the concentrations of chemical and biological components.
Photo-ionization Detector (PID)	An ion detector which uses high-energy photons, typically in the ultraviolet range, to break molecules into positively charged ions.
Polychlorinated Biphenyls (PCB)	A class of organic compounds that were used as coolants and insulating fluids for transformers and capacitors. The production of these compounds was banned in the 1970's due to their high toxicity.
Positive Control	Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.
Post-Digestion Spike	A sample prepared for metals analyses that has analytes spike added to determine if matrix effects may be a factor in the results.
Power of Hydrogen (pH)	The measure of acidity or alkalinity of a solution.
Practical Quantitation Limit (PQL)	Another term for a method reporting limit. The lowest reportable concentration of a compound based on parameters set up in an analytical method and the laboratory's ability to reproduce those conditions.
Precision	TNI- The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.
Preservation	TNI and DoD- Any conditions under which a sample must be kept in order to maintain chemical, physical, and/or biological integrity prior to analysis.
Primary Accreditation Body (Primary AB)	TNI- The accreditation body responsible for assessing a laboratory's total quality system, on-site assessment, and PT performance tracking for fields of accreditation.
Procedure	TNI- A specified way to carry out an activity or process. Procedures can be documented or not.
Proficiency Testing (PT)	TNI- A means to evaluate a laboratory's performance under controlled conditions relative to a given set of criteria, through analysis of unknown samples provided by an external source.
Proficiency Testing Program (PT Program)	TNI- The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories.
Proficiency Testing Provider (PT Provider)	TNI- A person or organization accredited by a TNI-approved Proficiency Testing Provider Accreditor to operate a TNI-compliant PT Program.
Proficiency Testing Provider Accreditor (PTPA)	TNI- An organization that is approved by TNI to accredit and monitor the performance of proficiency testing providers.
Proficiency Testing Reporting Limit (PTRL)	TNI- A statistically derived value that represents the lowest acceptable concentration for an analyte in a PT sample, if the analyte is spiked into the PT sample. The PTRLs are specified in the TNI FoPT tables.

Terms and Definitions	
Proficiency Testing Sample (PT)	TNI- A sample, the composition of which is unknown to the laboratory, and is provided to test whether the laboratory can produce analytical results within the specified acceptance criteria.
Proficiency Testing (PT) Study	TNI- a) Scheduled PT Study: A single complete sequence of circulation and scoring of PT samples to all participants in a PT program. The study must have the same pre-defined opening and closing dates for all participants; b) Supplemental PT Study: A PT sample that may be from a lot previously released by a PT Provider that meets the requirements for supplemental PT samples given in Volume 3 of this Standard [TNI] but that does not have a pre-determined opening date and closing date.
Proficiency Testing Study Closing Date	TNI- a) Scheduled PT Study: The calendar date by which all participating laboratories must submit analytical results for a PT sample to a PT Provider; b) Supplemental PT Study: The calendar date a laboratory submits the results for a PT sample to the PT Provider.
Proficiency Testing Study Opening Date	TNI- a) Scheduled PT Study: The calendar date that a PT sample is first made available to all participants of the study by a PT Provider; b) Supplemental PT Study: The calendar date the PT Provider ships the sample to a laboratory.
Protocol	TNI- A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) that must be strictly followed.
Qualitative Analysis	DoD- Analysis designed to identify the components of a substance or mixture.
Quality Assurance (QA)	TNI- An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.
Quality Assurance Manual (QAM)	A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality Assurance Project Plan (QAPP)	A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.
Quality Control (QC)	TNI- The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality.
Quality Control Sample (QCS)	TNI- A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control.
Quality Manual	TNI- A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.

Terms and Definitions	
Quality System	TNI and DoD- A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance and quality control activities.
Quality System Matrix	TNI and DoD- These matrix definitions shall be used for purposes of batch and quality control requirements and may be different from a field of accreditation matrix: • **Air and Emissions**: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device • **Aqueous**: Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, groundwater effluents, and TCLP or other extracts. • **Biological Tissue**: Any sample of a biological origin such as fish tissue, shellfish or plant material. Such samples shall be grouped according to origin. • **Chemical Waste**: A product or by-product of an industrial process that results in a matrix not previously defined. • **Drinking Water**: Any aqueous sample that has been designated a potable or potentially potable water source. • **Non-aqueous liquid**: Any organic liquid with <15% settleable solids • **Saline/Estuarine**: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake. • **Solids**: Includes soils, sediments, sludges, and other matrices with >15% settleable solids.
Quantitation Range	DoD- The range of values (concentrations) in a calibration curve between the LOQ and the highest successively analyzed initial calibration standard used to relate instrument response to analyte concentration. The quantitation range (adjusted for initial sample volume/weight, concentration/dilution and final volume) lies within the calibration range.
Quantitative Analysis	DoD- Analysis designed to determine the amounts or proportions of the components of a substance.
Random Error	The EPA has established that there is a 5% probability that the results obtained for any one analyte will exceed the control limits established for the test due to random error. As the number of compounds measured increases in a given sample, the probability for statistical error also increases.
Raw Data	TNI- The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records.

Terms and Definitions	
Reagent Blank (method reagent blank)	A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps.
Reagent Grade	Analytical reagent (AR) grade, ACS reagent grade, and reagent grade are synonymous terms for reagents that conform to the current specifications of the Committee on Analytical Reagents of the American Chemical Society.
Records	DoD- The output of implementing and following management system documents (e.g., test data in electronic or hand-written forms, files, and logbooks).
Reference Material	TNI- Material or substance one or more of whose property values are sufficiently homogenized and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
Reference Method	TNI- A published method issued by an organization generally recognized as competent to do so. (When the ISO language refers to a "standard method", that term is equivalent to "reference method"). When a laboratory is required to analyze by a specified method due to a regulatory requirement, the analyte/method combination is recognized as a reference method. If there is no regulatory requirement for the analyte/method combination, the analyte/method combination is recognized as a reference method if it can be analyzed by another reference method of the same matrix and technology.
Reference Standard	TNI- Standard used for the calibration of working measurement standards in a given organization or at a given location.
Relative Percent Difference (RPD)	A measure of precision defined as the difference between two measurements divided by the average concentration of the two measurements.
Reporting Limit (RL)	The level at which method, permit, regulatory and customer-specific objectives are met. The reporting limit may never be lower than the Limit of Detection (i.e., statistically determined MDL). Reporting limits are corrected for sample amounts, including the dry weight of solids, unless otherwise specified. There must be a sufficient buffer between the Reporting Limit and the MDL. DoD- A customer-specified lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.
Reporting Limit Verification Standard (RLVS)	A standard analyzed at the reporting limit for an analysis to verify the laboratory's ability to report to that level.
Representativeness	A quality element related to the ability to collect a sample reflecting the characteristics of the part of the environment to be assessed. Sample representativeness is dependent on the sampling techniques specified in the project work plan.
Requirement	Denotes a mandatory specification; often designated by the term "shall".
Retention Time	The time between sample injection and the appearance of a solute peak at the detector.
Revocation	TNI- The total or partial withdrawal of a laboratory's accreditation by an accreditation body.

Terms and Definitions	
Sample	Portion of material collected for analysis, identified by a single, unique alphanumeric code. A sample may consist of portions in multiple containers, if a single sample is submitted for multiple or repetitive analysis.
Sample Condition Upon Receipt Form (SCURF)	Form used by sample receiving personnel to document the condition of sample containers upon receipt to the laboratory (used in conjunction with a COC).
Sample Delivery Group (SDG)	A unit within a single project that is used to identify a group of samples for delivery. An SDG is a group of 20 or fewer field samples within a project, received over a period of up to 14 calendar days. Data from all samples in an SDG are reported concurrently.
Sample Receipt Form (SRF)	Letter sent to the client upon login to show the tests requested and pricing.
Sample Tracking	Procedures employed to record the possession of the samples from the time of sampling until analysis, reporting and archiving. These procedures include the use of a chain-of-custody form that documents the collection, transport, and receipt of compliance samples to the laboratory. In addition, access to the laboratory is limited and controlled to protect the integrity of the samples.
Sampling	TNI- Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.
Selected Ion Monitoring (SIM)	A mode of analysis in mass spectrometry where the detector is set to scan over a very small mass range, typically one mass unit. The narrower the range, the more sensitive the detector. DoD- Using GC/MS, characteristic ions specific to target compounds are detected and used to quantify in applications where the normal full scan mass spectrometry results in excessive noise.
Selectivity	TNI- The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system.
Sensitivity	TNI- The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.
Serial Dilution	The stepwise dilution of a substance in a solution.
Shall	Denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification as long as the requirement is fulfilled.
Should	Denotes a guideline or recommendation whenever noncompliance with the specification is permissible.
Signal-to-Noise Ratio (S/N)	DoD- A measure of signal strength relative to background noise. The average strength of the noise of most measurements is constant and independent of the magnitude of the signal. Thus, as the quantity being measured (producing the signal) decreases in magnitude, S/N decreases and the effect of the noise on the relative error of a measurement increases.
Source Water	TNI- When sampled for drinking water compliance, untreated water from streams, rivers, lakes, or underground aquifers, which is used to supply private and public drinking water supplies.

Terms and Definitions	
Spike	A known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.
Standard (Document)	TNI- The document describing the elements of a laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies.
Standard (Chemical)	Standard samples are comprised of a known amount of standard reference material in the matrix undergoing analysis. A standard reference material is a certified reference material produced by US NIST and characterized for absolute content, independent of analytical test method.
Standard Blank (or Reagent Blank)	A calibration standard consisting of the same solvent/reagent matrix used to prepare the calibration standards without the analytes. It is used to construct the calibration curve by establishing instrument background.
Standard Method	A test method issued by an organization generally recognized as competent to do so.
Standard Operating Procedure (SOP)	TNI- A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks.
Standard Reference Material (SRM)	A certified reference material produced by the US NIST or other equivalent organization and characterized for absolute content, independent of analytical method.
Statement of Qualifications (SOQ)	A document that lists information about a company, typically the qualifications of that company to compete on a bid for services.
Stock Standard	A concentrated reference solution containing one or more analytes prepared in the laboratory using an assayed reference compound or purchased from a reputable commercial source.
Storage Blank	DoD- A sample of analyte-free media prepared by the laboratory and retained in the sample storage area of the laboratory. A storage blank is used to record contamination attributable to sample storage at the laboratory.
Supervisor	The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses.
Surrogate	DoD- A substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples and is added to them for quality control purposes.
Suspension	TNI- The temporary removal of a laboratory's accreditation for a defined period of time, which shall not exceed 6 months or the period of accreditation, whichever is longer, in order to allow the laboratory time to correct deficiencies or area of non-conformance with the Standard.
Systems Audit	An on-site inspection or assessment of a laboratory's quality system.
Target Analytes	DoD- Analytes or chemicals of primary concern identified by the customer on a project-specific basis.

Terms and Definitions	
Technical Director	Individual(s) who has overall responsibility for the technical operation of the environmental testing laboratory.
Technology	TNI- A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.
Test	A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate.
Test Method	DoD- A definitive procedure that determines one or more characteristics of a given substance or product.
Test Methods for Evaluating Solid Waste, Physical/ Chemical (SW-846)	EPA Waste's official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with RCRA regulations.
Test Source	TNI- A radioactive source that is tested, such as a sample, calibration standard, or performance check source. A Test Source may also be free of radioactivity, such as a Test Source counted to determine the subtraction background, or a short-term background check.
The NELAC Institute (TNI)	A non-profit organization whose mission is to foster the generation of environmental data of known and documented quality through an open, inclusive, and transparent process that is responsive to the needs of the community. Previously known as NELAC (National Environmental Laboratory Accreditation Conference).
Total Petroleum Hydrocarbons (TPH)	A term used to denote a large family of several hundred chemical compounds that originate from crude oil. Compounds may include gasoline components, jet fuel, volatile organics, etc.
Toxicity Characteristic Leaching Procedure (TCLP)	A solid sample extraction method for chemical analysis employed as an analytical method to simulate leaching of compounds through a landfill.
Traceability	TNI- The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical conditions or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.
Training Document	A training resource that provides detailed instructions to execute a specific method or job function.
Trip Blank	This blank sample is used to detect sample contamination from the container and preservative during transport and storage of the sample. A cleaned sample container is filled with laboratory reagent water and the blank is stored, shipped, and analyzed with its associated samples.
Tuning	A check and/or adjustment of instrument performance for mass spectrometry as required by the method.

Terms and Definitions	
Ultraviolet Spectrophotometer (UV)	Instrument routinely used in quantitative determination of solutions of transition metal ions and highly conjugated organic compounds.
Uncertainty, Counting	TNI- The component of Measurement Uncertainty attributable to the random nature of radioactive decay and radiation counting (often estimated as the square root of observed counts (MARLAP). Older references sometimes refer to this parameter as Error, Counting Error or Count Error (c.f., Total Uncertainty).
Uncertainty, Expanded	TNI- The product of the Standard Uncertainty and a coverage factor, k, which is chosen to produce an interval about the result that has a high probability of containing the value of the measurand (c.f., Standard Uncertainty). NOTE: Radiochemical results are generally reported in association with the Total Uncertainty. Either if these estimates of uncertainty can be reported as the Standard Uncertainty (one-sigma) or as an Expanded Uncertainty (k-sigma, where $k > 1$).
Uncertainty, Measurement	TNI- Parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand.
Uncertainty, Standard	TNI- An estimate of the Measurement Uncertainty expressed as a standard deviation (c.f., Expanded Uncertainty).
Uncertainty, Total	TNI- An estimate of the Measurement Uncertainty that accounts for contributions from all significant sources of uncertainty associated with the analytical preparation and measurement of a sample. Such estimates are also commonly referred to as Combined Standard Uncertainty or Total Propagated Uncertainty, and in some older references as the Total Propagated Error, among other similar items (c.f., Counting Uncertainty).
Unethical actions	DoD- Deliberate falsification of analytical or quality control results where failed method or contractual requirements are made to appear acceptable.
United States Department of Agriculture (USDA)	A department of the federal government that provides leadership on food, agriculture, natural resources, rural development, nutrition and related issues based on public policy, the best available science, and effective management.
United States Geological Survey (USGS)	Program of the federal government that develops new methods and tools to supply timely, relevant, and useful information about the Earth and its processes.
Unregulated Contaminant Monitoring Rule (UCMR)	EPA program to monitor unregulated contaminants in drinking water.
Validation	DoD- The confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.
Verification	TNI- Confirmation by examination and objective evidence that specified requirements have been met. In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.

Terms and Definitions	
Voluntary Action Program (VAP)	A program of the Ohio EPA that gives individuals a way to investigate possible environmental contamination, clean it up if necessary and receive a promise from the State of Ohio that no more cleanup is needed.
Whole Effluent Toxicity (WET)	The aggregate toxic effect to aquatic organisms from all pollutants contained in a facility's wastewater (effluent).

10.0. REFERENCES

10.1. "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act." Federal Register, 40 CFR Part 136, most current version.

10.2. "Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods." SW-846.

10.3. "Methods for Chemical Analysis of Water and Wastes", EPA 600-4-79-020, 1979 Revised 1983, U.S. EPA.

10.4. U.S. EPA Contract Laboratory Program Statement of Work for Organic Analysis.

10.5. U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analysis.

10.6. "Standard Methods for the Examination of Water and Wastewater." Current Edition APHA-AWWA-WPCF.

10.7. "Annual Book of ASTM Standards", Section 4: Construction, Volume 04.04: Soil and Rock; Building Stones, American Society of Testing and Materials.

10.8. "Annual Book of ASTM Standards", Section 11: Water and Environmental Technology, American Society of Testing and Materials.

10.9. "NIOSH Manual of Analytical Methods", U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, most current version.

10.10. "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water", U.S. EPA, Environmental Monitoring and Support Laboratory – Cincinnati (Sep 1986).

10.11. Quality Assurance of Chemical Measurements, Taylor, John K.; Lewis Publishers, Inc. 1987.

10.12. Methods for Non-conventional Pesticides Chemicals Analysis of Industrial and Municipal Wastewater, Test Methods, EPA-440/1-83/079C.

10.13. Environmental Measurements Laboratory (EML) Procedures Manual, HASL-300, US DOE, February, 1992.

10.14. Requirements for Quality Control of Analytical Data, HAZWRAP, DOE/HWP-65/R1, July, 1990.

10.15. Requirements for Quality Control of Analytical Data for the Environmental Restoration Program, Martin Marietta, ES/ER/TM-16, December, 1992.

10.16. Quality Assurance Manual for Industrial Hygiene Chemistry, AIHA, most current version.

10.17. National Environmental Laboratory Accreditation Conference (NELAC) Standard- most current version.

10.18. ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories- most current version.

10.19. Department of Defense Quality Systems Manual (QSM), most current version.

10.20. TNI (The NELAC Institute) Standard- most current version applicable to each lab.

10.21. UCMR Laboratory Approval Requirements and Information Document, most current version.

10.22. US EPA Drinking Water Manual, most current version.

11.0. REVISIONS

The Pace Corporate Environmental Quality Office files an electronic version of a Microsoft Word document with tracked changes detailing all revisions made to previous versions of the Quality Assurance Manual. This document is available upon request. All current revisions are summarized in the table below.

Document Number	Reason for Change	Date
Quality Assurance Manual 19.0	General: made administrative edits that do not affect the policies or procedures within the document (including revising company name to Pace Analytical Services, LLC). Cover page: removed corporate approval signature lines. Old Section 3: moved to other sections of the QAM as applicable and deleted entire section (All section references below reflect the new section numbers). Section 1.1.2: replaced with section 3.1.1. Sections 1.3, 1.4, 1.11: removed extraneous language. Sections 1.5: added language from old section 1.6. Section 1.6: revised anonymous reporting information. Section 1.7.6: added deputies per position and deleted DoD language from old section 1.7.7. Section 1.8: removed non-key personnel job descriptions. Section 2: rearranged existing sections. Section 2.4: reworded to match existing Sample Acceptance policy document. Section 4: in general, for each QC type, removed language regarding frequency and corrective actions and referenced lab-specific SOPs. Section 5: in general, removed extraneous language and Management of Change section. Section 5.1, 5.2: reorganized into Primary and Secondary Review sections and removed extraneous language. Section 6: removed extraneous language including Quarterly Report section. Section 9 (glossary): revised and added definitions based on 2016 TNI Standard. Section 10: Added EPA DW Manual and revised references as applicable. Attachment III: updated corporate organizational chart. Old Attachment IV: removed floor plan attachment. Old Attachment VII: removed COC (available in SOPs).	10Mar2017
Quality Assurance Manual 19.1	1. Updated SOP references. 2. Update lab org chart. 3. Updated equipment list 4. Updated SOP list. 5. Updated certification list.	18May2018

ATTACHMENT I- QUALITY CONTROL CALCULATIONS

PERCENT RECOVERY (%REC)

$$\%REC = \frac{(MSConc - SampleConc)}{TrueValue} * 100$$

NOTE: The SampleConc is zero (0) for the LCS and Surrogate Calculations

PERCENT DIFFERENCE (%D)

$$\%D = \frac{MeasuredValue - TrueValue}{TrueValue} * 100$$

where:
TrueValue = Amount spiked (can also be the $\overline{CF}$ or $\overline{RF}$ of the ICAL Standards)
Measured Value = Amount measured (can also be the CF or RF of the CCV)

PERCENT DRIFT

$$\%Drift = \frac{CalculatedConcentration - TheoreticalConcentration}{TheoreticalConcentrtion} * 100$$

RELATIVE PERCENT DIFFERENCE (RPD)

$$RPD = \frac{|(R1 - R2)|}{(R1 + R2)/2} * 100$$

where:
R1 = Result Sample 1
R2 = Result Sample 2

CORRELATION COEFFICIENT (R)

$$CorrCoeff = \frac{\sum_{i=1}^{N} W_i * (X_i - \overline{X}) * (Y_i - \overline{Y})}{\sqrt{\left(\sum_{i=1}^{N} W_i * (X_i - \overline{X})^2\right) * \left(\sum_{i=1}^{N} W_i * (Y_i - \overline{Y})^2\right)}}$$

With:	N	Number of standard samples involved in the calibration
	i	Index for standard samples
	Wi	Weight factor of the standard sample no. i
	Xi	X-value of the standard sample no. i
	X(bar)	Average value of all x-values
	Yi	Y-value of the standard sample no. i
	Y(bar)	Average value of all y-values

ATTACHMENT I- QUALITY CONTROL CALCULATIONS (CONTINUED)

STANDARD DEVIATION (S)

$$S = \sqrt{\sum_{i=1}^{n} \frac{(X_i - \overline{X})^2}{(n-1)}}$$

where:
n = number of data points
X_i = individual data point
$\overline{X}$ = average of all data points

AVERAGE ($\overline{X}$)

$$\overline{X} = \frac{\sum_{n=1}^{i} X_i}{n}$$

where:
n = number of data points
X_i = individual data point

RELATIVE STANDARD DEVIATION (RSD)

$$RSD = \frac{S}{\overline{X}} * 100$$

where:
S = Standard Deviation of the data points
$\overline{X}$ = average of all data points

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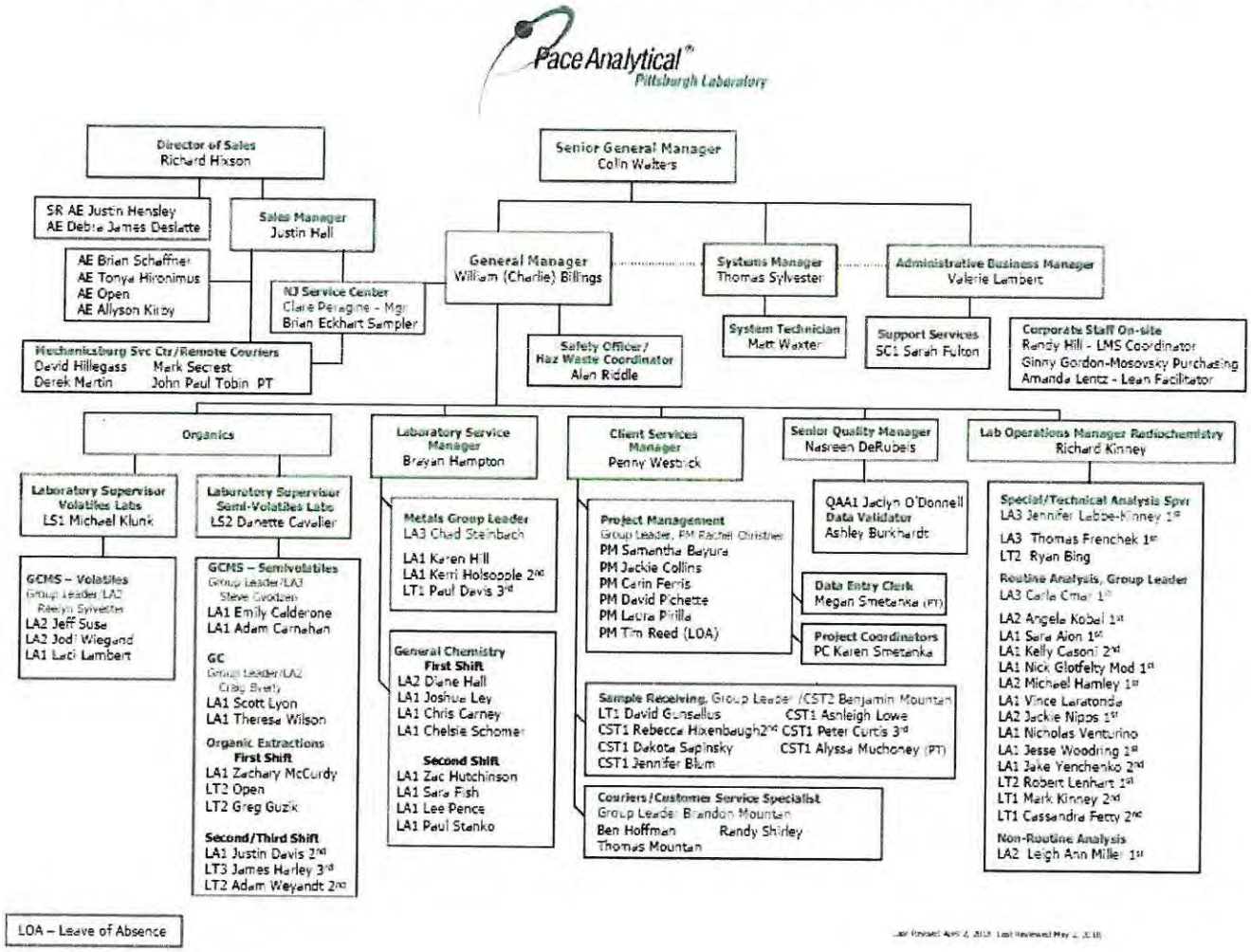
ATTACHMENT II- LABORATORY ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



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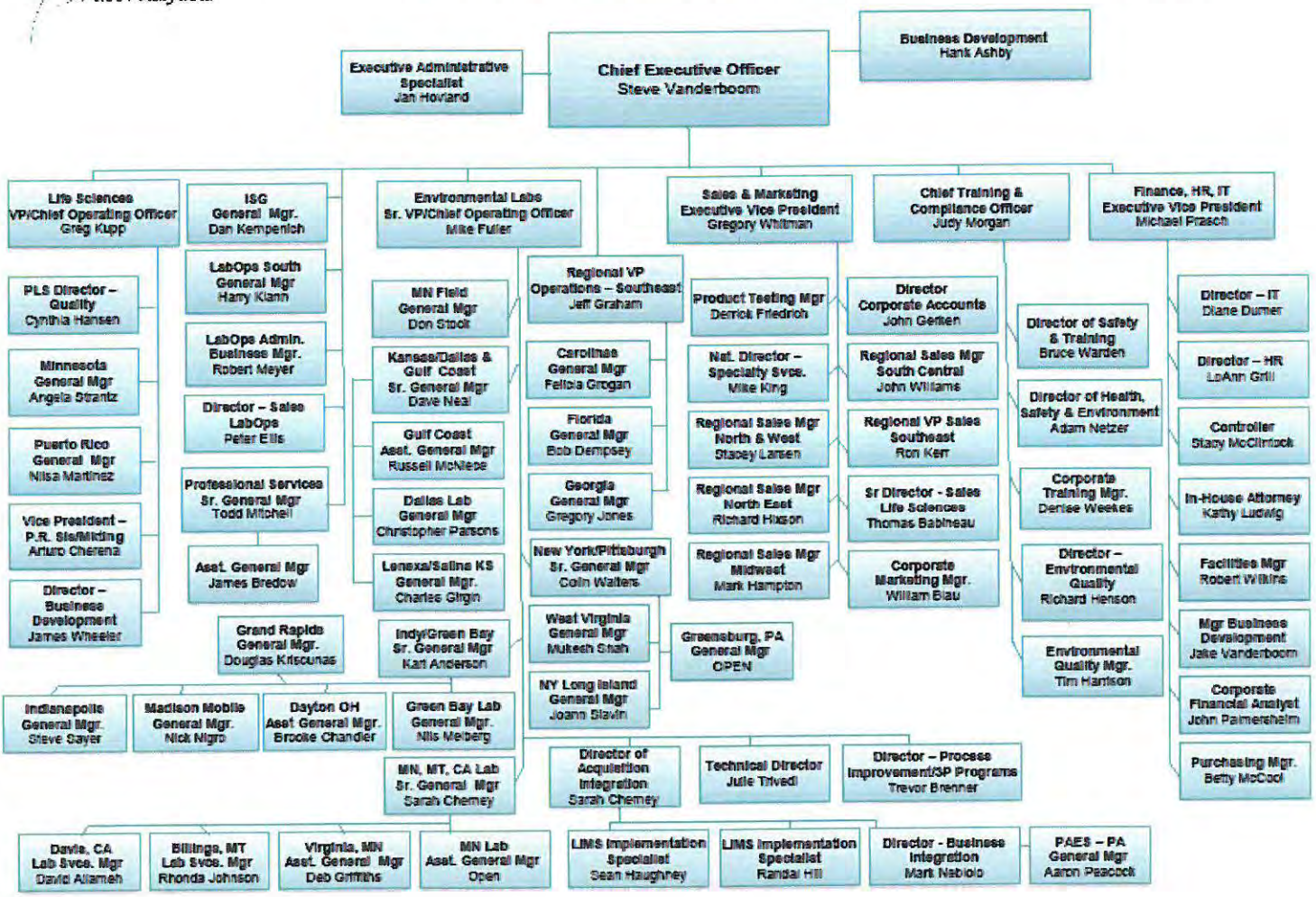
ATTACHMENT III- CORPORATE ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)

Pace Analytical

CORPORATE MANAGEMENT STAFF

March 2017



ATTACHMENT IV- EQUIPMENT LIST (CURRENT AS OF ISSUE DATE)

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
ICP	Iteva V2.8.096	CETAC	6500	20090207	ICP-2	ICP-2	PMT's	Metals	Trace Metals	New	2009	2009
ICP	Iteva V2.8.097	CETAC	6500	1665DC132619	ICP-3	ICP-3	PMT's	Metals	Trace Metals	New	7/26/2013	8/27/2013
Mercury Analysis	Quick Trace V1.7.6	CETAC	Cetac	Quicktrace M-6100	HG-1	NA	30HG1	Metals	Metals	New	2009	3/3/2009
Microwave	NA	CEM Corp	MDS2100	ZR8160	NA	NA	NA	Metals	Metals	Unknown	Unknown	Unknown
Balance	NA	Mettler-Toledo	XS203S	B08050503		30BAL6	NA	Metals	Metals	Unknown	Unknown	Unknown
IC	Chromeleon 7	Dionex	ICS 1100	98100641E991001	IC	30WTA4	IC	WC	Anions	new	2016	10/1/2016
Automated Spectrometer	Omnion V 4.0	Lachat	8500	150700001870	NA	30WTA7	UV	WC	Wet Chemistry	new	7/9/2015	Unknown
Automated Spectrometer	Omnion V3.0	Lachat	8500	120400001408	NA	30WTA5	UV	WC	Wet Chemistry	New	4/25/2012	NA
Automated Spectrometer	SmartChem V3.1.14	SmartChem	Discrete Analyzer	W0602083	NA	30WTA1	UV	WC	Wet Chemistry	New	2008	2008
Spectrophotometer	NA	Milton-Roy	SPEC 21D	3156129024	NA	30WET2	UV	WC	Thiocyanate, MBAS, OrthoP(in EPIC)	used	Unknown	Unknown
Spectrophotometer	Hach Lange:66	Milton-Roy	DR 5000	1259771	NA	30WETF/ 30WET9	UV	WC	HexCr W/S, Phenol, OrthoP, Res chlorine, COD, MBAS - (EPIC 30WETF is associated with Soil DR-5000 HexCr SEPC - Soil)	new	Unknown	Unknown

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Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
Rotary Piston Vacuum Pump for O&G	NA	ANVER	PMP-4.3HP	NA	NA	NA	NA	WC	O & G (1664)	New	4/21/2017	4/21/2017
Solid Phase Extractor	NA	Horizon	SPE-Dex 3000XL	00241	NA	NA	NA	WC	O & G (1664)	new	6/10/2003	4/2/2009
Infrared Spectrometer	NA	Perkin Elmer	1310	132724	NA	30WET7	NA	WC	TPH			
Solvent Extractor	NA	Dionex	ASE-200	99090116	ASE-200	NA	NA	WC	Soil Extraction			
Dissolved O2 Meter	Hach Lab V2.1.0.713	Hach	Sension 8	110100050689	NA	30WETA	Meter	WC	BOD/CBOD	Unknown	Unknown	Unknown
pH/Ion/Conductivity	NA	Accumet	50	C0021230	NA		Meter	WC	Fluoride	new	Unknown	Unknown
pH/Ion/Conductivity	NA	Accumet	Acuumet AB250	AB92350833	30WETG	30WETG	Meter	WC	pH	new	6/16/2017	6/16/2017
pH/Ion/Conductivity	NA	Orion Star	A215	X05092	NA	30WETC	Meter	WC	pH, Conductance	new	Unknown	Unknown
pH/Ion/Conductivity	NA	Precision	Flash Alert	NA	NA	30WET6	NA	WC	Flash Point	New	Unknown	Unknown
MARS 230/60	NA	CEM	907501	MD9413	1		NA	Oprep	O-Prep	New	2007	2008
TOC	NA	OI Analytical	1030	D750788365	NA	30WTA2	UV	WC	TOC	new	Jan-08	Feb-08
TOC	NA	Shimadzu	TOC-V WP	638-91064-12 (autosample S/N: 638-93141-08	30WTA8	30WTA8	UV	WC	TOC	new	Jul-17	Not Yet
TKN block (new)	SCP V1.4	SCP SCIENTIFIC	HTC 1014220373	TSA1014061434	NA		NA	WC	TKN	new	2015	2015
Turbidimeter	NA	Hf Scientific	Micro 100	200802069	NA	30WET8	NA	WC	Turbidity	new	2012	2012
COD block	NA	HACH	45600-00	910605052	NA	COD001	NA	WC	COD	new	Unknown	Unknown
COD block	NA	HACH	45600-00	940100010288	NA	COD002	NA	WC	COD	new	Unknown	Unknown
Distillation block	NA	NA	NA	NA	NA	DIST003	NA	WC	CN	Unknown	Unknown	Unknown
Distillation block	NA	NA	NA	NA	NA	DIST004	NA	WC	CN	Unknown	Unknown	Unknown
Distillation block	NA	NA	NA	NA	NA	DIST005	NA	WC	Cyanide	new	2008	2008
Distillation block	NA	NA	NA	NA	NA	DIST006	NA	WC	Cyanide	new	9/15/2017	9/15/2017
Pressure Cooker	NA	NA	NA	NA	NA	AC001	NA	WC	Phos	Unknown	Unknown	Unknown
Pressure Cooker	NA	NA	NA	NA	NA	AC002	NA	WC	Phos	Unknown	Unknown	Unknown
Balance	NA	Mettler	ML802	B329563586	PJ3600	30BAL2	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown
Balance	NA	Sartorius	BS 2105	40248175	NA	30BAL7	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
Balance	NA	Mettler	MS204S/03	B510684209	B510684209	30BAL8	NA	WC	Extra Wet Chemistry	Unknown	Unknown	Unknown
Oven #3	NA	Fisher Scientific	NA	NA	OVN003	OVN003	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown
Oven #9	NA	Thelco	NA	NA	OVN009	OVN009	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown
Oven #10	NA	Fisher Scientific	NA	NA	OVN010	OVN010	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown
Incubator #1	NA	NA	NA	NA	INC001	INC001	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown
Incubator #2	NA	NA	NA	NA	INC002	INC002	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown
Incubator #5	NA	NA	NA	NA	INC005	INC005	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown
Incubatory #6	NA	NA	NA	NA	INC006	INC006	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown
Incubatory #7	NA	NA	NA	NA	INC007	INC007	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown
Refrigerator #10	NA	Kenmore	253.607210 1	WA14800568	NA	NA	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown
Refrigerator # 26	NA	Beverage Air	C134	1515739	NA	NA	NA	WC	Wet Chemistry	Unknown	Unknown	Unknown
Refrigerator # 27	NA	Kool IT	KSM42	1200WAB2014092 6010	NA	NA	NA	WC	Wet Chemistry	New	11/17/201 4	NA
Refrigerator # 29	NA	Kool IT	KSM42	1200WAB2014122 8055	NA	NA	NA	WC	Wet Chemistry	new	Unknown	Unknown
Refrigerator # 30	NA	Kool IT	KSM42	1200WAB2014122 8056	NA	NA	NA	WC	Wet Chemistry	new	Unknown	Unknown
Refrigerator # 33	NA	Kool IT	KSM42	KSM42150723008	NA	NA	NA	WC	Wet Chemistry	new	Sep-15	Sep-15
Refrigerator # 39	NA	Avantco	178GDS47	621231171607150 0	NA	NA	NA	WC	Wet Chemistry	new	Out of Service as pf 3/1/17	Out of Service as pf 3/1/17
GC/MS	Chemstation 1701BA Rev2.0/Targ et RC-10	Hewlett-Packard	6890/5973	US82321858; oven US00024152	MSS1	30MSS1	MSD	GCMS Semi	GCMS Semivolatil e	Used /Refurbish ed	Unknown	5/1/2002

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
GC/MS	Chemstation 1701EA Rev2.0/Target RC-10	Hewlett-Packard	6890N/5973Network	US01150089; oven US00035050	MSS2	30MSS2	MSD	GCMS Semi	GCMS Semivolatile	Used /Refurbished	Unknown	5/1/2002
GC/MS	Chemstation 1701EA Rev2.0/Target RC-10	Agilent	6890N/5973Network	US43146815; oven CN10435024	MSS3	30MSS3	MSD	GCMS Semi	GCMS Semivolatile	Used /Refurbished	Unknown	5/1/2002
GC/MS	Chemstation 1701EA Rev2.0/Target RC-10	Hewlett-Packard	6890/5975	US52420703; oven US10248098	MSS4	30MSS4	MSD	GCMS Semi	GCMS Semivolatile	Used /Refurbished	10/14	10/14
GC/MS	Chemstation 1701EA Rev2.0/Target RC-10	Hewlett-Packard	6890A/5975B	US62744417; oven US00037743	MSS5	30MSS5	MSD	GCMS Semi	GCMS Semivolatile	Used /Refurbished	10/15	10/15
GC/MS	Chemstation 1701EA Rev2.0/Target RC-10	Hewlett-Packard	oven model 7890A; MSD model 5975C	oven SN: CN11281016; MSD SN: US11483920	MSS6	30MSS6	MSD	GCMS Semi	GCMS Semivolatile	Used /Refurbished	7/16	10/16
Refrigerator #1	NA	Fisher Scientific	13-988-450RW	30330074	NA	NA	NA	GCMS Semi	GC & GCMS Semivolatiles	Unknown	Unknown	Unknown
Refrigerator #2	NA	Fisher Scientific	TDX155NSBRHW	GH750959	NA	NA	NA	GCMS Semi	GC & GCMS Semivolatiles	Unknown	Unknown	Unknown
Refrigerator / Freezer #41	NA	Isotemp	10FCEEFSA	1162937201170920	NA	NA	NA	GCMS Semi	GC & GCMS Semivolatiles	New	9/28/2017	

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
Refrigerator/ new walk-in #42	NA	Cold Vault	3678-3-L	DX1801915-01	NA	N	NA	Receiving	Sample Receiving	new	4/16/2018	5/7/2018
GC	Chemstation Rev B.04.02(118)	Hewlett-Packard	7890A	CN10041083	7	30GCS7	FID	GC Semi	DRO	Used /Refurbished	Unknown	Unknown
GC	Chemstation Rev B.03.01(317)	Hewlett-Packard	5890A	2643A11529	8	30GCS8	Dual ECD	GC Semi	PCB, 8011	Used /Refurbished	Unknown	Unknown
GC	Chemstation Rev B.03.01(317)	Hewlett-Packard	5890 Ser. II	3029A0193	9	30GCS9	Dual ECD	GC Semi	Pest	Used /Refurbished	Unknown	Unknown
GC	Chemstation Rev C.00.00	Agilent	6890	US10250070	A	30GCSA	Dual ECD	GC Semi	PCB	Used /Refurbished	Unknown	Unknown
GC	Chemstation Rev C.00.00	Agilent	7890B	SN: CN14173047	B	30GCSB	Dual FID	GC Semi	ORO	Used /Refurbished	7/16	1/17
GC	Chemstation Rev C.00.00	Agilent	7890B	SN: CN17253167 (Autosample tray SN: CN17240018, injector SN: CN17240077)	C	30GCSC	Dual uECD	GC Semi	Pest	new	8/4	8/10
GC	Chemstation Rev C.00.00	Agilent	7890B	SN: CN17313056 (Autosampler SN: CN8174787)	D	30GCSD	Dual uECD	GC Semi	PCB	New	9/1	Not Yet
Balance	NA	Mettler-Toledo	PL6001E	B651482025	B651482025	30BA26	NA	GC Semi	8011	New	Jan-17	2/23/2017

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
GC/MS (Out of service)	Chemstation 1701BA Rev2.0/Target RC-10	Hewlett-Packard	6890/5973	US00007782/US70820584	HPMS1	30MV1A-B	MSD	GCMS VOA	Volatiles	Used /Refurbished	5/1/2002	Out of Service (Waiting for a board)
GC/MS	Chemstation 1701BA Rev2.0/Target RC-10	Hewlett-Packard	6890/5973	DE00004512/US72821154	HPMS2	30MV2A-B	MSD	GCMS VOA	Volatiles	Used /Refurbished	5/1/2002	5/1/2002
GC/MS	Chemstation 1701BA Rev2.0/Target RC-10	Hewlett-Packard	6890/5973	US00032703/US94223089	HPMS3	30MV3A-B	MSD	GCMS VOA	Volatiles	Used /Refurbished	5/1/2002	5/1/2002
GC/MS	Chemstation 1701BA Rev2.0/Target RC-10	Hewlett-Packard	6890/5973	US00007768/US70820610	HPMS4	30MV4A-B	MSD	GCMS VOA	Volatiles	Used /Refurbished	11/14/2006	11/18/2006
GC/MS	Chemstation 1701EA Rev2.0/Target RC-10	Hewlett-Packard	6850/5975	CN11004009/US10050001	HPMS5	30MV5A-B	MSD	GCMS VOA	Volatiles	Used /Refurbished	Unknown	Unknown
GC/MS	Chemstation 1701EA Rev2.0/Target RC-10	Hewlett-Packard	6890A/5973N MS	US00040634/US10360153	HPMS6	30MV6A-B	MSD	GCMS VOA	Volatiles	Used /Refurbished	10/1/2015	10/1/2015
GC/MS	Chemstation 1701EA Rev2.0/Target RC-10	NA	6890N/5975 MS	CN10539039/US53921127	HPMS7	30MV7A-B	MSD	GCMS VOA	Volatiles	Used /Refurbished	7/16	7/16
P&T Autosampler 30MSV1	NA	Archon	8100	11856-196A	HPMS1	30MSV1	NA	GCMS VOA	Volatiles	Used /Refurbished	5/1/2002	Out of Service
P&T Concentrator 1-A	NA	Tekmar	3000	94348006	HPMS1	30MSV1	NA	GCMS VOA	Volatiles	Used /Refurbished	5/1/2002	Out of Service
P&T Concentrator 1-B	NA	Tekmar	3000	98082011	HPMS1	30MSV1	NA	GCMS VOA	Volatiles	Used /Refurbished	5/1/2002	Out of Service

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Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
P&T Autosampler 30MSV2	NA	EST	Centurion	144061104	HPMS2	30MSV2	NA	GCMS VOA	Volatiles	Used /Refurbished	Unknown	5/1/2002
P&T Concentrator 2-A	NA	EST	Evolution	EV674060115	HPMS2	30MSV2	NA	GCMS VOA	Volatiles	New	Unknown	Unknown
P&T Concentrator	NA	EST	Evolution	EV675060115	HPMS2	30MSV2	NA	GCMS VOA	Volatiles	New	Unknown	Unknown
P&T Autosampler 30MSV3	NA	EST	Centurion	CENT233040307	HPMS3	30MSV3	NA	GCMS VOA	Volatiles	Used /Refurbished	Unknown	5/1/2002
P&T Concentrator 3-A	NA	Tekmar	3000	9924010	HPMS3	30MSV3	NA	GCMS VOA	Volatiles	New	Unknown	Unknown
P&T Concentrator 3-B	NA	Tekmar	3000	00060005	HPMS3	30MSV3	NA	GCMS VOA	Volatiles	New	Unknown	Unknown
P&T Autosampler 30MSV4	NA	EST	Centurion	CENT214101206	HPMS4	30MSV4	NA	GCMS VOA	Volatiles	Used /Refurbished	Unknown	11/18/2006
P&T Concentrator 4-A	NA	Tekmar	3000	94259003	HPMS4	30MSV4	NA	GCMS VOA	Volatiles	Used /Refurbished	Unknown	11/18/2006
P&T Concentrator 4-B	NA	Tekmar	3000	94264003	HPMS4	30MSV4	NA	GCMS VOA	Volatiles	Used /Refurbished	Unknown	11/18/2006
P&T Autosampler 30MSV5	NA	EST	Centurion	CENTS397112514	HPMS5	30MSV5	NA	GCMS VOA	Volatiles	New	Unknown	Unknown
P&T Concentrator 5-A	NA	EST	Evolution	EV234122809	HPMS5	30MSV5	NA	GCMS VOA	Volatiles	New	Unknown	Unknown
P&T Concentrator 5-B	NA	EST	Evolution	EV623100614	HPMS5	30MSV5	NA	GCMS VOA	Volatiles	New	Unknown	Unknown
P&T Autosampler 30MSV6	NA	EST	Centurion	CENTS397112514	HPMS6	30MSV6	NA	GCMS VOA	Volatiles	Used /Refurbished	10/1/2015	10/1/2015
P&T Concentrator 6-A	NA	EST	Evolution	EV690070915	HPMS6	30MSV6	NA	GCMS VOA	Volatiles	Used /Refurbished	10/1/2015	10/1/2015
P&T Concentrator 6-B	NA	EST	Evolution	EV620092414	HPMS6	30MSV6	NA	GCMS VOA	Volatiles	Used /Refurbished	10/1/2015	10/1/2015
P&T Autosampler 30MSV7	NA	EST	Centurion	CENTS460063019	HPMS7	30MSV7	NA	GCMS VOA	Volatiles	New	7/16	7/16

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
P&T Concentrator 7-A	NA	EST	Evolution	EV758063016	HPMS7	30MSV7	NA	GCMS VOA	Volatiles	New	7/16	7/16
P&T Concentrator 7-B	NA	EST	Evolution	EV757063016	HPMS7	30MSV7	NA	GCMS VOA	Volatiles	New	7/16	7/16
Balance	NA	HRB	1002TL	HR1409140	HR1409140	30BAL15	NA	GCMS VOA	GCMS Volatiles	Unknown	Unknown	Unknown
Balance	NA	Mettler	AE240	K89959	AE240	30BAL1	NA	GCMS VOA	GCMS Volatiles	Unknown	Unknown	Unknown
GC	Chemstation 1701BA Rev2.0/Target RC-10	Hewlett-Packard	5890 Ser. II	3033A31116	GCV-1	30GCV1	PID/FID	GCMS VOA	GC Volatiles	Used /Refurbished	5/1/2002	5/1/2002
GC	Chemstation 1701DA Rev2.0/Target RC-10	Hewlett-Packard	6890 N	US10608040	GCV-2	30GCV2	FID	GCMS VOA	GRO	Used /Refurbished	3/16	3/16
GC	Chemstation 1701BA Rev2.0/Target RC-10	Hewlett-Packard	3890 Ser. II	3121A35926	Screen	No ID	Dual FID	GCMS VOA	GC Volatiles	Used /Refurbished	Unknown	Unknown
Refrigerator #4	NA	Fisher Scientific	K89959/ TB15SPFR	MG732472	NA	NA	NA	GCMS VOA	GCMS Volatiles	Unknown	Unknown	Unknown
Refrigerator #18	NA	TRUE	GDM-47	4503580	NA	NA	NA	GCMS VOA	GCMS Volatiles	Unknown	Unknown	Unknown
Refrigerator #20 (Walk-in)	NA	American Cooler Tech	NA	NA	NA	NA	NA	Samp Receiving	Receiving	New	Unknown	moved to receiving
Refrigerator #38 (walk in)	NA	Cold Vault	3678-3-L	DX1604122	NA	NA	NA	GCMS VOA	GCMS Volatiles	New	8/16	8/16
Freezer Chest #7	NA	Kelvinator	NA	NA	NA	NA	NA	GCMS VOA	GCMS Volatiles	Unknown	Unknown	Unknown
Muffle Furnace	NA	Fisher Scientific	NA	NA	OVN001	OVN001	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
Refrigerator #15	NA	Fisher Scientific	NA	NA	NA	NA	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
Refrigerator #40	NA	Frigidaire	FFPA33L2SM	71601377	NA	NA	NA	OPrep	O-Prep	New	6/14/2017	6/16/2017

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
Mechanical Shaker	NA	J-Kem Scientific	Max-Q	NA	NA	NA	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
Rotator #1	NA	NA	NA	NA	NA	NA	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
Rotator #2	NA	NA	NA	NA	NA	NA	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
Rotator #3	NA	NA	NA	NA	NA	NA	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
ZHE Tumbler #1	NA	Millipore	34R4BFC1-23	0455NZML0008	NA	NA	NA	OPrep	O-Prep	New	6/23/2017	Not Yet
ZHE Tumbler #2	NA	Millipore	34R4BFC1-23	4555N4003	NA	NA	NA	OPrep	O-Prep	New	7/5/2017	Not Yet
Hot Plate	NA	Thermolyne	Cimarec3	NA	NA	NA	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
TurboVap II #6	NA	Biotage	NA	NA	NA	NA	NA	OPrep	O-Prep	Used /Refurbished	Unknown	Unknown
TurboVap II #5	NA	Caliper Life Sciences	NA	NA	NA	NA	NA	OPrep	O-Prep	Used /Refurbished	Unknown	2/18/2008
TurboVap II #3	NA	Zymark	NA	TV9937N9099	NA	NA	NA	OPrep	O-Prep	Used /Refurbished	Unknown	2/18/2008
TurboVap II #4	NA	Zymark	NA	TV9941N9146	NA	NA	NA	OPrep	O-Prep	Used /Refurbished	Unknown	2/18/2008
TurboVap II #7?	NA	Zymark	TurboVap II	NA	NA	NA	NA	OPrep	O-Prep	Used /Refurbished	1/17	Not Yet
TurboVap II #9	NA	Zymark	TurboVap II	TV0431N12480	NA	NA	NA	OPrep	O-Prep	Used/Refurbished	1/1/2017	Not Yet
Centrifuge	NA	Thermo Fisher Scientific	Survall ST-8	720016022706 Cat#: 75007200	NA	NA	NA	OPrep	O-Prep	New	2016	2016
Oven #6 (dry wghts)	NA	Fisher Scientific	Isotherm 500 Series	NA	OVN006	OVN006	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
Oven #11	NA	Fisher Scientific	NA	NA	OVN011	OVN011	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
Microwave 1	NA	Mars Xpress	MARS 230/60/ 907501	MD9413	NA	NA	NA	OPrep	O-Prep	Unknown	Unknown	Unknown

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
Microwave 2	NA	CEM Mars	MARS 6 230/60/ 910900	MJ5218	NA	NA	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
Multi-tube Vortexer	NA	Fisher Scientific	NA	170620003	NA	NA	NA	GC & GCMS Semi	GC & GCMS Semivolatiles	New	8/15/2017	8/15/2017
Ultrasonic Bath	NA	Fisher Scientific	Ultrasonic Bath 9.5L	BX0041461710	NA	NA	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
pH/Ion/Conductivity	NA	Accumet TCLP#1	AB15	NA	NA	NA	Meter	OPrep	O-Prep	Unknown	Unknown	Unknown
pH/Ion/Conductivity	NA	Accumet TCLP#2	AB150	AB92350773	NA	NA	Meter	OPrep	O-Prep	new	6/19/2017	6/19/2017
Balance	NA	Mettler	PL6001E	B614292857		30BA16	NA	OPrep	O-Prep	Unknown	Unknown	Unknown
Balance	NA	Mettler	ML802	B435978730		30BA12	NA	OPrep	O-Prep	New	Unknown	Unknown
Balance	NA	Mettler	PL602E	B615334699		30BA17	NA	OPrep	O-Prep	new	Unknown	Unknown
Balance	NA	Mettler	PL6001E	B725267510	B725267510	30BA25	NA	OPrep	O-Prep	new	6/21/2017	
Oven #6B	NA	Isotemp	NA	NA	NA	NA	NA	Rad	Radiological	Unknown	Unknown	Unknown
Oven #7	NA	Fisher Scientific	NA	NA	NA	NA	NA	Rad	Radiological	Unknown	Unknown	Unknown
Oven 13	NA	Grieve	LR-271C	NA	NA	NA	NA	Rad	Radiological	Unknown	Unknown	Unknown
Refrigerator #22 (out of service)	NA	Haier	10954	Not on Site	NA	NA	NA	Rad	Radiological	used	Jun-08	Jun-08
Refrigerator #37	NA	Haier	HC17SW20 RB	BA0A6VM0100TR FSW0983	NA	NA	NA	Rad	Radiological	New	Jan-16	1/13/2016
Balance	NA	Denver Instruments	XP300	990366	XP300	30BA24	NA	Rad	Radiological	used	6/2008, Out of Service	Jun-08
Balance	NA	Mettler	AE163	88919	88919	NA	NA	Rad	Radiological	used	5/2010, now replaced	May-10
Balance	NA	Mettler-Toledo	MS3002S/0 3	B435969938	B435969938	30BA23	NA	Rad	Radiological	New	5/10/2016	5/10/2016
Balance (AS Area)	NA	AND	GX8K	14900809	14900809	30BA18	NA	Rad	Radiologic	used	Feb-13	Feb-13

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
									al			
Balance (Sample Prep)	NA	AND	GX8K	14900804	14900804	30BA19	NA	Rad	Radiologic al	used	Feb-13	Feb-13
Balance	NA	Denver Instrument Corp	A160	B034176	B034176	NA	NA	Rad	Radiologic al	used	Feb-03	Feb-03
Balance	NA	Mettler	ME204E	B614292248	B61429224 8	30BA20	NA	Rad	Radiologic al	New	5/10/2016	5/10/2016
Balance (Ra-228)	NA	Mettler	ME204E	B610197175	B61019717 5	30BA21	NA	Rad	Radiologic al	New	5/10/2016	5/10/2016
Balance (Ra-228)	NA	Radwag	AS82220R2 WIFI	501949	501949	NA	NA	Rad	Radiologic al	good	2/23/2017	2/23/2017
Balance (Spare)	NA	Mettler	AE240	NA	NA	NA	NA	Rad	Radiologic al	New	2/24/2017	NIS
Balance	NA	Mettler	ME4002E	B618430806	B61843080 6	30BA22	NA	Rad	Radiologic al	new	5/10/2016	5/10/2016
Liquid Scintillation Counter	Quantasmart V1.31	Packard	Tricarb 2900TR/LL	4CLC01	#2	NA	#2	Rad	Radiologic al	used	February-03	February-03
Alpha/Beta Counter	UMS V 1.09o	Berthold	LB-770	145103-1058	Det 1-10	NA	Det 1-10	Rad	Radiologic al	used	February-03	February-03
Alpha/Beta Counter	PIC Vista 2000 V1.007	Protean Instrument Corp	MPC9604	236529-BO	Det 11-14	NA	Det 11-14	Rad	Radiologic al	New	Jun-04	Jun-04
Alpha/Beta Counter	PIC Vista 2000 V1.007	Protean Instrument Corp	MPC9604	236528-BO	Det 15-18	NA	Det 15-18	Rad	Radiologic al	New	Jun-04	Jun-04
Alpha/Beta Counter	PIC Vista 2000 V1.007	Protean Instrument Corp	MPC9604	236527-BO	Det 19-22	NA	Det 19-22	Rad	Radiologic al	New	Jun-04	Jun-04
Alpha/Beta Counter	PIC Vista 2000 V1.007	Protean Instrument Corp	MPC9604	521665	Det 23-26	NA	Det 23-26	Rad	Radiologic al	New	Aug-05	Aug-05
Alpha/Beta Counter	PIC Vista 2000 V1.007	Protean Instrument Corp	MPC9604	521664	Det 27-30	NA	Det 27-30	Rad	Radiologic al	New	Aug-05	Aug-05
Alpha/Beta Counter	PIC Vista 2000 V1.007	Protean Instrument Corp	MPC9604	521663	Det 31-34	NA	Det 31-34	Rad	Radiologic al	New	Aug-05	Aug-05
Alpha/Beta Counter	PIC Vista 2000 V1.007	Protean Instrument Corp	MPC9604	521662	Det 35-38	NA	Det 35-38	Rad	Radiologic al	New	Aug-05	Aug-05
Alpha/Beta Counter	PIC Vista 2000 V1.007	Protean Instrument	NPC9604	15289409	Det 39-42	NA	Det 39-42	Rad	Radiologic al	New	Oct-15	Oct-15

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
		Corp										
Alpha/Beta Counter	PIC Vista 2000 V1.007	Protean Instrument Corp	NPC9605	15289410	Det 43-46	NA	Det 43-46	Rad	Radiological	New	Oct-15	Oct-15
Alpha/Beta Counter	PIC Vista 2000 V1.007	Protean Instrument Corp	NPC9606	15289411	Det 47-50	NA	Det 47-50	Rad	Radiological	New	Oct-15	Oct-15
Alpha/Beta Counter	PIC Vista 2000 V1.007	Protean Instrument Corp	NPC9607	15289412	Det 51-54	NA	Det 51-54	Rad	Radiological	New	Oct-15	Oct-15
Alpha/Beta Counter	PIC Vista 2000 V1.008	Protean Instrument Corp	MPC9604	16147442	Det 55-58	NA	Det 55-58	Rad	Radiological	New	Jun-16	Jun-16
Alpha/Beta Counter	PIC Vista 2000 V1.009	Protean Instrument Corp	MPC9604	16147443	Det 59-62	NA	Det 59-62	Rad	Radiological	New	Jun-16	Jun-16
Alpha/Beta Counter	PIC Vista 2000 V1.010	Protean Instrument Corp	MPC9604	16147444	Det 63-66	NA	Det 63-66	Rad	Radiological	New	Jun-16	Jun-16
Alpha/Beta Counter	PIC Vista 2000 V1.011	Protean Instrument Corp	MPC9604	16147445	Det 67-70	NA	Det 67-70	Rad	Radiological	New	Jun-16	Jun-16
Alpha/Beta Counter	PIC Vista 2000 V1.012	Protean Instrument Corp	MPC9604	16147446	Det 71-74	NA	Det 71-74	Rad	Radiological	New	Jun-16	Jun-16
Radium Analysis (Radon Emenation)	NA	Ludlum Measurements Inc.	Model 2200 Scaler	No tag (Detector A)	A	NA	A	Rad	Radiological	used	Feb-03	Feb-03
Radium Analysis (Radon Emenation)	NA	Ludlum Measurements Inc.	Model 2200 Scaler	245722 (Detector B)	B	NA	B	Rad	Radiological	used	Feb-03	Feb-03
Radium Analysis (Radon Emenation)	NA	Ludlum Measurements Inc.	Model 2200 Scaler	No tag (Detector C)	C	NA	C	Rad	Radiological	used	Feb-03	Feb-03
Radium Analysis (Radon Emenation)	NA	Ludlum Measurements Inc.	Model 2200 Scaler	245744 (Detector D)	D	NA	D	Rad	Radiological	used	Feb-03	Feb-03

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
Radium Analysis (Radon Emenation)	NA	Ludlum Measurements Inc.	Model 2200 Scaler	326506 (Detector E)	E	NA	E	Rad	Radiological	New	8/15/2016	8/26/2016
Radium Analysis (Radon Emenation)	NA	Ludlum Measurements Inc.	Model 2200 Scaler	326509 (Detector F)	F	NA	F	Rad	Radiological	New	8/15/2016	8/26/2016
Radium Analysis (Radon Emenation)	NA	Ludlum Measurements Inc.	Model 2200 Scaler	324512 (Detector G)	G	NA	G	Rad	Radiological	New	8/15/2016	8/26/2016
Radium Analysis (Radon Emenation)	NA	Ludlum Measurements Inc.	Model 2200 Scaler	326498 (Detector H)	H	NA	H	Rad	Radiological	New	8/15/2016	8/26/2016
Radium Analysis (Radon Emenation)	NA	Meter	Model 182	PR227468 (Detector A)	A	NA	A	Rad	Radiological	used	Feb-03	Feb-03
Radium Analysis (Radon Emenation)	NA	Meter	Model 182	PR083007 (Detector B)	B	NA	B	Rad	Radiological	used	Feb-03	Feb-03
Radium Analysis (Radon Emenation)	NA	Meter	Model 182	PR083010 (Detector C)	C	NA	C	Rad	Radiological	used	Feb-03	Feb-03
Radium Analysis (Radon Emenation)	NA	Meter	Model 182	PR261260 (Detector D)	D	NA	D	Rad	Radiological	used	Feb-03	Feb-03
Radium Analysis (Radon Emenation)	NA	Meter	Model 182	PR083011 (Detector E)	E	NA	E	Rad	Radiological	Used	Aug-16	8/26/2016
Radium Analysis (Radon Emenation)	NA	Meter	Model 182	PR083008 (Detector F)	F	NA	F	Rad	Radiological	Used	Aug-16	8/26/2016
Radium Analysis (Radon Emenation)	NA	Meter	Model 182	PR083005 (Detector G)	G	NA	G	Rad	Radiological	Used	Aug-16	8/26/2016
Radium Analysis (Radon Emenation)	NA	Meter	Model 182	PR083006 (Detector H)	H	NA	H	Rad	Radiological	Used	Aug-16	8/26/2016
KPA	KPA Win 128	ChemChek	KPA-11	92-45050031	NA	NA	NA	Rad	Radiological	used	Feb-03	Feb-03
Gamma Counter	Canberra VAX	Canberra	IGC-4019	2676	Detector 40% A	NA	A	Rad	Radiological	used	Feb-03	Feb-03
Gamma Counter (out of service)	Canberra VAX	Canberra	GX 5019	9005136	Detector 50% B	NA	B	Rad	Radiological	used	2/2003 out of service	Feb-03
Gamma Counter (out of service)	Canberra VAX	Canberra	GC 6020	9983922	Detector 60% C	NA	C	Rad	Radiological	used	2/2003 out of service	Feb-03

Instrument	Software & Version #	Manufacturer	Model No.	Serial No.	Instrument ID	Epic Pro Instr. ID	Detector	Dept	Analysis/ Location	Condition when Received	Date Received	Date Placed in Service
Gamma Counter	Canberra VAX	Canberra	GR 3521	2016166	Detector 35% D	NA	D	Rad	Radiological	used	Feb-03	Feb-03
Gamma Counter	Gammavision Windows XP/7	Ortec	GEM-100-S	46-P41426A	Detector #2	NA	#2	Rad	Radiological	New	Mar-06	Mar-06
Gamma Counter	Gammavision Windows XP/7	Ortec	GEM-100P4-ST	46-TP41365A	Detector #5	NA	#5	Rad	Radiological	used	Feb-03	Feb-03
Gamma Counter (out of service)	Gammavision Windows XP/7	Ortec Module	DSPEC Jr 2.0 V.046	10071606	Detector #3	NA	#3	Rad	Radiological	New	Oct-08	Oct-08
Gamma Counter (out of service)	Gammavision Windows XP/7	Ortec Module	DSPEC Jr 2.0 V.046	06116387	Detector #2	NA	#2	Rad	Radiological	New	Mar-06	Mar-06
Gamma Counter (out of service)	Gammavision Windows XP/7	Ortec Module	DSPEC Jr 2.0 V.046	06053268	Detector #5	NA	#5	Rad	Radiological	New	Mar-06	Mar-06
Alpha Spec	Ortec Alphavision 5.3	Oxford Tennelec	S5HP	37959	Detectors 25 through 40	NA	25-40	Rad	Radiological	used	Jan-04	Feb-04
Alpha Spec (out of service)	Canberra VAX	Canberra	7200-04	6972152	Detectors 1 through 24, and 25C through 36C	NA	1-24, 25C-36C	Rad	Radiological	used	2/2003 - Out of Service on 5/2015	Feb-03
Sodium Iodide Detectors	Maestro V 7.01	Ortec	Digibase Unispec	14346852 (Detector 1)	#1	NA	1	Rad	Radiological	New	Apr-15	Apr-15
Sodium Iodide Detectors	Maestro V 7.01	Ortec	Digibase Unispec	14346844 (Detector 2)	#2	NA	2	Rad	Radiological	New	Apr-15	Apr-15
Sodium Iodide Detectors	Maestro V 7.01	Ortec	Digibase Unispec	14346843 (Detector 3)	#3	NA	3	Rad	Radiological	New	Apr-15	Apr-15
Sodium Iodide Detectors	Maestro V 7.01	Ortec	Digibase Unispec	14346847 (Detector 4)	#4	NA	4	Rad	Radiological	New	Apr-15	Apr-15
Survey Meter	NA	Ludlum Measurements Inc.	3019	25014380	25014380	NA	NA	Rad	Radiological	New	Jul-17	Jul-17

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ATTACHMENT V- LABORATORY SOP LIST (CURRENT AS OF ISSUE DATE)

Lab Area	Pace SOP No.	Revision	Document Name	Effective/Review Date	Review Date	Review Date
AD	S-PGH-C-001	14	Sample Management	3/1/2018		
AD	S-PGH-C-008	7	Subcontracting Samples	5/2/2018		
AD	PGH-C-012	3	Customer Complaints	8/29/2017		
AD	PGH-C-016	5	Data Packages	3/10/2017		
AD	PGH-C-017	4	Waste Handling and Management	8/29/2017		
AD	S-PGH-L-027	3	DI Water Quality & Suitability	3/19/2018		
AD	S-PGH-C-028	6	Bottle Prep	12/4/2017		
AD	PGH-C-033	2	Review of Analytical Requests	4/12/2017		
AD	WI-PGH-C-039	2	Documentation of Non-Compliances for Sample Receipt and Handling	12/26/2016		
AD	WI-PGH-C-040	0	Project Login Review of Workorders for Drinking Water Samples	2/10/2017		
AD	S-PGH-F-004	1	Collection of Environmental Samples by Pace Personnel	3/15/2018		
AD	S-ALL-Q-030	5	Data Checker	10/16/2014	10/28/2016	
GC	S-PGH-O-004	12	Diesel Range Organics (DRO) by EPA 8015B & 8015D	3/20/2018		
GC	PGH-O-006	8	Polychlorinated Biphenyls (608)	12/23/2016		
GC	PGH-O-009	13	Polychlorinated Biphenyls (8082-8082A)	12/21/2016		
GC	PGH-O-010	5	Sulfur Cleanup, Method 3660B	2/2/2017		
GC	PGH-O-017	7	Sulfuric Acid Cleanup, Method 3665A	2/21/2017		
GC	PGH-O-019	5	ETPH (Connecticut Method)	3/20/2018		
GC	PGH-O-021	7	OC Pesticide Analysis by GC (608)	12/23/2016		
GC	S-PGH-O-024	15	EDB & DBCP by Method 8011	4/26/2018		
GC	PGH-O-026	10	OC Pesticide Analysis by GC (8081A-8081B)	4/18/2017		
GC	WI-PGH-O-001	1	Materials Cleanliness Protocol	4/18/2017		
GC	WI-PGH-O-002	1	DRO (8015B) - Sparrows Point	4/17/2018		
GC	WI-PGH-O-038	1	Polychlorinated Biphenyls (8082-8082A) Sparrows Point	4/17/2018		
MET	PGH-M-008	17	Determination of Metals by ICP (200.7 and 6010B)	12/23/2016		
MET	PGH-M-011	8	Mercury Prep (Aq)	12/23/2016		
MET	PGH-M-012	10	Mercury Prep (Solid & Semi-solid)	3/21/2018		
MET	PGH-M-013	10	Preparation Solid/Semisolid Samples for ICP Analysis, Method 3050B	3/21/2018		
MET	PGH-M-014	9	Microwave Digestion of Organic Wastes	12/23/2016		
MET	PGH-M-015	11	Preparation of Aqueous Samples for ICP Analysis, Methods 3005A & 200.7	12/23/2016		
MET	PGH-M-017	6	Mercury Analysis by CVAA Cetac	12/23/2016		
OPrep	PGH-M-003	9	TCLP/ZHE Extraction Procedure	8/23/2017		
OPrep	S-PGH-O-016	5	Percent Moisture in Soils ASTM D2974-87	1/22/2018		
OPrep	PGH-O-002	5	Extraction of PCBs from Wipes	7/12/2014	12/28/2016	
OPrep	S-PGH-O-007	8	Solid Phase Extraction of TCLP for SemiVoa Compounds.	4/25/2018		
OPrep	PGH-O-011	8	Extraction of Organic Waste	1/26/2017		
OPrep	PGH-O-020	6	CT-ETPH - Extraction of Aqueous and Solid	4/12/2017		

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			Samples			
OPrep	S-PGH-O-022	8	Microwave Extraction of Solid Samples for Organics	5/17/2018		
OPrep	PGH-O-028	7	Separatory Funnel Extraction	3/26/2018		
OPrep	PGH-O-034	4	SPLP & ZHE Extraction (1312)	5/24/2017		
OPrep	S-PGH-O-036	3	ASTM Leach Extraction	4/25/2018		
OPrep	WI-PGH-O-039	1	Microwave Extraction of Solids - Sparrows Point	2/22/2016	2/28/2018	
QA	S-PGH-Q-020	5	Logbook of Logbooks	3/15/2018		
QA	S-PGH-Q-023	6	Archiving Laboratory Documents	3/15/2018		
QA	PGH-C-031	2	PT Program	7/17/2017		
QA	PGH-C-032	4	Support Equipment	2/27/2017		
QA	S-PGH-L-036	2	Purchase of Laboratory Supplies	3/1/2018		
QA	PGH-C-037	0	Standard and Reagent Management and Traceability	9/9/2013	6/1/2017	
QA	PGH-C-038	2	Receipt and Storage of Laboratory Supplies	8/31/2017		
QA	PGH-Q-022		Spreadsheet Validation	12/26/2016		
QA	S-PGH-Q-025	5	Reporting SDWA MCL Violations	5/9/2018		
QA	S-PGH-Q-035	3	MDL/LOD/LOQ	12/14/2017		
QA	PGH-Q-037	3	Data Review Process	12/10/2014	10/28/2016	
QA	S-PGH-Q-038	1	Laboratory Equipment	5/16/2018		
QA	PGH-Q-039	2	Corrective And Preventative Action	3/10/2017		
QA	PGH-Q-040	0	Internal and External Audits	9/23/2014	10/28/2016	
QA	PGH-Q-041	0	Evaluation and Qualification of Vendors	9/23/2014	10/28/2016	
QA	PGH-Q-042	0	Regulatory Limit Notification	10/20/2014	10/28/2016	
QA	S-PGH-Q-043	2	Document Control and Management	3/9/2018		
QA	PGH-Q-044	0	Monitoring Storage Units	11/21/2014	10/28/2016	
QA	PGH-Q-045	0	Control Charts & Acceptance Limits	7/16/2015	6/1/2017	
QA	PGH-Q-046	0	Estimation of Measurement Uncertainty	7/20/2015	6/1/2017	
QA	PGH-Q-047	0	Management of Change	8/14/2015	6/1/2017	
QA	PGH-Q-048	0	Sample Homogenization and Sub-sampling	8/18/2015	6/1/2017	
QA	S-PGH-L-009	6	Glassware Washing	4/5/2018		
QA	S-PGH-Q-001	11	Preparation of Standard Operating Procedures	3/9/2018		
QA	S-All-Q-003	11	Document Numbering Procedure	3/9/2018		
QA	S-All-Q-009	8	General Documentation Requirements	3/9/2018		
QA	S-All-Q-014	8	Quarterly Quality Report	5/3/2018		
QA	S-All-Q-015	3	Review of Laboratory Management System	3/9/2018		
QA	S- All-Q-016	8	Manual Integration	4/17/2017		
QA	S-All-Q-020	6	Orientation and Training Procedures	7/20/2015	6/1/2017	
QA	S-All-Q-028	4	Use and Operations of Lab Track System	3/16/2018		
QA	S-All-Q-029	3	MintMiner Data File Review for Data Integrity Monitoring	3/16/2018		
QA	S-All-Q-035	3	Data Recall	3/16/2018		
QA	S-All-Q-047	0	Method Validation and Instrument Verification	3/8/2018		
QA	WI-PGH-Q-001	0	Marathon Analysis Guide	6/11/2014	3/22/2016	5/1/2018

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QA	WI-PGH-Q-002	0	NJ Data of Known Quality Guide	4/15/2015	4/18/2016	5/1/2018
QA	QA Manual	19	Quality Assurance Manual	3/10/2017		
RAD	S-PGH-R-001	19	Analysis of samples for Gross Alpha and Gross Beta - 900.0 & SM 7110C	2/8/2018		
RAD	S-PGH-R-002	6	Gas Flow Proportional Counter Instrument Operations	3/21/2018		
RAD	S-PGH-R-003	19	Analysis of Water Samples for Ra-228 Content - 904.0	2/8/2018		
RAD	S-PGH-R-004	14	Analysis of Water Samples for Total Alpha Radium - 903.0, SM7500	2/8/2018		
RAD	S-PGH-R-005	14	Analysis of Water Samples for Sr90 Content - 905.0	2/8/2018		
RAD	S-PGH-R-007	18	Analysis of Water Samples for Ra-226 Content - 903.1	2/8/2018		
RAD	S-PGH-R-008	13	Analysis of Samples for Alpha Emitting Actinides and Pu-241	2/8/2018		
RAD	S-PGH-R-010	9	Sr-89/90 by Extraction Chromatography ASTM D5811-08 (2013)	3/15/2018		
RAD	S-PGH-R-013	6	Ni-59/Ni-63 Analysis Eichrom	3/27/2018		
RAD	PGH-R-014	3	Analysis of Iron-55	2/15/2017		
RAD	PGH-R-015	3	Analysis of samples for Technetium-99	2/15/2017		
RAD	S-PGH-R-017	6	Glassware Cleaning	2/28/2018		
RAD	S-PGH-R-018	4	Radioactive Standards Preparation	3/15/2018		
RAD	S-PGH-R-020	10	Alpha Spectroscopy Instrument Operation	3/1/2018		
RAD	S-PGH-R-021	17	Tritium in Water - Distillation - 906.0	2/8/2018		
RAD	S-PGH-R-022	5	Liquid Scintillation Counting	3/15/2018		
RAD	S-PGH-R-023	12	Gamma Spec Instrument Operations - 901.1	2/2/2018		
RAD	PGH-R-024	4	Rad Sample Preparation	3/2/2016	3/6/2017	
RAD	S-PGH-R-027	4	Neutron Dosimeter Wires by Gamma Spec	2/15/2018		
RAD	S-PGH-R-028	4	Neutron Dosimeter Capsules for Cs-137	2/15/2018		
RAD	S-PGH-R-030	4	Analysis of samples for I-129	2/13/2018		
RAD	S-PGH-R-031	12	Total Uranium by KPA	2/8/2018		
RAD	S-PGH-R-032	11	State of NJ 48Hr Gross Alpha Analysis	2/9/2018		
RAD	PGH-R-034	3	Analysis of C-14	2/15/2017		
RAD	PGH-R-037	10	Radon in Water	4/17/2017		
RAD	PGH-R-038	2	Dosimetry Foils for Niobium	11/21/2014	3/6/2017	
RAD	S-PGH-R-040	7	Gamma Spectroscopy Analysis - Prep - 901.1	3/1/2018		
RAD	S-PGH-R-041	4	Analysis of Polonium-210	2/9/2018		
RAD	PGH-R-042	5	Analysis of samples for Pb-210	7/13/2017		
RAD	WI-PGH-R-063	1	Radioactive Calibrations	2/28/2018		
RAD	PGH-R-064	0	Isotopic Radium Analysis in Water; Ra-226 and Ra-223/224 by Alpha Spec -Eichrom	10/27/2014	3/6/2017	
RAD	PGH-R-065	0	Alpha Scintillation Counter Operations	11/25/2015	2/6/2017	2/18/2018
RAD	S-PGH-R-066	1	Analysis of Gaseous Samples for Radon by Alpha Scintillation Counting	2/9/2018		
RAD	WI-PGH-R-067	1	Rad Sample pH checks	2/8/2018		
RAD	WI-PGH-R-068	1	Receipt of Sample Packages Marked Radioactive (UN2910)	11/7/2017		

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RAD	WI-PGH-R-069	0	Work Instruction for Treatment of Aqueous Waste for Isotopic Radium Analyses Utilizing Ba-133	10/12/2017		
RAD	WI-PGH-R_070	0	Work Instruction for Sample Management of Westinghouse Dosimetry projects	10/13/2017		
RAD	PGH-R-069	1	Analysis of Drinking Water Samples for Gross Alpha and Gross Beta Content, Method EPA 900.0	5/8/2017	2/28/2018	
RAD	PGH-R-071	1	Analysis of Drinking Water Samples for Ra-228, Method 904.0	11/20/2017		
RAD	PGH-R-072	0	Analysis of Drinking Water Samples for Total Alpha Radium, Method: EPA 903.0	2/27/2017	2/28/2018	
RAD	PGH-R-074	0	Total Uranium Content of Drinking Water Samples by Laser Kinetic Phosphorimetry Analysis (KPA) Method: ASTM D5174	2/24/2017	2/28/2018	
RAD	PGH-R-075	0	Coprecipitation Method for Gross Alpha Radioactivity in Drinking Water Methods: SM 7110C-00	2/27/2017	2/28/2018	
SVOA	PGH-O-001	14	Semivolatiles by GC/MS (8270C & 8270D)	3/21/2018		
SVOA	PGH-O-003	8	Semivolatiles by GC/MS (625)	5/24/2017		
SVOA	PGH-O-023	8	PAH's by SIM	3/20/2018		
SVOA	WI-PGH-O-004	1	Initial Calibration Procedure for GC/MS Methods	3/27/2018		
Safety	SOP-All-S-005-0	0	Air Quality Monitoring and Fume Hood Monitoring	11/22/2017		
Safety	PGH-S-001	3	Rescue Alert System Operation	4/17/2017		
Safety	PGH-S-002	0	Radiation Safety Compliance	6/7/2017		
Safety	S-ALL-S-001	5	Hazard Assessment	4/17/2017		
Safety	Rad Safety Manual	4	Radiation Safety Manual	4/7/2017		
VOA	PGH-O-012	3	Preparation of EnCore Solid Samples and Terracore solid samples by EPA Method 5035A	7/27/2016		
VOA	PGH-O-015	14	Volatile Organic Compounds by EPA Methods 8260B & 8260C	3/23/2018		
VOA	PGH-O-016	12	Gasoline Range Organics (GRO) by EPA Method 8015B & 8015D	3/20/2018		
VOA	PGH-O-033	8	Volatile Organic Compounds by EPA Method 624	3/20/2018		
VOA	WI-PGH-O-003	1	GRO (8015B) - Sparrows Point	3/20/2018		
VOA	S-All-O-038	2	Processing TICs for GCMS	3/9/2018		
WC	PGH-I-003	8	pH in Water, Soil & Waste	8/22/2017		
WC	PGH-I-004	11	Phenolics	11/1/2017		
WC	S-PGH-I-009	12	BOD/CBOD - SM 5210-B-2011	2/14/2018		
WC	PGH-I-010	8	Sulfide	8/8/2017		
WC	S-PGH-I-011	12	Orthophosphate	4/20/2018		
WC	S-PGH-I-012	14	Hexavalent Chromium	5/9/2018		

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WC	S-PGH-I-013	14	Non-Filterable Residue (Total Suspended Solids, TSS) - 2540D-1997	5/9/2018		
WC	S-PGH-I-015	10	Alkalinity	4/18/2018		
WC	PGH-I-016	6	Acidity - Titrimetric	11/8/2017		
WC	PGH-I-017	6	Reactive Cyanide and Sulfide	8/14/2017		
WC	PGH-I-019	6	Paint Filter Liquids Test	4/24/2017		
WC	S-PGH-I-020	12	Filterable Residue (TDS), SM 2540C-1997	5/9/2018		
WC	S-PGH-I-021	6	Pensky-Martens Closed-Cup Method for Determining Ignitability	5/17/2018		
WC	PGH-I-024	8	Turbidity	12/22/2016		
WC	S-PGH-I-025	9	Fluoride	5/1/2018		
WC	S-PGH-I-027	8	Total Kjeldahl Nitrogen (TKN)	4/19/2018		
WC	PGH-I-028	10	Color	8/9/2017		
WC	PGH-I-030	9	Nitrate/Nitrite	12/12/2016		
WC	S-PGH-I-031	11	Chloride (by Lachat)	5/9/2018		
WC	S-PGH-I-033	9	Chemical Oxygen Demand	3/2/2018		
WC	S-PGH-I-035	12	Ammonia	4/20/2018		
WC	PGH-I-037	5	Sulfite	12/20/2016		
WC	S-PGH-I-038	8	Residual Chlorine	5/9/2018		
WC	S-PGH-I-039	16	Total Solids (TS) and Total Volatile Solids (TVS)	5/9/2018		
WC	PGH-I-042	12	Oil & Grease in water by SPE (EPA 1664)	12/20/2016		
WC	PGH-I-045	8	Dissolved Oxygen	8/7/2017		
WC	S-PGH-I-047	7	Settleable Material	5/11/2018		
WC	PGH-I-050	9	Methylene Blue Activated Substances (MBAS)	12/21/2016		
WC	PGH-I-052	8	O&G/TPH Soxhlet (hexane)	12/20/2016		
WC	PGH-I-053	16	Cyanide: Total and Amenable	9/11/2017		
WC	PGH-I-054	7	Nitrite - Smartchem	12/16/2016		
WC	PGH-I-055	8	Thiocyanate	5/18/2017		
WC	S-PGH-I-056	12	Sulfate - Smartchem - ASTM D516-11 and EPA 9038	1/22/2018		
WC	S-PGH-I-057	14	Phosphorus - SmartChem, 4500-P B (5)-11, 4500-P E-11	1/25/2018		
WC	S-PGH-I-058	5	Ferrous Iron -SmartChem	4/18/2018		
WC	S-PGH-I-059	11	Anions by Ion Chromatography	3/2/2018		
WC	PGH-I-060	8	Total Organic Carbon	12/16/2016		
WC	S-PGH-I-062	5	Specific Conductance	4/18/2018		
WC	S-PGH-I-065	1	Fluoroborate	4/20/2018		
WC	S-PGH-I-066	3	Alkaline Digestion for Cr+6 (3060A)	4/4/2018		
WC	S-PGH-I-067	1	Free Cyanide	4/20/2018		
SOM	S-SOM-C-001	0	Support Equipment	3/20/2017		
SOM	S-SOM-F-001	0	Measuring Temperature in the Field	3/20/2017	3/22/2018	
SOM	S-SOM-F-002	0	Measuring pH in the Field	3/20/2017	3/22/2018	
SOM	S-SOM-F-003	0	DO in the Field	3/20/2017	3/22/2018	
SOM	S-SOM-F-004	0	Specific Conductance in the Field	4/21/2017	5/2/2018	
SOM	S-SOM-F-005	0	Turbidity in the Field	4/25/2017	5/2/2018	
SOM	S-SOM-F-006	1	Total Residual Chlorine in the Field	5/2/2018		
SOM	S-SOM-F-007	0	Field Sampling	9/25/2017		

ATTACHMENT VI- LABORATORY CERTIFICATION LIST (CURRENT AS OF ISSUE DATE)

SCOPE AND APPLICATION CERTIFICATES ARE MAINTAINED AND FILED IN THE LOCAL QUALITY DEPARTMENT

Laboratory: Pittsburgh Environmental Certifications

Accrediting Authority	Program Category	Accrediting Agency	Certification # / Lab ID
Connecticut	Waste Water & Hazardous Waste - Solid	DOPH	PH-0694
Maine	Waste Water	DOH&HS	PA01457
New Hampshire	Waste Water & Hazardous Waste - Solid	DES	2976
New Jersey	Waste Water & Hazardous Waste - Solid	DEP	PA-051
New Jersey	Drinking Water and Waste Water	DEP	11050 (Pace Somerset NJ)
New York	Waste Water & Hazardous Waste - Solid	DOH - ELAP	10888
Pennsylvania	Drinking Water (RAD)	DEP	65-00282
Pennsylvania	Waste Water & Hazardous Waste - Solid	DEP	65-00282
PA Rad License	Materials License	NRC	PA-1057
USDA	Soil Permit	USDA	P330-17-00091
USDA	Compliance Agreement PPQ form 519	USDA	P-SOIL-03
West Virginia	Waste Water & Hazardous Waste - Solid	DEP	143
Laboratory: Pittsburgh Radiological Certifications			
Alabama	Drinking Water	DEM	41590
Arizona	Drinking Water	DOHS	AZ0734
Arkansas	Drinking Water	DEQ	NA
California	Drinking Water & Hazardous Waste	DOH	04222CA
Colorado	Drinking Water	DPH&E	NA
Connecticut	Drinking Water, Waste Water and Hazardous Waste	DPH	PH-0694
EPA Region 4	Drinking Water	EPA	NA
EPA Region 5	Drinking Water	US EPA	NA
Delaware	Drinking Water	H&SS	NA
DoD	Waste Water & Hazardous Waste	ANAB	L2417
Florida	Drinking Water & Waste Water	DOH	E87683

Laboratory: Pittsburgh Environmental Certifications

Accrediting Authority	Program Category	Accrediting Agency	Certification # / Lab ID
Georgia	Drinking Water	DNR	C040
Guam	Drinking Water	EPA	NA
Hawaii	Drinking Water	DOH	NA
Idaho	Drinking Water	DOH&W	NA
Illinois	Drinking Water	DEP	NA
Indiana	Drinking Water	DEP	NA
Iowa	Drinking Water	DNR	391
Kansas	Drinking Water	DOH&EC	E-10358
Kentucky DW	Drinking Water	DEP	90133
Kentucky WW	Waste Water	DEP	90133
Los Angeles Sanitation	Waste Water	Sanitation District	10257
Louisiana	Drinking Water	DHH	LA170007
Louisiana	Waste Water & Hazardous Waste - Solid	DEQ	04086
Maine	Drinking Water & Waste Water	DH & HS	PA01457
Maryland	Drinking Water	DOH&MH	308
Massachusetts	Drinking Water	DEP	M-PA1457
Michigan	Drinking Water	DEQ	NA
Missouri	Drinking Water	DONR	235
Montana	Drinking Water	DOPH&HS	Cert0082
Nebraska	Drinking Water	DOH&HS	NE-OS-29-14
Nevada	Drinking Water, Waste Water & Hazardous Waste	DOC&NR	PA014572017-1
New Hampshire	Drinking Water, Waste Water	DES	2976
New Jersey	Drinking Water	DEP	PA051
New Mexico	Drinking Water, Waste Water and Hazardous Waste	DPNR	PA01457
New York	Drinking Water, Waste Water	DOH	10888
North Carolina	Drinking Water	DOH&HS	42706
North Dakota	Drinking Water, Waste Water & Hazardous Waste	ND DOH	R-190
Ohio	Drinking Water	OH EPA	41249
Oregon	Drinking Water, Waste Water and Hazardous Waste	ORELAP	PA200002
Pennsylvania	Drinking Water, Waste Water and Hazardous Waste	DEP	65-00282
Pennsylvania	Rad License	DEP - BRP	PA-1057

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Accrediting Authority	Program Category	Accrediting Agency	Certification # / Lab ID
Puerto Rico	Drinking Water	DOH	PA01457
Rhode Island	Drinking Water	DOH	65-00282
South Dakota	Drinking Water	DOE&NR	PA01457
Tennessee	Drinking Water	DEC	02867
Texas	Drinking Water	COEQ	T104704188-16-11
US Virgin Islands	Drinking Water	DPNR	NA
Utah	Drinking Water, Waste Water and Hazardous Waste	DOH	PA014572017-9
Vermont	Drinking Water	DOH	VT-0282
Virginia (VELAP)	Drinking Water, Waste Water and Hazardous Waste	DGS	460198
Washington	Drinking Water	DOE	C868
West Virginia	Drinking Water	DOH	9964C
West Virginia	Waste Water & Hazardous Waste	DEP	143
Wisconsin	Drinking Water	DOH	NA
Wyoming	Drinking Water	DEP	8TMS-L

ATTACHMENT VII- METHOD HOLD TIME, CONTAINER AND PRESERVATION GUIDE (CURRENT AS OF ISSUE DATE)

THE HOLDING TIME INDICATED IN THE CHART BELOW IS THE MAXIMUM ALLOWABLE TIME FROM COLLECTION TO EXTRACTION AND/OR ANALYSIS PER THE ANALYTICAL METHOD. FOR METHODS THAT REQUIRE PROCESSING PRIOR TO ANALYSIS, THE HOLDING TIME IS DESIGNATED AS 'PREPARATION HOLDING TIME/ANALYSIS HOLDING TIME'.

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Acid Base Accounting	Sobek	Solid	Plastic/Glass	None	N/A
Acidity	SM2310B	Water	Plastic/Glass	≤ 6°C	14 Days
Acid Volatile Sulfide	Draft EPA 1629	Solid	8oz Glass	≤ 6°C	14 Days
Actinides	HASL-300	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Actinides	HASL-300	Solid	Plastic/Glass	None	180 Days
Alkalinity	SM2320B/310.2	Water	Plastic/Glass (NY requires separate bottle filled to the exclusion of air)	≤ 6°C	14 Days
Alkylated PAHs		Water	1L Amber Glass	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved
Alkylated PAHs		Solid	8oz Glass	≤ 10°C	1 Year/40 Days
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0/300.1/SM4110 B	Water	Plastic/Glass	≤ 6°C; EDA if bromate or chlorite run	All analytes 28 days except: NO_2, NO_3, o-Phos (48 Hours); chlorite (immediately for 300.0; 14 Days for 300.1). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0	Solid	Plastic/Glass	≤ 6°C	All analytes 28 days except: NO_2, NO_3, o-Phos (48 hours); chlorite (immediately). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4	9056	Water/ Solid	Plastic/Glass	≤ 6°C	48 hours
Aromatic and Halogenated Volatiles (see note 1)	8021	Solid	5035 vial kit	See note 1	14 days
Aromatic and Halogenated Volatiles	602/8021	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present	14 Days (7 Days for aromatics if unpreserved)

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Asbestos	EPA 600/R-93/116	Solid	Plastic/Glass; bulk- 2" square; popcorn ceiling- 2tbsp; soil- 4oz	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Bacteria, Total Plate Count	SM9221D	Water	Plastic/WK	$\leq$ 6°C; $Na_2S_2O_3$	24 Hours
Base/Neutrals and Acids	8270	Solid	8oz Glass	$\leq$ 6°C	14/40 Days
Base/Neutrals and Acids	625/8270	Water	1L Amber Glass	$\leq$ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Base/Neutrals, Acids & Pesticides	525.2	Water	1L Amber Glass	pH<2 HCl; $\leq$ 6°C; Na sulfite if Cl present	14/30 Days
Biomarkers		Water	$\leq$ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	$\leq$ 6°C; pH<2 1:1 HCl (optional)
Biomarkers		Solid	$\leq$ 10°C	1 Year/40 Days	$\leq$ 10°C
BOD/cBOD	SM5210B	Water	Plastic/Glass	$\leq$ 6°C	48 hours
Boiling Range Distribution of Petroleum Fractions	ASTM D2887-98	Product	10mL glass vials	$\leq$ 6°C	N/A
BTEX/Total Hydrocarbons	TO-3	Air	Summa Canister	None	28 Days
BTEX/Total Hydrocarbons	TO-3	Air	Tedlar Bag or equivalent	None	72 Hours
Carbamates	531.1	Water	Glass	$Na_2S_2O_3$, Monochloroacetic acid pH <3; $\leq$ 6°C	28 Days
Carbamates	8318	Water	Glass	Monochloroacetic acid pH 4-5; $\leq$ 6°C	7/40 Days
Carbamates	8318	Solid	Glass	$\leq$ 6°C	7/40 Days
Carbon Specific Isoptope Analysis (CSIA)	AM24	Water	40mL clear VOA vial with TLS	$\leq$ 6°C, trisodium phosphate or HCl	N/A
Cation/Anion Balance	SM1030E	Water	Plastic/Glass	None	None
Cation Exchange	9081	Solid	8oz Glass	None	unknown
Cations (Ferrous Iron, Ferric Iron, Divalent Manganese)	7199 modified	Water	40mL clear VOA vials with mylar septum	$\leq$ 6°C; HCl	48 Hours
Chloride	SM4500Cl-C,E	Water	Plastic/Glass	None	28 Days
Chlorinated Hydrocarbons in Vapor	AM4.02	Vapor	20cc vapor vial with flat septum	None	N/A
Chlorine, Residual	SM4500Cl-D,E,G/330.5/Hach 8167	Water	Plastic/Glass	None	15 minutes

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Chlorophyll	SM10200H	Water	Opaque bottle or aluminum foil	≤ 6°C	48 Hours to filtration
COD	SM5220C, D/410.4/Hach 8000	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Coliform, Fecal	SM9222D	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9222D	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	24 Hours
Coliform, Fecal	SM9221E	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9221E	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	24 Hours
Coliform, Total	SM9222B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total	SM9221B	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total, Fecal and E. coli	Colilert/ Quanti-tray	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total and E. coli	SM9223B	Drinking Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	30 Hours
Color	SM2120B,E	Water	Covered Plastic/Acid Washed Amber Glass	≤ 6°C	48 Hours
Condensable Particulate Emissions	EPA 202	Air	Solutions	None	180 Days
Cyanide, Reactive	SW846 chap.7	Water	Plastic/Glass	None	28 Days
Cyanide, Reactive	SW846 chap.7	Solid	Plastic/Glass	None	28 Days
Cyanide, Total and Amenable	SM4500CN-A,B,C,D,E,G,I,N/9010/ 9012/335.4	Water	Plastic/Glass	pH≥12 NaOH; ≤ 6°C; ascorbic acid if Cl present	14 Days (24 Hours if sulfide present-applies to SM4500CN only)
Diesel Range Organics- Alaska DRO	AK102	Solid	8oz Glass	≤ 6°C	14/40 Days
Diesel Range Organics- Alaska DRO	AK102	Water	1L Glass	pH<2 HCl; ≤ 6°C	14/40 Days
Diesel Range Organics- TPH DRO	8015	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Diesel Range Organics- TPH DRO	8015	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Diesel Range Organics- TPH DRO	8015	Tissue	1L Amber Glass	≤ - 10°C	1 Year if frozen/40 Days
Diesel Range Organics- TPH DRO	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Diesel Range Organics- NwTPH-Dx	Nw-TPH-Dx	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Diesel Range Organics- NwTPH-Dx	Nw-TPH-Dx	Water	1L Amber Glass	pH <2 HCl; ≤ 6°C	14/40 Days; 7 Days from collection to

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
					extraction if unpreserved
Diesel Range Organics- Wisconsin DRO	WI MOD DRO	Solid	Tared 4oz Glass Jar	≤ 6°C	10/47 Days
Diesel Range Organics- Wisconsin DRO	WI MOD DRO	Water	1L Amber Glass	≤ 6°C; pH <2 HCl	14/40 Days
Dioxins and Furans	1613B	Solid	8oz Glass	≤ 6°C	1 year
Dioxins and Furans	1613B	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	1 year
Dioxins and Furans	1613B	Fish/ Tissue	Aluminum foil	≤ 6°C	1 year
Dioxins and Furans	8290	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	30/45 Days
Dioxins and Furans	8290	Solid	8oz Glass	≤ 6°C	30/45 Days
Dioxins and Furans	8290	Fish/ Tissue	Not specified	< -10°C	30/45 Days
Dioxins and Furans	TO-9	Air	PUF	None	7/40 Days
Diquat/Paraquat	549.2	Water	Amber Plastic	≤ 6°C; $Na_2S_2O_3$	7/21 Days
EDB/DBCP (8011) EDB/DBCP/1,2,3-TCP (504.1)	504.1/8011	Water	40mL vials	≤ 6°C; $Na_2S_2O_3$ if Cl present	14 Days
Endothall	548.1	Water	Amber Glass	≤ 6°C; $Na_2S_2O_3$	7/14 Days
Enterococci	EPA 1600	Water	100mL Plastic	≤ 10°C	8 Hours
Enterococci	Enterolert	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Explosives	8330/8332	Water	1L Amber Glass	≤ 6°C	7/40 Days
Explosives	8330/8332	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Water	1L Amber Glass	pH < 2 HCl; ≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Solid	4oz Glass Jar	≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	MA-EPH	Water	1L Amber Glass	pH<2 HCl; ≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	MA-EPH	Solid	4oz Glass Jar	≤ 6°C	7/40 Days
Fecal Streptococci	SM9230B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Ferrous Iron	SN3500Fe-D; Hach 8146	Water	Glass	None	Immediate
Flashpoint/ Ignitability	1010	Liquid	Plastic/Glass	None	28 Days
Florida PRO	FL PRO DEP (11/1/95)	Liquid	Glass, PTFE lined cap	≤ 6°C; pH <2 H_2SO_4 or HCl	7/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Fluoride	SM4500Fl-C,D	Water	Plastic	None	28 Days
Gamma Emitting Radionuclides	901.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Gasoline Range Organics	8015	Water	40mL vials	pH<2 HCl	14 Days
Gasoline Range Organics	8015	Solid	5035 vial kit	See note 1	14 days
Gasoline Range Organics (C3-C10)	8260B modified	Water	40mL vials	≤ 6°C; HCl	14 Days
Gasoline Range Organics (C3-C10)	8260B modified	Solid	4oz Glass Jar	≤ 6°C	14 Days
Gasoline Range Organics- Alaska GRO	AK101	Solid	5035 vial kit	See 5035 note*	28 Days if GRO only (14 Days with BTEX)
Gasoline Range Organics- Alaska GRO	AK101	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Water	40mL vials	pH<2 HCl; ≤ 6°C	7 Days unpreserved; 14 Days preserved
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Solid	40mL vials	≤ 6°C; packed jars with no headspace	14 Days
Gasoline Range Organics- Wisconsin GRO	WI MOD GRO	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days
Gasoline Range Organics- Wisconsin GRO	WI MOD GRO	Solid	40mL MeOH vials	≤ 6°C in MeOH	21 Days
Glyphosate	547	Water	Glass	≤ 6°C; $Na_2S_2O_3$	14 Days (18 Months frozen)
Grain Size	ASTM D422	Solid	Not specified	Ambient	N/A
Gross Alpha (NJ 48Hr Method)	NJAC 7:18-6	Water	Plastic/Glass	pH<2 HNO_3	48 Hrs
Gross Alpha and Gross Beta	9310/900.0	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Gross Alpha and Gross Beta	9310	Solid	Glass	None	180 Days
Haloacetic Acids	552.1/552.2	Water	40mL Amber vials	NH_4Cl; ≤ 6°C	14/7 Days if extracts stored ≤ 6°C or 14/14 Days if extracts stored at ≤ -10°C
Hardness, Total ($CaCO_3$)	SM2340B,C/130.1	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Heterotrophic Plate Count (SPC/HPC)	SM9215B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Heterotrophic Plate Count (SPC/HPC)	SimPlate	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Herbicides, Chlorinated	8151	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Herbicides,	8151	Water	1L Amber	≤ 6°C; $Na_2S_2O_3$ if Cl	7/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Chlorinated			Glass	present	
Herbicides, Chlorinated	515.1/515.3	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	14/28 Days
Hexavalent Chromium	7196/218.6/ SM3500Cr-B, C, D	Water	Plastic/Glass	≤ 6°C	24 Hours (see note 4)
Hexavalent Chromium	218.6/SM3500Cr-B, C, D	Water	Plastic/Glass	Ammonium Buffer pH 9.3-9.7	28 Days (see note 4)
Hexavalent Chromium	218.6/218.7	Drinking Water	Plastic/Glass	Ammonium Buffer pH >8	14 Days (see note 4)
Hexavalent Chromium	7196 (with 3060A)	Solid		≤ 6°C	30 Days from collection to extraction and 7 days from extraction to analysis
Hydrocarbons in Vapor	AM4.02	Vapor	20cc vapor vial with flat septum	None	N/A
Hydrogen by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Hydrogen Halide and Halogen Emissions	EPA 26	Air	Solutions	None	6 Months
Ignitability of Solids	1030	Non-liquid Waste	Plastic/Glass	None	28 Days
Lead Emissions	EPA 12	Air	Filter/Solutions	None	6 Months
Light Hydrocarbons by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Light Hydrocarbons in Vapor	AM20GAx	Vapor	20cc vapor vial with flat septum	None	14 Days
Lipids	Pace Lipids	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen
Mercury, Low-Level	1631E	Solid	Glass	None	28 Days
Mercury, Low-Level	1631E	Water	Fluoropolymer bottles (Glass if Hg is only analyte being tested)	12N HCl or BrCl	48 Hours for preservation or analysis; 28 Days to preservation if sample oxidized in bottle; 90 Days for analysis if preserved
Mercury, Low-Level	1631E	Tissue	Plastic/Glass	≤ - 10°C	28 Days if frozen
Mercury	7471	Solid	8oz Glass Jar	≤ 6°C	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Mercury	7470/245.1/245.2	Water	Plastic/Glass	pH<2 HNO_3	28 Days
Mercury	7471/245.6	Tissue	Plastic/Glass	≤ - 10°C	28 Days if frozen
Metals (GFAA)	7000/200.9	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP)	NIOSH 7300A/7303	Air	Filters	None	180 Days
Metals (ICP/ICPMS)	6010/6020	Solid	8oz Glass Jar	None	180 Days
Metals (ICP/ICPMS)	6010/6020/200.7/200.8	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP/ICPMS)	6020	Tissue	Plastic/Glass	≤ -10°C	180 Days if frozen
Methane, Ethane, Ethene	8015 modified	Water	40mL vials	HCl	14 Days
Methane, Ethane, Ethene	RSK-175; PM01/AM20GAx	Water	20mL vials	HCl; or trisodium phosphate or benzalkonium chloride and ≤ 6°C	14 Days; 7 Days unpreserved
Methane, Ethane, Ethene	EPA 3C	Air	Summa Canister	None	28 Days
Methane, Ethane, Ethene	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
Methanol, Ethanol	8015 modified	Water	40mL vials	≤ 6°C	14 Days
Methanol, Ethanol	8015 modified	Solid	2oz Glass	≤ 6°C	14 Days
Methyl Mercury	1630	Water	Teflon/ fluoropolymer	Fresh water- 4mL/L HCl; Saline water- 2mL/L H_2SO_4 (must be preserved within 48 hours of collection)	6 months
Methyl Mercury	1630	Tissue	2-4oz glass jar	≤ 0°C	28 Days; ethylated distillate 48 hours
Nitrogen, Ammonia	SM4500NH3/350.1	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Total Kjeldahl (TKN)	351.2	Solid	Plastic/Glass	≤ 6°C	28 Days
Nitrogen, Total Kjeldahl (TKN)	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Nitrate	SM4500-NO3/352.1	Water	Plastic/Glass	≤ 6°C	24 Hours preferred
Nitrogen, Nitrate & Nitrite combination	353.2	Solid	Plastic/Glass	≤ 6°C	28 Days
Nitrogen, Nitrate & Nitrite combination	SM4500-NO3/353.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Nitrite or Nitrate separately	SM4500-NO2/353.2	Water	Plastic/Glass	≤ 6°C	48 Hours
Nitrogen, Organic	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Non-Methane Organics	EPA 25C	Air	Summa Canister	None	28 Days
Non-Methane Organics	EPA 25C	Air	Tedlar Bag or equivalent	None	72 Hours
Odor	SM2150B	Water	Glass	≤ 6°C	24 Hours

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Oil and Grease/HEM	1664A/SM5520B/9070	Water	Glass	pH<2 H_2SO_4 or HCl; ≤ 6°C	28 Days
Oil and Grease/HEM	9071	Solid	Glass	≤ 6°C	28 Days
Oil Range Organics	8015	Solid	Glass	≤ 6°C	14/40 Days
Oil Range Organics	8015	Water	Glass	≤ 6°C	7/40 Days
Organic Matter	ASA 29-3.5.2	Solid	Plastic/Glass	None; samples air-dried and processed prior to analysis	N/A
Oxygen, Dissolved (Probe)	SM4500-O	Water	Glass	None	15 minutes
Oxygenates on Product (GCMS SIM)	1625 modified	Product	10mL glass vial	≤ 6°C	14 Days (7 Days from extraction)
PBDEs	1614	Water	1L Amber Glass	≤ 6°C	1 Year/1 Year
PBDEs	1614	Solid	Wide Mouth Jar	≤ 6°C	1 Year/1 Year
PBDEs	1614	Tissue	Aluminum Foil	≤ -10°C	1 Year/1 Year
PCBs and Pesticides, Organochlorine (OC)	TO-4/TO-10	Air	PUF	None	7/40 Days
PCBs and Pesticides, Organochlorine (OC)	608	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	Pest: 7/40 Days; PCB: 1 Year/1 Year
PCBs, Pesticides (OC), Herbicides	508.1	Water	Glass	Na2SO3; pH<2 HCl; ≤ 6°C	14/30 Days
PCBs, total as Decachlorobiphenyl	508A	Water	1L Glass, TFE lined cap	≤ 6°C	14/30 Days
Perchlorate	331	Water	Plastic/Glass	≥0-6°C, field filtered with headspace	28 Days
Permanent Gases (O2, N2, CO2)	RSK-175; PM01/AM20GAx	Water	40mL vials	benzalkonium chloride and ≤ 6°C	14 Days
Permanent Gases by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Permanent Gases in Vapor	AM20GAx	Vapor	20cc vapor vial with flat septum	None	14 Days
Pesticides, Organochlorine (OC)	8081	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Pesticides, Organochlorine (OC)	8081	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Pesticides, Organochlorine (OC)	8081	Tissue	8oz Glass Jar	≤ -10°C	1 Year if frozen/40 Days
Pesticides, Organophosphorous (OP)	8141	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Pesticides, Organophosphorous (OP)	8141	Water	1L Amber Glass	pH 5-8 with NaOH or H_2SO_4; ≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
PCBs (Aroclors)	8082	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	1 Year/1 Year
PCBs (Aroclors)	8082	Solid	8oz Glass Jar	≤ 6°C	1 Year/1 Year
PCBs (Aroclors)	8082	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen/1 Year
PCB Congeners	1668A	Water	1L Amber Glass	≤ 6°C but above freezing	1 Year/1 Year
PCB Congeners	1668A	Solid	4-8oz Glass Jar	≤ 6°C but above freezing	1 Year/1 Year
PCB Congeners	1668A	Tissue	4-8oz Glass Jar	≤ -10°C	1 Year/1 Year
Paint Filter Liquid Test	9095	Water	Plastic/Glass	None	N/A
Particle Size	ASA 15-5 modified	Solid	Plastic/Glass (100g sample)	None	N/A
Particulates	PM-10	Air	Filters	None	180 Days
Permanent Gases	EPA 3C	Air	Summa Canister	None	28 Days
Permanent Gases	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
pH	SM4500H+B/9040	Water	Plastic/Glass	None	15 minutes
pH	9045	Solid	Plastic/Glass	None	7 Days
Phenol, Total	420.1/420.4/9065/9066	Water	Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Phosphorus, Orthophosphate	SM4500P/365.1/365.3	Water	Plastic	≤ 6°C	Filter within 15 minutes, Analyze within 48 Hours
Phosphorus, Total	SM4500P/ 365.1/365.3/365.4	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Phosphorus, Total	365.4	Solid	Plastic/Glass	≤ 6°C	28 Days
Polynuclear Aromatic Hydrocarbons (PAH)	TO-13	Air	PUF	None	7/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen/40 Days
Purgeable Organic Halides (POX)	9021	Water	Glass; no headspace	≤ 6°C	14 Days
Radioactive Strontium	905.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-226	903.0/903.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note 3)	9320/904.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note	9320	Solid	Plastic/Glass		

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
3)					
Residual Range Organics- Alaska RRO	AK103	Solid	8oz Glass	≤ 6°C	14/40 Days
Saturated Hydrocarbons		Water	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	≤ 6°C; pH<2 1:1 HCl (optional)
Saturated Hydrocarbons		Solid	≤ 10°C	1 Year/40 Days	≤ 10°C
Silica, Dissolved	SM4500Si-D	Water	Plastic	≤ 6°C	28 Days
Solids, Settleable	SM2540F	Water	Glass	≤ 6°C	48 Hours
Solids, Total	SM2540B	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total	SM2540G	Solid	Plastic/Glass	≤ 6°C	7 Days
Solids, Total (FOC, OM, Ash)	ASTM D2974	Solid	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Dissolved	SM2540C	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Suspended	SM2540D/USGS I-3765-85	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Volatile	160.4/SM2540E	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Volatile	160.4	Solid	Plastic/Glass	≤ 6°C	7 Days
Specific Conductance	SM2510B/9050/120.1	Water	Plastic/Glass	≤ 6°C	28 Days
Stationary Source Dioxins and Furans	EPA 23	Air	XAD Trap	None	30/45 Days
Stationary Source Mercury	EPA 101	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source Metals	EPA 29	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source PM10	EPA 201A	Air	Filters	None	180 Days
Stationary Source Particulates	EPA 5	Air	Filter/Solutions	None	180 Days
Sulfate	SM4500SO4/9036/9038/375.2/ASTM D516	Water	Plastic/Glass	≤ 6°C	28 Days
Sulfide, Reactive	SW-846 Chap.7	Water	Plastic/Glass	None	28 Days
Sulfide, Reactive	SW-846 Chap.7	Solid	Plastic/Glass	None	28 Days
Sulfide, Total	SM4500S/9030	Water	Plastic/Glass	pH>9 NaOH; $Zn(OAc)_2$; ≤ 6°C	7 Days
Sulfite	SM4500SO3	Water	Plastic/Glass	None	15 minutes
Surfactants (MBAS)	SM5540C	Water	Plastic/Glass	≤ 6°C	48 Hours
Total Alpha Radium (see note 3)	9315/903.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Total Alpha Radium (see note 3)	9315	Solid	Plastic/Glass	None	180 days
Total Inorganic Carbon (TIC)	PM01/AM20GAx	Water	40mL VOA vial with mylar septum	≤ 6°C	14 Days
Total Organic Carbon	SM5310B,C,D/9060	Water	Glass	pH<2 H_2SO_4 or	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
(TOC)				HCl; ≤ 6°C	
Total Organic Carbon (TOC)	9060/Walkley Black/Lloyd Kahn	Solid	Glass	≤ 6°C	14 Days
Total Organic Halogen (TOX)	SM5320/9020	Water	Glass; no headspace	≤ 6°C	14 Days
Total Petroleum Hydrocarbons (aliphatic and aromatic)	TPHCWG	Water	40mL vials	pH<2 HCl, no headspace, ≤ 6°C	7 Days
Total Petroleum Hydrocarbons (aliphatic and aromatic)	TPHCWG	Solid	Glass	≤ 6°C	14 days
Tritium	906.0	Water	Glass	None	180 days
Turbidity	SM2130B/180.1	Water	Plastic/Glass	≤ 6°C	48 Hours
Total Uranium	908.0/ASTM D5174-97	Water	Plastic/Glass	pH<2 HNO_3	180 days
UCMR Metals	200.8	Water	Plastic or glass	pH<2 HNO_3	28 Days
UCMR Hexavalent Chromium	218.7	Water	HDPE or propylene	Na_2CO_3/$NaHCO_3$/($NH_4)_2SO_4$; pH>8	14 Days
UCMR Chlorate	300.1	Water	Plastic or glass	EDA	28 Days
UCMR Perfluorinated Compounds	537	Water	Polypropylene	Trizma	14 Days
UCMR 1, 4 Dioxane	522	Water	Glass	Na_2SO_3, $NaHSO_4$; pH<4	28 Days
UV254	SM5910B	Water	Glass	≤ 6°C	48 Hours
Vermiculite	EPA 600/R-93/116	Solid	Plastic/Glass	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Volatile Fatty Acids	AM21G	Water	40mL clear VOA vials	≤ 6°C	21 Days
Volatile Fatty Acids (low level)	AM23G	Water	40mL clear VOA vials	≤ 6°C with benzalkonium chloride	14 Days
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days preserved
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Solid	4-8oz Glass Jar	≤ 6°C; packed jars with no headspace	7/28 Days
Volatiles	TO-14	Air	Summa Canister	None	28 Days
Volatiles	TO-14	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	TO-15	Air	Summa Canister or Tedlar Bag	None	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Volatiles	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Volatiles	TO-18/8260	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	8260	Solid	5035 vial kit	See note 1 (analyze for acrolein and acrylonitrile per local requirements)	14 days
Volatiles	8260	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days
Volatiles	8260	Conc. Waste	5035 vial kit or 40mL vials	≤ 6°C	14 Days
Volatiles	624	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present (or unpreserved if run within 7 days of collection) (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days (7 Days for aromatics if unpreserved)
Volatiles (see note 2)	524.2	Water	40mL vials (in duplicate)	pH<2 HCl; ≤ 6°C; Ascorbic acid or $Na_2S_2O_3$ if Cl present[2]	14 Days
Whole Oil	ASTM D3328 (prep); ASTM D5739	Product	10mL glass vials	≤ 6°C	N/A

[1] **5035/5035A Note**: 5035 vial kit typically contains 2 vials water, preserved by freezing **or**, 2 vials aqueous sodium bisulfate preserved at 4°C, **and** one vial methanol preserved at ≤6°C **and** one container of unpreserved sample stored at ≤6°C.

[2] Method 524.2 lists ascorbic acid as the preservative when residual chlorine is suspected, unless gases or Table 7 compounds are NOT compounds of interest and then sodium thiosulfate is the preservative recommended.

[3] Methods 9315 and 9320 both state that if samples are unpreserved, the samples should be brought to the lab within 5 days of collection, preserved in the lab, and then allowed to sit for a minimum of 16 hours before sample preparation/analysis.

[4] The holding time for hexavalent chromium may be extended by the addition of the ammonium buffer listed in EPA 218.6 per the 2012 EPA Method Update Rule. Although Method 218.6 stipulates a different pH range (9.0 to 9.5) for buffering, this method requirement was modified in the Method Update Rule to a pH range of 9.3 to 9.7.For non-potable waters, adjust the pH of the sample to 9.3 to 9.7 during collection with the method required ammonium sulfate buffer to extend the holding time to 28 days. For potable waters, addition of the buffer during collection will extend the holding time for 14 days per EPA 218.7 and the EPA UCMR program.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF LABORATORIES

LABORATORY ACCREDITATION PROGRAM

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certifies That

65-00282

Pace Analytical Services LLC - Pittsburgh PA

1638 Roseytown Suites 2, 3, & 4, Greensburg, PA, 15601

Having duly met the requirement of
The act of June 29, 2002 (P.L. 596, No. 90)
dealing with Environmental Laboratories Accreditation
(27 Pa. C.S. 4104-4113) and the
National Environmental Laboratory Accreditation Program Standard
is hereby approved as an

Accredited Laboratory

to conduct analysis within the fields of accreditations more fully described in the attached Scope of Accreditation

NELAP accreditation granted by the PA DEP to an environmental laboratory is conditioned upon continued compliance with the current edition of the NELAC Standard or TNI Standard and the following Subchapters and Sections of 25 Pa. Code Chapter 252: Subchapter A (relating to general provisions); Subchapter B (relating to application, fees and supporting documents); Subchapter E (relating to proficiency test study requirements); Subchapter F (relating to assessment requirements); Subchapter G (relating to miscellaneous provisions); Section 252.307; and Section 252.401.

Expiration Date: **03/31/2020**

Certificate Number: **019**

Aaren S. Alger, Chief
Laboratory Accreditation Program
Bureau of Laboratories

Continued accreditation status depends on successful ongoing participation in the program
Certificate not transferable Surrender upon revocation
To be conspicuously displayed at the Laboratory
Not valid unless accompanied by a valid Scope of Accreditation
Shall not be used to imply endorsement by the Commonwealth of Pennsylvania
Customers are urged to verify the laboratory's current accreditation status
PA DEP is a NELAP recognized accreditation body

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 019-001 expiration date 03/31/2020. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Pittsburgh PA
1638 Roseytown Suites 2, 3, & 4
Greensburg, PA 15601
(724) 850-5600

DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Drinking Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
ASTM D5174-97		Uranium, total	NELAP	PA	10/12/2010
ECLS-R-GA		Gross alpha (including radium & U, excluding radon)	NELAP	PA	08/01/2016
EPA 900.0		Gross alpha	NELAP	PA	05/27/2008
EPA 900.0		Gross beta	NELAP	PA	05/27/2008
EPA 901.1		Gamma emitters	NELAP	PA	05/27/2008
EPA 903.0		Total alpha radium	NELAP	PA	03/31/2017
EPA 903.1		Radium-226	NELAP	PA	07/15/2011
EPA 904.0		Radium-228	NELAP	PA	05/27/2008
EPA 905.0		Strontium-90	NELAP	PA	02/01/2011
EPA 906.0		Tritium	NELAP	PA	05/27/2008
HASL 300 U-02-RC		Uranium-234	NELAP	PA	01/16/2014
HASL 300 U-02-RC		Uranium-235	NELAP	PA	01/16/2014
HASL 300 U-02-RC		Uranium-238	NELAP	PA	01/16/2014
SM 7110 C		Gross alpha	NELAP	PA	09/25/2008
SM 7500-Rn B		Radon-222 in water	NELAP	PA	10/10/2008
SOP (00282) R-008		Americium-241	NELAP	PA	05/27/2008
SOP (00282) R-008		Plutonium-239	NELAP	PA	05/27/2008
SOP (00282) R-008		Thorium-230	NELAP	PA	05/27/2008
SOP (00282) R-008		Uranium-234	NELAP	PA	05/27/2008
SOP (00282) R-008		Uranium-238	NELAP	PA	05/27/2008

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
ASTM D516-02		Sulfate	NELAP	PA	05/06/2009
ASTM D516-11		Sulfate	NELAP	PA	04/02/2018
ASTM D516-90		Sulfate	NELAP	PA	05/06/2009
ASTM D5174-97		Uranium, total	NELAP	PA	08/12/2008
ASTM D7237-10		Free cyanide	NELAP	PA	03/31/2017
EPA 120.1		Conductivity	NELAP	PA	04/21/2014
EPA 1311		Toxicity characteristic leaching procedure (TCLP)	NELAP	PA	03/29/2005
EPA 1312		Synthetic precipitation leaching procedure (SPLP)	NELAP	PA	03/29/2005
EPA 160.4		Residue, volatile	NELAP	PA	07/28/2006
EPA 1664	A	Oil and grease	NELAP	PA	10/01/2014
EPA 1664	A	Total recoverable petroleum hydrocarbons (TRPH)	NELAP	PA	08/17/2017
EPA 180.1		Turbidity	NELAP	PA	07/28/2006
EPA 200.7	4.4	Aluminum	NELAP	PA	03/29/2005
EPA 200.7	4.4	Antimony	NELAP	PA	03/29/2005
EPA 200.7	4.4	Arsenic	NELAP	PA	03/29/2005
EPA 200.7	4.4	Barium	NELAP	PA	03/29/2005

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DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 200.7	4.4	Beryllium	NELAP	PA	03/29/2005
EPA 200.7	4.4	Boron	NELAP	PA	03/29/2005
EPA 200.7	4.4	Cadmium	NELAP	PA	03/29/2005
EPA 200.7	4.4	Calcium	NELAP	PA	03/29/2005
EPA 200.7	4.4	Chromium	NELAP	PA	03/29/2005
EPA 200.7	4.4	Cobalt	NELAP	PA	03/29/2005
EPA 200.7	4.4	Copper	NELAP	PA	03/29/2005
EPA 200.7	4.4	Iron	NELAP	PA	03/29/2005
EPA 200.7	4.4	Lead	NELAP	PA	03/29/2005
EPA 200.7	4.4	Lithium	NELAP	PA	06/22/2006
EPA 200.7	4.4	Magnesium	NELAP	PA	03/29/2005
EPA 200.7	4.4	Manganese	NELAP	PA	03/29/2005
EPA 200.7	4.4	Molybdenum	NELAP	PA	03/29/2005
EPA 200.7	4.4	Nickel	NELAP	PA	03/29/2005
EPA 200.7	4.4	Phosphorus, total	NELAP	PA	01/04/2007
EPA 200.7	4.4	Potassium	NELAP	PA	03/29/2005
EPA 200.7	4.4	Selenium	NELAP	PA	03/29/2005
EPA 200.7	4.4	Silica, as SiO2	NELAP	PA	06/22/2006
EPA 200.7	4.4	Silicon	NELAP	PA	06/22/2006
EPA 200.7	4.4	Silver	NELAP	PA	03/29/2005
EPA 200.7	4.4	Sodium	NELAP	PA	03/29/2005
EPA 200.7	4.4	Strontium	NELAP	PA	06/22/2006
EPA 200.7	4.4	Sulfur	NELAP	PA	01/09/2012
EPA 200.7	4.4	Thallium	NELAP	PA	03/29/2005
EPA 200.7	4.4	Tin	NELAP	PA	01/04/2007
EPA 200.7	4.4	Titanium	NELAP	PA	03/29/2005
EPA 200.7	4.4	Vanadium	NELAP	PA	03/29/2005
EPA 200.7	4.4	Zinc	NELAP	PA	03/29/2005
EPA 200.7	4.4	Zirconium	NELAP	PA	06/22/2006
EPA 245.1	3.0	Mercury	NELAP	PA	03/29/2005
EPA 300.0	2.1	Bromide	NELAP	PA	05/18/2009
EPA 300.0	2.1	Chloride	NELAP	PA	09/29/2010
EPA 300.0	2.1	Fluoride	NELAP	PA	05/06/2009
EPA 300.0	2.1	Sulfate	NELAP	PA	09/29/2010
EPA 3005	A	Preconcentration under acid	NELAP	PA	03/29/2005
EPA 335.4		Total cyanide	NELAP	PA	05/06/2009
EPA 350.1		Ammonia as N	NELAP	PA	05/06/2009
EPA 351.2		Kjeldahl nitrogen, total (TKN)	NELAP	PA	05/06/2009
EPA 3510	C	Separatory funnel liquid-liquid extraction	NELAP	PA	03/29/2005
EPA 3535	A	Solid-phase extraction (SPE)	NELAP	PA	09/18/2013
EPA 3535		Solid-phase extraction (SPE)	NELAP	PA	03/29/2005
EPA 3660	B	Sulfur cleanup	NELAP	PA	03/29/2005

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Greensburg, PA 15601
(724) 850-5600

DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 3665	A	Sulfuric acid/permanganate clean-up	NELAP	PA	03/29/2005
EPA 410.4		Chemical oxygen demand (COD)	NELAP	PA	05/06/2009
EPA 420.1		Total phenolics	NELAP	PA	05/06/2009
EPA 5030	B	Aqueous-phase purge-and-trap	NELAP	PA	03/29/2005
EPA 5030	C	Aqueous-phase purge-and-trap	NELAP	PA	09/18/2013
EPA 6010	B	Metals by ICP/AES	NELAP	PA	02/25/2010
EPA 6010	C	Metals by ICP/AES	NELAP	PA	09/18/2013
EPA 6010		Aluminum	NELAP	PA	02/25/2010
EPA 6010		Antimony	NELAP	PA	02/25/2010
EPA 6010		Arsenic	NELAP	PA	02/25/2010
EPA 6010		Barium	NELAP	PA	02/25/2010
EPA 6010		Beryllium	NELAP	PA	02/25/2010
EPA 6010		Boron	NELAP	PA	02/25/2010
EPA 6010		Cadmium	NELAP	PA	02/25/2010
EPA 6010		Calcium	NELAP	PA	02/25/2010
EPA 6010		Chromium	NELAP	PA	02/25/2010
EPA 6010		Cobalt	NELAP	PA	02/25/2010
EPA 6010		Copper	NELAP	PA	02/25/2010
EPA 6010		Iron	NELAP	PA	02/25/2010
EPA 6010		Lead	NELAP	PA	02/25/2010
EPA 6010		Lithium	NELAP	PA	02/25/2010
EPA 6010		Magnesium	NELAP	PA	02/25/2010
EPA 6010		Manganese	NELAP	PA	02/25/2010
EPA 6010		Molybdenum	NELAP	PA	02/25/2010
EPA 6010		Nickel	NELAP	PA	02/25/2010
EPA 6010		Phosphorus, total	NELAP	PA	02/25/2010
EPA 6010		Potassium	NELAP	PA	02/25/2010
EPA 6010		Selenium	NELAP	PA	02/25/2010
EPA 6010		Silica, as SiO2	NELAP	PA	02/25/2010
EPA 6010		Silicon	NELAP	PA	02/25/2010
EPA 6010		Silver	NELAP	PA	02/25/2010
EPA 6010		Sodium	NELAP	PA	02/25/2010
EPA 6010		Strontium	NELAP	PA	02/25/2010
EPA 6010		Sulfur	NELAP	PA	01/09/2012
EPA 6010		Thallium	NELAP	PA	02/25/2010
EPA 6010		Tin	NELAP	PA	02/25/2010
EPA 6010		Titanium	NELAP	PA	02/25/2010
EPA 6010		Vanadium	NELAP	PA	02/25/2010
EPA 6010		Zinc	NELAP	PA	02/25/2010
EPA 6010		Zirconium	NELAP	PA	02/25/2010
EPA 608		4,4'-DDD	NELAP	PA	03/29/2005
EPA 608		4,4'-DDE	NELAP	PA	03/29/2005

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DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 608		4,4'-DDT	NELAP	PA	03/29/2005
EPA 608		Aldrin (HHDN)	NELAP	PA	03/29/2005
EPA 608		Aroclor-1016 (PCB-1016)	NELAP	PA	03/29/2005
EPA 608		Aroclor-1221 (PCB-1221)	NELAP	PA	03/29/2005
EPA 608		Aroclor-1232 (PCB-1232)	NELAP	PA	03/29/2005
EPA 608		Aroclor-1242 (PCB-1242)	NELAP	PA	03/29/2005
EPA 608		Aroclor-1248 (PCB-1248)	NELAP	PA	03/29/2005
EPA 608		Aroclor-1254 (PCB-1254)	NELAP	PA	03/29/2005
EPA 608		Aroclor-1260 (PCB-1260)	NELAP	PA	03/29/2005
EPA 608		Aroclor-1262 (PCB-1262)	NELAP	PA	02/09/2007
EPA 608		Aroclor-1268 (PCB-1268)	NELAP	PA	02/09/2007
EPA 608		Chlordane (tech.)	NELAP	PA	03/29/2005
EPA 608		Dieldrin	NELAP	PA	03/29/2005
EPA 608		Endosulfan I	NELAP	PA	03/29/2005
EPA 608		Endosulfan II	NELAP	PA	03/29/2005
EPA 608		Endosulfan sulfate	NELAP	PA	03/29/2005
EPA 608		Endrin	NELAP	PA	03/29/2005
EPA 608		Endrin aldehyde	NELAP	PA	03/29/2005
EPA 608		Endrin ketone	NELAP	PA	02/05/2007
EPA 608		Heptachlor	NELAP	PA	03/29/2005
EPA 608		Heptachlor epoxide	NELAP	PA	03/29/2005
EPA 608		Toxaphene (Chlorinated camphene)	NELAP	PA	03/29/2005
EPA 608		alpha-BHC (alpha-Hexachlorocyclohexane)	NELAP	PA	03/29/2005
EPA 608		alpha-Chlordane	NELAP	PA	02/22/2013
EPA 608		beta-BHC (beta-Hexachlorocyclohexane)	NELAP	PA	03/29/2005
EPA 608		delta-BHC (delta-Hexachlorocyclohexane)	NELAP	PA	03/29/2005
EPA 608		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	PA	03/29/2005
EPA 608		gamma-Chlordane	NELAP	PA	02/22/2013
EPA 608.3		4,4'-DDD	NELAP	PA	03/21/2019
EPA 608.3		4,4'-DDE	NELAP	PA	03/21/2019
EPA 608.3		4,4'-DDT	NELAP	PA	03/21/2019
EPA 608.3		Aldrin (HHDN)	NELAP	PA	03/21/2019
EPA 608.3		Aroclor-1016 (PCB-1016)	NELAP	PA	03/21/2019
EPA 608.3		Aroclor-1221 (PCB-1221)	NELAP	PA	03/21/2019
EPA 608.3		Aroclor-1232 (PCB-1232)	NELAP	PA	03/21/2019
EPA 608.3		Aroclor-1242 (PCB-1242)	NELAP	PA	03/21/2019
EPA 608.3		Aroclor-1248 (PCB-1248)	NELAP	PA	03/21/2019
EPA 608.3		Aroclor-1254 (PCB-1254)	NELAP	PA	03/21/2019
EPA 608.3		Aroclor-1260 (PCB-1260)	NELAP	PA	03/21/2019
EPA 608.3		Aroclor-1262 (PCB-1262)	NELAP	PA	03/21/2019
EPA 608.3		Aroclor-1268 (PCB-1268)	NELAP	PA	03/21/2019

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DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 608.3		Chlordane (tech.)	NELAP	PA	03/21/2019
EPA 608.3		Dieldrin	NELAP	PA	03/21/2019
EPA 608.3		Endosulfan I	NELAP	PA	03/21/2019
EPA 608.3		Endosulfan II	NELAP	PA	03/21/2019
EPA 608.3		Endosulfan sulfate	NELAP	PA	03/21/2019
EPA 608.3		Endrin	NELAP	PA	03/21/2019
EPA 608.3		Endrin aldehyde	NELAP	PA	03/21/2019
EPA 608.3		Heptachlor	NELAP	PA	03/21/2019
EPA 608.3		Heptachlor epoxide	NELAP	PA	03/21/2019
EPA 608.3		Toxaphene (Chlorinated camphene)	NELAP	PA	03/21/2019
EPA 608.3		alpha-BHC (alpha-Hexachlorocyclohexane)	NELAP	PA	03/21/2019
EPA 608.3		alpha-Chlordane	NELAP	PA	03/21/2019
EPA 608.3		beta-BHC (beta-Hexachlorocyclohexane)	NELAP	PA	03/21/2019
EPA 608.3		delta-BHC (delta-Hexachlorocyclohexane)	NELAP	PA	03/21/2019
EPA 608.3		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	PA	03/21/2019
EPA 608.3		gamma-Chlordane	NELAP	PA	03/21/2019
EPA 624		1,1,1,2-Tetrachloroethane	NELAP	PA	06/22/2006
EPA 624		1,1,1-Trichloroethane	NELAP	PA	03/29/2005
EPA 624		1,1,2,2-Tetrachloroethane	NELAP	PA	03/29/2005
EPA 624		1,1,2-Trichloroethane	NELAP	PA	03/29/2005
EPA 624		1,1-Dichloroethane	NELAP	PA	03/29/2005
EPA 624		1,1-Dichloroethene (1,1-Dichloroethylene)	NELAP	PA	03/29/2005
EPA 624		1,1-Dichloropropene	NELAP	PA	06/22/2006
EPA 624		1,2,3-Trichlorobenzene	NELAP	PA	06/22/2006
EPA 624		1,2,3-Trichloropropane (1,2,3-TCP)	NELAP	PA	06/22/2006
EPA 624		1,2,4-Trichlorobenzene	NELAP	PA	06/22/2006
EPA 624		1,2,4-Trimethylbenzene	NELAP	PA	06/22/2006
EPA 624		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	PA	06/22/2006
EPA 624		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	PA	06/22/2006
EPA 624		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	03/29/2005
EPA 624		1,2-Dichloroethane	NELAP	PA	03/29/2005
EPA 624		1,2-Dichloropropane	NELAP	PA	03/29/2005
EPA 624		1,3,5-Trimethylbenzene	NELAP	PA	10/01/2014
EPA 624		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	04/29/2016
EPA 624		1,3-Dichloropropane	NELAP	PA	05/30/2013
EPA 624		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	03/29/2005
EPA 624		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	05/30/2013
EPA 624		2,2-Dichloropropane	NELAP	PA	06/22/2006
EPA 624		2-Butanone (Methyl ethyl ketone, MEK)	NELAP	PA	06/22/2006
EPA 624		2-Chloroethyl vinyl ether	NELAP	PA	06/22/2006

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TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 624		2-Chlorotoluene	NELAP	PA	06/22/2006
EPA 624		2-Hexanone	NELAP	PA	06/22/2006
EPA 624		2-Methylnaphthalene	NELAP	PA	05/30/2013
EPA 624		2-Nitropropane	NELAP	PA	05/30/2013
EPA 624		4-Chlorotoluene	NELAP	PA	05/30/2013
EPA 624		4-Methyl-2-pentanone (MIBK)	NELAP	PA	06/22/2006
EPA 624		Acetone	NELAP	PA	06/22/2006
EPA 624		Acetonitrile	NELAP	PA	05/30/2013
EPA 624		Acrolein (Propenal)	NELAP	PA	06/22/2006
EPA 624		Acrylonitrile	NELAP	PA	06/22/2006
EPA 624		Allyl chloride (3-Chloropropene)	NELAP	PA	05/30/2013
EPA 624		Benzene	NELAP	PA	03/29/2005
EPA 624		Bromobenzene	NELAP	PA	06/22/2006
EPA 624		Bromochloromethane	NELAP	PA	05/30/2013
EPA 624		Bromodichloromethane	NELAP	PA	03/29/2005
EPA 624		Bromoform	NELAP	PA	03/29/2005
EPA 624		Carbon disulfide	NELAP	PA	06/22/2006
EPA 624		Carbon tetrachloride	NELAP	PA	03/29/2005
EPA 624		Chlorobenzene	NELAP	PA	03/29/2005
EPA 624		Chloroethane	NELAP	PA	03/29/2005
EPA 624		Chloroform	NELAP	PA	03/29/2005
EPA 624		Chloroprene (2-Chloro-1,3-butadiene)	NELAP	PA	05/30/2013
EPA 624		Cyclohexane	NELAP	PA	05/30/2013
EPA 624		Cyclohexanone	NELAP	PA	05/30/2013
EPA 624		Dibromochloromethane	NELAP	PA	03/29/2005
EPA 624		Dibromomethane	NELAP	PA	06/22/2006
EPA 624		Dichlorodifluoromethane (Freon 12)	NELAP	PA	06/22/2006
EPA 624		Diethyl ether (Ethyl ether)	NELAP	PA	05/30/2013
EPA 624		Diisopropyl ether (DIPE)	NELAP	PA	05/30/2013
EPA 624		Ethanol	NELAP	PA	05/30/2013
EPA 624		Ethyl acetate	NELAP	PA	05/30/2013
EPA 624		Ethyl methacrylate	NELAP	PA	05/30/2013
EPA 624		Ethylbenzene	NELAP	PA	03/29/2005
EPA 624		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	06/22/2006
EPA 624		Iodomethane (Methyl iodide)	NELAP	PA	05/30/2013
EPA 624		Isobutyl alcohol (2-Methyl-1-propanol)	NELAP	PA	05/30/2013
EPA 624		Isopropylbenzene (Cumene)	NELAP	PA	06/22/2006
EPA 624		Methacrylonitrile	NELAP	PA	05/30/2013
EPA 624		Methyl acetate	NELAP	PA	05/30/2013
EPA 624		Methyl bromide (Bromomethane)	NELAP	PA	03/29/2005
EPA 624		Methyl chloride (Chloromethane)	NELAP	PA	03/29/2005
EPA 624		Methyl tert-butyl ether (MTBE)	NELAP	PA	06/22/2006

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

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Pace Analytical Services LLC - Pittsburgh PA
1638 Roseytown Suites 2, 3, & 4
Greensburg, PA 15601
(724) 850-5600

DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 624		Methylcyclohexane	NELAP	PA	05/30/2013
EPA 624		Methylene chloride (Dichloromethane)	NELAP	PA	03/29/2005
EPA 624		Methylmethacrylate	NELAP	PA	08/12/2015
EPA 624		Naphthalene	NELAP	PA	06/22/2006
EPA 624		Propionitrile (Ethyl cyanide)	NELAP	PA	05/30/2013
EPA 624		Styrene	NELAP	PA	06/22/2006
EPA 624		Tetrachloroethene (PCE, Perchloroethylene)	NELAP	PA	03/29/2005
EPA 624		Tetrahydrofuran (THF)	NELAP	PA	05/30/2013
EPA 624		Toluene	NELAP	PA	03/29/2005
EPA 624		Trichloroethene (TCE, Trichloroethylene)	NELAP	PA	03/29/2005
EPA 624		Trichlorofluoromethane (Freon 11)	NELAP	PA	01/04/2007
EPA 624		Vinyl acetate	NELAP	PA	05/30/2013
EPA 624		Vinyl chloride (Chloroethene)	NELAP	PA	03/29/2005
EPA 624		Xylenes, total	NELAP	PA	03/29/2005
EPA 624		cis-1,2-Dichloroethene	NELAP	PA	06/22/2006
EPA 624		cis-1,3-Dichloropropene	NELAP	PA	03/29/2005
EPA 624		m+p-Xylene	NELAP	PA	06/22/2006
EPA 624		n-Butylbenzene	NELAP	PA	06/22/2006
EPA 624		n-Hexane	NELAP	PA	05/30/2013
EPA 624		n-Propylbenzene	NELAP	PA	06/22/2006
EPA 624		o-Xylene	NELAP	PA	06/22/2006
EPA 624		p-Isopropyltoluene (4-Isopropyltoluene)	NELAP	PA	06/22/2006
EPA 624		sec-Butylbenzene	NELAP	PA	06/22/2006
EPA 624		tert-Butyl alcohol (2-Methyl-2-propanol)	NELAP	PA	06/22/2006
EPA 624		tert-Butyl ethyl ether	NELAP	PA	05/30/2013
EPA 624		trans-1,2-Dichloroethene	NELAP	PA	03/29/2005
EPA 624		trans-1,3-Dichloropropene	NELAP	PA	03/29/2005
EPA 624		trans-1,4-Dichloro-2-butene	NELAP	PA	05/30/2013
EPA 625		1,1'-Biphenyl (Biphenyl, Lemonene)	NELAP	PA	02/22/2013
EPA 625		1,2,4-Trichlorobenzene	NELAP	PA	03/29/2005
EPA 625		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	03/29/2005
EPA 625		1,2-Diphenylhydrazine	NELAP	PA	06/22/2006
EPA 625		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	03/29/2005
EPA 625		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	03/29/2005
EPA 625		1-Methylnaphthalene	NELAP	PA	02/22/2013
EPA 625		2,2'-oxybis(1-Chloropropane)	NELAP	PA	03/29/2005
EPA 625		2,4,5-Trichlorophenol	NELAP	PA	06/22/2006
EPA 625		2,4,6-Trichlorophenol	NELAP	PA	03/29/2005
EPA 625		2,4-Dichlorophenol	NELAP	PA	03/29/2005
EPA 625		2,4-Dimethylphenol	NELAP	PA	03/29/2005
EPA 625		2,4-Dinitrophenol	NELAP	PA	03/29/2005
EPA 625		2,4-Dinitrotoluene (2,4-DNT)	NELAP	PA	03/29/2005

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PADWIS ID: 65282

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Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 625		2,6-Dinitrotoluene (2,6-DNT)	NELAP	PA	03/29/2005
EPA 625		2-Chloronaphthalene	NELAP	PA	03/29/2005
EPA 625		2-Chlorophenol	NELAP	PA	03/29/2005
EPA 625		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	NELAP	PA	03/29/2005
EPA 625		2-Methylnaphthalene	NELAP	PA	02/22/2013
EPA 625		2-Methylphenol (o-Cresol)	NELAP	PA	02/22/2013
EPA 625		2-Nitroaniline	NELAP	PA	02/22/2013
EPA 625		2-Nitrophenol	NELAP	PA	03/29/2005
EPA 625		3+4-Methylphenol (m+p-Cresol)	NELAP	PA	06/14/2011
EPA 625		3,3'-Dichlorobenzidine	NELAP	PA	03/29/2005
EPA 625		4-Bromophenyl phenyl ether	NELAP	PA	03/29/2005
EPA 625		4-Chloro-3-methylphenol	NELAP	PA	03/29/2005
EPA 625		4-Chloroaniline	NELAP	PA	02/22/2013
EPA 625		4-Chlorophenyl phenyl ether	NELAP	PA	03/29/2005
EPA 625		4-Nitroaniline	NELAP	PA	02/22/2013
EPA 625		4-Nitrophenol	NELAP	PA	03/29/2005
EPA 625		Acenaphthene	NELAP	PA	03/29/2005
EPA 625		Acenaphthylene	NELAP	PA	03/29/2005
EPA 625		Acetophenone	NELAP	PA	02/22/2013
EPA 625		Aniline	NELAP	PA	02/22/2013
EPA 625		Anthracene	NELAP	PA	03/29/2005
EPA 625		Atrazine	NELAP	PA	02/22/2013
EPA 625		Benzaldehyde	NELAP	PA	02/22/2013
EPA 625		Benzidine	NELAP	PA	03/29/2005
EPA 625		Benzo[a]anthracene	NELAP	PA	03/29/2005
EPA 625		Benzo[a]pyrene	NELAP	PA	03/29/2005
EPA 625		Benzo[b]fluoranthene	NELAP	PA	03/29/2005
EPA 625		Benzo[ghi]perylene	NELAP	PA	03/29/2005
EPA 625		Benzo[k]fluoranthene	NELAP	PA	03/29/2005
EPA 625		Benzoic acid	NELAP	PA	02/22/2013
EPA 625		Benzyl alcohol	NELAP	PA	02/22/2013
EPA 625		Butyl benzyl phthalate (Benzyl butyl phthalate)	NELAP	PA	03/29/2005
EPA 625		Caprolactam	NELAP	PA	02/22/2013
EPA 625		Carbazole	NELAP	PA	02/22/2013
EPA 625		Chrysene (Benzo[a]phenanthrene)	NELAP	PA	03/29/2005
EPA 625		Di-n-butyl phthalate	NELAP	PA	03/29/2005
EPA 625		Di-n-octyl phthalate	NELAP	PA	03/29/2005
EPA 625		Dibenzo[a,h]anthracene	NELAP	PA	03/29/2005
EPA 625		Dibenzofuran	NELAP	PA	02/22/2013
EPA 625		Diethyl phthalate	NELAP	PA	03/29/2005
EPA 625		Dimethyl phthalate	NELAP	PA	03/29/2005

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Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 625		Fluoranthene	NELAP	PA	03/29/2005
EPA 625		Fluorene	NELAP	PA	03/29/2005
EPA 625		Hexachlorobenzene	NELAP	PA	03/29/2005
EPA 625		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	03/29/2005
EPA 625		Hexachlorocyclopentadiene	NELAP	PA	03/29/2005
EPA 625		Hexachloroethane	NELAP	PA	03/29/2005
EPA 625		Indeno(1,2,3-cd)pyrene	NELAP	PA	03/29/2005
EPA 625		Isophorone	NELAP	PA	03/29/2005
EPA 625		N-Nitrosodi-n-propylamine	NELAP	PA	03/29/2005
EPA 625		N-Nitrosodimethylamine	NELAP	PA	03/29/2005
EPA 625		N-Nitrosodiphenylamine	NELAP	PA	03/29/2005
EPA 625		Naphthalene	NELAP	PA	03/29/2005
EPA 625		Nitrobenzene	NELAP	PA	03/29/2005
EPA 625		Pentachlorophenol (PCP)	NELAP	PA	03/29/2005
EPA 625		Phenanthrene	NELAP	PA	03/29/2005
EPA 625		Phenol	NELAP	PA	03/29/2005
EPA 625		Pyrene	NELAP	PA	03/29/2005
EPA 625		bis(2-Chloroethoxy)methane	NELAP	PA	03/29/2005
EPA 625		bis(2-Chloroethyl) ether	NELAP	PA	03/29/2005
EPA 625		bis(2-Ethylhexyl) phthalate (DEHP)	NELAP	PA	03/29/2005
EPA 7.3.3.2		Reactive cyanide	NELAP	PA	03/29/2005
EPA 7.3.4.2		Reactive sulfide	NELAP	PA	03/29/2005
EPA 7196	A	Chromium VI	NELAP	PA	05/06/2009
EPA 7470	A	Mercury	NELAP	PA	03/29/2005
EPA 8011		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	PA	03/04/2015
EPA 8011		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	PA	03/04/2015
EPA 8015	B	Nonhalogenated organics by GC/FID	NELAP	PA	02/25/2010
EPA 8015	D	Nonhalogenated organics by GC/FID	NELAP	PA	09/18/2013
EPA 8015		Diesel-range organics (DRO)	NELAP	PA	02/25/2010
EPA 8015		Gasoline-range organics (GRO)	NELAP	PA	02/25/2010
EPA 8081	B	Organochlorine pesticides by GC/ECD	NELAP	PA	09/18/2013
EPA 8081		4,4'-DDD	NELAP	PA	02/25/2010
EPA 8081		4,4'-DDE	NELAP	PA	02/25/2010
EPA 8081		4,4'-DDT	NELAP	PA	02/25/2010
EPA 8081		Aldrin (HHDN)	NELAP	PA	02/25/2010
EPA 8081		Chlordane (tech.)	NELAP	PA	02/25/2010
EPA 8081		Dieldrin	NELAP	PA	02/25/2010
EPA 8081		Endosulfan I	NELAP	PA	02/25/2010
EPA 8081		Endosulfan II	NELAP	PA	02/25/2010
EPA 8081		Endosulfan sulfate	NELAP	PA	02/25/2010
EPA 8081		Endrin	NELAP	PA	02/25/2010

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PADWIS ID: 65282

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 8081		Endrin aldehyde	NELAP	PA	02/25/2010
EPA 8081		Endrin ketone	NELAP	PA	02/25/2010
EPA 8081		Heptachlor	NELAP	PA	02/25/2010
EPA 8081		Heptachlor epoxide	NELAP	PA	02/25/2010
EPA 8081		Methoxychlor	NELAP	PA	02/25/2010
EPA 8081		Toxaphene (Chlorinated camphene)	NELAP	PA	02/25/2010
EPA 8081		alpha-BHC (alpha-Hexachlorocyclohexane)	NELAP	PA	02/25/2010
EPA 8081		alpha-Chlordane	NELAP	PA	02/25/2010
EPA 8081		beta-BHC (beta-Hexachlorocyclohexane)	NELAP	PA	02/25/2010
EPA 8081		delta-BHC (delta-Hexachlorocyclohexane)	NELAP	PA	02/25/2010
EPA 8081		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	PA	02/25/2010
EPA 8081		gamma-Chlordane	NELAP	PA	02/25/2010
EPA 8082	A	PCBs by GC/ECD	NELAP	PA	09/18/2013
EPA 8082		Aroclor-1016 (PCB-1016)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1221 (PCB-1221)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1232 (PCB-1232)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1242 (PCB-1242)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1248 (PCB-1248)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1254 (PCB-1254)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1260 (PCB-1260)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1262 (PCB-1262)	NELAP	PA	02/09/2007
EPA 8082		Aroclor-1268 (PCB-1268)	NELAP	PA	02/09/2007
EPA 8260	B	VOCs by GC/MS	NELAP	PA	02/25/2010
EPA 8260	C	VOCs by GC/MS	NELAP	PA	09/18/2013
EPA 8260		1,1,1,2-Tetrachloroethane	NELAP	PA	02/25/2010
EPA 8260		1,1,1-Trichloroethane	NELAP	PA	02/25/2010
EPA 8260		1,1,2,2-Tetrachloroethane	NELAP	PA	02/25/2010
EPA 8260		1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	NELAP	PA	02/25/2010
EPA 8260		1,1,2-Trichloroethane	NELAP	PA	02/25/2010
EPA 8260		1,1-Dichloroethane	NELAP	PA	02/25/2010
EPA 8260		1,1-Dichloroethene (1,1-Dichloroethylene)	NELAP	PA	02/25/2010
EPA 8260		1,1-Dichloropropene	NELAP	PA	02/25/2010
EPA 8260		1,2,3-Trichlorobenzene	NELAP	PA	02/25/2010
EPA 8260		1,2,3-Trichloropropane (1,2,3-TCP)	NELAP	PA	02/25/2010
EPA 8260		1,2,4-Trichlorobenzene	NELAP	PA	02/25/2010
EPA 8260		1,2,4-Trimethylbenzene	NELAP	PA	02/25/2010
EPA 8260		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	PA	02/25/2010
EPA 8260		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	PA	02/25/2010
EPA 8260		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	02/25/2010
EPA 8260		1,2-Dichloroethane	NELAP	PA	02/25/2010

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Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 8260		1,2-Dichloropropane	NELAP	PA	02/25/2010
EPA 8260		1,3,5-Trimethylbenzene	NELAP	PA	10/01/2014
EPA 8260		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	04/29/2016
EPA 8260		1,3-Dichloropropane	NELAP	PA	02/25/2010
EPA 8260		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	02/25/2010
EPA 8260		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	02/25/2010
EPA 8260		2,2-Dichloropropane	NELAP	PA	02/25/2010
EPA 8260		2-Butanone (Methyl ethyl ketone, MEK)	NELAP	PA	02/25/2010
EPA 8260		2-Chloroethyl vinyl ether	NELAP	PA	02/25/2010
EPA 8260		2-Chlorotoluene	NELAP	PA	02/25/2010
EPA 8260		2-Hexanone	NELAP	PA	02/25/2010
EPA 8260		2-Methylnaphthalene	NELAP	PA	05/30/2013
EPA 8260		2-Nitropropane	NELAP	PA	02/25/2010
EPA 8260		4-Chlorotoluene	NELAP	PA	02/25/2010
EPA 8260		4-Methyl-2-pentanone (MIBK)	NELAP	PA	02/25/2010
EPA 8260		Acetone	NELAP	PA	02/25/2010
EPA 8260		Acetonitrile	NELAP	PA	02/25/2010
EPA 8260		Acrolein (Propenal)	NELAP	PA	02/25/2010
EPA 8260		Acrylonitrile	NELAP	PA	02/25/2010
EPA 8260		Allyl chloride (3-Chloropropene)	NELAP	PA	02/25/2010
EPA 8260		Benzene	NELAP	PA	02/25/2010
EPA 8260		Bromobenzene	NELAP	PA	02/25/2010
EPA 8260		Bromochloromethane	NELAP	PA	02/25/2010
EPA 8260		Bromodichloromethane	NELAP	PA	02/25/2010
EPA 8260		Bromoform	NELAP	PA	02/25/2010
EPA 8260		Bromomethane (Methyl bromide)	NELAP	PA	02/25/2010
EPA 8260		Carbon disulfide	NELAP	PA	02/25/2010
EPA 8260		Carbon tetrachloride	NELAP	PA	02/25/2010
EPA 8260		Chlorobenzene	NELAP	PA	02/25/2010
EPA 8260		Chloroethane	NELAP	PA	02/25/2010
EPA 8260		Chloroform	NELAP	PA	02/25/2010
EPA 8260		Chloromethane (Methyl chloride)	NELAP	PA	02/25/2010
EPA 8260		Chloroprene (2-Chloro-1,3-butadiene)	NELAP	PA	02/25/2010
EPA 8260		Cyclohexane	NELAP	PA	02/25/2010
EPA 8260		Cyclohexanone	NELAP	PA	02/25/2010
EPA 8260		Dibromochloromethane	NELAP	PA	02/25/2010
EPA 8260		Dibromomethane	NELAP	PA	02/25/2010
EPA 8260		Dichlorodifluoromethane (Freon 12)	NELAP	PA	02/25/2010
EPA 8260		Diethyl ether (Ethyl ether)	NELAP	PA	02/25/2010
EPA 8260		Diisopropyl ether (DIPE)	NELAP	PA	02/25/2010
EPA 8260		Ethanol	NELAP	PA	06/14/2011
EPA 8260		Ethyl acetate	NELAP	PA	02/25/2010

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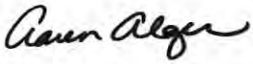
EPA 8260		Ethyl methacrylate	NELAP	PA	02/25/2010
EPA 8260		Ethyl tert-butyl ether (ETBE)	NELAP	PA	02/25/2010
EPA 8260		Ethylbenzene	NELAP	PA	02/25/2010
EPA 8260		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	02/25/2010
EPA 8260		Iodomethane (Methyl iodide)	NELAP	PA	02/25/2010
EPA 8260		Isobutyl alcohol (2-Methyl-1-propanol)	NELAP	PA	02/25/2010
EPA 8260		Isopropylbenzene (Cumene)	NELAP	PA	02/25/2010
EPA 8260		Methacrylonitrile	NELAP	PA	02/25/2010
EPA 8260		Methyl acetate	NELAP	PA	02/25/2010
EPA 8260		Methyl tert-butyl ether (MTBE)	NELAP	PA	02/25/2010
EPA 8260		Methylacrylate	NELAP	PA	02/25/2010
EPA 8260		Methylcyclohexane	NELAP	PA	02/25/2010
EPA 8260		Methylene chloride (Dichloromethane)	NELAP	PA	02/25/2010
EPA 8260		Methylmethacrylate	NELAP	PA	08/12/2015
EPA 8260		Naphthalene	NELAP	PA	02/25/2010
EPA 8260		Propionitrile (Ethyl cyanide)	NELAP	PA	02/25/2010
EPA 8260		Styrene	NELAP	PA	02/25/2010
EPA 8260		Tetrachloroethene (PCE, Perchloroethylene)	NELAP	PA	02/25/2010
EPA 8260		Tetrahydrofuran (THF)	NELAP	PA	02/25/2010
EPA 8260		Toluene	NELAP	PA	02/25/2010
EPA 8260		Trichloroethene (TCE, Trichloroethylene)	NELAP	PA	02/25/2010
EPA 8260		Trichlorofluoromethane (Freon 11)	NELAP	PA	02/25/2010
EPA 8260		Vinyl acetate	NELAP	PA	02/25/2010
EPA 8260		Vinyl chloride (Chloroethene)	NELAP	PA	02/25/2010
EPA 8260		Xylenes, total	NELAP	PA	02/25/2010
EPA 8260		cis-1,2-Dichloroethene	NELAP	PA	02/25/2010
EPA 8260		cis-1,3-Dichloropropene	NELAP	PA	02/25/2010
EPA 8260		m+p-Xylene	NELAP	PA	02/25/2010
EPA 8260		n-Butylbenzene	NELAP	PA	02/25/2010
EPA 8260		n-Hexane	NELAP	PA	02/25/2010
EPA 8260		n-Propylbenzene	NELAP	PA	02/25/2010
EPA 8260		o-Xylene	NELAP	PA	02/25/2010
EPA 8260		p-Isopropyltoluene (4-Isopropyltoluene)	NELAP	PA	02/25/2010
EPA 8260		sec-Butylbenzene	NELAP	PA	02/25/2010
EPA 8260		tert-Amyl ethyl ether (TAEE)	NELAP	PA	02/25/2010
EPA 8260		tert-Amyl methyl ether (TAME)	NELAP	PA	08/11/2011
EPA 8260		tert-Butyl alcohol (2-Methyl-2-propanol)	NELAP	PA	02/25/2010
EPA 8260		tert-Butylbenzene	NELAP	PA	02/25/2010
EPA 8260		trans-1,2-Dichloroethene	NELAP	PA	02/25/2010
EPA 8260		trans-1,3-Dichloropropene	NELAP	PA	02/25/2010
EPA 8260		trans-1,4-Dichloro-2-butene	NELAP	PA	02/25/2010
EPA 8270	D	SOCs by GC/MS	NELAP	PA	09/18/2013



pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 019-001 expiration date 03/31/2020. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Pittsburgh PA
1638 Roseytown Suites 2, 3, & 4
Greensburg, PA 15601
(724) 850-5600

DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 8270		1,1'-Biphenyl (Biphenyl, Lemonene)	NELAP	PA	02/25/2010
EPA 8270		1,2,4,5-Tetrachlorobenzene	NELAP	PA	10/02/2012
EPA 8270		1,2,4-Trichlorobenzene	NELAP	PA	02/25/2010
EPA 8270		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	02/25/2010
EPA 8270		1,2-Diphenylhydrazine	NELAP	PA	02/25/2010
EPA 8270		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	02/25/2010
EPA 8270		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	02/25/2010
EPA 8270		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	02/25/2010
EPA 8270		1-Methylnaphthalene	NELAP	PA	09/18/2013
EPA 8270		2,2'-oxybis(1-Chloropropane)	NELAP	PA	02/25/2010
EPA 8270		2,3,4,6-Tetrachlorophenol	NELAP	PA	10/02/2012
EPA 8270		2,4,5-Trichlorophenol	NELAP	PA	02/25/2010
EPA 8270		2,4,6-Trichlorophenol	NELAP	PA	02/25/2010
EPA 8270		2,4-Dichlorophenol	NELAP	PA	02/25/2010
EPA 8270		2,4-Dimethylphenol	NELAP	PA	02/25/2010
EPA 8270		2,4-Dinitrophenol	NELAP	PA	02/25/2010
EPA 8270		2,4-Dinitrotoluene (2,4-DNT)	NELAP	PA	02/25/2010
EPA 8270		2,6-Dinitrotoluene (2,6-DNT)	NELAP	PA	02/25/2010
EPA 8270		2-Chloronaphthalene	NELAP	PA	02/25/2010
EPA 8270		2-Chlorophenol	NELAP	PA	02/25/2010
EPA 8270		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	NELAP	PA	02/25/2010
EPA 8270		2-Methylnaphthalene	NELAP	PA	02/25/2010
EPA 8270		2-Methylphenol (o-Cresol)	NELAP	PA	02/25/2010
EPA 8270		2-Nitroaniline	NELAP	PA	02/25/2010
EPA 8270		2-Nitrophenol	NELAP	PA	02/25/2010
EPA 8270		3+4-Methylphenol (m+p-Cresol)	NELAP	PA	02/25/2010
EPA 8270		3,3'-Dichlorobenzidine	NELAP	PA	02/25/2010
EPA 8270		3-Nitroaniline	NELAP	PA	02/25/2010
EPA 8270		4-Bromophenyl phenyl ether	NELAP	PA	02/25/2010
EPA 8270		4-Chloro-3-methylphenol	NELAP	PA	02/25/2010
EPA 8270		4-Chloroaniline	NELAP	PA	02/25/2010
EPA 8270		4-Chlorophenyl phenyl ether	NELAP	PA	02/25/2010
EPA 8270		4-Nitroaniline	NELAP	PA	02/25/2010
EPA 8270		4-Nitrophenol	NELAP	PA	02/25/2010
EPA 8270		8-Hydroxyquinoline	NELAP	PA	02/25/2010
EPA 8270		Acenaphthene	NELAP	PA	02/25/2010
EPA 8270		Acenaphthylene	NELAP	PA	02/25/2010
EPA 8270		Acetophenone	NELAP	PA	02/25/2010
EPA 8270		Aniline	NELAP	PA	02/25/2010
EPA 8270		Anthracene	NELAP	PA	02/25/2010
EPA 8270		Atrazine	NELAP	PA	02/25/2010

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

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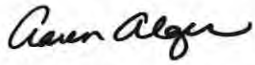
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 8270		Benzaldehyde	NELAP	PA	02/25/2010
EPA 8270		Benzidine	NELAP	PA	02/25/2010
EPA 8270		Benzo[a]anthracene	NELAP	PA	02/25/2010
EPA 8270		Benzo[a]pyrene	NELAP	PA	02/25/2010
EPA 8270		Benzo[b]fluoranthene	NELAP	PA	02/25/2010
EPA 8270		Benzo[ghi]perylene	NELAP	PA	02/25/2010
EPA 8270		Benzo[k]fluoranthene	NELAP	PA	02/25/2010
EPA 8270		Benzoic acid	NELAP	PA	02/25/2010
EPA 8270		Benzyl alcohol	NELAP	PA	02/25/2010
EPA 8270		Benzyl butyl phthalate (Butyl benzyl phthalate)	NELAP	PA	02/25/2010
EPA 8270		Caprolactam	NELAP	PA	02/25/2010
EPA 8270		Carbazole	NELAP	PA	02/25/2010
EPA 8270		Chrysene (Benzo[a]phenanthrene)	NELAP	PA	02/25/2010
EPA 8270		Di-n-butyl phthalate	NELAP	PA	02/25/2010
EPA 8270		Di-n-octyl phthalate	NELAP	PA	02/25/2010
EPA 8270		Dibenzo[a,h]anthracene	NELAP	PA	02/25/2010
EPA 8270		Dibenzofuran	NELAP	PA	02/25/2010
EPA 8270		Diethyl phthalate	NELAP	PA	02/25/2010
EPA 8270		Dimethyl phthalate	NELAP	PA	02/25/2010
EPA 8270		Fluoranthene	NELAP	PA	02/25/2010
EPA 8270		Fluorene	NELAP	PA	02/25/2010
EPA 8270		Hexachlorobenzene	NELAP	PA	02/25/2010
EPA 8270		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	02/25/2010
EPA 8270		Hexachlorocyclopentadiene	NELAP	PA	02/25/2010
EPA 8270		Hexachloroethane	NELAP	PA	02/25/2010
EPA 8270		Indeno(1,2,3-cd)pyrene	NELAP	PA	02/25/2010
EPA 8270		Isophorone	NELAP	PA	02/25/2010
EPA 8270		N-Nitrosodi-n-propylamine	NELAP	PA	02/25/2010
EPA 8270		N-Nitrosodimethylamine	NELAP	PA	02/25/2010
EPA 8270		N-Nitrosodiphenylamine	NELAP	PA	02/25/2010
EPA 8270		Naphthalene	NELAP	PA	02/25/2010
EPA 8270		Nitrobenzene	NELAP	PA	02/25/2010
EPA 8270		Pentachlorophenol (PCP)	NELAP	PA	02/25/2010
EPA 8270		Phenanthrene	NELAP	PA	02/25/2010
EPA 8270		Phenol	NELAP	PA	02/25/2010
EPA 8270		Pyrene	NELAP	PA	02/25/2010
EPA 8270		Pyridine	NELAP	PA	02/25/2010
EPA 8270		Tributyl phosphate	NELAP	PA	02/25/2010
EPA 8270		bis(2-Chloroethoxy)methane	NELAP	PA	02/25/2010
EPA 8270		bis(2-Chloroethyl) ether	NELAP	PA	02/25/2010
EPA 8270		bis(2-Ethylhexyl) phthalate (DEHP)	NELAP	PA	02/25/2010
EPA 900.0		Gross alpha	NELAP	PA	05/27/2008



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DEP Laboratory ID: 65-00282
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TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 900.0		Gross beta	NELAP	PA	05/27/2008
EPA 901.1		Gamma emitters	NELAP	PA	08/12/2008
EPA 9010	C	Amenable cyanide	NELAP	PA	08/31/2006
EPA 9010	C	Total cyanide	NELAP	PA	08/31/2006
EPA 9012	A	Total cyanide	NELAP	PA	02/22/2013
EPA 9012	B	Total cyanide	NELAP	PA	08/31/2006
EPA 9014		Total cyanide	NELAP	PA	03/25/2014
EPA 903.0		Total alpha radium	NELAP	PA	03/31/2017
EPA 903.1		Radium-226	NELAP	PA	05/27/2008
EPA 9038		Sulfate	NELAP	PA	05/06/2009
EPA 904.0		Radium-228	NELAP	PA	08/12/2008
EPA 9040	B	pH	NELAP	PA	03/29/2005
EPA 9040	C	pH	NELAP	PA	02/22/2013
EPA 905.0		Strontium-90	NELAP	PA	08/12/2008
EPA 9050	A	Conductivity	NELAP	PA	04/21/2014
EPA 906.0		Tritium	NELAP	PA	08/12/2008
EPA 9060	A	Total organic carbon (TOC)	NELAP	PA	09/18/2013
EPA 9060		Total organic carbon (TOC)	NELAP	PA	02/03/2009
EPA 9065		Total phenolics	NELAP	PA	05/06/2009
EPA 9251		Chloride	NELAP	PA	05/06/2009
EPA 9310		Gross alpha	NELAP	PA	05/27/2008
EPA 9310		Gross beta	NELAP	PA	05/27/2008
EPA 9315		Radium-226	NELAP	PA	05/30/2013
EPA 9315		Total radium	NELAP	PA	05/27/2008
EPA 9320		Radium-228	NELAP	PA	05/27/2008
SM 2120 B		Color	NELAP	PA	04/10/2007
SM 2310 B		Acidity as CaCO3	NELAP	PA	04/21/2014
SM 2320 B		Alkalinity as CaCO3	NELAP	PA	01/04/2007
SM 2540 B		Residue, total	NELAP	PA	04/10/2007
SM 2540 C		Residue, filterable (TDS)	NELAP	PA	04/10/2007
SM 2540 D		Residue, nonfilterable (TSS)	NELAP	PA	04/10/2007
SM 2540 F		Residue, settleable	NELAP	PA	04/10/2007
SM 2550 B		Temperature, deg. C	NELAP	PA	04/10/2007
SM 3500-Cr B	20-22	Chromium VI	NELAP	PA	09/18/2013
SM 3500-Fe B	20/21	Ferrous iron	NELAP	PA	01/09/2012
SM 3500-Fe D	18/19	Ferrous iron	NELAP	PA	01/09/2012
SM 4500-CN- C/E		Total cyanide	NELAP	PA	04/10/2007
SM 4500-CN- G		Amenable cyanide	NELAP	PA	04/10/2007
SM 4500-CN- I		Weak acid dissociable cyanide	NELAP	PA	05/06/2009
SM 4500-CN- M		Thiocyanate	NELAP	PA	05/06/2009
SM 4500-Cl G		Total residual chlorine	NELAP	PA	04/10/2007
SM 4500-Cl- E		Chloride	NELAP	PA	05/06/2009

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PADWIS ID: 65282

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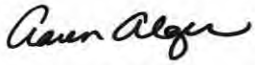
Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
SM 4500-F- C		Fluoride	NELAP	PA	05/06/2009
SM 4500-H+ B		pH	NELAP	PA	04/10/2007
SM 4500-NO2- B		Nitrite as N	NELAP	PA	06/30/2011
SM 4500-NO3- F		Nitrate as N	NELAP	PA	05/06/2009
SM 4500-NO3- F		Total nitrate-nitrite	NELAP	PA	04/13/2017
SM 4500-O G		Oxygen (dissolved)	NELAP	PA	04/10/2007
SM 4500-P B		Preliminary treatment of phosphate samples	NELAP	PA	05/06/2009
SM 4500-P E		Orthophosphate as P	NELAP	PA	05/06/2009
SM 4500-P E		Phosphorus, total	NELAP	PA	05/06/2009
SM 4500-S F		Sulfide	NELAP	PA	04/10/2007
SM 4500-SO3 B		Sulfite, SO3	NELAP	PA	04/10/2007
SM 5210 B		Biochemical oxygen demand (BOD)	NELAP	PA	05/06/2009
SM 5210 B		Carbonaceous BOD (CBOD)	NELAP	PA	05/06/2009
SM 5310 C		Total organic carbon (TOC)	NELAP	PA	04/25/2008
SM 5540 C		Surfactants as MBAS	NELAP	PA	05/06/2009
SM 7110 C-00		Gross alpha	NELAP	PA	05/27/2008
SOP (00282) PGH-I-065-0		Fluoroborate	NELAP	PA	10/01/2014

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
ASTM D3987-85		Water leach	NELAP	PA	10/18/2013
ASTM D93-13		Flashpoint	NELAP	PA	04/21/2014
DOE 4.5.2.3		Gamma emitters	NELAP	PA	09/18/2013
EPA 1010	A	Ignitability	NELAP	PA	04/21/2014
EPA 1010		Ignitability	NELAP	PA	03/29/2005
EPA 1311		Toxicity characteristic leaching procedure (TCLP)	NELAP	PA	03/29/2005
EPA 1312		Synthetic precipitation leaching procedure (SPLP)	NELAP	PA	03/29/2005
EPA 160.4		Residue, volatile	NELAP	PA	05/30/2013
EPA 1664	A	Non-polar material	NELAP	PA	03/31/2017
EPA 3050	B	Acid digestion of solids	NELAP	PA	03/29/2005
EPA 3060	A	Alkaline digestion of Cr(VI)	NELAP	PA	02/22/2013
EPA 3060		Alkaline digestion of Cr(VI)	NELAP	PA	05/06/2009
EPA 350.1		Ammonia as N	NELAP	PA	08/01/2013
EPA 351.2		Kjeldahl nitrogen, total (TKN)	NELAP	PA	09/18/2013
EPA 3546		Microwave extraction	NELAP	PA	04/20/2009
EPA 3580	A	Waste dilution	NELAP	PA	03/29/2005
EPA 3660	B	Sulfur cleanup	NELAP	PA	03/29/2005
EPA 3665	A	Sulfuric acid/permanganate clean-up	NELAP	PA	03/29/2005
EPA 5035	A	Closed-system purge-and-trap (bisulfate option)	NELAP	PA	10/29/2009
EPA 5035	A	Closed-system purge-and-trap (methanol option)	NELAP	PA	10/29/2009



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EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 5035	A	Closed-system purge-and-trap (unpreserved)	NELAP	PA	10/29/2009
EPA 6010	B	Metals by ICP/AES	NELAP	PA	02/25/2010
EPA 6010	C	Metals by ICP/AES	NELAP	PA	09/18/2013
EPA 6010		Aluminum	NELAP	PA	02/25/2010
EPA 6010		Antimony	NELAP	PA	02/25/2010
EPA 6010		Arsenic	NELAP	PA	02/25/2010
EPA 6010		Barium	NELAP	PA	02/25/2010
EPA 6010		Beryllium	NELAP	PA	02/25/2010
EPA 6010		Boron	NELAP	PA	02/25/2010
EPA 6010		Cadmium	NELAP	PA	02/25/2010
EPA 6010		Calcium	NELAP	PA	02/25/2010
EPA 6010		Chromium	NELAP	PA	02/25/2010
EPA 6010		Cobalt	NELAP	PA	02/25/2010
EPA 6010		Copper	NELAP	PA	02/25/2010
EPA 6010		Iron	NELAP	PA	02/25/2010
EPA 6010		Lead	NELAP	PA	02/25/2010
EPA 6010		Lithium	NELAP	PA	02/25/2010
EPA 6010		Magnesium	NELAP	PA	02/25/2010
EPA 6010		Manganese	NELAP	PA	02/25/2010
EPA 6010		Molybdenum	NELAP	PA	02/25/2010
EPA 6010		Nickel	NELAP	PA	02/25/2010
EPA 6010		Phosphorus, total	NELAP	PA	02/25/2010
EPA 6010		Potassium	NELAP	PA	02/25/2010
EPA 6010		Selenium	NELAP	PA	02/25/2010
EPA 6010		Silica, as SiO2	NELAP	PA	02/25/2010
EPA 6010		Silicon	NELAP	PA	03/25/2014
EPA 6010		Silver	NELAP	PA	02/25/2010
EPA 6010		Sodium	NELAP	PA	02/25/2010
EPA 6010		Strontium	NELAP	PA	02/25/2010
EPA 6010		Thallium	NELAP	PA	02/25/2010
EPA 6010		Tin	NELAP	PA	02/25/2010
EPA 6010		Titanium	NELAP	PA	02/25/2010
EPA 6010		Vanadium	NELAP	PA	02/25/2010
EPA 6010		Zinc	NELAP	PA	02/25/2010
EPA 6010		Zirconium	NELAP	PA	02/25/2010
EPA 7.3.3.2		Reactive cyanide	NELAP	PA	03/29/2005
EPA 7.3.4.2		Reactive sulfide	NELAP	PA	03/29/2005
EPA 7196	A	Chromium VI	NELAP	PA	05/06/2009
EPA 7470	A	Mercury	NELAP	PA	03/29/2005
EPA 7471	A	Mercury	NELAP	PA	03/29/2005
EPA 7471	B	Mercury	NELAP	PA	09/18/2013
EPA 8015	B	Nonhalogenated organics by GC/FID	NELAP	PA	02/25/2010

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Matrix: Solid and Chemical Materials

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EPA 8015	D	Nonhalogenated organics by GC/FID	NELAP	PA	09/18/2013
EPA 8015		Diesel-range organics (DRO)	NELAP	PA	02/25/2010
EPA 8015		Gasoline-range organics (GRO)	NELAP	PA	02/25/2010
EPA 8081	B	Organochlorine pesticides by GC/ECD	NELAP	PA	09/18/2013
EPA 8081		4,4'-DDD	NELAP	PA	02/25/2010
EPA 8081		4,4'-DDE	NELAP	PA	02/25/2010
EPA 8081		4,4'-DDT	NELAP	PA	02/25/2010
EPA 8081		Aldrin (HHDN)	NELAP	PA	02/25/2010
EPA 8081		Chlordane (tech.)	NELAP	PA	02/25/2010
EPA 8081		Dieldrin	NELAP	PA	02/25/2010
EPA 8081		Endosulfan I	NELAP	PA	02/25/2010
EPA 8081		Endosulfan II	NELAP	PA	02/25/2010
EPA 8081		Endosulfan sulfate	NELAP	PA	02/25/2010
EPA 8081		Endrin	NELAP	PA	02/25/2010
EPA 8081		Endrin aldehyde	NELAP	PA	02/25/2010
EPA 8081		Endrin ketone	NELAP	PA	02/25/2010
EPA 8081		Heptachlor	NELAP	PA	02/25/2010
EPA 8081		Heptachlor epoxide	NELAP	PA	02/25/2010
EPA 8081		Methoxychlor	NELAP	PA	02/25/2010
EPA 8081		Toxaphene (Chlorinated camphene)	NELAP	PA	02/25/2010
EPA 8081		alpha-BHC (alpha-Hexachlorocyclohexane)	NELAP	PA	02/25/2010
EPA 8081		alpha-Chlordane	NELAP	PA	02/25/2010
EPA 8081		beta-BHC (beta-Hexachlorocyclohexane)	NELAP	PA	02/25/2010
EPA 8081		delta-BHC (delta-Hexachlorocyclohexane)	NELAP	PA	02/25/2010
EPA 8081		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	PA	02/25/2010
EPA 8081		gamma-Chlordane	NELAP	PA	02/25/2010
EPA 8082	A	PCBs by GC/ECD	NELAP	PA	09/18/2013
EPA 8082		Aroclor-1016 (PCB-1016)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1221 (PCB-1221)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1232 (PCB-1232)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1242 (PCB-1242)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1248 (PCB-1248)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1254 (PCB-1254)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1260 (PCB-1260)	NELAP	PA	03/29/2005
EPA 8082		Aroclor-1262 (PCB-1262)	NELAP	PA	02/09/2007
EPA 8082		Aroclor-1268 (PCB-1268)	NELAP	PA	02/09/2007
EPA 8260	B	VOCs by GC/MS	NELAP	PA	02/25/2010
EPA 8260	C	VOCs by GC/MS	NELAP	PA	09/18/2013
EPA 8260		1,1,1,2-Tetrachloroethane	NELAP	PA	02/25/2010
EPA 8260		1,1,1-Trichloroethane	NELAP	PA	02/25/2010
EPA 8260		1,1,2,2-Tetrachloroethane	NELAP	PA	02/25/2010

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Pace Analytical Services LLC - Pittsburgh PA
1638 Roseytown Suites 2, 3, & 4
Greensburg, PA 15601
(724) 850-5600

DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 8260		1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	NELAP	PA	02/25/2010
EPA 8260		1,1,2-Trichloroethane	NELAP	PA	02/25/2010
EPA 8260		1,1-Dichloroethane	NELAP	PA	02/25/2010
EPA 8260		1,1-Dichloroethene (1,1-Dichloroethylene)	NELAP	PA	02/25/2010
EPA 8260		1,1-Dichloropropene	NELAP	PA	02/25/2010
EPA 8260		1,2,3-Trichlorobenzene	NELAP	PA	02/25/2010
EPA 8260		1,2,3-Trichloropropane (1,2,3-TCP)	NELAP	PA	02/25/2010
EPA 8260		1,2,4-Trichlorobenzene	NELAP	PA	02/25/2010
EPA 8260		1,2,4-Trimethylbenzene	NELAP	PA	02/25/2010
EPA 8260		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	PA	02/25/2010
EPA 8260		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	PA	02/25/2010
EPA 8260		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	02/25/2010
EPA 8260		1,2-Dichloroethane	NELAP	PA	02/25/2010
EPA 8260		1,2-Dichloropropane	NELAP	PA	02/25/2010
EPA 8260		1,3,5-Trimethylbenzene	NELAP	PA	02/25/2010
EPA 8260		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	02/25/2010
EPA 8260		1,3-Dichloropropane	NELAP	PA	05/30/2013
EPA 8260		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	02/25/2010
EPA 8260		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	02/25/2010
EPA 8260		2,2-Dichloropropane	NELAP	PA	02/25/2010
EPA 8260		2-Butanone (Methyl ethyl ketone, MEK)	NELAP	PA	02/25/2010
EPA 8260		2-Chloroethyl vinyl ether	NELAP	PA	02/25/2010
EPA 8260		2-Chlorotoluene	NELAP	PA	02/25/2010
EPA 8260		2-Hexanone	NELAP	PA	02/25/2010
EPA 8260		2-Methylnaphthalene	NELAP	PA	05/30/2013
EPA 8260		2-Nitropropane	NELAP	PA	05/30/2013
EPA 8260		4-Chlorotoluene	NELAP	PA	02/25/2010
EPA 8260		4-Methyl-2-pentanone (MIBK)	NELAP	PA	02/25/2010
EPA 8260		Acetone	NELAP	PA	02/25/2010
EPA 8260		Acetonitrile	NELAP	PA	05/30/2013
EPA 8260		Acrolein (Propenal)	NELAP	PA	02/25/2010
EPA 8260		Acrylonitrile	NELAP	PA	02/25/2010
EPA 8260		Allyl chloride (3-Chloropropene)	NELAP	PA	05/30/2013
EPA 8260		Benzene	NELAP	PA	02/25/2010
EPA 8260		Bromobenzene	NELAP	PA	02/25/2010
EPA 8260		Bromochloromethane	NELAP	PA	02/25/2010
EPA 8260		Bromodichloromethane	NELAP	PA	02/25/2010
EPA 8260		Bromoform	NELAP	PA	02/25/2010
EPA 8260		Bromomethane (Methyl bromide)	NELAP	PA	02/25/2010
EPA 8260		Carbon disulfide	NELAP	PA	02/25/2010
EPA 8260		Carbon tetrachloride	NELAP	PA	02/25/2010

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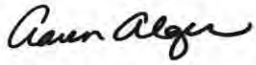
Pace Analytical Services LLC - Pittsburgh PA
1638 Roseytown Suites 2, 3, & 4
Greensburg, PA 15601
(724) 850-5600

DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 8260		Chlorobenzene	NELAP	PA	02/25/2010
EPA 8260		Chloroethane	NELAP	PA	02/25/2010
EPA 8260		Chloroform	NELAP	PA	02/25/2010
EPA 8260		Chloromethane (Methyl chloride)	NELAP	PA	02/25/2010
EPA 8260		Chloroprene (2-Chloro-1,3-butadiene)	NELAP	PA	05/30/2013
EPA 8260		Cyclohexane	NELAP	PA	02/25/2010
EPA 8260		Cyclohexanone	NELAP	PA	05/30/2013
EPA 8260		Dibromochloromethane	NELAP	PA	02/25/2010
EPA 8260		Dibromomethane	NELAP	PA	02/25/2010
EPA 8260		Dichlorodifluoromethane (Freon 12)	NELAP	PA	02/25/2010
EPA 8260		Diethyl ether (Ethyl ether)	NELAP	PA	05/30/2013
EPA 8260		Diisopropyl ether (DIPE)	NELAP	PA	02/25/2010
EPA 8260		Ethanol	NELAP	PA	05/30/2013
EPA 8260		Ethyl acetate	NELAP	PA	05/30/2013
EPA 8260		Ethyl methacrylate	NELAP	PA	05/30/2013
EPA 8260		Ethyl tert-butyl ether (ETBE)	NELAP	PA	02/25/2010
EPA 8260		Ethylbenzene	NELAP	PA	02/25/2010
EPA 8260		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	02/25/2010
EPA 8260		Iodomethane (Methyl iodide)	NELAP	PA	05/30/2013
EPA 8260		Isobutyl alcohol (2-Methyl-1-propanol)	NELAP	PA	05/30/2013
EPA 8260		Isopropylbenzene (Cumene)	NELAP	PA	02/25/2010
EPA 8260		Methacrylonitrile	NELAP	PA	05/30/2013
EPA 8260		Methyl acetate	NELAP	PA	02/25/2010
EPA 8260		Methyl tert-butyl ether (MTBE)	NELAP	PA	02/25/2010
EPA 8260		Methylcyclohexane	NELAP	PA	02/25/2010
EPA 8260		Methylene chloride (Dichloromethane)	NELAP	PA	02/25/2010
EPA 8260		Methylmethacrylate	NELAP	PA	08/12/2015
EPA 8260		Naphthalene	NELAP	PA	02/25/2010
EPA 8260		Propionitrile (Ethyl cyanide)	NELAP	PA	05/30/2013
EPA 8260		Styrene	NELAP	PA	02/25/2010
EPA 8260		Tetrachloroethene (PCE, Perchloroethylene)	NELAP	PA	02/25/2010
EPA 8260		Tetrahydrofuran (THF)	NELAP	PA	05/30/2013
EPA 8260		Toluene	NELAP	PA	02/25/2010
EPA 8260		Trichloroethene (TCE, Trichloroethylene)	NELAP	PA	02/25/2010
EPA 8260		Trichlorofluoromethane (Freon 11)	NELAP	PA	02/25/2010
EPA 8260		Vinyl acetate	NELAP	PA	02/25/2010
EPA 8260		Vinyl chloride (Chloroethene)	NELAP	PA	02/25/2010
EPA 8260		Xylenes, total	NELAP	PA	02/25/2010
EPA 8260		cis-1,2-Dichloroethene	NELAP	PA	02/25/2010
EPA 8260		cis-1,3-Dichloropropene	NELAP	PA	02/25/2010
EPA 8260		m+p-Xylene	NELAP	PA	02/25/2010
EPA 8260		n-Butylbenzene	NELAP	PA	02/25/2010



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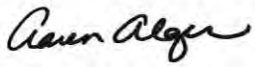
Pace Analytical Services LLC - Pittsburgh PA
1638 Roseytown Suites 2, 3, & 4
Greensburg, PA 15601
(724) 850-5600

DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 8260		n-Hexane	NELAP	PA	02/25/2010
EPA 8260		n-Propylbenzene	NELAP	PA	02/25/2010
EPA 8260		o-Xylene	NELAP	PA	02/25/2010
EPA 8260		p-Isopropyltoluene (4-Isopropyltoluene)	NELAP	PA	02/25/2010
EPA 8260		sec-Butylbenzene	NELAP	PA	02/25/2010
EPA 8260		tert-Amyl methyl ether (TAME)	NELAP	PA	02/25/2010
EPA 8260		tert-Butyl alcohol (2-Methyl-2-propanol)	NELAP	PA	02/25/2010
EPA 8260		tert-Butylbenzene	NELAP	PA	02/25/2010
EPA 8260		trans-1,2-Dichloroethene	NELAP	PA	02/25/2010
EPA 8260		trans-1,3-Dichloropropene	NELAP	PA	02/25/2010
EPA 8260		trans-1,4-Dichloro-2-butene	NELAP	PA	05/30/2013
EPA 8270	D	SOCs by GC/MS	NELAP	PA	09/18/2013
EPA 8270		1,1'-Biphenyl (Biphenyl, Lemonene)	NELAP	PA	03/30/2015
EPA 8270		1,2,4,5-Tetrachlorobenzene	NELAP	PA	10/02/2012
EPA 8270		1,2,4-Trichlorobenzene	NELAP	PA	02/25/2010
EPA 8270		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	02/25/2010
EPA 8270		1,2-Diphenylhydrazine	NELAP	PA	02/25/2010
EPA 8270		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	02/25/2010
EPA 8270		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	02/25/2010
EPA 8270		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	02/25/2010
EPA 8270		1-Methylnaphthalene	NELAP	PA	09/18/2013
EPA 8270		2,2'-oxybis(1-Chloropropane)	NELAP	PA	02/25/2010
EPA 8270		2,3,4,6-Tetrachlorophenol	NELAP	PA	10/02/2012
EPA 8270		2,4,5-Trichlorophenol	NELAP	PA	02/25/2010
EPA 8270		2,4,6-Trichlorophenol	NELAP	PA	02/25/2010
EPA 8270		2,4-Dichlorophenol	NELAP	PA	02/25/2010
EPA 8270		2,4-Dimethylphenol	NELAP	PA	02/25/2010
EPA 8270		2,4-Dinitrophenol	NELAP	PA	02/25/2010
EPA 8270		2,4-Dinitrotoluene (2,4-DNT)	NELAP	PA	02/25/2010
EPA 8270		2,6-Dinitrotoluene (2,6-DNT)	NELAP	PA	02/25/2010
EPA 8270		2-Chloronaphthalene	NELAP	PA	02/25/2010
EPA 8270		2-Chlorophenol	NELAP	PA	02/25/2010
EPA 8270		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	NELAP	PA	02/25/2010
EPA 8270		2-Methylnaphthalene	NELAP	PA	02/25/2010
EPA 8270		2-Methylphenol (o-Cresol)	NELAP	PA	02/25/2010
EPA 8270		2-Nitroaniline	NELAP	PA	02/25/2010
EPA 8270		2-Nitrophenol	NELAP	PA	02/25/2010
EPA 8270		3+4-Methylphenol (m+p-Cresol)	NELAP	PA	02/25/2010
EPA 8270		3,3'-Dichlorobenzidine	NELAP	PA	02/25/2010
EPA 8270		3-Nitroaniline	NELAP	PA	02/25/2010
EPA 8270		4-Bromophenyl phenyl ether	NELAP	PA	02/25/2010



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Pace Analytical Services LLC - Pittsburgh PA
1638 Roseytown Suites 2, 3, & 4
Greensburg, PA 15601
(724) 850-5600

DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 8270		4-Chloro-3-methylphenol	NELAP	PA	02/25/2010
EPA 8270		4-Chloroaniline	NELAP	PA	02/25/2010
EPA 8270		4-Chlorophenyl phenyl ether	NELAP	PA	02/25/2010
EPA 8270		4-Nitroaniline	NELAP	PA	02/25/2010
EPA 8270		4-Nitrophenol	NELAP	PA	02/25/2010
EPA 8270		Acenaphthene	NELAP	PA	02/25/2010
EPA 8270		Acenaphthylene	NELAP	PA	02/25/2010
EPA 8270		Acetophenone	NELAP	PA	02/25/2010
EPA 8270		Aniline	NELAP	PA	02/25/2010
EPA 8270		Anthracene	NELAP	PA	02/25/2010
EPA 8270		Atrazine	NELAP	PA	03/30/2015
EPA 8270		Benzaldehyde	NELAP	PA	03/30/2015
EPA 8270		Benzidine	NELAP	PA	02/25/2010
EPA 8270		Benzo[a]anthracene	NELAP	PA	02/25/2010
EPA 8270		Benzo[a]pyrene	NELAP	PA	02/25/2010
EPA 8270		Benzo[b]fluoranthene	NELAP	PA	02/25/2010
EPA 8270		Benzo[ghi]perylene	NELAP	PA	02/25/2010
EPA 8270		Benzo[k]fluoranthene	NELAP	PA	02/25/2010
EPA 8270		Benzoic acid	NELAP	PA	02/25/2010
EPA 8270		Benzyl alcohol	NELAP	PA	02/25/2010
EPA 8270		Benzyl butyl phthalate (Butyl benzyl phthalate)	NELAP	PA	02/25/2010
EPA 8270		Caprolactam	NELAP	PA	03/30/2015
EPA 8270		Carbazole	NELAP	PA	02/25/2010
EPA 8270		Chrysene (Benzo[a]phenanthrene)	NELAP	PA	02/25/2010
EPA 8270		Di-n-butyl phthalate	NELAP	PA	02/25/2010
EPA 8270		Di-n-octyl phthalate	NELAP	PA	02/25/2010
EPA 8270		Dibenzo[a,h]anthracene	NELAP	PA	02/25/2010
EPA 8270		Dibenzofuran	NELAP	PA	02/25/2010
EPA 8270		Diethyl phthalate	NELAP	PA	02/25/2010
EPA 8270		Dimethyl phthalate	NELAP	PA	02/25/2010
EPA 8270		Fluoranthene	NELAP	PA	02/25/2010
EPA 8270		Fluorene	NELAP	PA	02/25/2010
EPA 8270		Hexachlorobenzene	NELAP	PA	02/25/2010
EPA 8270		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	02/25/2010
EPA 8270		Hexachlorocyclopentadiene	NELAP	PA	02/25/2010
EPA 8270		Hexachloroethane	NELAP	PA	02/25/2010
EPA 8270		Indeno(1,2,3-cd)pyrene	NELAP	PA	02/25/2010
EPA 8270		Isophorone	NELAP	PA	02/25/2010
EPA 8270		N-Nitrosodi-n-propylamine	NELAP	PA	02/25/2010
EPA 8270		N-Nitrosodimethylamine	NELAP	PA	02/25/2010
EPA 8270		N-Nitrosodiphenylamine	NELAP	PA	02/25/2010
EPA 8270		Naphthalene	NELAP	PA	02/25/2010

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Greensburg, PA 15601
(724) 850-5600

DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary State	Effective Date
EPA 8270		Nitrobenzene	NELAP	PA	02/25/2010
EPA 8270		Pentachlorophenol (PCP)	NELAP	PA	02/25/2010
EPA 8270		Phenanthrene	NELAP	PA	02/25/2010
EPA 8270		Phenol	NELAP	PA	02/25/2010
EPA 8270		Pyrene	NELAP	PA	02/25/2010
EPA 8270		Pyridine	NELAP	PA	02/25/2010
EPA 8270		bis(2-Chloroethoxy)methane	NELAP	PA	02/25/2010
EPA 8270		bis(2-Chloroethyl) ether	NELAP	PA	02/25/2010
EPA 8270		bis(2-Ethylhexyl) phthalate (DEHP)	NELAP	PA	02/25/2010
EPA 901.1		Gamma emitters	NELAP	PA	08/12/2008
EPA 9010	C	Total cyanide	NELAP	PA	02/22/2013
EPA 9012	A	Total cyanide	NELAP	PA	02/05/2007
EPA 9012	B	Total cyanide	NELAP	PA	02/22/2013
EPA 9013		Cyanide extraction for solids and oils	NELAP	PA	04/22/2008
EPA 9014		Total cyanide	NELAP	PA	04/22/2008
EPA 9038		Sulfate	NELAP	PA	04/15/2009
EPA 9040	B	pH	NELAP	PA	06/22/2006
EPA 9040	C	pH	NELAP	PA	02/22/2013
EPA 9045	C	pH	NELAP	PA	03/29/2005
EPA 9045	D	pH	NELAP	PA	02/22/2013
EPA 905.0 (Modified)		Strontium-90	NELAP	PA	08/12/2008
EPA 906.0 (Modified)		Tritium	NELAP	PA	08/12/2008
EPA 9065		Total phenolics	NELAP	PA	05/06/2009
EPA 9071	B	Oil and grease	NELAP	PA	05/07/2010
EPA 9071	B	Total petroleum hydrocarbons (TPH)	NELAP	PA	05/07/2010
EPA 9095	A	Paint filter liquids test	NELAP	PA	03/29/2005
EPA 9095	B	Paint filter liquids test	NELAP	PA	02/22/2013
EPA 9251		Chloride	NELAP	PA	10/30/2015
EPA 9310		Gross alpha	NELAP	PA	05/27/2008
EPA 9310		Gross beta	NELAP	PA	05/27/2008
EPA 9315		Total radium	NELAP	PA	05/27/2008
EPA 9320		Radium-228	NELAP	PA	05/27/2008
SM 4500-P B		Preliminary treatment of phosphate samples	NELAP	PA	09/11/2009
SM 4500-P E		Phosphorus, total	NELAP	PA	09/11/2009

Laboratory Status Summary

Pace Analytical Services LLC - Pittsburgh PA
1638 Roseytown Suites 2, 3, & 4
Greensburg, PA 15601
(724) 850-5600

DEP Laboratory ID: 65-00282
EPA Lab Code: PA01457
TNI Code: TNI02141
PADWIS ID: 65282

Matrix: Non-Potable Water

Method	Revision	Analyte	Status	Effective Date
EPA 6010	D	Metals by ICP/AES	Applied	02/14/2018
EPA 608.3		Endrin ketone	Applied	02/14/2018
EPA 624.1		1,1,1,2-Tetrachloroethane	Applied	02/14/2018
EPA 624.1		1,1,1-Trichloroethane	Applied	02/14/2018
EPA 624.1		1,1,2,2-Tetrachloroethane	Applied	02/14/2018
EPA 624.1		1,1,2-Trichloroethane	Applied	02/14/2018
EPA 624.1		1,1-Dichloroethane	Applied	02/14/2018
EPA 624.1		1,1-Dichloroethene (1,1-Dichloroethylene)	Applied	02/14/2018
EPA 624.1		1,1-Dichloropropene	Applied	02/14/2018
EPA 624.1		1,2,3-Trichlorobenzene	Applied	02/14/2018
EPA 624.1		1,2,3-Trichloropropane (1,2,3-TCP)	Applied	02/14/2018
EPA 624.1		1,2,4-Trichlorobenzene	Applied	02/14/2018
EPA 624.1		1,2,4-Trimethylbenzene	Applied	02/14/2018
EPA 624.1		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	Applied	02/14/2018
EPA 624.1		1,2-Dibromoethane (EDB, Ethylene dibromide)	Applied	02/14/2018
EPA 624.1		1,2-Dichlorobenzene (o-Dichlorobenzene)	Applied	02/14/2018
EPA 624.1		1,2-Dichloroethane	Applied	02/14/2018
EPA 624.1		1,2-Dichloropropane	Applied	02/14/2018
EPA 624.1		1,3,5-Trimethylbenzene	Applied	02/14/2018
EPA 624.1		1,3-Dichlorobenzene (m-Dichlorobenzene)	Applied	02/14/2018
EPA 624.1		1,3-Dichloropropane	Applied	02/14/2018
EPA 624.1		1,4-Dichlorobenzene (p-Dichlorobenzene)	Applied	02/14/2018
EPA 624.1		1,4-Dioxane (1,4-Diethyleneoxide)	Applied	02/14/2018
EPA 624.1		2,2-Dichloropropane	Applied	02/14/2018
EPA 624.1		2-Butanone (Methyl ethyl ketone, MEK)	Applied	02/14/2018
EPA 624.1		2-Chloroethyl vinyl ether	Applied	02/14/2018
EPA 624.1		2-Chlorotoluene	Applied	02/14/2018
EPA 624.1		2-Hexanone	Applied	02/14/2018
EPA 624.1		2-Methylnaphthalene	Applied	02/14/2018
EPA 624.1		2-Nitropropane	Applied	02/14/2018
EPA 624.1		4-Chlorotoluene	Applied	02/14/2018
EPA 624.1		4-Methyl-2-pentanone (MIBK)	Applied	02/14/2018
EPA 624.1		Acetone	Applied	02/14/2018
EPA 624.1		Acetonitrile	Applied	02/14/2018
EPA 624.1		Acrolein (Propenal)	Applied	02/14/2018
EPA 624.1		Acrylonitrile	Applied	02/14/2018
EPA 624.1		Allyl chloride (3-Chloropropene)	Applied	02/14/2018
EPA 624.1		Benzene	Applied	02/14/2018
EPA 624.1		Bromobenzene	Applied	02/14/2018
EPA 624.1		Bromochloromethane	Applied	02/14/2018
EPA 624.1		Bromodichloromethane	Applied	02/14/2018
EPA 624.1		Bromoform	Applied	02/14/2018
EPA 624.1		Bromomethane (Methyl bromide)	Applied	02/14/2018
EPA 624.1		Carbon disulfide	Applied	02/14/2018
EPA 624.1		Carbon tetrachloride	Applied	02/14/2018
EPA 624.1		Chlorobenzene	Applied	02/14/2018
EPA 624.1		Chloroethane	Applied	02/14/2018
EPA 624.1		Chloroform	Applied	02/14/2018
EPA 624.1		Chloromethane (Methyl chloride)	Applied	02/14/2018
EPA 624.1		Chloroprene (2-Chloro-1,3-butadiene)	Applied	02/14/2018
EPA 624.1		Cyclohexane	Applied	02/14/2018
EPA 624.1		Cyclohexanone	Applied	02/14/2018
EPA 624.1		Dibromochloromethane	Applied	02/14/2018

EPA 624.1	Dibromomethane	Applied	02/14/2018
EPA 624.1	Dichlorodifluoromethane (Freon 12)	Applied	02/14/2018
EPA 624.1	Diethyl ether (Ethyl ether)	Applied	02/14/2018
EPA 624.1	Diisopropyl ether (DIPE)	Applied	02/14/2018
EPA 624.1	Ethanol	Applied	02/14/2018
EPA 624.1	Ethyl acetate	Applied	02/14/2018
EPA 624.1	Ethyl methacrylate	Applied	02/14/2018
EPA 624.1	Ethylbenzene	Applied	02/14/2018
EPA 624.1	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	Applied	02/14/2018
EPA 624.1	Iodomethane (Methyl iodide)	Applied	02/14/2018
EPA 624.1	Isobutyl alcohol (2-Methyl-1-propanol)	Applied	02/14/2018
EPA 624.1	Isopropylbenzene (Cumene)	Applied	02/14/2018
EPA 624.1	Methacrylonitrile	Applied	02/14/2018
EPA 624.1	Methyl acetate	Applied	02/14/2018
EPA 624.1	Methyl tert-butyl ether (MTBE)	Applied	02/14/2018
EPA 624.1	Methylcyclohexane	Applied	02/14/2018
EPA 624.1	Methylene chloride (Dichloromethane)	Applied	02/14/2018
EPA 624.1	Methylmethacrylate	Applied	02/14/2018
EPA 624.1	Naphthalene	Applied	02/14/2018
EPA 624.1	Propionitrile (Ethyl cyanide)	Applied	02/14/2018
EPA 624.1	Styrene	Applied	02/14/2018
EPA 624.1	Tetrachloroethene (PCE, Perchloroethylene)	Applied	02/14/2018
EPA 624.1	Tetrahydrofuran (THF)	Applied	02/14/2018
EPA 624.1	Toluene	Applied	02/14/2018
EPA 624.1	Trichloroethene (TCE, Trichloroethylene)	Applied	02/14/2018
EPA 624.1	Trichlorofluoromethane (Freon 11)	Applied	02/14/2018
EPA 624.1	Vinyl acetate	Applied	02/14/2018
EPA 624.1	Vinyl chloride (Chloroethene)	Applied	02/14/2018
EPA 624.1	Xylenes, total	Applied	02/14/2018
EPA 624.1	cis-1,2-Dichloroethene	Applied	02/14/2018
EPA 624.1	cis-1,3-Dichloropropene	Applied	02/14/2018
EPA 624.1	m+p-Xylene	Applied	02/14/2018
EPA 624.1	n-Butylbenzene	Applied	02/14/2018
EPA 624.1	n-Hexane	Applied	02/14/2018
EPA 624.1	n-Propylbenzene	Applied	02/14/2018
EPA 624.1	o-Xylene	Applied	02/14/2018
EPA 624.1	p-Isopropyltoluene (4-Isopropyltoluene)	Applied	02/14/2018
EPA 624.1	sec-Butylbenzene	Applied	02/14/2018
EPA 624.1	tert-Butyl alcohol (2-Methyl-2-propanol)	Applied	02/14/2018
EPA 624.1	tert-Butyl ethyl ether	Applied	02/14/2018
EPA 624.1	trans-1,2-Dichloroethene	Applied	02/14/2018
EPA 624.1	trans-1,3-Dichloropropene	Applied	02/14/2018
EPA 624.1	trans-1,4-Dichloro-2-butene	Applied	02/14/2018
EPA 625.1	1,1'-Biphenyl (Biphenyl, Lemonene)	Applied	02/14/2018
EPA 625.1	1,2,4-Trichlorobenzene	Applied	02/14/2018
EPA 625.1	1,2-Dichlorobenzene (o-Dichlorobenzene)	Applied	02/14/2018
EPA 625.1	1,2-Diphenylhydrazine	Applied	02/14/2018
EPA 625.1	1,3-Dichlorobenzene (m-Dichlorobenzene)	Applied	02/14/2018
EPA 625.1	1,4-Dichlorobenzene (p-Dichlorobenzene)	Applied	02/14/2018
EPA 625.1	1-Methylnaphthalene	Applied	02/14/2018
EPA 625.1	2,2'-oxybis(1-Chloropropane)	Applied	02/14/2018
EPA 625.1	2,4,5-Trichlorophenol	Applied	02/14/2018
EPA 625.1	2,4,6-Trichlorophenol	Applied	02/14/2018
EPA 625.1	2,4-Dichlorophenol	Applied	02/14/2018
EPA 625.1	2,4-Dimethylphenol	Applied	02/14/2018
EPA 625.1	2,4-Dinitrophenol	Applied	02/14/2018
EPA 625.1	2,4-Dinitrotoluene (2,4-DNT)	Applied	02/14/2018
EPA 625.1	2,6-Dinitrotoluene (2,6-DNT)	Applied	02/14/2018
EPA 625.1	2-Chloronaphthalene	Applied	02/14/2018
EPA 625.1	2-Chlorophenol	Applied	02/14/2018
EPA 625.1	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	Applied	02/14/2018

EPA 625.1		2-Methylnaphthalene	Applied	02/14/2018
EPA 625.1		2-Methylphenol (o-Cresol)	Applied	02/14/2018
EPA 625.1		2-Nitroaniline	Applied	02/14/2018
EPA 625.1		2-Nitrophenol	Applied	02/14/2018
EPA 625.1		3+4-Methylphenol (m+p-Cresol)	Applied	02/14/2018
EPA 625.1		3,3'-Dichlorobenzidine	Applied	02/14/2018
EPA 625.1		4-Bromophenyl phenyl ether	Applied	02/14/2018
EPA 625.1		4-Chloro-3-methylphenol	Applied	02/14/2018
EPA 625.1		4-Chloroaniline	Applied	02/14/2018
EPA 625.1		4-Nitroaniline	Applied	02/14/2018
EPA 625.1		4-Nitrophenol	Applied	02/14/2018
EPA 625.1		Acenaphthene	Applied	02/14/2018
EPA 625.1		Acenaphthylene	Applied	02/14/2018
EPA 625.1		Acetophenone	Applied	02/14/2018
EPA 625.1		Aniline	Applied	02/14/2018
EPA 625.1		Anthracene	Applied	02/14/2018
EPA 625.1		Atrazine	Applied	02/14/2018
EPA 625.1		Benzaldehyde	Applied	02/14/2018
EPA 625.1		Benzidine	Applied	02/14/2018
EPA 625.1		Benzo[a]anthracene	Applied	02/14/2018
EPA 625.1		Benzo[a]pyrene	Applied	02/14/2018
EPA 625.1		Benzo[b]fluoranthene	Applied	02/14/2018
EPA 625.1		Benzo[ghi]perylene	Applied	02/14/2018
EPA 625.1		Benzo[k]fluoranthene	Applied	02/14/2018
EPA 625.1		Benzoic acid	Applied	02/14/2018
EPA 625.1		Benzyl alcohol	Applied	02/14/2018
EPA 625.1		Butyl benzyl phthalate (Benzyl butyl phthalate)	Applied	02/14/2018
EPA 625.1		Caprolactam	Applied	02/14/2018
EPA 625.1		Carbazole	Applied	02/14/2018
EPA 625.1		Chrysene (Benzo[a]phenanthrene)	Applied	02/14/2018
EPA 625.1		Di-n-butyl phthalate	Applied	02/14/2018
EPA 625.1		Di-n-octyl phthalate	Applied	02/14/2018
EPA 625.1		Dibenzo[a,h]anthracene	Applied	02/14/2018
EPA 625.1		Dibenzofuran	Applied	02/14/2018
EPA 625.1		Diethyl phthalate	Applied	02/14/2018
EPA 625.1		Dimethyl phthalate	Applied	02/14/2018
EPA 625.1		Fluoranthene	Applied	02/14/2018
EPA 625.1		Fluorene	Applied	02/14/2018
EPA 625.1		Hexachlorobenzene	Applied	02/14/2018
EPA 625.1		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	Applied	02/14/2018
EPA 625.1		Hexachlorocyclopentadiene	Applied	02/14/2018
EPA 625.1		Hexachloroethane	Applied	02/14/2018
EPA 625.1		Indeno(1,2,3-cd)pyrene	Applied	02/14/2018
EPA 625.1		Isophorone	Applied	02/14/2018
EPA 625.1		N-Nitrosodi-n-propylamine	Applied	02/14/2018
EPA 625.1		N-Nitrosodimethylamine	Applied	02/14/2018
EPA 625.1		N-Nitrosodiphenylamine	Applied	02/14/2018
EPA 625.1		Naphthalene	Applied	02/14/2018
EPA 625.1		Nitrobenzene	Applied	02/14/2018
EPA 625.1		Pentachlorophenol (PCP)	Applied	02/14/2018
EPA 625.1		Phenanthrene	Applied	02/14/2018
EPA 625.1		Phenol	Applied	02/14/2018
EPA 625.1		Pyrene	Applied	02/14/2018
EPA 625.1		bis(2-Chloroethoxy)methane	Applied	02/14/2018
EPA 625.1		bis(2-Chloroethyl) ether	Applied	02/14/2018
EPA 625.1		bis(2-Ethylhexyl) phthalate (DEHP)	Applied	02/14/2018
EPA 8081	A	Organochlorine pesticides by GC/ECD	Withdrawn	03/21/2019
EPA 8270	C	SOCs by GC/MS	Withdrawn	03/21/2019
EPA 8270 SIM		1,4-Dioxane (1,4-Diethyleneoxide)	Withdrawn	03/21/2019
EPA 8270 SIM		Acenaphthene	Withdrawn	03/21/2019
EPA 8270 SIM		Acenaphthylene	Withdrawn	03/21/2019

EPA 8270 SIM	Anthracene	Withdrawn	03/21/2019
EPA 8270 SIM	Benzo[a]anthracene	Withdrawn	03/21/2019
EPA 8270 SIM	Benzo[a]pyrene	Withdrawn	03/21/2019
EPA 8270 SIM	Benzo[b]fluoranthene	Withdrawn	03/21/2019
EPA 8270 SIM	Benzo[ghi]perylene	Withdrawn	03/21/2019
EPA 8270 SIM	Benzo[k]fluoranthene	Withdrawn	03/21/2019
EPA 8270 SIM	Chrysene (Benzo[a]phenanthrene)	Withdrawn	03/21/2019
EPA 8270 SIM	Dibenzo[a,h]anthracene	Withdrawn	03/21/2019
EPA 8270 SIM	Fluoranthene	Withdrawn	03/21/2019
EPA 8270 SIM	Fluorene	Withdrawn	03/21/2019
EPA 8270 SIM	Indeno(1,2,3-cd)pyrene	Withdrawn	03/21/2019
EPA 8270 SIM	Naphthalene	Withdrawn	03/21/2019
EPA 8270 SIM	Phenanthrene	Withdrawn	03/21/2019
EPA 8270 SIM	Pyrene	Withdrawn	03/21/2019
EPA 8270 SIM	Quinoline	Withdrawn	03/21/2019

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Status	Effective Date
EPA 3051	A	Microwave digestion of solids (HNO3 + HCl)	Withdrawn	03/21/2019
EPA 3051		Microwave digestion of solids (HNO3 only)	Withdrawn	03/21/2019
EPA 6010	D	Metals by ICP/AES	Applied	02/14/2018
EPA 8081	A	Organochlorine pesticides by GC/ECD	Withdrawn	03/21/2019
EPA 8270	C	SOCs by GC/MS	Withdrawn	03/21/2019
EPA 8270 SIM		1,4-Dioxane (1,4-Diethyleneoxide)	Withdrawn	03/21/2019
EPA 8270 SIM		Acenaphthene	Withdrawn	03/21/2019
EPA 8270 SIM		Acenaphthylene	Withdrawn	03/21/2019
EPA 8270 SIM		Anthracene	Withdrawn	03/21/2019
EPA 8270 SIM		Benzo[a]anthracene	Withdrawn	03/21/2019
EPA 8270 SIM		Benzo[a]pyrene	Withdrawn	03/21/2019
EPA 8270 SIM		Benzo[b]fluoranthene	Withdrawn	03/21/2019
EPA 8270 SIM		Benzo[ghi]perylene	Withdrawn	03/21/2019
EPA 8270 SIM		Benzo[k]fluoranthene	Withdrawn	03/21/2019
EPA 8270 SIM		Chrysene (Benzo[a]phenanthrene)	Withdrawn	03/21/2019
EPA 8270 SIM		Dibenzo[a,h]anthracene	Withdrawn	03/21/2019
EPA 8270 SIM		Fluoranthene	Withdrawn	03/21/2019
EPA 8270 SIM		Fluorene	Withdrawn	03/21/2019
EPA 8270 SIM		Indeno(1,2,3-cd)pyrene	Withdrawn	03/21/2019
EPA 8270 SIM		Naphthalene	Withdrawn	03/21/2019
EPA 8270 SIM		Phenanthrene	Withdrawn	03/21/2019
EPA 8270 SIM		Pyrene	Withdrawn	03/21/2019
EPA 8270 SIM		Quinoline	Withdrawn	03/21/2019

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

03/22/2019

William Billings
Pace Analytical Services LLC - Pittsburgh PA
1638 Roseytown Suites 2, 3, & 4
Greensburg, PA 15601

Re: Certificate of Accreditation
DEP Lab ID No. 65-00282

Dear Laboratory Supervisor:

Enclosed is your new Certificate of Accreditation to operate as a Pennsylvania Accredited Laboratory. This Certificate of Accreditation expires **03/31/2020** unless suspended or revoked earlier. As a laboratory accredited in accordance with the Environmental Laboratory Accreditation Act of June 29, 2002 (P.L 596, No 90) (27 Pa C.S. §§ 4101 – 4113) and The Environmental Laboratory Accreditation Regulations of 25 Pa. Code Chapter 252 you are responsible for continual compliance with the accreditation Act and regulations promulgated thereunder. Failure to comply with all applicable Federal and Departmental laws and regulations may result in suspension or revocation of your laboratory's accreditation.

Your DEP laboratory identification number is **65-00282**. Please use this number on all correspondence with the PA Department of Environmental Protection (Department).

Your laboratory is accredited to perform only the analyses by the methods listed on the Scope of Accreditation that accompanies the Certificate of Accreditation. The Certificate of Accreditation remains the property of the Department and must be displayed in the laboratory.

Please note this certification must be renewed annually. Renewal applications must be submitted to the Department *no later than 60 days prior to the expiration of the certification*. Failure to submit a renewal application within this time period may result in a lapse of the laboratory's accreditation. Should this occur, the laboratory may not conduct any further analyses for which accreditation is required and, if the laboratory is accredited to perform analyses on drinking water, the laboratory must notify the public water suppliers served by the laboratory of the laboratory's failure to renew its certificate of accreditation. Copies of the renewal application may be found on the Department's web site (www.depweb.state.pa.us/labs).

If you have any questions concerning your certificate, you may contact your laboratory's accreditation officer Mike Azar at 717-346-8206 or miazar@pa.gov.

Sincerely,

Aaren Alger

Aaren S. Alger, Chief
Laboratory Accreditation Program

Enclosures

Recd
3-28-19

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

03/21/2019

William Billings
Pace Analytical Services LLC - Pittsburgh PA
1638 Roseytown Suites 2, 3, & 4
Greensburg, PA 15601

Re: Accreditation Status Change (A19-00282-01)
DEP Lab # 65-00282

Dear Laboratory Supervisor:

On January 22, 2019, the Laboratory Accreditation Program of the Pennsylvania Department of Environmental Protection ("Department") received a Part 4—Add FOA Application from your laboratory. The Department reviewed this application and associated materials for EPA 608.3 in the non-potable matrix. Your accreditation status in the Pennsylvania Environmental Laboratory Accreditation Program has changed due to your application request. Your current accreditation status is as shown on the attached listing. That list of accredited fields of testing replaces all previous lists.

Your laboratory shall not use this Scope of Accreditation to imply endorsement by the Department. In order to maintain accreditation, your laboratory must remain in compliance with Departmental regulations.

Any person aggrieved by this action may appeal, pursuant to Section 4 of the Environmental Hearing Board Act, 35 P.S. Section 7514, and the Administrative Agency Law, 2 Pa.C.S. Chapter 5A, to the Environmental Hearing Board, Second Floor, Rachel Carson State Office Building, 400 Market Street, P.O. Box 8457, Harrisburg, PA 17105-8457, 717-787-3483. TDD users may contact the Board through the Pennsylvania Relay Service, 800-654-5984. Appeals must be filed with the Environmental Hearing Board within 30 days of receipt of written notice of this action unless the appropriate statute provides a different time period. Copies of the appeal form and the Board's rules of practice and procedure may be obtained from the Board. The appeal form and the Board's rules of practice and procedure are also available in braille or on audiotape from the Secretary to the Board at 717-787-3483. This paragraph does not, in and of itself, create any right of appeal beyond that permitted by applicable statutes and decisional law.

IF YOU WANT TO CHALLENGE THIS ACTION, YOUR APPEAL MUST REACH THE BOARD WITHIN 30 DAYS. YOU DO NOT NEED A LAWYER TO FILE AN APPEAL WITH THE BOARD.

IMPORTANT LEGAL RIGHTS ARE AT STAKE, HOWEVER, SO YOU SHOULD SHOW THIS DOCUMENT TO A LAWYER AT ONCE. IF YOU CANNOT AFFORD A LAWYER, YOU MAY QUALIFY FOR FREE PRO BONO REPRESENTATION. CALL THE SECRETARY TO THE BOARD (717-787-3483) FOR MORE INFORMATION.

If you have any questions please contact your laboratory's accreditation officer Mike Azar at 717-346-8206 or miazar@pa.gov.

Sincerely,

Aaren Alger

Aaren S. Alger, Chief
Laboratory Accreditation Program

Enclosure

CERTIFICATE OF ACCREDITATION

ANSI National Accreditation Board

11617 Coldwater Road, Fort Wayne, IN 46845 USA

This is to certify that

Pace Analytical Services, LLC – Pittsburgh PA

1638 Roseytown Road, Suites 2, 3 & 4
Greensburg, PA 15601

has been assessed by ANAB and meets the requirements of international standard

ISO/IEC 17025:2005

and the

U.S. Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (DoD QSM V5.1.1)

while demonstrating technical competence in the field of

TESTING

Refer to the accompanying Scope of Accreditation for information regarding the types of activities to which this accreditation applies

L2417
Certificate Number

ANAB Approval

Certificate Valid Through: 04/02/2022
Version No. 003 Issued: 03/18/2019

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005 AND U.S DEPARTMENT OF DEFENSE (DOD) QUALITY SYSTEMS MANUAL FOR ENVIRONMENTAL LABORATORIES (DOD QSM V5.1.1)

Pace Analytical Services, LLC - Pittsburgh PA

1638 Roseytown Road, Suites 2, 3 & 4
Greensburg, PA 15601
Nasreen DeRubeis
724-850-5630

TESTING

Valid to: **April 2, 2022** Certificate Number: **L2417**

Environmental

Drinking Water		
Technology	**Method**	**Analyte**
Alpha Spec	HASL 300 U-02-RCm	Isotopic Uranium (232, 233/234, 235/236, 238)
GFPC	EPA 900.0	Gross Alpha/Beta
GFPC	SM 7110C	Gross Alpha
Gamma Spec	EPA 901.1	Gamma Emitters
Gamma Spec	EPA 901.1	Barium-133, Cesium-134, Cesium-137, Cobalt-60 and Zinc-65
GFPC	EPA 903.0	Total Alpha Radium
Alpha scintillation Counter	EPA 903.1	Radium 226
GFPC	EPA 904.0	Radium-228
GFPC	EPA 905.0	Strontium 90
Liquid Scintillation Counter	EPA 906.0	Tritium
KPA	ASTM D5174-97	Uranium-Total
Liquid Scintillation Counter	SM 7500-Rn B	Radon-222

Non-Potable Water		
Technology	**Method**	**Analyte**
Alpha Spec	HASL 300 Am-04 RCm	Am-241, Am-243, Cm- 243/244, Cm-245/246, Cm-248
Alpha Spec	HASL 300 Pu-02-RCm	Isotopic Plutonium (236, 238, 239, 240, 241, 242, 244)
Liquid Scintillation	HASL 300 Pu-02-RCm	Pu-241
Alpha Spec	HASL 300 Th-01-RCm	Isotopic Thorium (228, 229, 230, 232)
Alpha Spec	HASL 300 U-02-RCm	Isotopic Uranium (232, 233/234, 235/236, 238)
GFPC	EPA 900.0	Gross Alpha/Beta
GFPC	SM 7110C	Gross Alpha
GFPC	EPA 9310	Gross Alpha/Beta
Gamma Spec	EPA 901.1	Gamma Emitters
Gamma Spec	EPA 901.1	Barium-133, Cesium-134, Cesium-137, Cobalt-60 and Zinc-65
GFPC	EPA 903.0	Total Alpha Radium
GFPC	EPA 9315	Total Radium
GFPC	EPA 9315	Radium 226
Alpha scintillation Counter	EPA 903.1	Radium 226
GFPC	EPA 904.0	Radium-228
GFPC	EPA 9320	Radium-228
GFPC	EPA 905.0	Strontium 90
GFPC	Eichrom Method SRW01	Strontium 90
Liquid Scintillation Counter	EPA 906.0	Tritium
KPA	ASTM D5174-97	Uranium-Total
Liquid Scintillation Counter	SM 7500-Rn B	Radon-222
Liquid Scintillation Counter	Liquid Scintillation	Carbon-14
GFPC	RP 280 DOE	Lead-210
Alpha Spec	HASL 300 Po-01-RC and Po-02-RC	Polonium-210

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	EPA 901.1	Gamma Emitters
Alpha Spec	HASL 300 Am-04-RCm	Am-241, Am-243, Cm- 243/244, Cm-245/246, Cm-248
Alpha Spec	HASL 300 Pu-02-RCm	Isotopic Plutonium (236, 238, 239, 240, 242, 244)
Liquid Scintillation	HASL 300 Pu-02-RCm	Pu-241

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
Gamma Spec	EPA 901.1	Ra-226
Gamma Spec	EPA 901.1	Ra-228
Alpha Spec	HASL 300 Th-01-RCm	Isotopic Thorium (228, 229, 230, 232)
Alpha Spec	HASL 300 U-02-RCm	Isotopic Uranium (232, 233/234, 235/236, 238)
GFPC	Eichrom Method SRW01	Strontium 90
Liquid Scintillation Counter	Liquid Scintillation	Carbon-14
GFPC	EPA 900.0	Gross Alpha/Beta
GFPC	EPA 9310	Gross Alpha/Beta
Liquid Scintillation Counter	EPA 906.0 modified	Tritium
GFPC	RP 280 DOE	Lead-210
Alpha Spec	HASL 300 Po-01-RC and Po-02-RC	Polonium-210

Note:

1. This scope is formatted as part of a single document including Certificate of Accreditation No. L2417

Vice President

APPENDIX A-3

PACE ENERGY SERVICES, PITTSBURGH, PENNSYLVANIA

Document Information

Document Number: ENV-MAN-PITTS-0001 **Revision:** 00

Document Title: Quality Manual

Department(s): Quality

Previous Document Number: Quality Manual rev.01 update 01

Date Information

Effective Date: 02 Aug 2018

Next Review Date: 02 Aug 2020 **Last Review Date:**

Notes

Document Notes:

All Dates and Times are listed in: Central Time Zone

Pace Analytical®	Document Name: Quality Assurance Manual	Document Revised: July 24, 2018 Effective Date of Final Signature Page 1 of 91
	Document No.: Quality Assurance Manual rev.01	Issuing Authorities: Pace Analytical Energy Services, LLC. Quality Office

QUALITY ASSURANCE MANUAL

Quality Assurance/Quality Control Policies and Procedures

Pace Analytical Energy Services, LLC – Pittsburgh
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APPROVAL

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1.0. INTRODUCTION AND ORGANIZATIONAL STRUCTURE

"Working together to protect our environment and improve our health"
Pace Analytical Services LLC - Mission Statement

1.1. Introduction to Pace

1.1.1. Pace Analytical Services, LLC is a privately held, full-service analytical testing firm operating a nationwide system of laboratories. Pace offers extensive services beyond standard analytical testing, including: bioassay for aquatic toxicity, air toxics, dioxins and coplanar PCB's by high resolution mass spectroscopy , radiochemical analyses, product testing, pharmaceutical testing, field services and mobile laboratory capabilities. This document defines the Quality System and Quality Assurance (QA)/Quality Control (QC) protocols.

1.1.2. Pace laboratories are capable of analyzing a full range of environmental samples from a variety of matrices, including air, surface water, wastewater, groundwater, soil, sediment, biota, and other waste products. Methods are applied from regulatory and professional sources including EPA, ASTM, USGS, NIOSH, Standard Methods, and State Agencies.

1.1.3. Pace Analytical Energy Services, LLC. (PAES) recognizes its crucial role in providing reliability and excellence in the environmental analytical industry. The laboratory provides information necessary for engineering, industrial, and regulatory clients to make informed judgments and applicable policy decisions. PAES' management acknowledges that uncompromising dedication to quality is fundamental to remaining a competitive force in the analytical services market. The scope of services includes:

Wastewater and storm water

- Ion analysis via Ion Chromatography
- Wet Chemistry analyses for pH and TOC/DOC

In Situ Remediation Analyses

- Dissolved Gas (Oxygen, Nitrogen, Carbon Dioxide, Carbon Monoxide, Hydrogen, Acetylene, Methane, Ethane, Ethene, Propane, Propene, Iso-Butane, n-Butane, Total Inorganic Carbon)
- Volatile Fatty Acids (Lactic, Pyruvic, Formic, Acetic Propionic, Pentanoic, Hexanoic and Butyric Acids)
- Ion Chromatography Analyses of chloride, nitrate, nitrite, sulfate, ferric iron, ferrous iron and divalent manganese
- Compound Specific Isotope Analysis (CSIA) of VOCs in groundwater and vapor

Soil Vapor Extraction Analyses

- VOC's in vapor
- Oxygen, Nitrogen, Carbon Dioxide, Carbon Monoxide, Hydrogen, Acetylene, Methane, Ethane, Ethene, Propane, Propene, Iso-Butane, and n-Butane in vapor

Shale Gas Analyses

- Compositional Analysis (nitrogen, oxygen, argon, carbon dioxide, C1-C6)

- Carbon isotopic ratio ($^{13}C/^{12}C$ or $\delta^{13}C$) of methane, ethane
- Hydrogen isotopic ratio ($^{2}H/^{1}H$ or $\delta^{2}H$) of methane

Petroleum Forensics

- C3-C12 Gasoline Range Hydrocarbons
- Oxygenates in product
- GC/MS Full Scan analyses
- Whole oil analyses
- Boiling Range Distribution of Petroleum Fractions
- EDB and Organic Lead

1.2. Statement of Purpose

1.2.1. To meet the business needs of our customers for high quality, cost-effective analytical measurements and services.

1.3. Quality Policy Statement and Goals of the Quality System

1.3.1. Pace management is committed to maintaining the highest possible standard of service and quality for our customers by following a documented quality system that is compliant with all current applicable state, federal, and industry standards, such as the NELAC Standard, the TNI Standard, and ISO standards and is in accordance with the stated methods and customer requirements. The overall objective of this quality system is to provide reliable data of known quality through adherence to rigorous quality assurance policies and quality control procedures as documented in this Quality Assurance Manual.

1.3.2. All personnel within the Pace network are required to be familiar with all facets of the quality system relevant to their position and implement these policies and procedures in their daily work.

1.4. Core Values

1.4.1. The following are the Pace Core Values:

- **Integrity**
- **Value Employees**
- **Know Our Customers**
- **Honor Commitments**
- **Flexible Response To Demand**
- **Pursue Opportunities**
- **Continuously Improve**

1.5. Code of Ethics and Standards of Conduct

1.5.1. **Code of Ethics:**

1.5.1.1. Each Pace employee is responsible for the propriety and consequences of his or her actions;

1.5.1.2. Each Pace employee must conduct all aspects of Company business in an ethical and strictly legal manner, and must obey the laws of the United States and of all localities, states and nations where Pace does business or seeks to do business;

1.5.1.3. Each Pace employee must reflect the highest standards of honesty, integrity and fairness on behalf of the Company with customers, suppliers, the public, and one another.

1.5.1.4. Each Pace employee must recognize and understand that our daily activities in environmental laboratories affect public health as well as the environment and that environmental laboratory analysts are a critical part of the system society depends upon to improve and guard our natural resources:

1.5.2. **Standards of Conduct:**

1.5.2.1. **Data Integrity**

1.5.2.1.1. The accuracy and integrity of the analytical results and its supporting documentation produced at Pace are the cornerstones of the company. Employees are to accurately prepare and maintain all technical records, scientific notebooks, calculations, and databases. Employees are prohibited from making false entries or misrepresentations of data for any reason.

1.5.2.1.2. Managerial staff must make every effort to ensure that personnel are free from any undue pressures that may affect the quality or integrity of their work including commercial, financial, over-scheduling, and working condition pressures.

1.5.2.1.3. The data integrity system includes in-depth, periodic monitoring of data integrity including peer data review and validation, internal raw data audits, proficiency testing studies, etc.

1.5.2.1.4. Any documentation related to data integrity issues, including any disciplinary actions involved, corrective actions taken, and notifications to customers must be retained for a minimum of five years.

1.5.2.2. **Confidentiality**

1.5.2.2.1. Pace employees must not use or disclose confidential or proprietary information except when in connection with their duties at Pace. This is effective over the course of employment and for an additional period of two years thereafter.

1.5.2.2.2. Confidential or proprietary information, belonging to either Pace and/or its customers, includes but is not limited to test results, trade secrets, research and development matters, procedures, methods, processes and standards, company-specific techniques and equipment, marketing and customer information, inventions, materials composition, etc.

1.5.2.3. **Conflict of Interest**

1.5.2.3.1. Pace employees must avoid situations that might involve a conflict of interest or could appear questionable to others. This includes participation in activities that conflict or appear to conflict with the employees' Pace responsibilities. This would also include

offering or accepting anything that might influence the recipient or cause another person to believe that the recipient may be influenced to behave or in a different manner than he would normally (such as bribes, gifts, kickbacks, or illegal payments).

1.5.2.3.2. Employees are not to engage in outside business or economic activity relating to a sale or purchase by the Company. Other problematic activities include service on the Board of Directors of a competing or supplier company, significant ownership in a competing or supplier company, employment for a competing or supplier company, or participation in any outside business during the employee's work hours.

1.5.3. Strict adherence by each Pace employee to this Code of Ethics and to the Standards of Conduct is essential to the continued vitality of Pace and to continue the pursuit of our common mission to protect our environment and improve our health.

1.5.4. Failure to comply with the Code of Ethics and Standards of Conduct will result in disciplinary action up to and including termination and referral for civil or criminal prosecution where appropriate. An employee will be notified of an infraction and given an opportunity to explain, as prescribed under current disciplinary procedures.

1.5.5. Compliance: all employees undergo annual Data Integrity/Ethics training which includes the concepts listed above. All employees also sign an annual Ethic Policy statement.

1.6. Anonymous Compliance Alertline

1.6.1. An ethical and safe workplace is important to the long-term success of Pace and the well-being of its employees. Pace has a responsibility to provide a work environmental where employees feel safe and can report unethical or improper behavior in complete confidence. With this in mind, Pace has engaged Lighthouse Services, Inc. to provide all employees with access to an anonymous ethics and compliance alertline for reporting possible ethics and compliance violations. The purpose of this service is to ensure that any employee can report anonymously and without fear of retaliation.

1.6.2. Lighthouse Services provides a toll-free number along with several other reporting methods, all of which are available 24 hours a day, seven days a week for use by employees and staff.

1.6.3. Telephone: English speaking USA and Canada: (844)-970-0003.

1.6.4. Telephone: Spanish speaking North America: (800)-216-1288.

1.6.5. Website: www.lighthouse-services.com/pacelabs.

1.6.6. Email: reports@lighthouse-services.com (must include company name with report).

1.7. Laboratory Organization

1.7.1. Each laboratory within the system operates with local management, but all labs share common systems and receive support from the Corporate Office. See Attachment III for the Corporate Organizational structure.

1.7.2. A Senior General Manager (SGM) oversees all laboratories and service centers in their assigned region. Each laboratory or facility in the company is then directly managed by an SGM, a General Manager (GM), an Assistant General Manager (AGM), or an Operations Manager (OM). Quality Managers (QM) or Senior Quality Managers (SQM) at each laboratory report directly to the highest

level of local laboratory management, however named, that routinely makes day-to-day decisions regarding that facility's operations. The QMs and SQMs will also receive guidance and direction from the corporate Director of Environmental Quality.

1.7.3. The SGM, GM, AGM or OM, or equivalent functionality in each facility, bears the responsibility for the laboratory operations and serves as the final, local authority in all matters. In the absence of these managers, the SQM/QM serves as the next in command, unless the manager in charge has assigned another designee. He or she assumes the responsibilities of the manager, however named, until the manager is available to resume the duties of their position. In the absence of both the manager and the SQM/QM, management responsibility of the laboratory is passed to the Technical Director, provided such a position is identified, and then to the most senior department manager until the return of the lab manager or SQM/QM. The most senior department manager in charge may include the Client Services Manager (CSM) or the Administrative Business Manager (ABM) at the discretion of the SGM/GM/AGM/OM.

1.7.4. A Technical Director who is absent for a period of time exceeding 15 consecutive calendar days shall designate another full-time staff member meeting the qualifications of the technical director to temporarily perform this function. The laboratory SGM/GM/AGM/OM or SQM/QM has the authority to make this designation in the event the existing Technical Director is unable to do so. If this absence exceeds 35 consecutive calendar days, the primary accrediting authority shall be notified in writing.

1.7.5. The SQM/QM has the responsibility and authority to ensure the Quality System is implemented and followed at all times. In circumstances where a laboratory is not meeting the established level of quality or following the policies set forth in this Quality Assurance Manual, the SQM/QM has the authority to halt laboratory operations should he or she deem such an action necessary. The SQM/QM will immediately communicate the halting of operations to the SGM/GM/AGM/OM and keep them posted on the progress of corrective actions. In the event the SGM/GM/AGM/OM and the SQM/QM are not in agreement as to the need for the suspension, the Chief Operating Officer (COO) and Director of Environmental Quality will be called in to mediate the situation.

1.7.6. The technical staff of the laboratory is generally organized into the following functional groups:

- Monitored Natural Attenuation (MNA)
- Compound Specific Isotopes (CSIA)
- Petroleum Forensics

1.7.7. The organizational structure for Pace Analytical Energy Services, LLC is listed in Attachment II. In the event of a change in SGM/GM/AGM/OM, SQM/QM, or any Technical Director, the laboratory will notify its accrediting authorities per their individual required timeframes, not to exceed 30 days. The QAM will remain in effect until the next scheduled revision.

1.8. Laboratory Job Descriptions

1.8.1. General Manager

- Oversees all functions of their assigned operations;
- Authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Prepares budgets and staffing plans;

- Monitors the Quality Systems of the laboratory and advises the SQM/QM accordingly;
- Presents the Ethics/Data Integrity training annually to all employees in their facilities as an instructor-led training.
- Ensures compliance with all applicable state, federal and industry standards.

1.8.2. Assistant General Manager

- Oversees all functions of their assigned operations;
- Authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Prepares budgets and staffing plans;
- Monitors the Quality Systems of the laboratory and advises the SQM/QM accordingly;
- Presents the Ethics/Data Integrity training annually to all employees in their facilities as an instructor-led training.
- Ensures compliance with all applicable state, federal and industry standards.
- Oversees the daily production and quality activities of all departments;
- Manages all departments and works with staff to ensure department objectives are met;
- Works with all departments to ensure capacity and customer expectations are accurately understood and met;
- Works with SGM to prepare appropriate budget and staffing plans for all departments;
- Responsible for prioritizing personnel and production activities within all departments;
- Performs formal and informal performance reviews of departmental staff.

1.8.3. Quality Manager

- Responsible for implementing, maintaining and improving the quality system while functioning independently from laboratory operations. Reports directly to the highest level of local laboratory facility management, however named, that routinely makes day-to-day decisions regarding laboratory operations, but receives direction and assistance from the Corporate Director of Environmental Quality.
- Ensures that communication takes place at all levels within the lab regarding the effectiveness of the quality system and that all personnel understand their contributions to the quality system;
- Monitors QA/QC activities to ensure that the laboratory achieves established standards of quality (as set forth by the Corporate Environmental Quality office). The QM is responsible for reporting the lab's level of compliance to these standards to the Corporate Director of Environmental Quality on a quarterly basis;
- Maintains records of quality control data and evaluates data quality;
- Conducts periodic internal audits and coordinates external audits performed by regulatory agencies or customer representatives;
- Reviews and maintains records of proficiency testing results;
- Maintains the document control system;
- Assists in development and implementation of appropriate training programs;
- Provides technical support to laboratory operations regarding methodology and project QA/QC requirements;
- Maintains certifications from federal and state programs;
- Ensures compliance with all applicable state, federal and industry standards;

- Maintains the laboratory training records, including those in the Learning Management System (LMS), and evaluates the effectiveness of training;
- Monitors corrective and preventive actions;
- Maintains the currency of the Quality Manual.

1.8.4. Technical Director

- Monitors the validity of analyses performed and data generated as needed;
- Provides technical guidance in the review, development, and validation of new methodologies.
- Assists clients evaluate their analytical needs.
- Prepares and presents written or oral interpretations of data.

1.8.5. Administrative Business Manager

- Responsible for financial and administrative management for the entire facility;
- Provides input relative to tactical and strategic planning activities;
- Organizes financial information so that the facility is run as a fiscally responsible business;
- Works with staff to confirm that appropriate processes are put in place to track revenues and expenses;
- Provide ongoing financial information to the SGM/GM/AGM/OM and the management team so they can better manage their business;
- Utilizes historical information and trends to accurately forecast future financial positions;
- Works with management to ensure that key measurements are put in place to be utilized for trend analysis—this will include personnel and supply expenses, and key revenue and expense ratios;
- Works with SGM/GM/AGM/OM to develop accurate budget and track on an ongoing basis;
- Works with entire management team to submit complete and justified capital budget requests and to balance requests across departments;
- Works with project management team and administrative support staff to ensure timely and accurate invoicing.
- Ensures that vendor invoices are properly coded and posted for payment
- Ensures that invoices are properly coded and posted for revenue

1.8.6. Client Services Manager

- Oversees all the day to day activities of the Client Services Department which includes Project Management and, possibly, Sample Control;
- Responsible for staffing and all personnel management related issues for Client Services;
- Serves as the primary senior consultant to customers on all project related issues such as set up, initiation, execution and closure;
- Performs or is capable of performing all duties listed for that of Project Manager.

1.8.7. Project Manager

- Coordinates daily activities including taking orders, reporting data and analytical results;
- Serves as the primary technical and administrative liaison between customers and Pace;

- Communicates with operations staff to update and set project priorities;
- Provides results to customers in the requested format (verbal, hardcopy, electronic, etc.);
- Works with customers, laboratory staff, and other appropriate Pace staff to develop project statements of work or resolve problems of data quality;
- Responsible for solicitation of work requests, assisting with proposal preparation and project initiation with customers and maintain customer records;
- Mediation of project schedules and scope of work through communication with internal resources and management;
- Responsible for preparing routine and non-routine quotations, reports and technical papers;
- Interfaces between customers and management personnel to achieve customer satisfaction;
- Manages large-scale complex projects;
- Supervises less experienced project managers and provide guidance on management of complex projects;
- Arranges bottle orders and shipment of sample kits to customers;
- Verifies login information relative to project requirements and field sample Chains-of-Custody.

1.8.8. CSIA Department Manager/Supervisor

- Oversees the day-to-day production and quality activities of their assigned department;
- Ensures that quality assurance and quality control criteria of analytical methods and projects are satisfied;
- Assesses data quality and takes corrective action when necessary;
- Approves and releases technical and data management reports;
- Ensures compliance with all applicable state, federal and industry standards;
- Works with SGM/GM to prepare appropriate budget and staffing plans;
- Responsible for prioritizing personnel and production activities;
- Performs formal and informal performance reviews of departmental staff.
- Works with all departments to ensure capacity and customer expectations are accurately understood and met.

1.8.9. IC Department Manager/Supervisor

- Oversees the day-to-day production and quality activities of their assigned department;
- Ensures that quality assurance and quality control criteria of analytical methods and projects are satisfied;
- Assesses data quality and takes corrective action when necessary;
- Approves and releases technical and data management reports;
- Ensures compliance with all applicable state, federal and industry standards;
- Works with SGM/GM to prepare appropriate budget and staffing plans;
- Responsible for prioritizing personnel and production activities ;
- Performs formal and informal performance reviews of departmental staff;
- Works with all departments to ensure capacity and customer expectations are accurately understood and met.

1.8.10. MNA Department Manager/Supervisor

- Oversees the day-to-day production and quality activities of their assigned department;
- Ensures that quality assurance and quality control criteria of analytical methods and projects are satisfied;
- Assesses data quality and takes corrective action when necessary;
- Approves and releases technical and data management reports;
- Works with SGM/GM to prepare appropriate budget and staffing plans;
- Responsible for prioritizing personnel and production activities ;
- Performs formal and informal performance reviews of departmental staff;
- Works with the department staff to ensure capacity and customer expectations are accurately understood and met;
- Works with staff to ensure department objectives are met;
- Review/approve all department generated data/results from staff with LIMS; apply results and/or quality assigned qualifiers manually, as needed; apply narrative information, as needed;
- Apply narrative information related to sample receipt; review final reports, as needed;
- Review and/or establish SOP's; adjustment to bench related QA protocols; data management.

1.8.11. Additional job descriptions are available upon request from the laboratory ABM.

1.9. Training and Orientation

1.9.1. Training for Pace employees is managed through a web-based training system. Employees are provided with several training activities for their particular job description and scope of duties. These training activities may include:

- Hands-on training led by supervisors;
- Job-specific training checklists and worksheets;
- Lectures and instructor-led training sessions;
- Method-specific training;
- External conferences and seminars;
- Reading Standard Operating Procedures (SOPs);
- Reading the Quality Assurance Manual and Safety Manual/Chemical Hygiene Plan;
- Core training modules (basic lab skills, etc.);
- Quality system training modules (support equipment use, corrective actions/root causes, etc.);
- Data Integrity/Ethics training;
- Specialized training by instrument manufacturers;
- On-line courses.

1.9.2. All procedures and training records are maintained and available for review during laboratory audits. Additional information can be found in SOP S-PAE-Q-015 **Administering and Documenting Training in Laboratory Procedures and Instrumentation** or its equivalent revision or replacement.

1.10. Laboratory Safety and Waste

1.10.1. It is the policy of Pace to make safety and waste compliance an integral part of daily operations and to ensure that all employees are provided with safe working conditions, personal protective equipment, and requisite training to do their work without injury. Each employee is responsible for his/her own safety as well as those working in the immediate area by complying with established company rules and procedures. These rules and procedures as well as a more detailed description of the employees' responsibilities are contained in the local Safety Manual/Chemical Hygiene Plan.

1.11. Security and Confidentiality

1.11.1. Security is maintained by controlled access to laboratory buildings. Exterior doors to laboratory buildings remain either locked or continuously monitored by Pace staff.

1.11.2. Employee access into the UPARC complex is controlled through key-card turn-styles where each individual that works in the complex has a unique code for entry. UPARC Security is aware of who is on-site or off-site at any given time. PAES laboratory areas are controlled through keyed entry to prevent employees from other firms housed in the complex from gaining access to PAES laboratories. Each employee is issued a key that will open doors to rooms occupied by PAES. During normal working hours, the laboratory areas are kept unlocked. After normal business hours the rooms are locked to prevent unauthorized personnel entry.

1.11.3. A UPARC security force monitors the facility twenty-four hours a day with a series of video cameras. The guards also make rounds by foot and vehicle during afternoon and night shifts. Visitors cannot gain access to the complex except through the Main Security Gate. All visitors are required to register at the main gate and obtain a visitor's pass before entering the complex. UPARC Security notifies PAES upon the visitor's arrival to verify admittance. Visitors are directed to PAES Reception Office to sign the visitor's log. The visitor is then escorted, by a PAES employee to the employee or laboratory they intend to visit.

All information pertaining to a particular customer, including national security concerns will remain confidential. Data will be released to outside agencies only with written authorization from the customer or where federal or state law requires the company to do so.

1.12. Communications

1.12.1. Management within each lab bears the responsibility of ensuring that appropriate communication processes are established and that communication takes place regarding the effectiveness of the management/quality system. These communication processes may include email, regular staff meetings, senior management meetings, etc.

1.12.2. Corporate management bears the responsibility of ensuring that appropriate communication processes are established within the network of facilities and that communication takes place at a company-wide level regarding the effectiveness of the management/quality systems of all Pace facilities. These communication processes may include email, quarterly continuous improvement conference calls for all lab departments, and annual continuous improvement meetings for all department supervisors, quality managers, client services managers, and other support positions.

2.0. SAMPLE CUSTODY

2.1. Project Initiation

2.1.1. Prior to accepting new work, the laboratory reviews its performance capability. The laboratory confirms that sufficient personnel, equipment capacity, analytical method capability, etc., are available to complete the required work. Customer needs, certification requirements, and data quality objectives are defined and the appropriate sampling and analysis plan is developed to meet the project requirements by project managers or sales representatives. Members of the management staff review current instrument capacity, personnel availability and training, analytical procedures capability, and projected sample load. Management then informs the sales and client services personnel whether or not the laboratory can accept the new project via written correspondence, email, and/or operations meetings.

2.1.2. All contract documents are forwarded to Corporate Counsel for review. Any exceptions with the contract language noted by the Counsel will be forwarded to the client for their approval. Once mutually acceptable agreement is reached, the General Manager or their designee with approval, will sign the contract and /or purchase order. In the event that the contract needs amended after work has commenced, the same contract review procedures shall be repeated and any changes shall be communicated to all affected personnel.

2.2. Sampling Materials and Support

2.2.1. Each individual Pace laboratory provides shipping containers, properly preserved sample containers, custody documents, and field quality control samples to support field-sampling events. Guidelines for sample container types, preservatives, and holding times for a variety of methods are listed in Attachment VII. Note that all analyses listed are not necessarily performed at all Pace laboratories and there may be additional laboratory analyses performed that are not included in these tables. Customers are encouraged to contact their local Pace Project Manager for questions or clarifications regarding sample handling. Pace may provide pick-up and delivery services to their customers when needed.

2.2.2. Some Pace facilities provide sampling support through a Field Services department. Field Services operates under the Pace Corporate Quality System, with applicable and necessary provisions to address the activities, methods, and goals specific to Field Services. All procedures and methods used by Field Services are documented in SOPs and Procedure Manuals.

2.3. Chain of Custody

2.3.1. A chain of custody (COC) provides the legal documentation of samples from time of collection to completion of analysis.

2.3.2. Field personnel or client representatives must complete a COC for all samples that are received by the laboratory. Samplers are required to properly complete a COC. This is critical to efficient sample receipt and to ensure the requested methods are used to analyze the correct samples. If sample shipments are not accompanied by the correct documentation, the Sample Receiving department notifies a Project Manager. The Project Manager then obtains the correct documentation/information from the customer in order for analysis of samples to proceed.

2.3.3. The COC is filled out completely and legibly with indelible ink. Errors are corrected by drawing a single line through the initial entry and initialing and dating the change. All transfers of samples are recorded on the chain of custody in the "relinquished" and "received by" sections. All information except signatures is printed.

2.3.4. Additional information can be found in SOP S-PAE-C-003 **Sample Receiving** or its equivalent revision or replacement.

2.4. Sample Acceptance Policy

2.4.1. In accordance with regulatory guidelines, Pace complies with the following sample acceptance policy for all samples received.

2.4.2. If the samples do not meet the sample receipt acceptance criteria outlined below, the laboratory is required to document all non-compliances, contact the customer, and either reject the samples or fully document any decisions to proceed with analyses of samples which do not meet the criteria. Any results reported from samples not meeting these criteria are appropriately communicated to the client.

2.4.3. Sample Acceptance Policy requirements:

- Sample containers must have unique client identification designations that are clearly marked with indelible ink on durable, water-resistant labels. The client identifications must match those on the chain-of-custody (COC).
- There must be clear documentation on the COC, or related documents, such as the Cooler Receipt form, that lists the unique sample identification, sampling site location, date and time of sample collection, and name of the sample collector.
- There must be clear documentation on the COC, or related documents that lists the requested analyses, the preservatives used, and any special remarks concerning the samples (i.e., data deliverables, samples are for evidentiary purposes, field filtration, etc.).
- Samples must be in appropriate sample containers. If the sample containers show signs of damage (i.e., broken or leaking) or if the samples show signs of contamination, the samples will not be processed without prior client approval.
- Samples must be correctly preserved upon receipt, unless the method requested allows for laboratory preservation. If the samples are received with inadequate preservation, and the samples cannot be preserved by the lab appropriately, the samples will not be processed without prior client approval.
- Samples must be received within required holding time. Any samples with hold times that are exceeded will not be processed without prior client approval. Clients are requested to notify a PAES Project Manager if samples with short hold times are being shipped.
- Samples must be received with sufficient sample volume or weight to proceed with the analytical testing. If insufficient sample volume or weight is received, analysis will not proceed without client approval.
- All samples that require thermal preservation are considered acceptable if they are received at a temperature within 2°C of the required temperature, or within the method-specified range. For samples with a required temperature of 4°C, samples with a temperature ranging from just above freezing to 6°C are acceptable. Samples that are delivered to the lab on the same day they are collected are considered acceptable if the samples are received on ice.

A cooler receipt form is generated and placed in the project file along with the chain of custody and other related documentation.

2.5.3. All documentation relating to the project is maintained in the project file and retained in the laboratory for five years following the date the project is completed.

2.5.4. Additional information can be found in SOP S-PAE-C-003 **Sample Receiving** or its equivalent revision or replacement.

2.6. Sample Storage

2.6.1. Additional information on sample storage can be found in SOP S-PAE-C-003 **Sample Receiving** or its equivalent revision or replacement and in SOP S-PAE-W-002 **Waste Handling and Management** or its equivalent revision or replacement.

2.6.2. Storage Conditions

2.6.2.1. Samples are stored away from all standards, reagents, or other potential sources of contamination. Samples are stored in a manner that prevents cross contamination. Volatile samples are stored separately from other samples. All sample fractions, extracts, leachates, and other sample preparation products are stored in the same manner as actual samples or as specified by the analytical method.

2.6.2.2. Additional information can be found in SOP S-PAE-Q-008 **Monitoring Temperature Controlled Units** or its equivalent revision or replacement.

2.6.3. Temperature Monitoring

2.6.3.1. Samples are taken to the appropriate storage location immediately after sample receipt and check-in procedures are completed.

2.6.3.2. The temperature of each refrigerated storage area is maintained at $\leq 6^{\circ}C$ (but above freezing) unless state, method or program requirements differ. The temperature of each freezer storage area is maintained at $\leq -10^{\circ}C$ unless state, method or program requirements differ. The temperature of each storage area is checked and documented each working day using Min/Max thermometers. Additional information, including corrective actions for temperatures outside of acceptance limits, can be found in SOP S-PAE-Q-008 **Monitoring Temperature Controlled Units** or its equivalent revision or replacement.

2.6.4. Hazardous Materials

2.6.4.1. Samples designated by clients upon receipt as pure product or potentially heavily contaminated samples, or samples found to be designated as such following analysis, will be handled according to SOP S-PAE-W-002 **Waste Handling and Management** or its equivalent revision or replacement.

2.6.5. Foreign/Quarantined Soils

2.6.5.1. Foreign soils and soils from USDA regulated areas must be adequately segregated to enable proper sample disposal. The USDA requires these samples to be treated by an approved procedure. Additional information regarding USDA regulations and sample handling can be found in the laboratory's SOP for **Regulated Soil Handling** S-PAE-S-002, or its equivalent revision or replacement.

Any samples that are not received at the required temperature will not be processed without prior client approval.

- Some specific clients may require custody seals. **For these clients**, samples or coolers that are not received with the proper custody seals will not be processed without prior client approval.
- Samples that fail the radiation screen according to the criteria set forth in SOP S-PAE-C-003, **Sample Receiving,** or its equivalent revision or replacement, will not be accepted.
- Coolers that arrive with hazard labels on them for which PAES is not equipped or certified will not be accepted. A chart listing these hazards is posted in Sample Receiving.

When problems with samples or documentation are found during the sample receiving process, a Non-Conformance Form is completed by sample receiving personnel and forwarded to a Project Manager. The Project manager will make every attempt to contact the client as soon as possible to make decisions concerning the discrepancies. The Non-Conformance Form is kept as a permanent part of the project file.

2.4.4. Upon sample receipt, the following items are also checked and recorded:

- Presence of custody seals or tapes on the shipping containers;
- Sample condition: Intact, broken/leaking, bubbles in VOA samples;
- Sample holding time;
- Sample pH
- Appropriate containers.

2.4.5. Additional information can be found in SOP S-PAE-C-003 **Sample Receiving** or its equivalent revision or replacement.

2.5. Sample Log-in

2.5.1. After sample inspection, all sample information on the COC is entered into the Laboratory Information Management System (LIMS). The lab's permanent records for samples received include the following information:

- Customer name and contact
- Customer number
- PAES Analytical project number
- PAES Analytical Project Manager
- Sample descriptions
- Due dates
- List of analyses requested
- Date and time of laboratory receipt
- Field ID code
- Date and time of collection
- Any comments resulting from inspection for sample rejection

2.5.2. Specific sample log in procedures are outlined in PAES Standard Operating Procedure for HORIZON LIMS. PAES LIMS assigns a unique internal project number and sequential sample numbers. These numbers are used to track the project through the laboratory. The sample numbers are transferred to each sample container using a computer-generated label. These numbers are documented on the chain of custody form and verified by the Sample Receiving Client Service Tech.

2.7. Subcontracting Analytical Services

2.7.1. Every effort is made to perform all analyses for Pace customers within the laboratory that receives the samples. When subcontracting to a laboratory other than the receiving laboratory, whether inside or outside the Pace network, becomes necessary, a preliminary verbal communication with that laboratory is undertaken. Customers are notified in writing of the laboratory's intention to subcontract any portion of the testing to another laboratory. Work performed under specific protocols may involve special considerations. When possible, subcontracting will be to a TNI-accredited laboratory.

2.7.2. Potential subcontract laboratories must be approved by Pace based on the criteria listed in SOP S-PAE-C-001 **Subcontracting** or its equivalent revision or replacement. All sample reports from the subcontracted labs are appended to the applicable Pace final reports.

2.7.3. Any Pace Analytical work sent to other labs within the Pace network is handled as inter-regional work and all final reports are labeled clearly with the name of the laboratory performing the work. Any non-TNI work is clearly identified. Pace will not be responsible for analytical data if the subcontract laboratory was designated by the customer.

2.7.4. Additional information can be found in SOP S-PAE-C-001 **Subcontracting** or its equivalent revision or replacement.

2.8. Sample Retention and Disposal

2.8.1. Samples, extracts, digestates, and leachates must be retained by the laboratory for the period of time necessary to protect the interests of the laboratory and the customer.

2.8.2. The minimum sample retention time is 30 days after final report generation. Samples requiring thermal preservation may be stored at ambient temperature when the hold time is expired, the report has been delivered, and/or allowed by the customer, program, or contract. Samples requiring storage beyond the minimum sample retention time due to special requests or contractual obligations may be stored at ambient temperature unless the laboratory has sufficient capacity and their presence does not compromise the integrity of other samples.

2.8.3. After this period expires, non-hazardous samples are properly disposed of as non-hazardous waste. The preferred method for disposition of hazardous samples is to return the excess sample to the customer. If it is not feasible to return samples, or the customer requires Pace to dispose of excess samples, proper arrangements will be made for disposal by an approved contractor.

2.8.4. Additional information can be found in SOP S-PAE-W-002 **Waste Handling and Management** and SOP S-PAE-C-003 **Sample Receiving** or their equivalent revisions or replacements.

3.0 QUALITY CONTROL PROCEDURES

3.1. Quality Control Samples

3.1.1. The quality control samples described in this section are analyzed per batch as applicable to the method used. Acceptance criteria must be established for all quality control samples and if the acceptance criteria are not met, corrective actions must be performed and samples reanalyzed, or final reports must be appropriately qualified.

3.1.2. Quality control samples must be processed in the same manner as associated client samples.

3.1.3. Please reference the glossary of this Quality Manual for definitions of all quality control samples mentioned in this section.

3.1.4. Any deviations to the policies and procedures governing quality control samples must be approved by the QM/SQM.

3.2. Method Blank

3.2.1. A method blank is a negative control used to assess the preparation/analysis system for possible contamination and is processed through all preparation and analytical steps with its associated client samples. The method blank is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples. Method blanks are not applicable for certain analyses (i.e., pH, flash point, temperature, etc.).

3.2.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for method blanks.

3.3. Laboratory Control Sample

3.3.1. The Laboratory Control Sample (LCS) is a positive control used to assess the performance of the entire analytical system including preparation and analysis. The LCS is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples.

3.3.2. The LCS contains **all** analytes required by a specific method or by the customer or regulatory agency, which may include full list of target compounds, with certain exceptions. The lab must ensure that all target components are included in the spike mixture for the LCS over a two (2) year period. In the absence of specified components, the laboratory will spike the LCS with the following compounds:

- For multi-peak analytes (e.g. PCBs, technical chlordane, toxaphene), a representative standard will be processed.
- For methods with long lists of analytes, a representative number of target analytes may be chosen. The following criteria is used to determine the number of LCS compounds used:
  - For methods with 1-10 target compounds, the laboratory will spike with all compounds;
  - For methods with 11-20 target compounds, the laboratory will spike with at least 10 compounds or 80%, whichever is greater;

- For methods with greater than 20 compounds, the laboratory will spike with at least 16 compounds.

3.3.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for LCSs.

3.3.4. For LCSs containing a large number of analytes, it is statistically likely that a few recoveries will be outside of control limits. This does not necessarily mean that the system is out of control, and therefore no corrective action would be necessary (except for proper documentation). TNI has allowed for a minimum number of marginal exceedances, defined as recoveries that are beyond the LCS control limits (3X the standard deviation) but within than the marginal exceedance limits (4X the standard deviation). The number of allowable exceedances depends on the number of compounds in the LCS. If more analyte recoveries exceed the LCS control limits than is allowed (see below) or if any one analyte exceeds the marginal exceedance limits, then the LCS is considered non-compliant and corrective actions are necessary. The number of allowable exceedances is as follows:

- >90 analytes in the LCS- 5 analytes
- 71-90 analytes in the LCS- 4 analytes
- 51-70 analytes in the LCS- 3 analytes
- 31-50 analytes in the LCS- 2 analytes
- 11-30 analytes in the LCS- 1 analyte
- <11 analytes in the LCS- no analytes allowed out)

Note: the use of marginal exceedances is not approved for work from the state of South Carolina.

3.4. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

3.4.1. A matrix spike (MS) is a positive control used to determine the effect of the sample matrix on compound recovery for a particular method. A matrix spike/matrix spike duplicate (MS/MSD) set or matrix spike/sample duplicate set is processed at a frequency specified in a particular method or as determined by a specific customer request. The MS and MSD consist of the sample matrix that is spiked with known concentrations of target analytes.

3.4.2. The MS and MSD contain all analytes required by a specific method or by the customer or regulatory agency. In the absence of specified components, the laboratory will spike the MS/MSD with the same number of compounds as previously discussed in the LCS section. However, the lab must ensure that all targeted components are included in the spike mixture for the MS/MSD over a two (2) year period.

3.4.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for MS/MSDs.

3.5. Sample Duplicate

3.5.1. A sample duplicate is a second portion of sample that is prepared and analyzed in the laboratory along with the first portion. It is used to measure the precision associated with preparation and analysis. A sample duplicate is processed at a frequency specified by the particular method or as determined by a specific customer.

3.5.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for sample duplicates.

3.6. Surrogates

3.6.1. Surrogates are compounds that reflect the chemistry of target analytes and are typically added to samples for organic analyses to measure the extraction or purge efficiency and to monitor the effect of the sample matrix on compound recovery.

3.6.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for surrogates.

3.7. Internal Standards

3.7.1. Internal Standards are method-specific analytes that are added, as applicable, to every standard, QC sample, and client sample at a known concentration, prior to analysis for the purpose of adjusting the response factor used in quantifying target analytes.

3.7.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for internal standards.

3.8. Limit of Detection (LOD)

3.8.1. Pace laboratories use a documented procedure to determine a limit of detection (LOD) for each analyte of concern in each matrix reported. Unless otherwise noted in a published method, the procedure used by Pace laboratories to determine LODs is based on the Method Detection Limit (MDL) procedure outlined in 40 CFR Part 136, Appendix B, the TNI Standard and the MUR. All sample processing steps of the preparation and analytical methods are included in the LOD determination including any clean ups.

3.8.2. Additional information can be found in SOP S-PAE-Q-010 **Determination of Detection Limits and Reporting Limits** or its equivalent revision or replacement.

3.9. Limit of Quantitation (LOQ)

3.9.1. A limit of quantitation (LOQ) for every analyte of concern must be determined. For Pace laboratories, this LOQ is referred to as the RL, or Reporting Limit. Results reported below the reporting limit are not allowed to be reported without qualification. For methods with a determined LOD, results can be reported out below the LOQ but above the LOD if they are properly qualified (e.g., J flag).

3.9.2. Additional information can be found in SOP S-PAE-Q-010 **Determination of Detection Limits and Reporting Limits** or its equivalent revision or replacement.

3.10. Estimate of Analytical Uncertainty

3.10.1. Pace laboratories can provide an estimation of uncertainty for results generated by the laboratory. The estimate quantifies the error associated with any given result at a 95% confidence interval. This estimate does not include bias that may be associated with sampling. The laboratory has a procedure in place for making this estimation. In the absence of a regulatory or customer-specific procedure, Pace laboratories base this estimation on the recovery data obtained from the Laboratory Control Samples. The uncertainty is a function of the standard deviation of the recoveries multiplied by the appropriate Student's t Factor at 95% confidence.

3.10.2. The measurement of uncertainty is provided only on request by the customer, as required by specification or regulation and when the result is used to determine conformance within a specification limit.

3.11. Proficiency Testing (PT) Studies

3.11.1. Pace laboratories participate in a defined proficiency testing (PT) program. PT samples are obtained from NIST approved providers and analyzed and reported at a minimum of two times per year for the relevant fields of testing per matrix.

3.12. Rounding and Significant Figures

3.12.1. In general, the Pace laboratories report data to no more than three significant figures. Therefore, all measurements made in the analytical process must reflect this level of precision. In the event that a parameter that contributes to the final result has less than three significant figures of precision, the final result must be reported with no more significant figures than that of the parameter in question. The rounding rules listed below are descriptive of the LIMS and not necessarily of any supporting program such as Excel.

3.12.2. **Rounding:** Pace-PAES follows the odd / even guidelines for rounding numbers:

- If the figure following the one to be retained is less than five, that figure is dropped and the retained ones are not changed (with three significant figures, 2.544 is rounded to 2.54).
- If the figure following the ones to be retained is greater than five, that figure is dropped and the last retained one is rounded up (with three significant figures, 2.546 is rounded to 2.55).
- If the figure following the ones to be retained is five and if there are no figures other than zeros beyond that five, then the five is dropped and the last figure retained is unchanged if it is even and rounded up if it is odd (with three significant figures, 2.525 is rounded to 2.52 and 2.535 is rounded to 2.54).

3.12.3. **Significant Figures**

- Unless specified by federal, state, or local requirements or on specific request by a customer, PAES reports all analytical results to at least 2 significant figures, regardless of the magnitude of the value reported.

3.13. Retention Time Windows

3.13.1. When chromatographic conditions are changed, retention times and analytical separations are often affected. As a result, two critical aspects of any chromatographic method are the determination and verification of retention times and analyte separation. Retention time windows must be established for the identification of target analytes. The retention times of all target analytes in all calibration verification standards must fall within the retention time windows. If an analyte falls outside the retention time window in an ICV or CCV, new absolute retention time windows must be calculated, unless instrument maintenance fixes the problem. When a new column is installed, a new retention time window study must be performed.

3.13.2. Please reference method-specific SOPs for the proper procedure for establishing retention time windows.

3.14. Analytical Method Validation and Instrument Validation

3.14.1. In some situations, Pace develops and validates methodologies that may be more applicable to a specific problem or objective. When non-standard methods are required for specific projects or analytes of interest, or when the laboratory develops or modifies a method, the laboratory validates the method prior to applying it to customer samples. Method validity is established by meeting criteria for precision and accuracy as established by the data quality objectives specified by the end user of the data. The laboratory records the validation procedure, the results obtained and a statement as to the usability of the method. The minimum requirements for method validation include evaluation of sensitivity, quantitation, precision, bias, and selectivity of each analyte of interest.

3.15. Regulatory and Method Compliance

3.15.1. It is Pace policy to disclose in a forthright manner any detected noncompliance affecting the usability of data produced by our laboratories. The laboratory will notify customers within 30 days of fully characterizing the nature of the nonconformance, the scope of the nonconformance and the impact it may have on data usability.

4.0. DOCUMENT MANAGEMENT AND CHANGE CONTROL

4.1. Document Management

4.1.1. Additional information can be found in SOP S-PAE-Q-002 **Document Control and Management** or its equivalent revision or replacement. Information on Pace's policy for electronic signatures can also be found in this SOP.

4.1.2. Pace has an established procedure for managing documents that are part of the quality system.

4.1.3. A master list of all managed documents is maintained at each facility identifying the current revision status and distribution of the controlled documents.

4.1.4. Each managed document is uniquely identified to include the date of issue, the revision identification, page numbers, the total number of pages and the issuing authorities. For complete information on document numbering, refer to SOP S-ALL-Q-003 **Document Numbering** or its equivalent revision or replacement

4.1.5. **Quality Assurance Manual (QAM):** The Quality Assurance Manual is the company-wide document that describes all aspects of the quality system for Pace. The base QAM template is distributed by the Corporate Environmental Quality Department to each of the SQMs/QMs. The local management personnel modify the necessary and permissible sections of the base template and then all applicable staff sign the Quality Assurance Manual. Each SQM/QM is then in charge of distribution to employees, external customers or regulatory agencies and maintaining a distribution list of controlled document copies. The Quality Assurance Manual template is reviewed on an annual basis and revised accordingly by the Corporate Quality office.

4.1.6. **Standard Operating Procedures (SOPs)**

4.1.6.1. SOPs are reviewed every two years at a minimum although a more frequent review may be required by some state or federal agencies or customers. If no revisions are made based on this review, documentation of the review itself is made by the addition of new signatures on the cover page. If revisions are made, documentation of the revisions is made in the revisions section of each SOP and a new revision number is applied to the SOP. This provides a historical record of all revisions.

4.1.6.2. All copies of superseded SOPs are removed from general use and the original copy of each SOP is archived for audit or knowledge preservation purposes. This ensures that all Pace employees use the most current version of each SOP and provides the SQM/QM with a historical record of each SOP.

4.1.6.3. Additional information can be found in SOP S-PAE-Q-001 **Preparation of SOPs** or its equivalent revision or replacement.

4.2. Document Change Control

4.2.1. Additional information can be found in SOP S-PAE-Q-002 **Document Control and Management** or its equivalent revision or replacement.

4.2.2. Changes to managed documents are reviewed and approved in the same manner as the original review. Any revision to a document requires the approval of the applicable signatories. After

revisions are approved, a revision number is assigned and the previous version of the document is officially retired.

4.2.3. All copies of the previous document are replaced with copies of the revised document and the superseded copies are destroyed or archived. All affected personnel are advised that there has been a revision and any necessary training is scheduled.

5.0. EQUIPMENT AND MEASUREMENT TRACEABILITY

5.1. Standards and Traceability

5.1.1. Each Pace facility retains pertinent information for standards, reagents, and chemicals to assure traceability to a national standard. This includes documentation of purchase, receipt, preparation, and use.

5.1.2. Upon receipt, all purchased standard reference materials are recorded into a standard logbook or database and assigned a unique identification number. The entries include the facility's unique identification number, the chemical name, manufacturer name, manufacturer's identification numbers, receipt date, and expiration date. Vendor's certificates of analysis for all standards, reagents, or chemicals are retained for future reference.

5.1.3. Subsequent preparations of intermediate or working solutions are also documented in a standard logbook or database. These entries include the stock standard name and lot number, the manufacturer name, the solvents used for preparation, the solvent lot number and manufacturer, the preparation steps, preparation date, expiration dates, preparer's initials, the concentration values and units, and a unique Pace identification number. This number is used in any applicable sample preparation or analysis logbook so the standard can be traced back to the standard preparation record. This process ensures traceability back to the national standard.

5.1.4. All prepared standard or reagent containers include the Pace identification number, the standard or chemical name, the date of preparation, the date of expiration, the concentration with units, and the preparer's initials, unless the container is too small to hold all of this information. This ensures traceability back to the standard preparation logbook or database.

5.1.5. All initial calibrations must be verified with a standard obtained from a second manufacturer or a separate lot prepared independently by the same manufacturer, unless client-specific QAPP requirements state otherwise.

5.1.6. Additional information concerning the procurement of standards and reagent and their traceability can be found in the SOP S-PAE-Q-011**Standard and Reagent Management and Traceability** or its equivalent revision or replacement.

5.2. General Analytical Instrument Calibration Procedures

5.2.1. All applicable instrumentation are calibrated or checked before use to ensure proper functioning and verify that laboratory, client and regulatory requirements are met. All calibrations are performed by, or under the supervision of, an experienced analyst at scheduled intervals against either certified standards traceable to recognized national standards or reference standards whose values have been statistically validated.

5.2.2. Calibration standards for each parameter are chosen to establish the linear range of the instrument and must bracket the concentrations of those parameters measured in the samples. The lowest calibration standard is the lowest concentration for which quantitative data may be reported. Data reported below this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in a narrative. The highest calibration standard is the highest concentration for which quantitative data may be reported. Data reported above this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in the narrative.

5.2.3. Instrumentation or support equipment that cannot be calibrated to specification or is otherwise defective is clearly labeled as out-of-service until it has been repaired and tested to demonstrate it meets the laboratory's specifications. All repair and maintenance activities including service calls are documented in the maintenance log. Equipment sent off-site for calibration testing is packed and transported to prevent breakage and is in accordance with the calibration laboratory's recommendations.

5.2.4. In the event that recalibration of a piece of test equipment indicates the equipment may have been malfunctioning during the course of sample analysis, an investigation is performed. The results of the investigation along with a summary of the information reviewed are documented and maintained by the quality manager. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed. This allows for sufficient investigation and review of documentation to determine the impact on the analytical results. Instrumentation found to be consistently out of calibration is either repaired and positively verified or taken out of service and replaced.

5.2.5. Raw data records are retained to document equipment performance. Sufficient raw data is retained to reconstruct the instrument calibration and explicitly connect the continuing calibration verification to the initial calibration.

5.3. Support Equipment Calibration and Verification Procedures

5.3.1. All support equipment is calibrated or verified at least annually using NIST traceable references over the entire range of use, as applicable. The results of calibrations or verifications must be within the specifications required or the equipment will be removed from service until brought back into control. Additional information regarding calibration and maintenance of support equipment can be found in SOP S-PAE-Q-009 **Support Equipment** or its equivalent revision or replacement.

5.3.2. On each day the support equipment is used, it is verified, as applicable, in the expected range of use with NIST traceable references in order to ensure the equipment meets laboratory specifications. These checks are documented appropriately. This applies mainly to thermometers within temperature-controlled units and balances.

5.3.3. **Analytical Balances**

5.3.3.1. Each analytical balance is calibrated or verified at least annually by a qualified service technician. The calibration of each balance is verified each day of use with weights traceable to NIST bracketing the range of use. Calibration weights are ASTM Class 1 or other class weights that have been calibrated against a NIST standard weight and are re-certified annually at a minimum against a NIST traceable reference. Some accrediting agencies may require more frequent checks. If balances are calibrated by an external agency, verification of their weights must be provided. All information pertaining to balance maintenance and calibration is recorded in the individual balance logbook and/or is maintained on file in the local Quality department.

5.3.4. **Thermometers**

5.3.4.1. Certified, or reference, thermometers are maintained for checking calibration of working thermometers. Reference thermometers are provided with NIST traceability for initial calibration and are re-certified, annually with equipment directly traceable to NIST.

5.3.4.2. Working thermometers are compared with the reference thermometers annually. Each thermometer is individually numbered and assigned a correction factor based on the NIST reference

source. In addition, working thermometers are visually inspected by laboratory personnel prior to use and temperatures are documented.

5.3.4.3. Laboratory thermometer inventory and calibration data are maintained in the local Quality department.

5.3.5. **pH/Electrometers**

5.3.5.1. The meter is calibrated before use each day, using fresh buffer solutions.

5.3.6. **Mechanical Volumetric Dispensing Devices**

5.3.6.1. Mechanical volumetric dispensing devices including bottle top dispensers (those that are critical in measuring a required amount of reagent), pipettes, and burettes, excluding Class A volumetric glassware, are checked for accuracy on a quarterly basis.

5.3.6.2. Additional information regarding calibration and maintenance of laboratory support equipment can be found in SOP S-PAE-Q-009 **Support Equipment** or its equivalent revision or replacement.

5.4. Instrument/Equipment Maintenance

5.4.1. The objectives of the Pace Analytical maintenance program are twofold: to establish a system of instrument care that maintains instrumentation and equipment at required levels of calibration and sensitivity, and to minimize loss of productivity due to repairs.

5.4.2. The Operations Manager and/or department manager/supervisors are responsible for providing technical leadership to evaluate new equipment, solve equipment problems, and coordinate instrument repair and maintenance. Analysts have the primary responsibility to perform routine maintenance.

5.4.3. To minimize downtime and interruption of analytical work, preventative maintenance may routinely be performed on each analytical instrument. Up-to-date instructions on the use and maintenance of equipment are available to staff in the department where the equipment is used.

5.4.4. Department manager/supervisors are responsible for maintaining an adequate inventory of spare parts required to minimize equipment downtime. This inventory includes parts and supplies that are subject to frequent failure, have limited lifetimes, or cannot be obtained in a timely manner should a failure occur.

5.4.5. All major equipment and instrumentation items are uniquely identified to allow for traceability. Equipment/instrumentation is, unless otherwise stated, identified as a system and not as individual pieces. The laboratory maintains equipment records that include the following:

- The name of the equipment and its software
- The manufacturer's name, type, and serial number
- Approximate date received and date placed into service
- Current location in the laboratory
- Condition when received (new, used, etc.)
- Copy of any manufacturer's manuals or instructions
- Dates and results of calibrations and next scheduled calibration (if known)
- Details of past maintenance activities, both routine and non-routine
- Details of any damage, modification or major repairs

5.4.6. All instrument maintenance is documented in maintenance logbooks that are assigned to each particular instrument or system.

5.4.7. The maintenance log entry must include a summary of the results of that analysis and verification by the analyst that the instrument has been returned to an in-control status. In addition, each entry must include the initials of the analyst making the entry, the dates the maintenance actions were performed, and the date the entry was made in the maintenance logbook, if different from the date(s) of the maintenance.

5.4.8. Any equipment that has been subjected to overloading or mishandling, or that gives suspect results, or has been shown to be defective, is taken out of service and clearly identified. The equipment shall not be used to analyze customer samples until it has been repaired and shown to perform satisfactorily. In the event of instrumentation failure, to avoid hold time issues, the lab may subcontract the necessary samples to another Pace lab or to an outside subcontract lab if possible.

6.0. CONTROL OF DATA

Analytical results processing, verification, and reporting are procedures employed that result in the delivery of defensible data. These processes include, but are not limited to, calculation of raw data into final concentration values, review of results for accuracy, evaluation of quality control criteria and assembly of technical reports for delivery to the data user.

All analytical data undergo a documented multi-tier review process prior to being reported to the customer. This section describes procedures used for translating raw analytical data into accurate final sample reports as well as Pace data storage policies.

When analytical, field, or product testing data is generated, it is documented appropriately. These logbooks and other laboratory records are kept in accordance with each facility's SOP for documentation storage and archival In this case, the laboratory must ensure that there are sufficient redundant electronic copies so no data is lost due to unforeseen computer issues

6.1. Primary Data Review

6.1.1. The primary analyst is responsible for initial data reduction and data review. This includes confirming compliance with required methodology, verifying calculations, evaluating quality control data, noting non-conformances in logbooks or as footnotes or narratives, and uploading analytical results into the LIMS. The primary analyst must be clearly identified in all applicable logbooks, spreadsheets, LIMS fields, and data review checklists.

6.1.2. The primary analyst compiles the initial data for secondary data review. This compilation must include sufficient documentation for secondary data review.

6.1.3. Additional information regarding data review procedures can be found in SOP S-PAE-Q-004 **Data Integrity, Review and Validation** or its equivalent revision or replacement, as well as in SOP S-PAE-Q-003 **Manual Integration** or its equivalent revision or replacement.

6.2. Secondary Data Review

6.2.1. Secondary data review is the process of examining data and accepting or rejecting it based on pre-defined criteria. This review step is designed to ensure that reported data are free from calculation and transcription errors, that quality control parameters are evaluated, and that any non-conformances are properly documented.

6.2.2. The completed data from the primary analyst is sent to a designated qualified secondary data reviewer (this cannot be the primary analyst). The secondary data reviewer provides an independent technical assessment of the data package and technical review for accuracy according to methods employed and laboratory protocols. This assessment involves a quality control review for use of the proper methodology and detection limits, compliance to quality control protocol and criteria, presence and completeness of required deliverables, and accuracy of calculations and data quantitation. The reviewer validates the data entered into the LIMS and documents approval of manual integrations.

6.2.2. Additional information regarding data review procedures can be found in SOP S-PAE-Q-004 **Data Integrity, Review and Validation** or its equivalent revision or replacement, as well as in SOP S-PAE-Q- 003 **Manual Integration** or its equivalent revision or replacement.

6.2.3. The Laboratory Manager attempts to review approximately 10% of all laboratory data. Either the Quality Systems Manager or his designee will review 10% of all DoD data packages. This review is part of the oversight program and does not have to be completed in "real time." Project Managers complete the data validation process by reviewing final reports for completeness prior to submission to the client.

6.3. Data Reporting

6.3.1. Data for each analytical fraction pertaining to a particular Pace project number are delivered to the Project Manager for assembly into the final report. All points mentioned during technical and QC reviews are included in data qualifiers on the final report or in a separate case narrative if there is potential for data to be impacted.

6.3.2. Final reports are prepared according to the level of reporting required by the customer and can be transmitted to the customer via hardcopy or electronic deliverable.

6.3.3. Any changes made to a final report shall be designated as "Revised" or equivalent wording. The laboratory must keep sufficient archived records of all laboratory reports and revisions. For higher levels of data deliverables, a copy of all supporting raw data is sent to the customer along with a final report of results. Pace will provide electronic data deliverables (EDD) as required by contracts or upon customer request.

6.3.4. Customer data that requires transmission by telephone, telex, facsimile or other electronic means undergoes appropriate steps to preserve confidentiality.

6.3.5. The following positions are the only approved signatories for Pace final reports:

- Senior General Manager
- General Manager
- Assistant General Manager
- Senior Quality Manager
- Quality Manager
- Client Services Manager
- Project Manager
- Project Coordinator

6.4. Data Security

6.4.1. All data including electronic files, logbooks, extraction/digestion/distillation worksheets, calculations, project files and reports, and any other information used to produce the technical report are maintained secured and retrievable by the Pace facility.

6.5. Data Archiving

6.5.1. All records compiled by Pace are archived in a suitable, limited-access environment to prevent loss, damage, or deterioration by fire, flood, vermin, theft, and/or environmental deterioration. Records are retained for a minimum of five years unless superseded by federal, state, contractual, and/or accreditation requirements. TNI-related records will be made readily available to

accrediting authorities. Access to archived data is documented and controlled by the SQM/QM or a designated Data Archivist.

6.5.2. Records that are computer-generated have either a hard copy or electronic backup copy. Hardware and software necessary for the retrieval of electronic data is maintained with the applicable records. Archived electronic records are stored protected against electronic and/or magnetic sources.

6.5.3. In the event of a change in ownership, accountability or liability, reports of analyses performed pertaining to accreditation will be maintained per the purchase agreement. In the event of bankruptcy, laboratory reports and/or records will be transferred to the customer and/or the appropriate regulatory entity upon request.

6.6. Data Disposal

6.6.1. Data that has been archived for the facility's required storage time may be disposed of in a secure manner by shredding, returning to customer, or utilizing some other means that does not jeopardize data confidentiality. Records of data disposal will be archived for a minimum of five years unless superseded by federal, contractual, and/or accreditation requirements. Data disposal includes any preliminary or final reports that are disposed.

7.0. QUALITY SYSTEM AUDITS AND REVIEWS

7.1. Internal Audits

7.1.1. Responsibilities

7.1.1.1. The SQM/QM is responsible for managing and/or conducting internal audits in accordance with a predetermined schedule and procedure. Since internal audits represent an independent assessment of laboratory functions, the auditor must be independent from laboratory operations to ensure objectivity. The auditor must be trained, qualified, and familiar enough with the objectives, principles, and procedures of laboratory operations to be able to perform a thorough and effective evaluation. The SQM/QM evaluates audit observations and verifies the completion of corrective actions. In addition, a periodic corporate audit will be conducted. The corporate audits will focus on the effectiveness of the Quality System as outlined in this manual but may also include other quality programs applicable to an individual laboratory.

7.1.1.2. Additional information can be found in SOP S-PAE-Q-007 **Internal Audits** or its equivalent revision or replacement.

7.1.2. Scope and Frequency of Internal Audits

7.1.2.1. The complete internal audit process consists of the following four sections: 1) Raw Data Reviews, 2) traditional Quality Systems internal audits (including SOP and method compliance), 3) Final Report Reviews, and 4) Corrective Action Effectiveness Follow-up.

7.1.2.2. Internal systems audits are conducted yearly at a minimum. The scope of these audits includes evaluation of specific analytical departments or a specific quality related system as applied throughout the laboratory.

7.1.2.3. Where the identification of non-conformities or departures cast doubt on the laboratory's compliance with its own policies and procedures, the lab must ensure that the appropriate areas of activity are audited as soon as possible.

7.1.2.4. Certain projects may require an internal audit to ensure laboratory conformance to site work plans, sampling and analysis plans, QAPPs, etc.

7.1.2.5. The laboratory, as part of their overall internal audit program, ensures that a review is conducted with respect to any evidence of inappropriate actions or vulnerabilities related to data integrity. Discovery and reporting of potential data integrity issues are handled in a confidential manner. All investigations that result in findings of inappropriate activity are fully documented, including the source of the problem, the samples and customers affected the impact on the data, the corrective actions taken by the laboratory, and which final reports had to be re-issued. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed.

7.1.2.6. Internal Audits are scheduled and conducted by the Quality Systems Department or their designees.

7.1.3. Internal Audit Reports and Corrective Action Plans

7.1.3.1. A full description of the audit, including the identification of the operation audited, the date(s) on which the audit was conducted, the specific systems examined, and the observations

noted are summarized in an internal audit report. Although other personnel may assist with the performance of the audit, the SQM/QM writes and issues the internal audit report identifying which audit observations are deficiencies that require corrective action.

7.1.3.2. Corrective Action based upon the root cause analysis is indicated on a Corrective Action Report (see Figure 2-3). A Corrective Action Report is prepared for each deficiency listed on the Internal Audit Report. The Internal Audit Report and Corrective Action Report are forwarded to the appropriate Department Head for corrective action. A follow-up audit is conducted and documented.

7.1.3.3. If the audit was of a technical nature, the Audit Report will be forwarded to the Laboratory Manager. The Laboratory Manager will meet with the specific Department Manager the first business day once the audit findings are received. The audit will be discussed along with the recommendations for corrective action. Corrective action is expected to take place as soon as possible following the audit. A follow-up audit of any deficient area(s) will be conducted within 60-120 days of audit completion, or as soon as corrective action is completed in order to monitor the effectiveness of corrective action. This timeframe is just a guide.

7.1.3.4. When audit findings cast doubt on the effectiveness of the operations or on the correctness or validity of the laboratory's environmental test results, the laboratory will take timely corrective action as specified in PAES' Quality Policy Statement. If the subsequent investigation shows that laboratory results have been affected, the affected client shall be notified in writing by the Client Service Office.

7.1.3.5. Additional information can be found in SOP S-PAE-Q-007 **Internal Audits** or its equivalent revision or replacement.

7.2. External Audits

7.2.1. Pace laboratories are audited regularly by regulatory agencies to maintain laboratory certifications and by customers to maintain appropriate specific protocols.

7.2.2. External audit teams review the laboratory to assess the effectiveness of quality systems. The SQM/QM host the external audit team and assist in facilitation of the audit process. After the audit, the external auditors will prepare a formalized audit report listing deficiencies observed and follow-up requirements for the laboratory. The laboratory staff and supervisors develop corrective action plans to address any deficiencies with the guidance of the SQM/QM, who provides a written response to the external audit team. The SQM/QM follows-up with the laboratory staff to ensure corrective actions are implemented and that the corrective action was effective.

7.3. Annual Managerial Review

7.3.1. A managerial review of Management and Quality Systems is performed on an annual basis at a minimum. This allows for assessing program effectiveness and introducing changes and/or improvements. Additional information can be found in SOP S-ALL-Q-015 **Review of Laboratory Management System** or its equivalent revision or replacement.

7.3.2. The managerial review must include the following topics of discussion:

- Suitability of quality management policies and procedures

- Manager/Supervisor reports
- Internal audit results
- Corrective and preventive actions
- External assessment results
- Proficiency testing studies
- Sample capacity and scope of work changes
- Customer feedback, including complaints
- Recommendations for improvement,
- Other relevant factors, such as quality control activities, resources, and staffing.

7.3.3. This managerial review must be documented for future reference by the SQM/QM and copies of the report are distributed to laboratory staff. Results must feed into the laboratory planning system and must include goals, objectives, and action plans for the coming year. The laboratory shall ensure that any actions identified during the review are carried out within an appropriate and agreed upon timescale.

8.0. CORRECTIVE ACTION

Additional information can be found in SOP SOP-PAE-Q-005 **Corrective Action Reports** or its equivalent revision or replacement.

During the process of sample handling, preparation, and analysis, or during review of quality control records, or during reviews of non-technical portions of the lab, certain occurrences may warrant the necessity of corrective actions. These occurrences may take the form of analyst errors, deficiencies in quality control, method deviations, or other unusual circumstances. The Quality System of Pace provides systematic procedures for the documentation, monitoring, completion of corrective actions, and follow-up verification of the effectiveness of these corrective actions. This can be done using procedures found in SOP-PAE-Q-005 that lists at a minimum, the deficiency by issue number, the deficiency source, responsible party, root cause, resolution, due date, and date resolved.

8.1. Corrective and Preventive Action Documentation

8.1.1. The person who discovers the deficiency or non-conformance initiates the corrective action documentation within the lab's corrective action system. The documentation must include (as applicable): the affected projects and sample numbers, the name of the applicable Project Manager, the customer name, and the sample matrix involved. The person initiating the corrective action documentation must also list the known causes of the deficiency or non-conformance as well as any corrective/preventative actions that they have taken. Preventive actions must be taken in order to prevent or minimize the occurrence of the situation.

8.1.2. **Root Cause Analysis**: Laboratory personnel and management staff will start a root cause analysis by going through an investigative process. During this process, the following general steps must be taken into account: defining the non-conformance, assigning responsibilities, determining if the condition is significant, and investigating the root cause. General non-conformance investigative techniques follow the path of the sample through the process looking at each individual step in detail. The root cause must be documented within the lab's corrective action system.

8.1.3. Based on the root cause(s) determined, the lab implements applicable corrective actions and verifies their effectiveness. In the event that analytical testing or results do not conform to documented laboratory policies or procedures Project Management will notify the customer of the situation and will advise of any ramifications to data quality if impacted (with the possibility of work being recalled).

8.1.4. **Preventive Actions**: The preferred course of laboratory quality and improvement is to identify opportunities for improvement rather than react to the occurrence of problems or complaints. PAES is continually seeking ways to improve its performance and product. When these areas are identified, a plan is developed by the department managers. Preventative actions are implemented according to the time table specified in the plan. Preventive action procedures include follow-up actions and applications of controls in order to ensure effectiveness. The laboratory seeks both negative and positive feedback from its customers. Feedback provides acknowledgement, corrective actions when needed, and opportunities for improvement. A statement printed on the front page of all final reports gives an avenue for customers to provide comments to us on our performance. Random surveys may also be used as a means to gather feedback from customers. This information is forwarded to the Quality Systems Department.

8.1.5. **Management Arrangements for Permitting Departures from Documented Procedures or Standard Specifications**: It is PAES management's intent to ensure that documented procedures are followed. Rarely, a situation may occur that requires a departure from documented quality procedures. When this type of situation occurs, the AGM/QM and department managers whose department may be affected, will discuss and unanimously agree upon the action to be taken. The departure will be documented in memo form and kept on file in the Quality office. Corrective action will be taken as soon as possible to prevent the necessity of the departure from reoccurring.

8.2. Corrective Action Completion

8.2.1. Internal Laboratory Non-Conformance Trends

8.2.1.1. There are several types of non-conformance trends that may occur in the laboratory that would require the initiation of a corrective action report. Laboratories may choose to initiate a corrective action for all instances of one or more of these categories if they so choose, however the intent is that each of these would be handled according to its severity; one time instances could be handled with a footnote or qualifier whereas a systemic problem with any of these categories may require an official corrective action process. These categories, as defined in the Corrective Action SOP are as follows:

- Login error
- Preparation Error
- Contamination
- Calibration Failure
- Internal Standard Failure
- LCS Failure
- Laboratory accident
- Spike Failure
- Instrument Failure
- Final Reporting error

8.2.2. PE/PT Sample Results

8.2.2.1. Any PT result assessed as "not acceptable" requires an investigation and applicable corrective actions. The operational staff is made aware of the PT failures and they are responsible for reviewing the applicable raw data and calibrations and list possible causes for error. The SQM/QM reviews their findings and initiates another external PT sample or an internal PT sample to try and correct the previous failure. Replacement PT results must be monitored by the SQM/QM and reported to the applicable regulatory authorities.

8.2.3. Internal and External Audits

8.2.3.1. The SQM/QM is responsible for documenting all audit findings and their corrective actions. This documentation must include the initial finding, the persons responsible for the corrective action, the due date for responding to the auditing body, the root cause of the finding, and the corrective actions needed for resolution. The SQM/QM is also responsible for providing any back-up documentation used to demonstrate that a corrective action has been completed.

8.2.4. Data Review

8.2.4.1. In the course of performing primary and secondary review of data or in the case of raw data reviews (e.g., by the SQM/QM), errors may be found which require corrective actions. Any finding that affects the quality of the data requires some form of corrective action, which may include revising and re-issuing of final reports.

8.2.5. Client Complaints

8.2.5.1. Project Managers are responsible for issuing corrective action forms, when warranted, for client complaints. As with other corrective actions, the possible causes of the problem are listed and the form is passed to the appropriate analyst or supervisor for investigation. After potential corrective actions have been determined, the Project Manager reviews the corrective action form to ensure all client needs or concerns are being adequately addressed.

8.2.6. Holding Time Violations

8.2.6.1. The Project Manager and the SQM/QM must be made aware of all holding time violations.

8.2.6.2. The Project Manager must contact the customer in order that appropriate decisions are made regarding the hold time excursion and the ultimate resolution is then documented and included in the customer project file.

9.0. GLOSSARY

The source of some of the definitions is indicated previous to the actual definition (e.g., TNI, DoD).

Terms and Definitions	
3P Program	The Pace continuous improvement program that focuses on Process, Productivity, and Performance. Best Practices are identified that can be used by all Pace labs.
Acceptance Criteria	TNI- Specified limits placed on characteristics of an item, process, or service defined in requirement documents.
Accreditation	TNI- The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. DoD- Refers to accreditation in accordance with the DoD ELAP.
Accreditation Body (AB)	TNI- The organization having responsibility and accountability for environmental laboratory accreditation and which grants accreditation under this program. DoD- Entities recognized in accordance with the DoD-ELAP that are required to operate in accordance with ISO/IEC 17011, *Conformity assessment: General requirements for accreditation bodies accrediting conformity assessment bodies*. The AB must be a signatory, in good standing, to the International Laboratory Accreditation Cooperation (ILAC) mutual recognition arrangement (MRA) that verifies, by evaluation and peer assessment, that its signatory members are in full compliance with ISO/IEC 17011 and that its accredited laboratories comply with ISO/IEC 17025.
Accuracy	TNI- The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator.
Activity, Absolute	TNI- Rate of nuclear decay occurring in a body of material, equal to the number of nuclear disintegrations per unit time. NOTE: Activity (absolute) may be expressed in becquerels (Bq), curies (Ci), or disintegrations per minute (dpm), and multiples or submultiples of these units.
Activity, Areic	TNI- Quotient of the activity of a body of material and its associated area.
Activity, Massic	TNI- Quotient of the activity of a body of material and its mass; also called specific activity.
Activity, Volumic	TNI- Quotient of the activity of a body of material and its volume; also called activity concentration. NOTE: In this module [TNI Volume 1, Module 6], unless otherwise stated, references to activity shall include absolute activity, areic activity, massic activity, and volumic activity.
Activity Reference Date	TNI- The date (and time, as appropriate to the half-life of the radionuclide) to which a reported activity result is calculated. NOTE: The sample collection date is most frequently used as the Activity Reference Date for environmental measurements, but different programs may specify other points in time for correction of results for decay and ingrowth.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.

American Society for Testing and Materials (ASTM)	An international standards organization that develops and publishes voluntary consensus standards for a wide range of materials, products, systems and services.
Analysis	DoD- A combination of sample preparation and instrument determination.
Analysis Code (Acode)	All the set parameters of a test, such as Analytes, Method, Detection Limits and Price.
Analysis Sequence	A compilation of all samples, standards and quality control samples run during a specific amount of time on a particular instrument in the order they are analyzed.
Analyst	TNI- The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.
Analyte	TNI- A substance, organism, physical parameter, property, or chemical constituent(s) for which an environmental sample is being analyzed. DoD- The specific chemicals or components for which a sample is analyzed; it may be a group of chemicals that belong to the same chemical family and are analyzed together.
Analytical Method	DoD- A formal process that identifies and quantifies the chemical components of interest (target analytes) in a sample.
Analytical Uncertainty	TNI- A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.
Annual (or Annually)	Defined by Pace as every 12 months ± 30 days.
Assessment	TNI - The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its system to defined criteria (to the standards and requirements of laboratory accreditation). DoD- An all-inclusive term used to denote any of the following: audit, performance evaluation, peer review, inspection, or surveillance conducted on-site.
Atomic Absorption Spectrometer	Instrument used to measure concentration in metals samples.
Atomization	A process in which a sample is converted to free atoms.
Audit	TNI- A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.

Batch	TNI- Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same quality systems matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed 20 samples.
Batch, Radiation Measurements (RMB)	TNI- An RMB is composed of 1 to 20 environmental samples that are counted directly without preliminary physical or chemical processing that affects the outcome of the test (e.g., non-destructive gamma spectrometry, alpha/beta counting of air filters, or swipes on gas proportional detectors). The samples in an RMB share similar physical and chemical parameter, and analytical configurations (e.g., analytes, geometry, calibration, and background corrections). The maximum time between the start of processing of the first and last in an RMB is 14 calendar days.
Bias	TNI- The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).
Blank	TNI and DoD- A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results (See Method Blank). DoD- Blank samples are negative control samples, which typically include field blank samples (e.g., trip blank, equipment (rinsate) blank, and temperature blank) and laboratory blank samples (e.g., method blank, reagent blank, instrument blank, calibration blank, and storage blank).
Blind Sample	A sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.
BNA (Base Neutral Acid compounds)	A list of semi-volatile compounds typically analyzed by mass spectrometry methods. Named for the way they can be extracted out of environmental samples in an acidic, basic or neutral environment.
BOD (Biochemical Oxygen Demand)	Chemical procedure for determining how fast biological organisms use up oxygen in a body of water.

Calibration	TNI- A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. 1) In calibration of support equipment, the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI); 2) In calibration according to test methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.
Calibration Curve	TNI- The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.
Calibration Method	A defined technical procedure for performing a calibration.
Calibration Range	DoD- The range of values (concentrations) between the lowest and highest calibration standards of a multi-level calibration curve. For metals analysis with a single-point calibration, the low-level calibration check standard and the high standard establish the linear calibration range, which lies within the linear dynamic range.
Calibration Standard	TNI- A substance or reference material used for calibration.
Certified Reference Material (CRM)	TNI- Reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute.
Chain of Custody	An unbroken trail of accountability that verifies the physical security of samples, data, and records.
Chain of Custody Form (COC)	TNI- Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and type of containers; the mode of collection, the collector, time of collection; preservation; and requested analyses.
Chemical Oxygen Demand (COD)	A test commonly used to indirectly measure the amount of organic compounds in water.
Client (referred to by ISO as Customer)	Any individual or organization for whom items or services are furnished or work performed in response to defined requirements and expectations.
Code of Federal Regulations (CFR)	A codification of the general and permanent rules published in the Federal Register by agencies of the federal government.
Comparability	An assessment of the confidence with which one data set can be compared to another. Comparable data are produced through the use of standardized procedures and techniques.
Completeness	The percent of valid data obtained from a measurement system compared to the amount of valid data expected under normal conditions. The equation for completeness is: % Completeness = (Valid Data Points/Expected Data Points)*100

Confirmation	TNI- Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: second-column confirmation; alternate wavelength; derivatization; mass spectral interpretation; alternative detectors; or additional cleanup procedures. DoD- Includes verification of the identity and quantity of the analyte being measured by another means (e.g., by another determinative method, technology, or column). Additional cleanup procedures alone are not considered confirmation techniques.
Conformance	An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements.
Congener	A member of a class of related chemical compounds (e.g., PCBs, PCDDs).
Consensus Standard	DoD- A standard established by a group representing a cross-section of a particular industry or trade, or a part thereof.
Continuing Calibration Blank (CCB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method.
Continuing Calibration Check Compounds (CCC)	Compounds listed in mass spectrometry methods that are used to evaluate an instrument calibration from the standpoint of the integrity of the system. High variability would suggest leaks or active sites on the instrument column.
Continuing Calibration Verification	DoD- The verification of the initial calibration. Required prior to sample analysis and at periodic intervals. Continuing calibration verification applies to both external and internal standard calibration techniques, as well as to linear and non-linear calibration models.
Continuing Calibration Verification (CCV) Standard	Also referred to as a Calibration Verification Standard (CVS) in some methods, it is a standard used to verify the initial calibration of compounds in an analytical method. CCVs are analyzed at a frequency determined by the analytical method.
Continuous Emission Monitor (CEM)	A flue gas analyzer designed for fixed use in checking for environmental pollutants.
Continuous Improvement Plan (CIP)	The delineation of tasks for a given laboratory department or committee to achieve the goals of that department.
Contract Laboratory Program (CLP)	A national network of EPA personnel, commercial labs, and support contractors whose fundamental mission is to provide data of known and documented quality.
Contract Required Detection Limit (CRDL)	Detection limit that is required for EPA Contract Laboratory Program (CLP) contracts.
Contract Required Quantitation Limit (CRQL)	Quantitation limit (reporting limit) that is required for EPA Contract Laboratory Program (CLP) contracts.
Control Chart	A graphic representation of a series of test results, together with limits within which results are expected when the system is in a state of statistical control (see definition for Control Limit)

Control Limit	A range within which specified measurement results must fall to verify that the analytical system is in control. Control limit exceedances may require corrective action or require investigation and flagging of non-conforming data.
Correction	DoD- Action taken to eliminate a detected non-conformity.
Corrective Action	DoD- The action taken to eliminate the causes of an existing non-conformity, defect, or other undesirable situation in order to prevent recurrence. A root cause analysis may not be necessary in all cases.
Corrective and Preventative Action (CAPA)	The primary management tools for bringing improvements to the quality system, to the management of the quality system's collective processes, and to the products or services delivered which are an output of established systems and processes.
Critical Value	TNI- Value to which a measurement result is compared to make a detection decision (also known as critical level or decision level). NOTE: The Critical Value is designed to give a specified low probability α of false detection in an analyte-free sample, which implies that a result that exceeds the Critical Value, gives high confidence $(1 - \alpha)$ that the radionuclide is actually present in the material analyzed. For radiometric methods, α is often set at 0.05.
Customer	DoD- Any individual or organization for which products or services are furnished or work performed in response to defined requirements and expectations.
Data Integrity	TNI- The condition that exists when data are sound, correct, and complete, and accurately reflect activities and requirements.
Data Quality Objective (DQO)	Systematic strategic planning tool based on the scientific method that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use or end user.
Data Reduction	TNI- The process of transforming the number of data items by arithmetic or statistical calculation, standard curves, and concentration factors, and collating them into a more usable form.
Definitive Data	DoD- Analytical data of known quantity and quality. The levels of data quality on precision and bias meet the requirements for the decision to be made. Data that is suitable for final decision-making.
Demonstration of Capability (DOC)	TNI- A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. DoD- A procedure to establish the ability of the analyst to generate analytical results by a specific method that meet measurement quality objectives (e.g., for precision and bias).
Department of Defense (DoD)	An executive branch department of the federal government of the United States charged with coordinating and supervising all agencies and functions of the government concerned directly with national security.
Detection Limit (DL)	DoD- The smallest analyte concentration that can be demonstrated to be different than zero or a blank concentration with 99% confidence. At the DL, the false positive rate (Type 1 error) is 1%. A DL may be used as the lowest concentration for reliably reporting a detection of a specific analyte in a specific matrix with a specific method with 99% confidence.

Detection Limit (DL) for Safe Drinking Water Act (SDWA) Compliance	TNI- Laboratories that analyze drinking-water samples for SDWA compliance monitoring must use methods that provide sufficient detection capability to meet the detection limit requirements established in 40 CFR 141. The SDWA DL for radioactivity is defined in 40 CFR Part 141.25.c as the radionuclide concentration, which can be counted with a precision of plus or minus 100% at the 95% confidence level (1.96σ where σ is the standard deviation of the net counting rate of the sample).
Deuterated Monitoring Compounds (DMCs)	DoD- SIM specific surrogates as specified for GC/MS SIM analysis.
Diesel Range Organics (DRO)	A range of compounds that denote all the characteristic compounds that make up diesel fuel (range can be state or program specific).
Digestion	DoD- A process in which a sample is treated (usually in conjunction with heat and acid) to convert the target analytes in the sample to a more easily measured form.
Document Control	The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.
Documents	DoD- Written components of the laboratory management system (e.g., policies, procedures, and instructions).
Dry Weight	The weight after drying in an oven at a specified temperature.
Duplicate (also known as Replicate or Laboratory Duplicate)	The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results of duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory.
Electron Capture Detector (ECD)	Device used in GC methods to detect compounds that absorb electrons (e.g., PCB compounds).
Electronic Data Deliverable (EDD)	A summary of environmental data (usually in spreadsheet form) which clients request for ease of data review and comparison to historical results.
Eluent	A solvent used to carry the components of a mixture through a stationary phase.
Elute	To extract, specifically, to remove (absorbed material) from an absorbent by means of a solvent.
Elution	A process in which solutes are washed through a stationary phase by movement of a mobile phase.
Environmental Data	DoD- Any measurements or information that describe environmental processes, locations, or conditions; ecological or health effects and consequences; or the performance of environmental technology.
Environmental Monitoring	The process of measuring or collecting environmental data.
Environmental Protection Agency (EPA)	An agency of the federal government of the United States which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress.

Environmental Sample	A representative sample of any material (aqueous, non-aqueous, or multimedia) collected from any source for which determination of composition or contamination is requested or required. Environmental samples can generally be classified as follows: • Non Potable Water (Includes surface water, ground water, effluents, water treatment chemicals, and TCLP leachates or other extracts) • Drinking Water - Delivered (treated or untreated) water designated as potable water • Water/Wastewater - Raw source waters for public drinking water supplies, ground waters, municipal influents/effluents, and industrial influents/effluents • Sludge - Municipal sludges and industrial sludges. • Soil - Predominately inorganic matter ranging in classification from sands to clays. • Waste - Aqueous and non-aqueous liquid wastes, chemical solids, and industrial liquid and solid wastes
Equipment Blank	A sample of analyte-free media used to rinse common sampling equipment to check effectiveness of decontamination procedures.
Extracted Internal Standard Analyte	Isotopically labeled analogs of analytes of interest added to all standards, blanks and samples analyzed. Added to samples and batch QC samples prior to the first step of sample extraction and to standards and instrument blanks prior to analysis. Used for isotope dilution methods.
Facility	A distinct location within the company that has unique certifications, personnel and waste disposal identifications.
False Negative	DoD- A result that fails to identify (detect) an analyte or reporting an analyte to be present at or below a level of interest when the analyte is actually above the level of interest.
False Positive	DoD- A result that erroneously identifies (detects) an analyte or reporting an analyte to be present above a level of interest when the analyte is actually present at or below the level of interest.
Field Blank	A blank sample prepared in the field by filling a clean container with reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken.
Field Measurement	Determination of physical, biological, or radiological properties, or chemical constituents that are measured on-site, close in time and space to the matrices being sampled/measured, following accepted test methods. This testing is performed in the field outside of a fixed-laboratory or outside of an enclosed structure that meets the requirements of a mobile laboratory.
Field of Accreditation	TNI- Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.
Field of Proficiency Testing (FoPT)	TNI- Matrix, technology/method, analyte combinations for which the composition, spike concentration ranges and acceptance criteria have been established by the PTPEC.

Finding	TNI- An assessment conclusion referenced to a laboratory accreditation standard and supported by objective evidence that identifies a deviation from a laboratory accreditation standard requirement. DoD- An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive, negative, or neutral and is normally accompanied by specific examples of the observed condition. The finding must be linked to a specific requirement (e.g., this standard, ISO requirements, analytical methods, contract specifications, or laboratory management systems requirements).
Flame Atomic Absorption Spectrometer (FAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the fact that ground state metals absorb light at different wavelengths. Metals in a solution are converted to the atomic state by use of a flame.
Flame Ionization Detector (FID)	A type of gas detector used in GC analysis where samples are passed through a flame which ionizes the sample so that various ions can be measured.
Gas Chromatography (GC)	Instrumentation which utilizes a mobile carrier gas to deliver an environmental sample across a stationary phase with the intent to separate compounds out and measure their retention times.
Gas Chromatograph/ Mass Spectrometry (GC/MS)	In conjunction with a GC, this instrumentation utilizes a mass spectrometer which measures fragments of compounds and determines their identity by their fragmentation patterns (mass spectra).
Gasoline Range Organics (GRO)	A range of compounds that denote all the characteristic compounds that make up gasoline (range can be state or program specific).
Graphite Furnace Atomic Absorption Spectrometry (GFAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the absorption of light at different wavelengths that are characteristic of different analytes.
High Pressure Liquid Chromatography (HPLC)	Instrumentation used to separate, identify and quantitate compounds based on retention times which are dependent on interactions between a mobile phase and a stationary phase.
Holding Time	TNI- The maximum time that can elapse between two specified activities. 40 CFR Part 136- The maximum time that samples may be held prior to preparation and/or analysis as defined by the method and still be considered valid or not compromised. For sample prep purposes, hold times are calculated using the time of the start of the preparation procedure. DoD- The maximum time that may elapse from the time of sampling to the time of preparation or analysis, or from preparation to analysis, as appropriate.
Homogeneity	The degree to which a property or substance is uniformly distributed throughout a sample.
Homologue	One in a series of organic compounds in which each successive member has one more chemical group in its molecule than the next preceding member. For instance, methanol, ethanol, propanol, butanol, etc., form a homologous series.
Improper Actions	DoD- Intentional or unintentional deviations from contract-specified or method-specified analytical practices that have not been authorized by the customer (e.g., DoD or DOE).

Incremental Sampling Method (ISM)	Soil preparation for large volume (1 kg or greater) samples.
In-Depth Data Monitoring	TNI- When used in the context of data integrity activities, a review and evaluation of documentation related to all aspects of the data generation process that includes items such as preparation, equipment, software, calculations, and quality controls. Such monitoring shall determine if the laboratory uses appropriate data handling, data use and data reduction activities to support the laboratory's data integrity policies and procedures.
Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)	Analytical technique used for the detection of trace metals which uses plasma to produce excited atoms that emit radiation of characteristic wavelengths.
Inductively Coupled Plasma- Mass Spectrometry (ICP/MS)	An ICP that is used in conjunction with a mass spectrometer so that the instrument is not only capable of detecting trace amounts of metals and non-metals but is also capable of monitoring isotopic speciation for the ions of choice.
Infrared Spectrometer (IR)	An instrument that uses infrared light to identify compounds of interest.
Initial Calibration (ICAL)	The process of analyzing standards, prepared at specified concentrations, to define the quantitative response relationship of the instrument to the analytes of interest. Initial calibration is performed whenever the results of a calibration verification standard do not conform to the requirements of the method in use or at a frequency specified in the method.
Initial Calibration Blank (ICB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method. This blank is specifically run in conjunction with the Initial Calibration Verification (ICV) where applicable.
Initial Calibration Verification (ICV)	DoD- Verifies the initial calibration with a standard obtained or prepared from a source independent of the source of the initial calibration standards to avoid potential bias of the initial calibration.
Injection Internal Standard Analyte	Isotopically labeled analogs of analytes of interest (or similar in physiochemical properties to the target analytes but with a distinct response) to be quantitated. Added to all blanks, standards, samples and batch QC after extraction and prior to analysis.
Instrument Blank	A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination.
Instrument Detection Limits (IDLs)	Limits determined by analyzing a series of reagent blank analyses to obtain a calculated concentration. IDLs are determined by calculating the average of the standard deviations of three runs on three non-consecutive days from the analysis of a reagent blank solution with seven consecutive measurements per day.
Interference, spectral	Occurs when particulate matter from the atomization scatters incident radiation from the source or when the absorption or emission from an interfering species either overlaps or is so close to the analyte wavelength that resolution becomes impossible.
Interference, chemical	Results from the various chemical processes that occur during atomization and later the absorption characteristics of the analyte.

Internal Standard	TNI and DoD- A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.
International Organization for Standardization (ISO)	An international standard-setting body composed of representatives from various national standards organizations.
Intermediate Standard Solution	Reference solutions prepared by dilution of the stock solutions with an appropriate solvent.
International System of Units (SI)	The coherent system of units adopted and recommended by the General Conference on Weights and Measures.
Ion Chromatography (IC)	Instrumentation or process that allows the separation of ions and molecules based on the charge properties of the molecules.
Isomer	One of two or more compounds, radicals, or ions that contain the same number of atoms of the same element but differ in structural arrangement and properties. For example, hexane (C6H14) could be n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane.
Laboratory	A body that calibrates and/or tests.
Laboratory Control Sample (LCS)	TNI- (also known as laboratory fortified blank (LFB), spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes and taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst-specific precision and bias or to evaluate the performance of all or a portion of the measurement system.
Laboratory Duplicate	Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently.
Laboratory Information Management System (LIMS)	DoD- The entirety of an electronic data system (including hardware and software) that collects, analyzes, stores, and archives electronic records and documents.
LabTrack	Database used by Pace to store and track corrective actions and other laboratory issues.
Learning Management System (LMS)	A web-based database used by the laboratories to track and document training activities. The system is administered by the corporate training department and each laboratory's learn centers are maintained by a local administrator.
Legal Chain-of-Custody Protocols	TNI- Procedures employed to record the possession of samples from the time of sampling through the retention time specified by the client or program. These procedures are performed at the special request of the client and include the use of a Chain-of-Custody (COC) Form that documents the collection, transport, and receipt of compliance samples by the laboratory. In addition, these protocols document all handling of the samples within the laboratory.

Limit(s) of Detection (LOD)	TNI- The minimum result, which can be reliably discriminated from a blank with predetermined confidence level. DoD- The smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence. At the LOD, the false negative rate (Type II error) is 1%. A LOD may be used as the lowest concentration for reliably reporting a non-detect of a specific analyte in a specific matrix with a specific method at 99% confidence.
Limit(s) of Quantitation (LOQ)	TNI- The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. DoD- The smallest concentration that produces a quantitative result with known and recorded precision and bias. For DoD/DOE projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard and within the calibration range.
Linear Dynamic Range	DoD- Concentration range where the instrument provides a linear response.
Liquid chromatography/ tandem mass spectrometry (LC/MS/MS)	Instrumentation that combines the physical separation techniques of liquid chromatography with the mass analysis capabilities of mass spectrometry.
Lot	TNI- A definite amount of material produced during a single manufacturing cycle, and intended to have uniform character and quality.
Management	Those individuals directly responsible and accountable for planning, implementing, and assessing work.
Management System	System to establish policy and objectives and to achieve those objectives.
Manager (however named)	The individual designated as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual.
Matrix	TNI- The substrate of a test sample.
Matrix Duplicate	TNI- A replicate matrix prepared in the laboratory and analyzed to obtain a measure of precision.
Matrix Spike (MS) (spiked sample or fortified sample)	TNI- A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.
Matrix Spike Duplicate (MSD) (spiked sample or fortified sample duplicate)	TNI- A replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.
Measurement Performance Criteria (MPC)	DoD- Criteria that may be general (such as completion of all tests) or specific (such as QC method acceptance limits) that are used by a project to judge whether a laboratory can perform a specified activity to the defined criteria.

Measurement Quality Objective (MQO)	TNI- The analytical data requirements of the data quality objectives are project- or program-specific and can be quantitative or qualitative. MQOs are measurement performance criteria or objectives of the analytical process. Examples of quantitative MQOs include statements of required analyte detectability and the uncertainty of the analytical protocol at a specified radionuclide activity, such as the action level. Examples of qualitative MQOs include statements of the required specificity of the analytical protocol, e.g., the ability to analyze for the radionuclide of interest given the presence of interferences.
Measurement System	TNI- A method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s). DoD- A test method, as implemented at a particular laboratory, and which includes the equipment used to perform the sample preparation and test and the operator(s).
Measurement Uncertainty	DoD- An estimate of the error in a measurement often stated as a range of values that contain the true value within a certain confidence level. The uncertainty generally includes many components which may be evaluated from experimental standard deviations based on repeated observations or by standard deviations evaluated from assumed probability distributions based on experience or other information. For DoD/DOE, a laboratory's Analytical Uncertainty (such as use of LCS control limits) can be reported as the minimum uncertainty.
Method	TNI- A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.
Method Blank	TNI- A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.
Method Detection Limit (MDL)	TNI- One way to establish a Detection Limit; defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.
Method of Standard Additions	A set of procedures adding one or more increments of a standard solution to sample aliquots of the same size in order to overcome inherent matrix effects. The procedures encompass the extrapolation back to obtain the sample concentration.

Minimum Detectable Activity (MDA)	TNI- Estimate of the smallest true activity that ensures a specified high confidence, $1-\beta$, of detection above the Critical Value, and a low probability β of false negatives below the Critical Value. For radiometric methods, β is often set at 0.05. NOTE 1: The MDS is a measure of the detection capability of a measurement process and as such, it is an a priori concept. It may be used in the selection of methods to meet specified MQOs. Laboratories may also calculate a "sample specific" MDA, which indicates how well the measurement process is performing under varying real-world measurement conditions, when sample-specific characteristics (e.g., interferences) may affect the detection capability. However, the MDA must never be used instead of the Critical Value as a detection threshold. NOTE 2: For the purpose of this Standard, the terms MDA and minimum detectable concentration (MDC) are equivalent.
MintMiner	Program used by Pace to review large amounts of chromatographic data to monitor for errors or data integrity issues.
Mobile Laboratory	TNI- A portable enclosed structure with necessary and appropriate accommodation and environmental conditions for a laboratory, within which testing is performed by analysts. Examples include but are not limited to trailers, vans, and skid-mounted structures configured to house testing equipment and personnel.
National Environmental Laboratory Accreditation Conference (NELAC)	See definition of The NELAC Institute (TNI).
National Institute of Occupational Safety and Health (NIOSH)	National institute charged with the provision of training, consultation and information in the area of occupational safety and health.
National Institute of Standards and Technology (NIST)	TNI- A federal agency of the US Department of Commerce's Technology Administration that is designed as the United States national metrology institute (or NMI).
National Pollutant Discharge Elimination System (NPDES)	A permit program that controls water pollution by regulating point sources that discharge pollutants into U.S. waters.
Negative Control	Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.
Nitrogen Phosphorus Detector (NPD)	A detector used in GC analyses that utilizes thermal energy to ionize an analyte. With this detector, nitrogen and phosphorus can be selectively detected with a higher sensitivity than carbon.
Nonconformance	An indication or judgment that a product or service has not met the requirement of the relevant specifications, contract, or regulation; also the state of failing to meet the requirements.
Not Detected (ND)	The result reported for a compound when the detected amount of that compound is less than the method reporting limit.
Operator Aid	DoD- A technical posting (such as poster, operating manual, or notepad) that assists workers in performing routine tasks. All operator aids must be controlled documents (i.e., a part of the laboratory management system).

Performance Based Measurement System (PBMS)	An analytical system wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner.
Physical Parameter	TNI- A measurement of a physical characteristic or property of a sample as distinguished from the concentrations of chemical and biological components.
Photo-ionization Detector (PID)	An ion detector which uses high-energy photons, typically in the ultraviolet range, to break molecules into positively charged ions.
Polychlorinated Biphenyls (PCB)	A class of organic compounds that were used as coolants and insulating fluids for transformers and capacitors. The production of these compounds was banned in the 1970's due to their high toxicity.
Positive Control	Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.
Post-Digestion Spike	A sample prepared for metals analyses that has analytes spike added to determine if matrix effects may be a factor in the results.
Power of Hydrogen (pH)	The measure of acidity or alkalinity of a solution.
Practical Quantitation Limit (PQL)	Another term for a method reporting limit. The lowest reportable concentration of a compound based on parameters set up in an analytical method and the laboratory's ability to reproduce those conditions.
Precision	TNI- The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.
Preservation	TNI and DoD- Any conditions under which a sample must be kept in order to maintain chemical, physical, and/or biological integrity prior to analysis.
Primary Accreditation Body (Primary AB)	TNI- The accreditation body responsible for assessing a laboratory's total quality system, on-site assessment, and PT performance tracking for fields of accreditation.
Procedure	TNI- A specified way to carry out an activity or process. Procedures can be documented or not.
Proficiency Testing (PT)	TNI- A means to evaluate a laboratory's performance under controlled conditions relative to a given set of criteria, through analysis of unknown samples provided by an external source.
Proficiency Testing Program (PT Program)	TNI- The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories.
Proficiency Testing Provider (PT Provider)	TNI- A person or organization accredited by a TNI-approved Proficiency Testing Provider Accreditor to operate a TNI-compliant PT Program.
Proficiency Testing Provider Accreditor (PTPA)	TNI- An organization that is approved by TNI to accredit and monitor the performance of proficiency testing providers.
Proficiency Testing Reporting Limit (PTRL)	TNI- A statistically derived value that represents the lowest acceptable concentration for an analyte in a PT sample, if the analyte is spiked into the PT sample. The PTRLs are specified in the TNI FoPT tables.

Proficiency Testing Sample (PT)	TNI- A sample, the composition of which is unknown to the laboratory, and is provided to test whether the laboratory can produce analytical results within the specified acceptance criteria.
Proficiency Testing (PT) Study	TNI- a) Scheduled PT Study: A single complete sequence of circulation and scoring of PT samples to all participants in a PT program. The study must have the same pre-defined opening and closing dates for all participants; b) Supplemental PT Study: A PT sample that may be from a lot previously released by a PT Provider that meets the requirements for supplemental PT samples given in Volume 3 of this Standard [TNI] but that does not have a pre-determined opening date and closing date.
Proficiency Testing Study Closing Date	TNI- a) Scheduled PT Study: The calendar date by which all participating laboratories must submit analytical results for a PT sample to a PT Provider; b) Supplemental PT Study: The calendar date a laboratory submits the results for a PT sample to the PT Provider.
Proficiency Testing Study Opening Date	TNI- a) Scheduled PT Study: The calendar date that a PT sample is first made available to all participants of the study by a PT Provider; b) Supplemental PT Study: The calendar date the PT Provider ships the sample to a laboratory.
Protocol	TNI- A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) that must be strictly followed.
Qualitative Analysis	DoD- Analysis designed to identify the components of a substance or mixture.
Quality Assurance (QA)	TNI- An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.
Quality Assurance Manual (QAM)	A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality Assurance Project Plan (QAPP)	A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.
Quality Control (QC)	TNI- The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality.
Quality Control Sample (QCS)	TNI- A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control.
Quality Manual	TNI- A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.

Quality System	TNI and DoD- A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance and quality control activities.
Quality System Matrix	TNI and DoD- These matrix definitions shall be used for purposes of batch and quality control requirements and may be different from a field of accreditation matrix: • **Air and Emissions**: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device • **Aqueous**: Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, groundwater effluents, and TCLP or other extracts. • **Biological Tissue**: Any sample of a biological origin such as fish tissue, shellfish or plant material. Such samples shall be grouped according to origin. • **Chemical Waste**: A product or by-product of an industrial process that results in a matrix not previously defined. • **Drinking Water**: Any aqueous sample that has been designated a potable or potentially potable water source. • **Non-aqueous liquid**: Any organic liquid with <15% settleable solids • **Saline/Estuarine**: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake. • **Solids**: Includes soils, sediments, sludges, and other matrices with >15% settleable solids.
Quantitation Range	DoD- The range of values (concentrations) in a calibration curve between the LOQ and the highest successively analyzed initial calibration standard used to relate instrument response to analyte concentration. The quantitation range (adjusted for initial sample volume/weight, concentration/dilution and final volume) lies within the calibration range.
Quantitative Analysis	DoD- Analysis designed to determine the amounts or proportions of the components of a substance.
Random Error	The EPA has established that there is a 5% probability that the results obtained for any one analyte will exceed the control limits established for the test due to random error. As the number of compounds measured increases in a given sample, the probability for statistical error also increases.
Raw Data	TNI- The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records.

Reagent Blank (method reagent blank)	A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps.
Reagent Grade	Analytical reagent (AR) grade, ACS reagent grade, and reagent grade are synonymous terms for reagents that conform to the current specifications of the Committee on Analytical Reagents of the American Chemical Society.
Records	DoD- The output of implementing and following management system documents (e.g., test data in electronic or hand-written forms, files, and logbooks).
Reference Material	TNI- Material or substance one or more of whose property values are sufficiently homogenized and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
Reference Method	TNI- A published method issued by an organization generally recognized as competent to do so. (When the ISO language refers to a "standard method", that term is equivalent to "reference method"). When a laboratory is required to analyze by a specified method due to a regulatory requirement, the analyte/method combination is recognized as a reference method. If there is no regulatory requirement for the analyte/method combination, the analyte/method combination is recognized as a reference method if it can be analyzed by another reference method of the same matrix and technology.
Reference Standard	TNI- Standard used for the calibration of working measurement standards in a given organization or at a given location.
Relative Percent Difference (RPD)	A measure of precision defined as the difference between two measurements divided by the average concentration of the two measurements.
Reporting Limit (RL)	The level at which method, permit, regulatory and customer-specific objectives are met. The reporting limit may never be lower than the Limit of Detection (i.e., statistically determined MDL). Reporting limits are corrected for sample amounts, including the dry weight of solids, unless otherwise specified. There must be a sufficient buffer between the Reporting Limit and the MDL. DoD- A customer-specified lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.
Reporting Limit Verification Standard (RLVS)	A standard analyzed at the reporting limit for an analysis to verify the laboratory's ability to report to that level.
Representativeness	A quality element related to the ability to collect a sample reflecting the characteristics of the part of the environment to be assessed. Sample representativeness is dependent on the sampling techniques specified in the project work plan.
Requirement	Denotes a mandatory specification; often designated by the term "shall".
Retention Time	The time between sample injection and the appearance of a solute peak at the detector.
Revocation	TNI- The total or partial withdrawal of a laboratory's accreditation by an accreditation body.

Sample	Portion of material collected for analysis, identified by a single, unique alphanumeric code. A sample may consist of portions in multiple containers, if a single sample is submitted for multiple or repetitive analysis.
Sample Condition Upon Receipt Form (SCURF)	Form used by sample receiving personnel to document the condition of sample containers upon receipt to the laboratory (used in conjunction with a COC).
Sample Delivery Group (SDG)	A unit within a single project that is used to identify a group of samples for delivery. An SDG is a group of 20 or fewer field samples within a project, received over a period of up to 14 calendar days. Data from all samples in an SDG are reported concurrently.
Sample Receipt Form (SRF)	Letter sent to the client upon login to show the tests requested and pricing.
Sample Tracking	Procedures employed to record the possession of the samples from the time of sampling until analysis, reporting and archiving. These procedures include the use of a chain-of-custody form that documents the collection, transport, and receipt of compliance samples to the laboratory. In addition, access to the laboratory is limited and controlled to protect the integrity of the samples.
Sampling	TNI- Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.
Selected Ion Monitoring (SIM)	A mode of analysis in mass spectrometry where the detector is set to scan over a very small mass range, typically one mass unit. The narrower the range, the more sensitive the detector. DoD- Using GC/MS, characteristic ions specific to target compounds are detected and used to quantify in applications where the normal full scan mass spectrometry results in excessive noise.
Selectivity	TNI- The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system.
Sensitivity	TNI- The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.
Serial Dilution	The stepwise dilution of a substance in a solution.
Shall	Denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification as long as the requirement is fulfilled.
Should	Denotes a guideline or recommendation whenever noncompliance with the specification is permissible.
Signal-to-Noise Ratio (S/N)	DoD- A measure of signal strength relative to background noise. The average strength of the noise of most measurements is constant and independent of the magnitude of the signal. Thus, as the quantity being measured (producing the signal) decreases in magnitude, S/N decreases and the effect of the noise on the relative error of a measurement increases.
Source Water	TNI- When sampled for drinking water compliance, untreated water from streams, rivers, lakes, or underground aquifers, which is used to supply private and public drinking water supplies.

Spike	A known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.
Standard (Document)	TNI- The document describing the elements of a laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies.
Standard (Chemical)	Standard samples are comprised of a known amount of standard reference material in the matrix undergoing analysis. A standard reference material is a certified reference material produced by US NIST and characterized for absolute content, independent of analytical test method.
Standard Blank (or Reagent Blank)	A calibration standard consisting of the same solvent/reagent matrix used to prepare the calibration standards without the analytes. It is used to construct the calibration curve by establishing instrument background.
Standard Method	A test method issued by an organization generally recognized as competent to do so.
Standard Operating Procedure (SOP)	TNI- A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks.
Standard Reference Material (SRM)	A certified reference material produced by the US NIST or other equivalent organization and characterized for absolute content, independent of analytical method.
Statement of Qualifications (SOQ)	A document that lists information about a company, typically the qualifications of that company to compete on a bid for services.
Stock Standard	A concentrated reference solution containing one or more analytes prepared in the laboratory using an assayed reference compound or purchased from a reputable commercial source.
Storage Blank	DoD- A sample of analyte-free media prepared by the laboratory and retained in the sample storage area of the laboratory. A storage blank is used to record contamination attributable to sample storage at the laboratory.
Supervisor	The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses.
Surrogate	DoD- A substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples and is added to them for quality control purposes.
Suspension	TNI- The temporary removal of a laboratory's accreditation for a defined period of time, which shall not exceed 6 months or the period of accreditation, whichever is longer, in order to allow the laboratory time to correct deficiencies or area of non-conformance with the Standard.
Systems Audit	An on-site inspection or assessment of a laboratory's quality system.
Target Analytes	DoD- Analytes or chemicals of primary concern identified by the customer on a project-specific basis.

Technical Director	Individual(s) who has overall responsibility for the technical operation of the environmental testing laboratory.
Technology	TNI- A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.
Test	A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate.
Test Method	DoD- A definitive procedure that determines one or more characteristics of a given substance or product.
Test Methods for Evaluating Solid Waste, Physical/ Chemical (SW-846)	EPA Waste's official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with RCRA regulations.
Test Source	TNI- A radioactive source that is tested, such as a sample, calibration standard, or performance check source. A Test Source may also be free of radioactivity, such as a Test Source counted to determine the subtraction background, or a short-term background check.
The NELAC Institute (TNI)	A non-profit organization whose mission is to foster the generation of environmental data of known and documented quality through an open, inclusive, and transparent process that is responsive to the needs of the community. Previously known as NELAC (National Environmental Laboratory Accreditation Conference).
Total Petroleum Hydrocarbons (TPH)	A term used to denote a large family of several hundred chemical compounds that originate from crude oil. Compounds may include gasoline components, jet fuel, volatile organics, etc.
Toxicity Characteristic Leaching Procedure (TCLP)	A solid sample extraction method for chemical analysis employed as an analytical method to simulate leaching of compounds through a landfill.
Traceability	TNI- The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical conditions or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.
Training Document	A training resource that provides detailed instructions to execute a specific method or job function.
Trip Blank	This blank sample is used to detect sample contamination from the container and preservative during transport and storage of the sample. A cleaned sample container is filled with laboratory reagent water and the blank is stored, shipped, and analyzed with its associated samples.
Tuning	A check and/or adjustment of instrument performance for mass spectrometry as required by the method.

Ultraviolet Spectrophotometer (UV)	Instrument routinely used in quantitative determination of solutions of transition metal ions and highly conjugated organic compounds.
Uncertainty, Counting	TNI- The component of Measurement Uncertainty attributable to the random nature of radioactive decay and radiation counting (often estimated as the square root of observed counts (MARLAP). Older references sometimes refer to this parameter as Error, Counting Error or Count Error (c.f., Total Uncertainty).
Uncertainty, Expanded	TNI- The product of the Standard Uncertainty and a coverage factor, k, which is chosen to produce an interval about the result that has a high probability of containing the value of the measurand (c.f., Standard Uncertainty). NOTE: Radiochemical results are generally reported in association with the Total Uncertainty. Either if these estimates of uncertainty can be reported as the Standard Uncertainty (one-sigma) or as an Expanded Uncertainty (k-sigma, where $k > 1$).
Uncertainty, Measurement	TNI- Parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand.
Uncertainty, Standard	TNI- An estimate of the Measurement Uncertainty expressed as a standard deviation (c.f., Expanded Uncertainty).
Uncertainty, Total	TNI- An estimate of the Measurement Uncertainty that accounts for contributions from all significant sources of uncertainty associated with the analytical preparation and measurement of a sample. Such estimates are also commonly referred to as Combined Standard Uncertainty or Total Propagated Uncertainty, and in some older references as the Total Propagated Error, among other similar items (c.f., Counting Uncertainty).
Unethical actions	DoD- Deliberate falsification of analytical or quality control results where failed method or contractual requirements are made to appear acceptable.
United States Department of Agriculture (USDA)	A department of the federal government that provides leadership on food, agriculture, natural resources, rural development, nutrition and related issues based on public policy, the best available science, and effective management.
United States Geological Survey (USGS)	Program of the federal government that develops new methods and tools to supply timely, relevant, and useful information about the Earth and its processes.
Unregulated Contaminant Monitoring Rule (UCMR)	EPA program to monitor unregulated contaminants in drinking water.
Validation	DoD- The confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.
Verification	TNI- Confirmation by examination and objective evidence that specified requirements have been met. In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.

Voluntary Action Program (VAP)	A program of the Ohio EPA that gives individuals a way to investigate possible environmental contamination, clean it up if necessary and receive a promise from the State of Ohio that no more cleanup is needed.
Whole Effluent Toxicity (WET)	The aggregate toxic effect to aquatic organisms from all pollutants contained in a facility's wastewater (effluent).

10.0. REFERENCES

10.1. "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act." Federal Register, 40 CFR Part 136, most current version.

10.2. "Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods." SW-846.

10.3. "Methods for Chemical Analysis of Water and Wastes", EPA 600-4-79-020, 1979 Revised 1983, U.S. EPA.

10.4. U.S. EPA Contract Laboratory Program Statement of Work for Organic Analysis.

10.5. U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analysis.

10.6. "Standard Methods for the Examination of Water and Wastewater." Current Edition APHA-AWWA-WPCF.

10.7. "Annual Book of ASTM Standards", Section 4: Construction, Volume 04.04: Soil and Rock; Building Stones, American Society of Testing and Materials.

10.8. "Annual Book of ASTM Standards", Section 11: Water and Environmental Technology, American Society of Testing and Materials.

10.9. "NIOSH Manual of Analytical Methods", U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, most current version.

10.10. "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water", U.S. EPA, Environmental Monitoring and Support Laboratory – Cincinnati (Sep 1986).

10.11. Quality Assurance of Chemical Measurements, Taylor, John K.; Lewis Publishers, Inc. 1987.

10.12. Methods for Non-conventional Pesticides Chemicals Analysis of Industrial and Municipal Wastewater, Test Methods, EPA-440/1-83/079C.

10.13. Environmental Measurements Laboratory (EML) Procedures Manual, HASL-300, US DOE, February, 1992.

10.14. Requirements for Quality Control of Analytical Data, HAZWRAP, DOE/HWP-65/R1, July, 1990.

10.15. Requirements for Quality Control of Analytical Data for the Environmental Restoration Program, Martin Marietta, ES/ER/TM-16, December, 1992.

10.16. Quality Assurance Manual for Industrial Hygiene Chemistry, AIHA, most current version.

10.17. National Environmental Laboratory Accreditation Conference (NELAC) Standard- most current version.

10.18. ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories- most current version.

10.19. Department of Defense Quality Systems Manual (QSM), most current version.

10.20. TNI (The NELAC Institute) Standard- most current version applicable to each lab.

10.21. UCMR Laboratory Approval Requirements and Information Document, most current version.

11.0. REVISIONS

All current revisions are summarized in the table below.

Document Number	Reason for Change	Date
Quality Assurance Manual	Initial change of format	July 31, 2017
Quality Assurance Manual Rev.00	Updated Attachments II, III, IV, V and VII with current information Corrected grammatical errors throughout the document	July 24, 2018

ATTACHMENT I- QUALITY CONTROL CALCULATIONS

PERCENT RECOVERY (%REC)

$$\%REC = \frac{(MSConc - SampleConc)}{TrueValue} * 100$$

NOTE: The SampleConc is zero (0) for the LCS and Surrogate Calculations

PERCENT DIFFERENCE (%D)

$$\%D = \frac{MeasuredValue - TrueValue}{TrueValue} * 100$$

where:
TrueValue = Amount spiked (can also be the $\overline{CF}$ or $\overline{RF}$ of the ICAL Standards)
Measured Value = Amount measured (can also be the CF or RF of the CCV)

PERCENT DRIFT

$$\%Drift = \frac{CalculatedConcentration - TheoreticalConcentration}{TheoreticalConcentration} * 100$$

RELATIVE PERCENT DIFFERENCE (RPD)

$$RPD = \frac{|(R1 - R2)|}{(R1 + R2)/2} * 100$$

where:
R1 = Result Sample 1
R2 = Result Sample 2

CORRELATION COEFFICIENT (R)

$$CorrCoeff = \frac{\sum_{i=1}^{N} W_i * (X_i - \overline{X}) * (Y_i - \overline{Y})}{\sqrt{\left(\sum_{i=1}^{N} W_i * (X_i - \overline{X})^2\right) * \left(\sum_{i=1}^{N} W_i * (Y_i - \overline{Y})^2\right)}}$$

With:	N	Number of standard samples involved in the calibration
	i	Index for standard samples
	Wi	Weight factor of the standard sample no. i
	Xi	X-value of the standard sample no. i
	X(bar)	Average value of all x-values
	Yi	Y-value of the standard sample no. i
	Y(bar)	Average value of all y-values

ATTACHMENT I- QUALITY CONTROL CALCULATIONS (CONTINUED)

STANDARD DEVIATION (S)

$$S = \sqrt{\sum_{i=1}^{n} \frac{(X_i - \overline{X})^2}{(n-1)}}$$

where:
n = number of data points
X_i = individual data point
$\overline{X}$ = average of all data points

AVERAGE ($\overline{X}$)

$$\overline{X} = \frac{\sum_{n=1}^{i} X_i}{n}$$

where:
n = number of data points
X_i = individual data point

RELATIVE STANDARD DEVIATION (RSD)

$$RSD = \frac{S}{\overline{X}} * 100$$

where:
S = Standard Deviation of the data points
$\overline{X}$ = average of all data points

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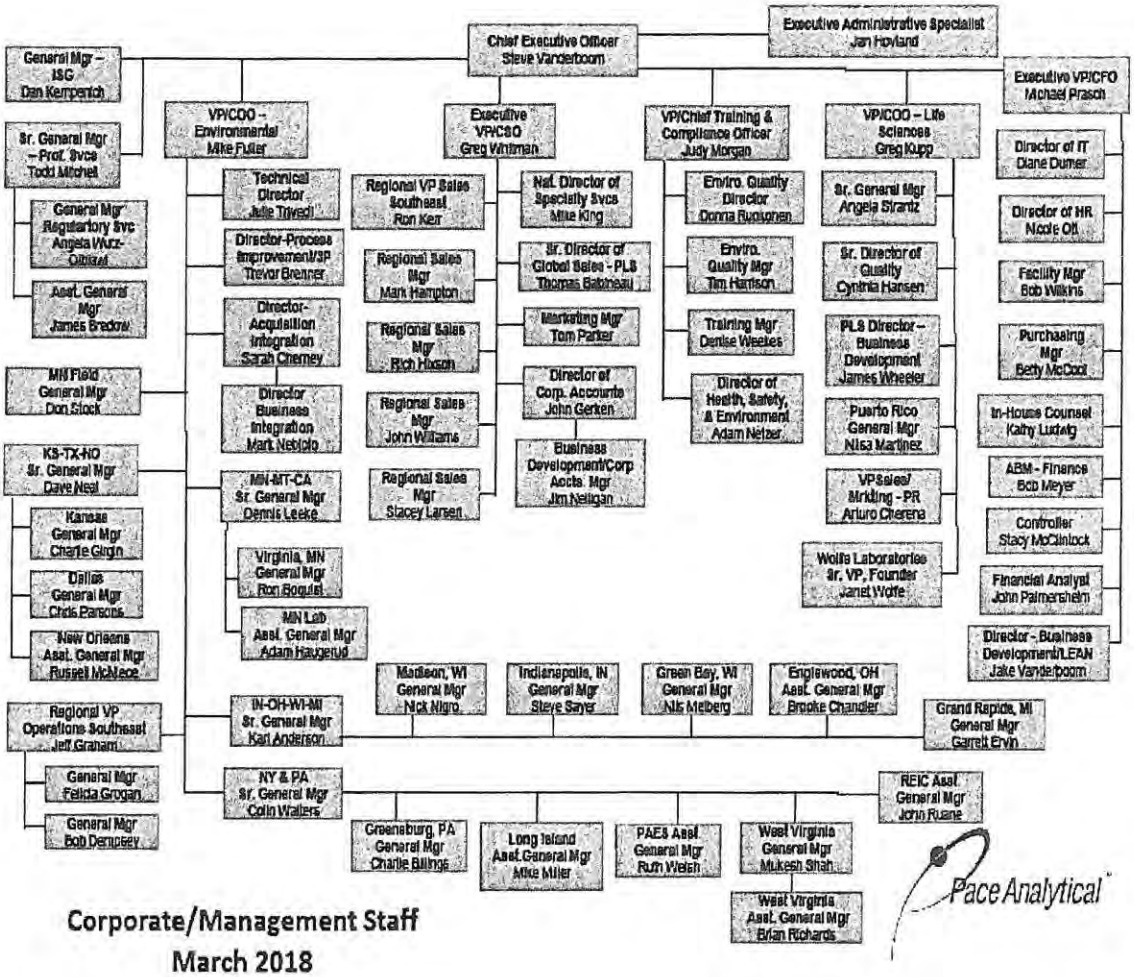
	Document No.: Quality Assurance Manual rev.01	Issuing Authorities: Pace Analytical Energy Services, LLC. Quality Office

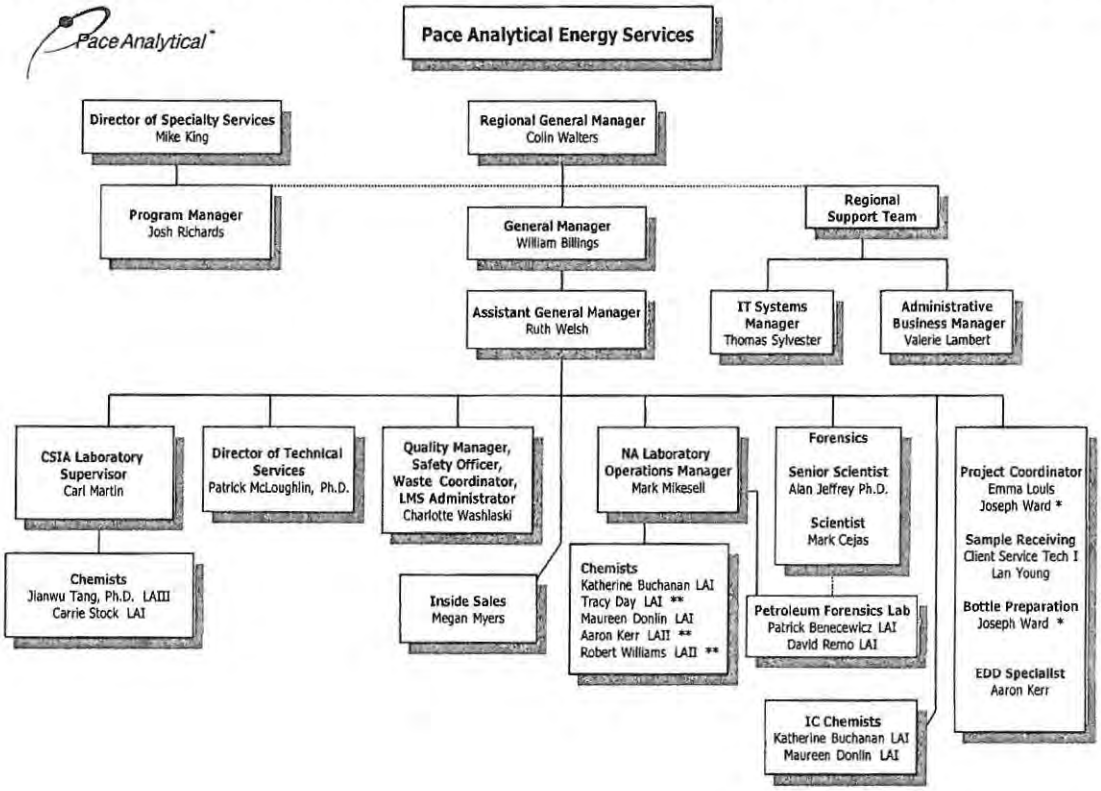
ATTACHMENT III- CORPORATE ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



Corporate/Management Staff
March 2018

Pace Analytical®	Document Name: Quality Assurance Manual	Document Revised: July 24, 2018 Effective Date of Final Signature Page 66 of 91
	Document No.: Quality Assurance Manual rev.01	Issuing Authorities: Pace Analytical Energy Services, LLC. Quality Office

ATTACHMENT II- LABORATORY ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



Last Revised – March 1, 2018
Last Reviewed – May 1, 2018

* holds safety responsibilities as well
** analyst in Petroleum Forensics lab as well

ATTACHMENT IV- EQUIPMENT LIST (CURRENT AS OF ISSUE DATE)

PAES Instrument and Equipment List

Natural Attenuation

EDONORS

Dionex Ion Chromatograph Model ISC 2000 with Degasser (Serial 08120332); Gradient Eluent Generator; AS-AP Autosampler (Serial 14092562), Columns.

Dionex Ion Chromatograph Model ISC 2100 with Degasser (Serial 14092120); Gradient Eluent Generator; AS-AP Autosampler (Serial 14092562), Columns.

Varian 3400 Gas Chromatograph (Serial 10272) with Varian 8100 Autosampler (Serial 1371)

Thermo-Fisher Scientific Ultra Trace GC (Serial 620120045) with TriPlus RSH Liquid Autosampler (Serial 241284)

Risk Analysis

Hewlett Packard 5890 Series A Gas Chromatograph (Serial 2536A05842) with Tekmar 7000 Autosampler (Serial 91099014/91135007)

Hewlett Packard 5890 Series II (Serial 3336A51836) with Tekmar 7000/7050 Autosampler (Serial 91346008/91346016)

Thermo-Fisher Scientific Ultra Trace GC (Serial 620120028) with TriPlus RSH Headspace Autosampler (Serial 237682)

Three Proprietary GCs

GOW MAC Series 580 Gas Chromatograph (Serial 580-200)

Ohaus Discovery Analytical Balance Model # DV215CD (Serial 1128122704)

Wet Chemistry/EACCEPTORS

Dionex ISC 3000 Ion Chromatograph with dual Autosamplers, columns, and ovens with conductivity and UV-VIS detectors

OI Analytical Aurora 1030 TOC Analyzer (Serial J025730751) with Autosampler (Serial E019788198)

Denver Instruments Model SI-4002 Top Loading Balance

Spectronic 20G Colorimeter

Spectronic 20D Colorimeter

Orion 601A pH Meter

Sartorius Model 1612 Analytical Balance

CSIA

Tekmar Aqua Tek 70 Autosampler (Serial US 06151001)

Tekmar Velocity XPT Purge and Trap (Serial US 06191003)

Entech 7100A Pre-concentrator (Serial 1304)

Thermo Trace GC Ultra Gas Chromatograph (Serial 200510408)

Thermo GC-Combustion III Interface (Serial 111201-175)

Thermo GC /TC Reactor OD (Serial 108520-349)

Thermo Delta V Plus Isotope Ratio Mass Spectrometer (Serial 8018)

Thermo-Electron GC (Serial 10603008) with DSQ II Mass Spectrometer (Serial 100442); Varian Archon Autosampler (Serial 14655) and Tekmar Velocity Concentrator (Serial US6047001)

Thermo Delta V Plus isotope ration mass spectrometer

Thermo Conflo IV interface

Thermo GC Isolink interface

Agilent 7890A GC System

Tekmar Aquatek 100 autosampler

Tekmar Stratum Purge and Trap concentrator

Entech 5400 Thermal Transfer System

Entech SL2 Perconcentrator

Agilent 6890N GC (Serial US10226064)

Agilent 5973N MSD (Serial US63810430)

Teledyne Tekmar Aquatek100 Autosampler (Serial US11348004) and Stratum Concentrator (Serial US11327002)

GC/MS Chemstation Datasystem (SN 2UA71516GF)

Agilent 6890N GC (serial # US10232118)

Agilent 7890A GC (serial # CN12121090)

Agilent 5975C MSD (serial # US12157802)

Agilent G4513A autosampler (serial # CN12090144)

Agilent G1888 Headspace Autosampler (serial IT40220036)

UPS (Model # TX90-10K)

UPS (Model # T90-EBP920)

Pacific Air Jun-Air Compressor Model 6 (serial # 1010200822)

Supelco 29541-U High Capacity Gas Purifier (serial # 1312955/1A-22)

Fisher Scientific Ultrasonic cleaner (serial # RUA030263007)

Eppendorf Centrifuge 5810R (serial # 581101849)

New Brunswick Scientific Innova 2000 Platform shaker (serial # 300544191)

Pelton & Crane Sterilizer (serial # AF - 005387)

Zymark TurboVap LV evaporator (serial # 04384)

Petroleum Forensics

HP Agilent 7890A GC/5975 MS System (Serial # CN12091092)

HP Agilent 6890 GC/5973 MS System (Serial # US00008852)

HP Agilent 6890 GC/5973 MS System (Serial # US00006875)

HP Agilent 6890N GC System (Serial # US10347026)

HP Agilent 6890 GC System (Serial # US00001417)

HP Agilent 5890 GC System

HP Agilent 5890 GC/5971 MS System

Tekmar LCS 2000 Purge and Trap

ESI Autosampler

Polyscience Refrigerated Recirculator

Zymark TurboVap 500 Concentrator

Sargent-Welch SWT-603D Scale (Serial # T0121781)

ATTACHMENT V- LABORATORY SOP LIST (CURRENT AS OF ISSUE DATE)

Description	Document Number
Prep of SOPs	S-PAE-Q-001
Document Control and Management	S-PAE-Q-002
Manual Integration	S-PAE-Q-003
Data Validation	S-PAE-Q-004
Corrective Action Reports	S-PAE-Q-005
Equipment Maintenance	S-PAE-Q-006
Internal Audits	S-PAE-Q-007
Monitoring Controlled Temperature Units	S-PAE-Q-008
Support Equipment	S-PAE-Q-009
Determination of Detection Limits and Reporting Limits	S-PAE-Q-010
Reference Materials and Reagents	S-PAE-Q-011
Logbooks	S-PAE-Q-012
Evaluation and Qualification of Vendors	S-PAE-Q-013
Purchasing of Lab Supplies	S-PAE-Q-014
Training	S-PAE-Q-015
Bubble Strip Sampling	S-PAE-RISK-001
PM01C	S-PAE-RISK-002
RSK175M	S-PAE-RISK-003
AM20GAx	S-PAE-RISK-004
AM4.02	S-PAE-RISK-005
Document Numbering	S-ALL-Q-003-rev.09
Laboratory Documentation	S-ALL-Q-009-rev 06
Quarterly Quality Reports	S-ALL-Q-014-rev.07
Management Review	S-ALL-Q-015-rev.03
AM21G In house only	S-PAE-VFA-001 In house only
AM21G Scrubbed	S-PAE-VFA-001 (S)
AM23G In house only	S-PAE-LLVFA-001 In House only
AM23G Scrubbed	S-PAE-LLVFA-001 (S)
Waste Management Training	S-PAE-W-001
Waste Handling and Management	S-PAE-W-002
Fume Hood Monitoring	S-PAE-S-001
Regulated Soil Handling	S-PAE-S-002
Subcontracting	S-PAE-C-001
Bottle Prep	S-PAE-C-002
Sample Receiving	S-PAE-C-003
Chain of Custody	S-PAE-C-004

pH	S-PAE-I-001
TOC	S-PAE-I-002
Anions by IC	S-PAE-I-003
Cations by IC	S-PAE-I-004
HORIZON LIMS	S-PAE-IT-001
SPME In house only	S-PAE-CSIA-001
Purge & Trap for CSIA In house only	S-PAE-CSIA-002
VI	S-PAE-CSIA-003
Carbon & Hydrogen Isotopes (1,4 dioxane) In house only	S-PAE-CSIA-004
Chlorine In house only	S-PAE-CSIA-005
1,4 Dioxane prep In house only	S-PAE-CSIA-006
Carbon Soil Prep CSIA In house only	S-PAE-CSIA-007
Full Scan	S-PAE-PF-001
Whole Oil	S-PAE-PF-002
Oxygenates	S-PAE-PF-003
EDB & Organic Lead	S-PAE-PF-004
SIM DIS	S-PAE-PF-005

ATTACHMENT VI- LABORATORY CERTIFICATION LIST (CURRENT AS OF ISSUE DATE) SCOPE AND APPLICATION CERTIFICATES ARE MAINTAINED AND FILED IN THE LOCAL QUALITY DEPARTMENT

PAES holds the following certifications:

- National Environmental Laboratory Accreditation Program (NELAP): Pennsylvania
- Connecticut
- Virginia
- South Carolina
- Texas
- New York
- New Jersey
- New Hampshire
- West Virginia

Specific parameter lists for the various certifications are available from the Client Service Department upon request.

NELAC Accredited Parameters/Methods

Primary NELAC: Pennsylvania
Secondary NELAC: NY, NJ, NH, VA, CT, SC, TX, WV
(Not all states accredit all parameters.)

Parameter	Method
Chloride	SW846-9056
Nitrate	SW846-9056
Nitrite	SW846-9056
Sulfate	SW846-9056
TOC/DOC	SW846-9060, SM 5310C
pH	SM 4500H+
Light Hydrocarbons	RSK175M
Volatile Fatty Acids	PAES SOP-AM23G

Call Client Service Department for state-specific analyte list.

ATTACHMENT VII- METHOD HOLD TIME, CONTAINER AND PRESERVATION GUIDE (CURRENT AS OF ISSUE DATE)

Note that all analyses listed are not necessarily performed at all Pace laboratories and there may be additional laboratory analyses performed that are not included in these tables.

THE HOLDING TIME INDICATED IN THE CHART BELOW IS THE MAXIMUM ALLOWABLE TIME FROM COLLECTION TO EXTRACTION AND/OR ANALYSIS PER THE ANALYTICAL METHOD. FOR METHODS THAT REQUIRE PROCESSING PRIOR TO ANALYSIS, THE HOLDING TIME IS DESIGNATED AS 'PREPARATION HOLDING TIME/ANALYSIS HOLDING TIME'.

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Acid Base Accounting	Sobek	Solid	Plastic/Glass	None	N/A
Acidity	SM2310B	Water	Plastic/Glass	≤ 6°C	14 Days
Acid Volatile Sulfide	Draft EPA 1629	Solid	8oz Glass	≤ 6°C	14 Days
Actinides	HASL-300	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Actinides	HASL-300	Solid	Plastic/Glass	None	180 Days
Alkalinity	SM2320B/310.2	Water	Plastic/Glass (NY requires separate bottle filled to the exclusion of air)	≤ 6°C	14 Days
Alkylated PAHs		Water	1L Amber Glass	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved
Alkylated PAHs		Solid	8oz Glass	≤ 10°C	1 Year/40 Days
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0/300.1/SM4110B	Water	Plastic/Glass	≤ 6°C; EDA if bromate or chlorite run	All analytes 28 days except: NO_2, NO_3, o-Phos (48 Hours); chlorite (immediately for 300.0; 14 Days for 300.1). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F,	300.0	Solid	Plastic/Glass	≤ 6°C	All analytes 28

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)					days except: NO_2, NO_3, o-Phos (48 hours); chlorite (immediately). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4	9056	Water/ Solid	Plastic/Glass	Cool to above freezing but < 6°C	48 hours
Aromatic and Halogenated Volatiles (see note 1)	8021	Solid	5035 vial kit	See note 1	14 days
Aromatic and Halogenated Volatiles	602/8021	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present	14 Days (7 Days for aromatics if unpreserved)
Asbestos	EPA 600/R-93/116	Solid	Plastic/Glass; bulk- 2" square; popcorn ceiling- 2tbsp; soil- 4oz	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Bacteria, Total Plate Count	SM9221D	Water	Plastic/WK	≤ 6°C; $Na_2S_2O_3$	24 Hours
Base/Neutrals and Acids	8270	Solid	8oz Glass	≤ 6°C	14/40 Days
Base/Neutrals and Acids	625/8270	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Base/Neutrals, Acids & Pesticides	525.2	Water	1L Amber Glass	pH<2 HCl; ≤ 6°C; Na sulfite if Cl present	14/30 Days
Biomarkers		Water	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	≤ 6°C; pH<2 1:1 HCl (optional)
Biomarkers		Solid	≤ 10°C	1 Year/40 Days	≤ 10°C
BOD/cBOD	SM5210B	Water	Plastic/Glass	≤ 6°C	48 hours
Boiling Range Distribution of Petroleum Fractions (SIM DIS)	ASTM D2887-98	Product	2 X 40ml VOA vials	Unpreserved	Unlimited Cannot analyze on waters or soils
BTEX/Total	TO-3	Air	Summa	None	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Hydrocarbons			Canister		
BTEX/Total Hydrocarbons	TO-3	Air	Tedlar Bag or equivalent	None	72 Hours
Carbamates	531.1	Water	Glass	$Na_2S_2O_3$, Monochloroacetic acid pH <3; ≤ 6°C	28 Days
Carbamates	8318	Water	Glass	Monochloroacetic acid pH 4-5; ≤ 6°C	7/40 Days
Carbamates	8318	Solid	Glass	≤ 6°C	7/40 Days
Carbon Specific Isoptope Analysis (CSIA)	AM24	Water	40mL clear VOA vial with TLS	≤ 6°C, trisodium phosphate or HCl	N/A
Cation/Anion Balance	SM1030E	Water	Plastic/Glass	None	None
Cation Exchange	9081	Solid	8oz Glass	None	Unknown
Cations (Ferrous Iron, Ferric Iron, Divalent Manganese)	Dionex Tech ote 10	Water	40mL clear VOA vials with mylar septum	≤ 6°C; HCl	48 Hours
Chloride	SM4500Cl-C,E	Water	Plastic/Glass	None	28 Days
VOC's in Vapor	AM4.02	Vapor	20cc vapor vial with flat septum; evacuated	None	Unspecified
Chlorine, Residual	SM4500Cl-D,E,G/330.5/Hach 8167	Water	Plastic/Glass	None	15 minutes
Chlorophyll	SM10200H	Water	Opaque bottle or aluminum foil	≤ 6°C	48 Hours to filtration
COD	SM5220C, D/410.4/Hach 8000	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Coliform, Fecal	SM9222D	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9222D	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	24 Hours
Coliform, Fecal	SM9221E	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9221E	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	24 Hours
Coliform, Total	SM9222B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total	SM9221B	Solid	100mL	≤ 10°C; $Na_2S_2O_3$	8 Hours

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
			Plastic		
Coliform, Total, Fecal and E. coli	Colilert/ Quanti-tray	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total and E. coli	SM9223B	Drinking Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	30 Hours
Color	SM2120B,E	Water	Covered Plastic/Acid Washed Amber Glass	≤ 6°C	48 Hours
Condensable Particulate Emissions	EPA 202	Air	Solutions	None	180 Days
Cyanide, Reactive	SW846 chap.7	Water	Plastic/Glass	None	28 Days
Cyanide, Reactive	SW846 chap.7	Solid	Plastic/Glass	None	28 Days
Cyanide, Total and Amenable	SM4500CN-A,B,C,D,E,G,I,N/9010/ 9012/335.4	Water	Plastic/Glass	pH≥12 NaOH; ≤ 6°C; ascorbic acid if Cl present	14 Days (24 Hours if sulfide present-applies to SM4500CN only)
Diesel Range Organics- Alaska DRO	AK102	Solid	8oz Glass	≤ 6°C	14/40 Days
Diesel Range Organics- Alaska DRO	AK102	Water	1L Glass	pH<2 HCl; ≤ 6°C	14/40 Days
Diesel Range Organics- TPH DRO	8015	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Diesel Range Organics- TPH DRO	8015	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Diesel Range Organics- TPH DRO	8015	Tissue	1L Amber Glass	≤ - 10°C	1 Year if frozen/40 Days
Diesel Range Organics- TPH DRO	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Diesel Range Organics- NwTPH-Dx	Nw-TPH-Dx	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Diesel Range	Nw-TPH-Dx	Water	1L Amber	pH <2 HCl; ≤ 6°C	14/40 Days; 7

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Organics- NwTPH-Dx			Glass		Days from collection to extraction if unpreserved
Diesel Range Organics- Wisconsin DRO	WI MOD DRO	Solid	Tared 4oz Glass Jar	≤ 6°C	10/47 Days
Diesel Range Organics- Wisconsin DRO	WI MOD DRO	Water	1L Amber Glass	≤ 6°C; pH <2 HCl	14/40 Days
Dioxins and Furans	1613B	Solid	8oz Glass	≤ 6°C	1 year
Dioxins and Furans	1613B	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	1 year
Dioxins and Furans	1613B	Fish/ Tissue	Aluminum foil	≤ 6°C	1 year
Dioxins and Furans	8290	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	30/45 Days
Dioxins and Furans	8290	Solid	8oz Glass	≤ 6°C	30/45 Days
Dioxins and Furans	8290	Fish/ Tissue	Not specified	< -10°C	30/45 Days
Dioxins and Furans	TO-9	Air	PUF	None	7/40 Days
Diquat/Paraquat	549.2	Water	Amber Plastic	≤ 6°C; $Na_2S_2O_3$	7/21 Days
EDB/DBCP (8011) EDB/DBCP/1,2,3-TCP (504.1)	504.1/8011	Water	40mL vials	≤ 6°C; $Na_2S_2O_3$ if Cl present	14 Days
Endothall	548.1	Water	Amber Glass	≤ 6°C; $Na_2S_2O_3$	7/14 Days
Enterococci	EPA 1600	Water	100mL Plastic	≤ 10°C	8 Hours
Enterococci	Enterolert	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Explosives	8330/8332	Water	1L Amber Glass	≤ 6°C	7/40 Days
Explosives	8330/8332	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Water	1L Amber Glass	pH < 2 HCl; ≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Solid	4oz Glass Jar	≤ 6°C	14/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	MA-EPH	Water	1L Amber Glass	pH<2 HCl; ≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	MA-EPH	Solid	4oz Glass Jar	≤ 6°C	7/40 Days
Fecal Streptococci	SM9230B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Ferrous Iron	SN3500Fe-D; Hach 8146	Water	Glass	None	Immediate
Flashpoint/ Ignitability	1010	Liquid	Plastic/Glass	None	28 Days
Florida PRO	FL PRO DEP (11/1/95)	Liquid	Glass, PTFE lined cap	≤ 6°C; pH <2 H_2SO_4 or HCl	7/40 Days
Fluoride	SM4500Fl-C,D	Water	Plastic	None	28 Days
Gamma Emitting Radionuclides	901.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Gasoline Range Organics	8015	Water	40mL vials	pH<2 HCl	14 Days
Gasoline Range Organics	8015	Solid	5035 vial kit	See note 1	14 days
Gasoline Range Organics (C3-C10)	8260B modified	Water	40mL vials	≤ 6°C; HCl	14 Days
Gasoline Range Organics (C3-C10)	8260B modified	Solid	4oz Glass Jar	≤ 6°C	14 Days
Gasoline Range Organics- Alaska GRO	AK101	Solid	5035 vial kit	See 5035 note*	28 Days if GRO only (14 Days with BTEX)
Gasoline Range Organics- Alaska GRO	AK101	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Water	40mL vials	pH<2 HCl; ≤ 6°C	7 Days unpreserved; 14 Days preserved
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Solid	40mL vials	≤ 6°C; packed jars with no headspace	14 Days
Gasoline Range Organics- Wisconsin	WI MOD GRO	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
GRO					
Gasoline Range Organics- Wisconsin GRO	WI MOD GRO	Solid	40mL MeOH vials	≤ 6°C in MeOH	21 Days
Glyphosate	547	Water	Glass	≤ 6°C; $Na_2S_2O_3$	14 Days (18 Months frozen)
Grain Size	ASTM D422	Solid	Not specified	Ambient	N/A
Gross Alpha (NJ 48Hr Method)	NJAC 7:18-6	Water	Plastic/Glass	pH<2 HNO_3	48 Hrs
Gross Alpha and Gross Beta	9310/900.0	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Gross Alpha and Gross Beta	9310	Solid	Glass	None	180 Days
Haloacetic Acids	552.1/552.2	Water	40mL Amber vials	NH_4Cl; ≤ 6°C	14/7 Days if extracts stored ≤ 6°C or 14/14 Days if extracts stored at ≤ -10°C
Hardness, Total ($CaCO_3$)	SM2340B,C/130.1	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Heterotrophic Plate Count (SPC/HPC)	SM9215B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Heterotrophic Plate Count (SPC/HPC)	SimPlate	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Herbicides, Chlorinated	8151	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Herbicides, Chlorinated	8151	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Herbicides, Chlorinated	515.1/515.3	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	14/28 Days
Hexavalent Chromium	7196/218.6/ SM3500Cr-B, C, D	Water	Plastic/Glass	≤ 6°C	24 Hours (see note 4)
Hexavalent Chromium	218.6/SM3500Cr-B, C, D	Water	Plastic/Glass	Ammonium Buffer pH 9.3-9.7	28 Days (see note 4)
Hexavalent Chromium	218.6/218.7	Drinking Water	Plastic/Glass	Ammonium Buffer pH >8	14 Days (see note 4)
Hexavalent Chromium	7196 (with 3060A)	Solid		≤ 6°C	30 Days from collection to extraction and 7 days from extraction to analysis
Hydrocarbons in	AM4.02	Vapor	20cc vapor	None	N/A

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Vapor			vial with stopper septum; evacuated		
Hydrogen by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum; atm pressure	None	14 Days
Hydrogen Halide and Halogen Emissions	EPA 26	Air	Solutions	None	6 Months
Ignitability of Solids	1030	Non-liquid Waste	Plastic/Glass	None	28 Days
Lead Emissions	EPA 12	Air	Filter/Solutions	None	6 Months
Light Hydrocarbons by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum; atm pressure	None	14 Days
Light Hydrocarbons in Vapor	AM20GAx	Vapor	20cc vapor vial with stopper septum; evacuated	None	Unspecified
Lipids	Pace Lipids	Tissue	Plastic/Glass	$\leq$ -10°C	1 Year if frozen
Mercury, Low-Level	1631E	Solid	Glass	None	28 Days
Mercury, Low-Level	1631E	Water	Fluoropolymer bottles (Glass if Hg is only analyte being tested)	12N HCl or BrCl	48 Hours for preservation or analysis; 28 Days to preservation if sample oxidized in bottle; 90 Days for analysis if preserved
Mercury, Low-Level	1631E	Tissue	Plastic/Glass	$\leq$ - 10°C	28 Days if frozen
Mercury	7471	Solid	8oz Glass Jar	$\leq$ 6°C	28 Days
Mercury	7470/245.1/245.2	Water	Plastic/Glass	pH<2 HNO_3	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Mercury	7471/245.6	Tissue	Plastic/Glass	≤ - 10°C	28 Days if frozen
Metals (GFAA)	7000/200.9	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP)	NIOSH 7300A/7303	Air	Filters	None	180 Days
Metals (ICP/ICPMS)	6010/6020	Solid	8oz Glass Jar	None	180 Days
Metals (ICP/ICPMS)	6010/6020/200.7/200.8	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP/ICPMS)	6020	Tissue	Plastic/Glass	≤ -10°C	180 Days if frozen
Methane, Ethane, Ethene	8015 modified	Water	40mL vials	HCl	14 Days
Methane, Ethane, Ethene, propane, propene, iso-butane, n-butane, 14 Daysacetylene	PM01/AM20GAx	Water	40ml clear VOA vials with butyl septa	trisodium phosphate or benzalkonium chloride, cool to above freezing but ≤6°C	14 Days; 7 Days unpreserved
Methane, Ethane, Ethene, propane, propene, iso-butane, n-butane	RSK 175M	Water	40ml VOA vials	trisodium phosphate, cool to above freezing but ≤6°C	14 Days
Methane, Ethane, Ethene	EPA 3C	Air	Summa Canister	None	28 Days
Methane, Ethane, Ethene	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
Methanol, Ethanol	8015 modified	Water	40mL vials	≤ 6°C	14 Days
Methanol, Ethanol	8015 modified	Solid	2oz Glass	≤ 6°C	14 Days
Methyl Mercury	1630	Water	Teflon/ fluoropolymer	Fresh water- 4mL/L HCl; Saline water- 2mL/L H_2SO_4 (must be preserved within 48 hours of collection)	6 months
Methyl Mercury	1630	Tissue	2-4oz glass jar	≤ 0°C	28 Days; ethylated distillate 48 hours
Nitrogen, Ammonia	SM4500NH3/350.1	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Total Kjeldahl (TKN)	351.2	Solid	Plastic/Glass	≤ 6°C	28 Days
Nitrogen, Total	SM4500-	Water	Plastic/Glass	pH<2 H_2SO_4; ≤	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Kjeldahl (TKN)	Norg/351.2			6°C	
Nitrogen, Nitrate	SM4500-NO3/352.1	Water	Plastic/Glass	≤ 6°C	24 Hours preferred
Nitrogen, Nitrate & Nitrite combination	353.2	Solid	Plastic/Glass	≤ 6°C	28 Days
Nitrogen, Nitrate & Nitrite combination	SM4500-NO3/353.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Nitrite or Nitrate separately	SM4500-NO2/353.2	Water	Plastic/Glass	≤ 6°C	48 Hours
Nitrogen, Organic	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Non-Methane Organics	EPA 25C	Air	Summa Canister	None	28 Days
Non-Methane Organics	EPA 25C	Air	Tedlar Bag or equivalent	None	72 Hours
Odor	SM2150B	Water	Glass	≤ 6°C	24 Hours
Oil and Grease/HEM	1664A/SM5520B/9070	Water	Glass	pH<2 H_2SO_4 or HCl; ≤ 6°C	28 Days
Oil and Grease/HEM	9071	Solid	Glass	≤ 6°C	28 Days
Oil Range Organics	8015	Solid	Glass	≤ 6°C	14/40 Days
Oil Range Organics	8015	Water	Glass	≤ 6°C	7/40 Days
Organic Matter	ASA 29-3.5.2	Solid	Plastic/Glass	None; samples air-dried and processed prior to analysis	N/A
Oxygen, Dissolved (Probe)	SM4500-O	Water	Glass	None	15 minutes
Oxygenates on Product (GCMS SIM)	1625 modified	Product	10mL glass vial	≤ 6°C	14 Days (7 Days from extraction)
PBDEs	1614	Water	1L Amber Glass	≤ 6°C	1 Year/1 Year
PBDEs	1614	Solid	Wide Mouth Jar	≤ 6°C	1 Year/1 Year
PBDEs	1614	Tissue	Aluminum Foil	≤ -10°C	1 Year/1 Year
PCBs and Pesticides, Organochlorine (OC)	TO-4/TO-10	Air	PUF	None	7/40 Days
PCBs and Pesticides, Organochlorine	608	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	Pest: 7/40 Days; PCB: 1 Year/1 Year

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
(OC)					
PCBs, Pesticides (OC), Herbicides	508.1	Water	Glass	Na2SO3; pH<2 HCl; ≤ 6°C	14/30 Days
PCBs, total as Decachlorobiphenyl	508A	Water	1L Glass, TFE lined cap	≤ 6°C	14/30 Days
Perchlorate	331	Water	Plastic/Glass	≥0-6°C, field filtered with headspace	28 Days
Permanent Gases (oxygen, nitrogen, carbon dioxide, carbon monoxide)	PM01/AM20GAx	Water	40ml amber VOA vials with butyl septa	benzalkonium chloride and cool to above freezing but ≤ 6°C	14 Days
Permanent Gases by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum; atm pressure	None	14 Days
Permanent Gases in Vapor	AM20GAx	Vapor	20cc vapor vial with stopper septum; evacuated	None	Unspecified
Pesticides, Organochlorine (OC)	8081	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Pesticides, Organochlorine (OC)	8081	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Pesticides, Organochlorine (OC)	8081	Tissue	8oz Glass Jar	≤ -10°C	1 Year if frozen/40 Days
Pesticides, Organophosphorous (OP)	8141	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Pesticides, Organophosphorous (OP)	8141	Water	1L Amber Glass	pH 5-8 with NaOH or H_2SO_4; ≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
PCBs (Aroclors)	8082	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	1 Year/1 Year
PCBs (Aroclors)	8082	Solid	8oz Glass Jar	≤ 6°C	1 Year/1 Year
PCBs (Aroclors)	8082	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen/1 Year
PCB Congeners	1668A	Water	1L Amber	≤ 6°C but above	1 Year/1 Year

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
			Glass	freezing	
PCB Congeners	1668A	Solid	4-8oz Glass Jar	≤ 6°C but above freezing	1 Year/1 Year
PCB Congeners	1668A	Tissue	4-8oz Glass Jar	≤ -10°C	1 Year/1 Year
Paint Filter Liquid Test	9095	Water	Plastic/Glass	None	N/A
Particle Size	ASA 15-5 modified	Solid	Plastic/Glass (100g sample)	None	N/A
Particulates	PM-10	Air	Filters	None	180 Days
Permanent Gases	EPA 3C	Air	Summa Canister	None	28 Days
Permanent Gases	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
pH	SM4500H+B/9040	Water	Plastic/Glass	None	15 minutes
pH	9045	Solid	Plastic/Glass	None	7 Days
Phenol, Total	420.1/420.4/9065/9066	Water	Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Phosphorus, Orthophosphate	SM4500P/365.1/365.3	Water	Plastic	≤ 6°C	Filter within 15 minutes, Analyze within 48 Hours
Phosphorus, Total	SM4500P/ 365.1/365.3/365.4	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Phosphorus, Total	365.4	Solid	Plastic/Glass	≤ 6°C	28 Days
Polynuclear Aromatic Hydrocarbons (PAH)	TO-13	Air	PUF	None	7/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen/40 Days
Purgeable Organic Halides (POX)	9021	Water	Glass; no headspace	≤ 6°C	14 Days
Radioactive Strontium	905.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-226	903.0/903.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note 3)	9320/904.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note 3)	9320	Solid	Plastic/Glass		
Residual Range Organics- Alaska RRO	AK103	Solid	8oz Glass	≤ 6°C	14/40 Days
Saturated Hydrocarbons		Water	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	≤ 6°C; pH<2 1:1 HCl (optional)
Saturated Hydrocarbons		Solid	≤ 10°C	1 Year/40 Days	≤ 10°C
Silica, Dissolved	SM4500Si-D	Water	Plastic	≤ 6°C	28 Days
Solids, Settleable	SM2540F	Water	Glass	≤ 6°C	48 Hours
Solids, Total	SM2540B	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total	SM2540G	Solid	Plastic/Glass	≤ 6°C	7 Days
Solids, Total (FOC, OM, Ash)	ASTM D2974	Solid	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Dissolved	SM2540C	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Suspended	SM2540D/USGS I-3765-85	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Volatile	160.4/SM2540E	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Volatile	160.4	Solid	Plastic/Glass	≤ 6°C	7 Days
Specific Conductance	SM2510B/9050/120.1	Water	Plastic/Glass	≤ 6°C	28 Days
Stationary Source Dioxins and Furans	EPA 23	Air	XAD Trap	None	30/45 Days
Stationary Source Mercury	EPA 101	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source Metals	EPA 29	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source	EPA 201A	Air	Filters	None	180 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
PM10					
Stationary Source Particulates	EPA 5	Air	Filter/Solutions	None	180 Days
Sulfate	SM4500SO4/9036/9038/375.2/ASTM D516	Water	Plastic/Glass	≤ 6°C	28 Days
Sulfide, Reactive	SW-846 Chap.7	Water	Plastic/Glass	None	28 Days
Sulfide, Reactive	SW-846 Chap.7	Solid	Plastic/Glass	None	28 Days
Sulfide, Total	SM4500S/9030	Water	Plastic/Glass	pH>9 NaOH; ZnOAc; ≤ 6°C	7 Days
Sulfite	SM4500SO3	Water	Plastic/Glass	None	15 minutes
Surfactants (MBAS)	SM5540C	Water	Plastic/Glass	≤ 6°C	48 Hours
Total Alpha Radium (see note 3)	9315/903.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Total Alpha Radium (see note 3)	9315	Solid	Plastic/Glass	None	180 days
Total Inorganic Carbon (TIC)	PM01/AM20GAx	Water	40ml clear VOA vial with butyl septum	Cool to above freezing but < 6°C	14 Days
Total Organic Carbon (TOC)	SM5310B,C,D/9060	Water	Glass	pH<2 H_2SO_4 or HCl; ≤ 6°C	28 Days
Total Organic Carbon (TOC)	9060/Walkley Black/Lloyd Kahn	Solid	Glass	≤ 6°C	14 Days
Total Organic Halogen (TOX)	SM5320/9020	Water	Glass; no headspace	≤ 6°C	14 Days
Total Petroleum Hydrocarbons (aliphatic and aromatic)	TPHCWG	Water	40mL vials	pH<2 HCl, no headspace, ≤ 6°C	7 Days
Total Petroleum Hydrocarbons (aliphatic and aromatic)	TPHCWG	Solid	Glass	≤ 6°C	14 days
Tritium	906.0	Water	Glass	None	180 days
Turbidity	SM2130B/180.1	Water	Plastic/Glass	≤ 6°C	48 Hours
Total Uranium	908.0/ASTM D5174-97	Water	Plastic/Glass	pH<2 HNO_3	180 days
UCMR Metals	200.8	Water	Plastic or glass	pH<2 HNO_3	28 Days
UCMR Hexavalent Chromium	218.7	Water	HDPE or propylene	Na_2CO_3/$NaHCO_3$/$(NH_4)_2SO_4$; pH>8	14 Days
UCMR Chlorate	300.1	Water	Plastic or glass	EDA	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
UCMR Perfluorinated Compounds	537	Water	Polypropylene	Trizma	14 Days
UCMR 1, 4 Dioxane	522	Water	Glass	Na_2SO_3, $NaHSO_4$; pH<4	28 Days
UV254	SM5910B	Water	Glass	≤ 6°C	48 Hours
Vermiculite	EPA 600/R-93/116	Solid	Plastic/Glass	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Volatile Fatty Acids	AM21G	Water	40mL clear VOA vials; Teflon septa	Cool to above freezing but < 6°C	21 Days
Volatile Fatty Acids (low level)	AM23G	Water	40mL clear VOA vials; Teflon septa	Cool to above freezing but < 6°C, Benzalkonium chloride	14 Days
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days preserved
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Solid	4-8oz Glass Jar	≤ 6°C; packed jars with no headspace	7/28 Days
Volatiles	TO-14	Air	Summa Canister	None	28 Days
Volatiles	TO-14	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	TO-15	Air	Summa Canister or Tedlar Bag	None	28 Days
Volatiles	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Volatiles	TO-18/8260	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	8260	Solid	5035 vial kit	See note 1 (analyze for acrolein and acrylonitrile per	14 days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
				local requirements)	
Volatiles	8260	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days
Volatiles	8260	Conc. Waste	5035 vial kit or 40mL vials	≤ 6°C	14 Days
Volatiles	624	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present (or unpreserved if run within 7 days of collection) (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days (7 Days for aromatics if unpreserved)
Volatiles (see note 2)	524.2	Water	40mL vials (in duplicate)	pH<2 HCl; ≤ 6°C; Ascorbic acid or $Na_2S_2O_3$ if Cl present[2]	14 Days
Whole Oil C3-C36 Whole Oil	ASTM D3328	Product	2 x 40ml VOA vials	Unpreserved	Unlimited Cannot analyze on water or soil
Parent and Alkylated PAHs	8270 (SIM) Modified	P, S, W	P - 2 x 40ml VOA Vials S - 1 x 4oz jar W – 2 x 1L Glass	Unpreserved Ice, maintained at ≤6°C	Unlimited if product, 14 days if solid or water
C8-C40 Full Scan	ASTM D5739 (GC/MS)	P,S,W	P – 2 x 40ml VOA Vials S – 1 x 4oz jar W – 2 x 1L	P-None S or W-ice, maintained at ≤6°C	Unlimited if product, 14 days if solid or water

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
			Glass		
Oxygenated Blending Agents	EPA 1624 Modified	P~~, W~~	2x40mL VOA vials ~~W – 2x40mL VOA vials~~	P – NONE ~~W – HClL; ice, maintained at 6°C~~	Unlimited ~~If water – 14 days~~
Organic Lead and Lead Scavengers	GC-ECD	Product	2 X 40ml VOA vials	None	Unlimited Cannot analyze water or soil
C3-C12~~0~~ PIANO	GC/MS	P, W, S	2x40mL VOA vials W – 2x40mL VOA vials S – 1 x 4oz jar	P – NONE W – HClL; ice, maintained at 6°C	Unlimited If solid or water – 14 days

[1] **5035/5035A Note**: 5035 vial kit typically contains 2 vials water, preserved by freezing **or**, 2 vials aqueous sodium bisulfate preserved at 4°C, **and** one vial methanol preserved at ≤6°C **and** one container of unpreserved sample stored at ≤6°C.

[2] Method 524.2 lists ascorbic acid as the preservative when residual chlorine is suspected, unless gases or Table 7 compounds are NOT compounds of interest and then sodium thiosulfate is the preservative recommended.

[3] Methods 9315 and 9320 both state that if samples are unpreserved, the samples should be brought to the lab within 5 days of collection, preserved in the lab, and then allowed to sit for a minimum of 16 hours before sample preparation/analysis.

[4] The holding time for hexavalent chromium may be extended by the addition of the ammonium buffer listed in EPA 218.6 per the 2012 EPA Method Update Rule. Although Method 218.6 stipulates a different pH range (9.0 to 9.5) for buffering, this method requirement was modified in the Method Update Rule to a pH range of 9.3 to 9.7.For non-potable waters, adjust the pH of the sample to 9.3 to 9.7 during collection with the method required ammonium sulfate buffer to extend the holding time to 28 days. For potable waters, addition of the buffer during collection will extend the holding time for 14 days per EPA 218.7 and the EPA UCMR program.

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LABORATORY ACCREDITATIONS & CERTIFICATIONS

ACCREDITOR:	Pennsylvania Department of Environmental Protection, Bureau of Laboratories
REGISTRATION NO.:	02-00538
SCOPE:	NELAP Non-Potable Water
EXPIRATION DATE:	November 30, 2019

ACCREDITOR:	NELAP: State of Virginia, Dept. of General Services/Div. of Consolidated Lab Serv.
ACCREDITATION ID:	460201
SCOPE:	Non-Potable Water
EXPIRATION DATE:	December 14, 2019

ACCREDITOR:	South Carolina Department of Health and Environmental Control, Office of Environmental Laboratory Certification
ACCREDITATION ID:	Certificate No. 89009003
SCOPE:	Clean Water Act (CWA); Resource Conservation and Recovery Act (RCRA)
EXPIRATION DATE:	November 30, 2019

ACCREDITOR:	NELAP: New Hampshire, Environmental Laboratory Accreditation Program
ACCREDITATION ID:	Certificate No. 299409
SCOPE:	Non-potable water
EXPIRATION DATE:	August 5, 2019

ACCREDITOR:	NELAP: New Jersey, Department of Environmental Protection
ACCREDITATION ID:	PA026
SCOPE:	Non-Potable Water;
EXPIRATION DATE:	June 30, 2019

ACCREDITOR:	NELAP: New York, Department of Health Wadsworth Center
ACCREDITATION ID:	11815
SCOPE:	Non-Potable Water;
EXPIRATION DATE:	April 1, 2020

ACCREDITOR:	NELAP: Connecticut, Department of Public Health, Division of Environmental Health
ACCREDITATION ID:	Certificate No. PH-0263
SCOPE:	Clean Water Act (CWA) Resource Conservation and Recovery Act (RCRA)
EXPIRATION DATE:	December 31, 2020

ACCREDITOR:	NELAP: Texas, Commission on Environmental Quality
ACCREDITATION ID:	Certificate No. T104704453-09-TX
SCOPE:	Non-Potable Water
EXPIRATION DATE:	December 31, 2019

ACCREDITOR:	West Virginia, Dept. of Environmental Protection
ACCREDITATION ID:	Certificate No. 395
SCOPE:	Non-Potable Water
EXPIRATION DATE:	May 31, 2019

SCHEDULE 1.1 (i)
Pace Analytical Energy Services, LLC
220 William Pitt Way
Pittsburgh, PA 15238
(412) 826-5245

LABORATORY ACCREDITATIONS & CERTIFICATIONS

COMMERCIAL LABORATORY STIPULATION: Georgia Rules for Commercial Environmental Laboratory Accreditation Chapter 391-3-26: As per the Georgia EPD Rules and Regulations for Commercial Laboratories, Pace Analytical Energy Services, LLC is accredited by the Pennsylvania Department of Environmental Protection Bureau of Laboratories under the National Environmental Laboratory Approval Program (NELAC). If you have any further questions regarding accreditation status for Pace Analytical Energy Services, LLC please contact your Pace Analytical Energy Services, LLC Project Manager.

APPENIDX A-4

PACE LENEXA, KANSAS

Document Information

Document Number: ENV-MAN-LENE-0001 **Revision:** 01

Document Title: Quality Manual

Department(s): Quality

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Notes

Document Notes:

All Dates and Times are listed in: Central Time Zone

Signature Manifest

Document Number: ENV-MAN-LENE-0001 **Revision:** 01
Title: Quality Manual

All dates and times are in Central Time Zone.

ENV-MAN-LENE-0001 Quality Manual

QM Approval

Name/Signature	Title	Date	Meaning/Reason
Gregory Busch (003971)	Quality Manager	17 Jan 2019, 02:49:09 PM	Approved

Management Approval

Name/Signature	Title	Date	Meaning/Reason
Gregory Busch (003971)	Quality Manager	17 Jan 2019, 02:49:28 PM	Approved
David Poague (005039)	Manager - Field Services	17 Jan 2019, 03:02:45 PM	Approved
Charles Girgin (002243)	General Manager	17 Jan 2019, 04:40:36 PM	Approved
Melissa Lundgrin (005033)	Lab Analyst III	18 Jan 2019, 11:24:10 AM	Approved
Gregory Groene (005025)	Manager - Client Services	18 Jan 2019, 05:12:49 PM	Approved
Timothy Harrell (005522)	Manager - Lab Services	21 Jan 2019, 10:10:59 AM	Approved
Harry Borg (005736)	Manager - Lab Services	21 Jan 2019, 12:34:11 PM	Approved
Joshua Cunningham (003261)	Manager - Lab Services	22 Jan 2019, 12:10:55 PM	Approved

QUALITY ASSURANCE MANUAL

Quality Assurance/Quality Control Policies and Procedures

Pace Analytical Services, LLC

Lenexa Laboratory
9608 Loiret Blvd,
Lenexa, KS 66219
913-599-5665

Salina Laboratory
525 N 8th St,
Salina, KS 67401
785-827-1273

SE KS Service Center
808 W McKay St
Frontenac, KS 66763
620-235-0003

Tulsa Service Center
5460 S Garnett Rd, Suite P
Tulsa, OK 74146
918-270-3901

Saint Louis Service Center
4120 Seven Hills Drive
Florissant MO, 63033
314.838.7223

1.0. INTRODUCTION AND ORGANIZATIONAL STRUCTURE

"Working together to protect our environment and improve our health"
Pace Analytical Services LLC - Mission Statement

1.1. Introduction to Pace

1.1.1. Pace Analytical Services, LLC is a privately held, full-service analytical testing firm operating a nationwide system of laboratories. Pace offers extensive services beyond standard analytical testing, including: bioassay for aquatic toxicity, air toxics, dioxins and coplanar PCB's by high resolution mass spectroscopy , radiochemical analyses, product testing, pharmaceutical testing, field services and mobile laboratory capabilities. This document defines the Quality System and Quality Assurance (QA)/Quality Control (QC) protocols.

1.1.2. Pace laboratories are capable of analyzing a full range of environmental samples from a variety of matrices, including air, surface water, wastewater, groundwater, soil, sediment, biota, and other waste products. Methods are applied from regulatory and professional sources including EPA, ASTM, USGS, NIOSH, Standard Methods, and State Agencies. Section 11 of this document is a representative listing of general analytical protocol references.

1.2. Statement of Purpose

1.2.1. To meet the business needs of our customers for high quality, cost-effective analytical measurements and services.

1.3. Quality Policy Statement and Goals of the Quality System

1.3.1. Pace management is committed to maintaining the highest possible standard of service and quality for our customers by following a documented quality system that is compliant with all current applicable state, federal, and industry standards, such as the NELAC Standard, the TNI Standard, and ISO standards and is in accordance with the stated methods and customer requirements. The overall objective of this quality system is to provide reliable data of known quality through adherence to rigorous quality assurance policies and quality control procedures as documented in this Quality Assurance Manual.

1.3.2. All personnel within the Pace network are required to be familiar with all facets of the quality system relevant to their position and implement these policies and procedures in their daily work.

1.4. Core Values

1.4.1. The following are the Pace Core Values:

- **Integrity**
- **Value Employees**
- **Know Our Customers**
- **Honor Commitments**
- **Flexible Response To Demand**
- **Pursue Opportunities**

- **Continuously Improve**

1.5. Code of Ethics and Standards of Conduct

1.5.1. **Code of Ethics**:

1.5.1.1. Each Pace employee is responsible for the propriety and consequences of his or her actions;

1.5.1.2. Each Pace employee must conduct all aspects of Company business in an ethical and strictly legal manner, and must obey the laws of the United States and of all localities, states and nations where Pace does business or seeks to do business;

1.5.1.3. Each Pace employee must reflect the highest standards of honesty, integrity and fairness on behalf of the Company with customers, suppliers, the public, and one another.

1.5.1.4. Each Pace employee must recognize and understand that our daily activities in environmental laboratories affect public health as well as the environment and that environmental laboratory analysts are a critical part of the system society depends upon to improve and guard our natural resources:

1.5.2. **Standards of Conduct:**

1.5.2.1. **Data Integrity**

1.5.2.1.1. The accuracy and integrity of the analytical results and its supporting documentation produced at Pace are the cornerstones of the company. Employees are to accurately prepare and maintain all technical records, scientific notebooks, calculations, and databases. Employees are prohibited from making false entries or misrepresentations of data for any reason.

1.5.2.1.2. Managerial staff must make every effort to ensure that personnel are free from any undue pressures that may affect the quality or integrity of their work including commercial, financial, over-scheduling, and working condition pressures.

1.5.2.1.3. The data integrity system includes in-depth, periodic monitoring of data integrity including peer data review and validation, internal raw data audits, proficiency testing studies, etc.

1.5.2.1.4. Any documentation related to data integrity issues, including any disciplinary actions involved, corrective actions taken, and notifications to customers must be retained for a minimum of five years.

1.5.2.2. **Confidentiality**

1.5.2.2.1. Pace employees must not use or disclose confidential or proprietary information except when in connection with their duties at Pace. This is effective over the course of employment and for an additional period of two years thereafter.

1.5.2.2.2. Confidential or proprietary information, belonging to either Pace and/or its customers, includes but is not limited to test results, trade secrets, research and development matters, procedures, methods, processes and standards, company-specific techniques and equipment, marketing and customer information, inventions, materials composition, etc.

1.5.2.3. **Conflict of Interest**

1.5.2.3.1. Pace employees must avoid situations that might involve a conflict of interest or could appear questionable to others. This includes participation in activities that conflict or

appear to conflict with the employees' Pace responsibilities. This would also include offering or accepting anything that might influence the recipient or cause another person to believe that the recipient may be influenced to behave or in a different manner than he would normally (such as bribes, gifts, kickbacks, or illegal payments).

1.5.2.3.2. Employees are not to engage in outside business or economic activity relating to a sale or purchase by the Company. Other problematic activities include service on the Board of Directors of a competing or supplier company, significant ownership in a competing or supplier company, employment for a competing or supplier company, or participation in any outside business during the employee's work hours.

1.5.3. Strict adherence by each Pace employee to this Code of Ethics and to the Standards of Conduct is essential to the continued vitality of Pace and to continue the pursuit of our common mission to protect our environment and improve our health.

1.5.4. Failure to comply with the Code of Ethics and Standards of Conduct will result in disciplinary action up to and including termination and referral for civil or criminal prosecution where appropriate. An employee will be notified of an infraction and given an opportunity to explain, as prescribed under current disciplinary procedures.

1.5.5. Compliance: all employees undergo annual Data Integrity/Ethics training which includes the concepts listed above. All employees also sign an annual Ethic Policy statement.

1.6. Anonymous Compliance Alertline

1.6.1. An ethical and safe workplace is important to the long-term success of Pace and the well-being of its employees. Pace has a responsibility to provide a work environmental where employees feel safe and can report unethical or improper behavior in complete confidence. With this in mind, Pace has engaged Lighthouse Services, Inc. to provide all employees with access to an anonymous ethics and compliance alertline for reporting possible ethics and compliance violations. The purpose of this service is to ensure that any employee can report anonymously and without fear of retaliation.

1.6.2. Lighthouse Services provides a toll-free number along with several other reporting methods, all of which are available 24 hours a day, seven days a week for use by employees and staff.

1.6.3. Telephone: English speaking USA and Canada: (844)-970-0003.

1.6.4. Telephone: Spanish speaking North America: (800)-216-1288.

1.6.5. Website: www.lighthouse-services.com/pacelabs.

1.6.6. Email: reports@lighthouse-services.com (must include company name with report).

1.7. Laboratory Organization

1.7.1. Each laboratory within the system operates with local management, but all labs share common systems and receive support from the Corporate Office. See Attachment III for the Corporate Organizational structure.

1.7.2. A Senior General Manager (SGM) oversees all laboratories and service centers in their assigned region. Each laboratory or facility in the company is then directly managed by an SGM, a General Manager (GM), an Assistant General Manager (AGM), or an Operations Manager (OM). Quality Managers (QM) or Senior Quality Managers (SQM) at each laboratory report directly to the highest level of local laboratory management, however named, that routinely makes day-to-day decisions

regarding that facility's operations. The QMs and SQMs will also receive guidance and direction from the corporate Director of Environmental Quality.

1.7.3. The SGM, GM, AGM or OM, or equivalent functionality in each facility, bears the responsibility for the laboratory operations and serves as the final, local authority in all matters. In the absence of these managers, the SQM/QM serves as the next in command, unless the manager in charge has assigned another designee. He or she assumes the responsibilities of the manager, however named, until the manager is available to resume the duties of their position. In the absence of both the manager and the SQM/QM, management responsibility of the laboratory is passed to the Technical Director, provided such a position is identified, and then to the most senior department manager until the return of the lab manager or SQM/QM. The most senior department manager in charge may include the Client Services Manager (CSM) or the Administrative Business Manager (ABM) at the discretion of the SGM/GM/AGM/OM.

1.7.4. A Technical Director who is absent for a period of time exceeding 15 consecutive calendar days shall designate another full-time staff member meeting the qualifications of the technical director to temporarily perform this function. The laboratory SGM/GM/AGM/OM or SQM/QM has the authority to make this designation in the event the existing Technical Director is unable to do so. If this absence exceeds 35 consecutive calendar days, the primary accrediting authority shall be notified in writing.

1.7.5. The SQM/QM has the responsibility and authority to ensure the Quality System is implemented and followed at all times. In circumstances where a laboratory is not meeting the established level of quality or following the policies set forth in this Quality Assurance Manual, the SQM/QM has the authority to halt laboratory operations should he or she deem such an action necessary. The SQM/QM will immediately communicate the halting of operations to the SGM/GM/AGM/OM and keep them posted on the progress of corrective actions. In the event the SGM/GM/AGM/OM and the SQM/QM are not in agreement as to the need for the suspension, the Chief Operating Officer (COO) and Director of Environmental Quality will be called in to mediate the situation.

1.7.6. The lab is required to appoint deputies for key managerial personnel. These deputies must be documented for auditing purposes. The deputies, by position, are the following:

1.7.6.1. Deputy for General Manager is Greg Busch

1.7.6.2. Deputies for Organics Technical Director are Jessica Leck (Volatiles) / John Tracy (Semivolatiles)

1.7.6.3. Deputies for Inorganics Technical Director are Josh Cunningham (Wet Chemistry) / Scott Wieters (Metals)

1.7.6.4. Deputy for Quality Manager is Robert Perez

1.7.6.5. Deputy for Client Services Manager is Angie Brown

1.7.7. The technical staff of the laboratory is generally organized into the following functional groups:

- Organic Sample Preparation
- Wet Chemistry Analysis
- Metals Analysis
- Volatiles Analysis
- Semi-volatiles Analysis
- Radiochemical Analysis
- Microbiological Analysis
- Bioassay Analysis

1.7.8. The organizational structure for Pace – Lenexa is listed in Attachment II. In the event of a change in SGM/GM/AGM/OM, SQM/QM, or any Technical Director, the laboratory will notify its accrediting authorities per their individual required timeframes, not to exceed 30 days. The QAM will remain in effect until the next scheduled revision.

1.8. Laboratory Job Descriptions

1.8.1. Senior General Manager

- Oversees all functions of all the operations within their designated region;
- Oversees the development of local GMs/AGMs/OMs within their designated region;
- Oversees and authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Oversees the preparation of budgets and staffing plans for all operations within their designated region;
- Ensures compliance with all applicable state, federal and industry standards;
- Works closely with Regional Sales Management.

1.8.2. General Manager

- Oversees all functions of their assigned operations;
- Authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Prepares budgets and staffing plans;
- Monitors the Quality Systems of the laboratory and advises the SQM/QM accordingly;
- Presents the Ethics/Data Integrity training annually to all employees in their facilities as an instructor-led training.
- Ensures compliance with all applicable state, federal and industry standards.

1.8.4. Quality Manager

- Responsible for implementing, maintaining and improving the quality system while functioning independently from laboratory operations. Reports directly to the highest level of local laboratory facility management, however named, that routinely makes day-to-day decisions regarding laboratory operations, but receives direction and assistance from the Corporate Director of Environmental Quality. They may also report to a Senior Quality Manager (SQM);
- Ensures that communication takes place at all levels within the lab regarding the effectiveness of the quality system and that all personnel understand their contributions to the quality system;
- Monitors QA/QC activities to ensure that the laboratory achieves established standards of quality (as set forth by the Corporate Environmental Quality office). The QM is responsible for reporting the lab's level of compliance to these standards to the Corporate Director of Environmental Quality on a quarterly basis;
- Maintains records of quality control data and evaluates data quality;
- Conducts periodic internal audits and coordinates external audits performed by regulatory agencies or customer representatives;
- Reviews and maintains records of proficiency testing results;
- Maintains the document control system;
- Assists in development and implementation of appropriate training programs;

- Provides technical support to laboratory operations regarding methodology and project QA/QC requirements;
- Maintains certifications from federal and state programs;
- Ensures compliance with all applicable state, federal and industry standards;
- Maintains the laboratory training records, including those in the Learning Management System (LMS), and evaluates the effectiveness of training;
- Monitors corrective and preventive actions;
- Maintains the currency of the Quality Manual.

1.8.5. Technical Director

- Monitors the standards of performance in quality assurance and quality control data;
- Monitors the validity of analyses performed and data generated;
- Reviews tenders, contracts and QAPPs to ensure the laboratory can meet the data quality objectives for any given project;
- Serves as the manager of the laboratory in the absence of the SGM/GM/AGM/OM and SQM/QM;
- Provides technical guidance in the review, development, and validation of new methodologies.

1.8.6. Client Services Manager

- Oversees all the day to day activities of the Client Services Department which includes Project Management and, possibly, Sample Control;
- Responsible for staffing and all personnel management related issues for Client Services;
- Serves as the primary senior consultant to customers on all project related issues such as set up, initiation, execution and closure;
- Performs or is capable of performing all duties listed for that of Project Manager.

1.8.7. Project Manager

- Coordinates daily activities including taking orders, reporting data and analytical results;
- Serves as the primary technical and administrative liaison between customers and Pace;
- Communicates with operations staff to update and set project priorities;
- Provides results to customers in the requested format (verbal, hardcopy, electronic, etc.);
- Works with customers, laboratory staff, and other appropriate Pace staff to develop project statements of work or resolve problems of data quality;
- Responsible for solicitation of work requests, assisting with proposal preparation and project initiation with customers and maintain customer records;
- Mediation of project schedules and scope of work through communication with internal resources and management;
- Responsible for preparing routine and non-routine quotations, reports and technical papers;
- Interfaces between customers and management personnel to achieve customer satisfaction;
- Manages large-scale complex projects;
- Supervises less experienced project managers and provide guidance on management of complex projects;
- Arranges bottle orders and shipment of sample kits to customers;
- Verifies login information relative to project requirements and field sample Chains-of-Custody.

1.8.8. Additional job descriptions are available upon request from the laboratory ABM.

1.9. Training and Orientation

1.9.1. Training for Pace employees is managed through a web-based training system. Employees are provided with several training activities for their particular job description and scope of duties. These training activities may include:

- Hands-on training led by supervisors;
- Job-specific training checklists and worksheets;
- Lectures and instructor-led training sessions;
- Method-specific training;
- External conferences and seminars;
- Reading Standard Operating Procedures (SOPs);
- Reading the Quality Assurance Manual and Safety Manual/Chemical Hygiene Plan;
- Core training modules (basic lab skills, etc.);
- Quality system training modules (support equipment use, corrective actions/root causes, etc.);
- Data Integrity/Ethics training;
- Specialized training by instrument manufacturers;
- On-line courses.

1.9.2. All procedures and training records are maintained and available for review during laboratory audits. Additional information can be found in SOP ENV-SOP-LENE-0110 **Training and Employee Orientation** or its equivalent revision or replacement.

1.10. Laboratory Safety and Waste

1.10.1. It is the policy of Pace to make safety and waste compliance an integral part of daily operations and to ensure that all employees are provided with safe working conditions, personal protective equipment, and requisite training to do their work without injury. Each employee is responsible for his/her own safety as well as those working in the immediate area by complying with established company rules and procedures. These rules and procedures as well as a more detailed description of the employees' responsibilities are contained in the local Safety Manual/Chemical Hygiene Plan.

1.11. Security and Confidentiality

1.11.1. Security is maintained by controlled access to laboratory buildings. Exterior doors to laboratory buildings remain either locked or continuously monitored by Pace staff.

1.11.2. Additional security is provided where necessary, (e.g., specific secure areas for sample, data, and customer report storage), as requested by customers, or cases where national security is of concern. These areas are lockable within the facilities, or are securely offsite. Access is limited to specific individuals or their designees.

1.11.3. All information pertaining to a particular customer, including national security concerns will remain confidential. Data will be released to outside agencies only with written authorization from the customer or where federal or state law requires the company to do so.

1.12. Communications

1.12.1. Management within each lab bears the responsibility of ensuring that appropriate communication processes are established and that communication takes place regarding the effectiveness of the management/quality system. These communication processes may include email, regular staff meetings, senior management meetings, etc.

1.12.2. Corporate management bears the responsibility of ensuring that appropriate communication processes are established within the network of facilities and that communication takes place at a company-wide level regarding the effectiveness of the management/quality systems of all Pace facilities. These communication processes may include email, quarterly continuous improvement conference calls for all lab departments, and annual continuous improvement meetings for all department supervisors, quality managers, client services managers, and other support positions.

2.0. SAMPLE CUSTODY

2.1. Project Initiation

2.1.1. Prior to accepting new work, the laboratory reviews its performance capability. The laboratory confirms that sufficient personnel, equipment capacity, analytical method capability, etc., are available to complete the required work. Customer needs, certification requirements, and data quality objectives are defined and the appropriate sampling and analysis plan is developed to meet the project requirements by project managers or sales representatives. Members of the management staff review current instrument capacity, personnel availability and training, analytical procedures capability, and projected sample load. Management then informs the sales and client services personnel whether or not the laboratory can accept the new project via written correspondence, email, and/or daily operations meetings.

2.1.2. Additional information regarding specific procedures for reviewing new work requests can be found in SOP ENV-SOP-LENE-0001 **Review of Analytical Requests** or its equivalent revision or replacement.

2.2. Sampling Materials and Support

2.2.1. Each individual Pace laboratory provides shipping containers, properly preserved sample containers, custody documents, and field quality control samples to support field-sampling events. Guidelines for sample container types, preservatives, and holding times for a variety of methods are listed in Attachment XIII. Note that all analyses listed are not necessarily performed at all Pace laboratories and there may be additional laboratory analyses performed that are not included in these tables. Customers are encouraged to contact their local Pace Project Manager for questions or clarifications regarding sample handling. Pace may provide pick-up and delivery services to their customers when needed

2.2.2. Some Pace facilities provide sampling support through a Field Services department. Field Services operates under the Pace Corporate Quality System, with applicable and necessary provisions to address the activities, methods, and goals specific to Field Services. All procedures and methods used by Field Services are documented in SOPs and Procedure Manuals.

2.3. Chain of Custody

2.3.1. A chain of custody (COC) provides the legal documentation of samples from time of collection to completion of analysis.

2.3.2. Field personnel or client representatives must complete a COC for all samples that are received by the laboratory. Samplers are required to properly complete a COC. This is critical to efficient sample receipt and to ensure the requested methods are used to analyze the correct samples. If sample shipments are not accompanied by the correct documentation, the Sample Receiving department notifies a Project Manager. The Project Manager then obtains the correct documentation/information from the customer in order for analysis of samples to proceed.

2.3.3. The COC is filled out completely and legibly with indelible ink. Errors are corrected by drawing a single line through the initial entry and initialing and dating the change. All transfers of samples are recorded on the chain of custody in the "relinquished" and "received by" sections. All information except signatures is printed.

2.3.4. Additional information can be found in SOP ENV-SOP-LENE-0021 **Sample Management** or its equivalent revision or replacement.

2.4. Sample Acceptance Policy

2.4.1. In accordance with regulatory guidelines, Pace complies with the following sample acceptance policy for all samples received.

2.4.2. If the samples do not meet the sample receipt acceptance criteria outlined below, the laboratory is required to document all non-compliances, contact the customer, and either reject the samples or fully document any decisions to proceed with analyses of samples which do not meet the criteria. Any results reported from samples not meeting these criteria are appropriately communicated to the client.

2.4.3. Sample Acceptance Policy requirements:

- Sample containers must have unique client identification designations that are clearly marked with indelible ink on durable, water-resistant labels. The client identifications must match those on the chain-of-custody (COC).
- There must be clear documentation on the COC, or related documents, that lists the unique sample identification, sampling site location, date and time of sample collection, and name of the sample collector.
- There must be clear documentation on the COC, or related documents, that lists the requested analyses, the preservatives used, and any special remarks concerning the samples (i.e., data deliverables, samples are for evidentiary purposes, field filtration, etc.).
- Samples must be in appropriate sample containers. If the sample containers show signs of damage (i.e., broken or leaking) or if the samples show signs of contamination, the samples will not be processed without prior client approval.
- Samples must be correctly preserved upon receipt, unless the method requested allows for laboratory preservation. If the samples are received with inadequate preservation, and the samples cannot be preserved by the lab appropriately, the samples will not be processed without prior client approval.
- Samples must be received within required holding time. Any samples with hold times that are exceeded will not be processed without prior client approval.
- Samples must be received with sufficient sample volume or weight to proceed with the analytical testing. If insufficient sample volume or weight is received, analysis will not proceed without client approval.
- All samples that require thermal preservation are considered acceptable if they are received at a temperature within 2°C of the required temperature, or within the method-specified range. For samples with a required temperature of 4°C, samples with a temperature ranging from just above freezing to 6°C are acceptable. Samples that are delivered to the lab on the same day they are collected are considered acceptable if the samples are received on ice. Any samples that are not received at the required temperature will not be processed without prior client approval.
- Samples for **drinking water** analyses will be rejected at the time of receipt if they are not received in a secure manner, are received in inappropriate containers, are received outside the required temperature range, are received outside the recognized holding time, are received with inadequate identification on sample containers or COC, or are improperly preserved (with the exception of VOA samples- tested for pH at time of analysis and TOC- tested for pH in the field).
- Some specific clients may require custody seals. **For these clients**, samples or coolers that are not received with the proper custody seals will not be processed without prior client approval.

Note 1: Temperature will be read and recorded based on the precision of the measuring device. For example, temperatures obtained from a thermometer graduated to 0.1°C will be read and recorded to ± 0.1°C. Measurements obtained from a thermometer graduate to 0.5°C will be read to ± 0.5°C. Measurements read at the specified precision are not to be rounded down to meet the ≤ 6°C limit. Please reference the Support Equipment SOP for more information.

Note 2: Some microbiology methods allow sample receipt temperatures of up to 10°C. Consult the specific method for microbiology samples received above 6°C prior to initiating corrective action for out of temperature preservation conditions.

2.4.4. Upon sample receipt, the following items are also checked and recorded:

- Presence of custody seals or tapes on the shipping containers;
- Sample condition: Intact, broken/leaking, bubbles in VOA samples;
- Sample holding time;
- Sample pH and residual chlorine when required;
- Appropriate containers.

2.4.5. Additional information can be found in SOP ENV-SOP-LENE-0021 **Sample Management** or its equivalent revision or replacement.

2.5. Sample Log-in

2.5.1. After sample inspection, all sample information on the COC is entered into the Laboratory Information Management System (LIMS). The lab's permanent records for samples received include the following information:

- Customer name and contact
- Customer number
- Pace Analytical project number
- Pace Analytical Project Manager
- Sample descriptions
- Due dates
- List of analyses requested
- Date and time of laboratory receipt
- Field ID code
- Date and time of collection
- Any comments resulting from inspection for sample rejection

2.5.2. If the time collected for any sample is unspecified and Pace is unable to obtain this information from the customer, the laboratory will use 08:00am as the time sampled. All hold times will be based on this sampling time and qualified accordingly if exceeded.

2.5.3. The LIMS automatically generates a unique identification number for each sample created in the system. The LIMS sample number follows the general convention of 60XXXX. This unique identification number is placed on the sample container as a durable label and becomes the link between the laboratory's sample management system and the customer's field identification; it will be a permanent reference number for all future interactions.

2.5.4. Sample labels are printed from the LIMS and affixed to each sample container.

2.5.5. Additional information can be found in SOP ENV-SOP-LENE-0021 **Sample Management** or its equivalent revision or replacement.

2.6. Sample Storage

2.6.1. Additional information on sample storage can be found in SOP ENV-SOP-LENE-0021 **Sample Management** or its equivalent revision or replacement and in SOP ENV-SOP-LENE-0127 **Waste Handling and Management** or its equivalent revision or replacement.

2.6.2. **Storage Conditions**

2.6.2.1. Samples are stored away from all standards, reagents, or other potential sources of contamination. Samples are stored in a manner that prevents cross contamination. Volatile samples are stored separately from other samples. All sample fractions, extracts, leachates, and other sample preparation products are stored in the same manner as actual samples or as specified by the analytical method.

2.6.2.2. Storage blanks are stored with volatile samples and are used to measure cross-contamination acquired during storage. Laboratories must have documented procedures and criteria for evaluating storage blanks, appropriate to the types of samples being stored.

2.6.2.3. Some customers require additional periodic and final temperature measurements to ensure proper temperature is being maintained beyond 20 minutes of safe removal from coolers. Additional information can be found in SOP ENV-SOP-LENE-0073 **Monitoring Temperature Controlled Units.**

2.6.3. **Temperature Monitoring**

2.6.3.1. Samples are taken to the appropriate storage location immediately after sample receipt and check-in procedures are completed.

2.6.3.2. The temperature of each refrigerated storage area is maintained at $\leq 6^{\circ}C$ (but above freezing) unless state, method or program requirements differ. The temperature of each freezer storage area is maintained at $\leq -10^{\circ}C$ unless state, method or program requirements differ. The temperature of each storage area is checked and documented each day of use (each calendar day). Additional information, including corrective actions for temperatures outside of acceptance limits, can be found in SOP ENV-SOP-LENE-0073 **Monitoring Temperature Controlled Units**.

2.6.4. **Hazardous Materials**

2.6.4.1. Samples received for volatile organic analysis that appear to contain pure product must be stored separately from other samples.

2.6.5. **Foreign/Quarantined Soils**

2.6.5.1. Foreign soils and soils from USDA regulated areas must be adequately segregated to enable proper sample disposal. The USDA requires these samples to be treated by an approved procedure. Additional information regarding USDA regulations and sample handling can be found in the laboratory's SOP for **Regulated Soil Handling** ENV-SOP-LENE-0132, or its equivalent revision or replacement.

2.7. Subcontracting Analytical Services

2.7.1. Every effort is made to perform all analyses for Pace customers within the laboratory that receives the samples. When subcontracting to a laboratory other than the receiving laboratory, whether inside or outside the Pace network, becomes necessary, a preliminary verbal communication with that laboratory is undertaken. Customers are notified in writing of the laboratory's intention to subcontract any portion of the testing to another laboratory. Work performed under specific protocols may involve special considerations. When possible, subcontracting will be to a TNI-accredited laboratory.

2.7.2. Potential subcontract laboratories must be approved by Pace based on the criteria listed in SOP ENV-SOP-LENE-0009 **Subcontracting Samples** or its equivalent revision or replacement. All sample reports from the subcontracted labs are appended to the applicable Pace final reports.

2.7.3. Any Pace Analytical work sent to other labs within the Pace network is handled as inter-regional work and all final reports are labeled clearly with the name of the laboratory performing the work. Any non-TNI work is clearly identified. Pace will not be responsible for analytical data if the subcontract laboratory was designated by the customer.

2.7.4. Additional information can be found in SOP ENV-SOP-LENE-0009 **Subcontracting Samples** or its equivalent revision or replacement.

2.8. Sample Retention and Disposal

2.8.1. Samples, extracts, digestates, and leachates must be retained by the laboratory for the period of time necessary to protect the interests of the laboratory and the customer.

2.8.2. The minimum sample retention time is 45 days from receipt of the samples. Samples requiring thermal preservation may be stored at ambient temperature when the hold time is expired, the report has been delivered, and/or allowed by the customer, program, or contract. Samples requiring storage beyond the minimum sample retention time due to special requests or contractual obligations may be stored at ambient temperature unless the laboratory has sufficient capacity and their presence does not compromise the integrity of other samples.

2.8.3. After this period expires, non-hazardous samples are properly disposed of as non-hazardous waste. The preferred method for disposition of **hazardous** samples is to return the excess sample to the customer. If it is not feasible to return samples, or the customer requires Pace to dispose of excess samples, proper arrangements will be made for disposal by an approved contractor.

2.8.4. Additional information can be found in SOP ENV-SOP-LENE-0127 **Waste Handling and Management** and SOP ENV-SOP-LENE-0021 **Sample Management** or their equivalent revisions or replacements.

3.0. QUALITY CONTROL PROCEDURES

3.1. Quality Control Samples

3.1.1. The quality control samples described in this section are analyzed per batch as applicable to the method used. Acceptance criteria must be established for all quality control samples and if the acceptance criteria are not met, corrective actions must be performed and samples reanalyzed, or final reports must be appropriately qualified.

3.1.2. Quality control samples must be processed in the same manner as associated client samples.

3.1.3. Please reference the glossary of this Quality Manual for definitions of all quality control samples mentioned in this section.

3.1.4. Any deviations to the policies and procedures governing quality control samples must be approved by the QM/SQM.

3.2. Method Blank

3.2.1. A method blank is a negative control used to assess the preparation/analysis system for possible contamination and is processed through all preparation and analytical steps with its associated client samples. The method blank is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples. Method blanks are not applicable for certain analyses (i.e., pH, flash point, temperature, etc.).

3.2.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for method blanks.

3.3. Laboratory Control Sample

3.3.1. The Laboratory Control Sample (LCS) is a positive control used to assess the performance of the entire analytical system including preparation and analysis. The LCS is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples.

3.3.2. The LCS contains **all** analytes required by a specific method or by the customer or regulatory agency, which may include full list of target compounds, with certain exceptions. The lab must ensure that all target components are included in the spike mixture for the LCS over a two (2) year period. In the absence of specified components, the laboratory will spike the LCS with the following compounds:

- For multi-peak analytes (e.g. PCBs, technical chlordane, toxaphene), a representative standard will be processed.
- For methods with long lists of analytes, a representative number of target analytes may be chosen. The following criteria is used to determine the number of LCS compounds used:
    - For methods with 1-10 target compounds, the laboratory will spike with all compounds;
    - For methods with 11-20 target compounds, the laboratory will spike with at least 10 compounds or 80%, whichever is greater;
    - For methods with greater than 20 compounds, the laboratory will spike with at least 16 compounds.

3.3.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for LCSs.

3.3.4. For LCSs containing a large number of analytes, it is statistically likely that a few recoveries will be outside of control limits. This does not necessarily mean that the system is out of control, and

therefore no corrective action would be necessary (except for proper documentation). TNI has allowed for a minimum number of marginal exceedances, defined as recoveries that are beyond the LCS control limits (3X the standard deviation) but within than the marginal exceedance limits (4X the standard deviation). The number of allowable exceedances depends on the number of compounds in the LCS. If more analyte recoveries exceed the LCS control limits than is allowed (see below) or if any one analyte exceeds the marginal exceedance limits, then the LCS is considered non-compliant and corrective actions are necessary. The number of allowable exceedances is as follows:

- >90 analytes in the LCS- 5 analytes
- 71-90 analytes in the LCS- 4 analytes
- 51-70 analytes in the LCS- 3 analytes
- 31-50 analytes in the LCS- 2 analytes
- 11-30 analytes in the LCS- 1 analyte
- <11 analytes in the LCS- no analytes allowed out)

Note: the use of marginal exceedances is not approved for work from the state of South Carolina.

3.3.5. A matrix spike (MS) can be used in place of a non-compliant LCS in a batch as long as the MS passes the LCS acceptance criteria (this is a TNI allowance). Note: the use of the MS to replace a non-compliant LCS is not approved for work from the state of South Carolina. When this happens, full documentation must be made available to the data user. If this is not allowed by a customer or regulatory body, the associated samples must be rerun with a compliant LCS (if possible) or reported with appropriate data qualifiers.

3.4. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

3.4.1. A matrix spike (MS) is a positive control used to determine the effect of the sample matrix on compound recovery for a particular method. A matrix spike/matrix spike duplicate (MS/MSD) set or matrix spike/sample duplicate set is processed at a frequency specified in a particular method or as determined by a specific customer request. The MS and MSD consist of the sample matrix that is spiked with known concentrations of target analytes.

3.4.2. The MS and MSD contain all analytes required by a specific method or by the customer or regulatory agency. In the absence of specified components, the laboratory will spike the MS/MSD with the same number of compounds as previously discussed in the LCS section. However, the lab must ensure that all targeted components are included in the spike mixture for the MS/MSD over a two (2) year period.

3.4.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for MS/MSDs.

3.5. Sample Duplicate

3.5.1. A sample duplicate is a second portion of sample that is prepared and analyzed in the laboratory along with the first portion. It is used to measure the precision associated with preparation and analysis. A sample duplicate is processed at a frequency specified by the particular method or as determined by a specific customer.

3.5.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for sample duplicates.

3.6. Surrogates

3.6.1. Surrogates are compounds that reflect the chemistry of target analytes and are typically added to samples for organic analyses to measure the extraction or purge efficiency and to monitor the effect of the sample matrix on compound recovery.

3.6.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for surrogates.

3.7. Internal Standards

3.7.1. Internal Standards are method-specific analytes that are added, as applicable, to every standard, QC sample, and client sample at a known concentration, prior to analysis for the purpose of adjusting the response factor used in quantifying target analytes.

3.7.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for internal standards.

3.8. Limit of Detection (LOD)

3.8.1. Pace laboratories use a documented procedure to determine a limit of detection (LOD) for each analyte of concern in each matrix reported. Unless otherwise noted in a published method, the procedure used by Pace laboratories to determine LODs is based on the Method Detection Limit (MDL) procedure outlined in 40 CFR Part 136, Appendix B. All sample processing steps of the preparation and analytical methods are included in the LOD determination including any clean ups.

3.8.2. Additional information can be found in SOP ENV-SOP-LENE-0117 **Limit of Detection** or its equivalent revision or replacement.

3.9. Limit of Quantitation (LOQ)

3.9.1. A limit of quantitation (LOQ) for every analyte of concern must be determined. For Pace laboratories, this LOQ is referred to as the RL, or Reporting Limit. Results reported below the reporting limit are not allowed to be reported without qualification. For methods with a determined LOD, results can be reported out below the LOQ but above the LOD if they are properly qualified (e.g., J flag).

3.9.2. Additional information can be found in SOP ENV-SOP-LENE-0117 **Limit of Detection** or its equivalent revision or replacement.

3.10. Estimate of Analytical Uncertainty

3.10.1. Pace laboratories can provide an estimation of uncertainty for results generated by the laboratory. The estimate quantifies the error associated with any given result at a 95% confidence interval. This estimate does not include bias that may be associated with sampling. The laboratory has a procedure in place for making this estimation. In the absence of a regulatory or customer-specific procedure, Pace laboratories base this estimation on the recovery data obtained from the Laboratory Control Samples. The uncertainty is a function of the standard deviation of the recoveries multiplied by the appropriate Student's t Factor at 95% confidence. Additional information pertaining to the estimation of uncertainty and the exact manner in which it is derived are contained in the SOP ENV-SOP-LENE-0029 **Estimation of Measurement Uncertainty** or its equivalent revision or replacement.

3.10.2. The measurement of uncertainty is provided only on request by the customer, as required by specification or regulation and when the result is used to determine conformance within a specification limit.

3.11. Proficiency Testing (PT) Studies

3.11.1. Pace laboratories participate in a defined proficiency testing (PT) program. PT samples are obtained from NIST approved providers and analyzed and reported at a minimum of two times per year for the relevant fields of testing per matrix.

3.11.2. Additional information can be found in SOP ENV-SOP-LENE-0044 **Proficiency Testing Program** or its equivalent revision or replacement.

3.12. Rounding and Significant Figures

3.12.1. In general, the Pace laboratories report data to no more than three significant figures. Therefore, all measurements made in the analytical process must reflect this level of precision. In the event that a parameter that contributes to the final result has less than three significant figures of precision, the final result must be reported with no more significant figures than that of the parameter in question. The rounding rules listed below are descriptive of the LIMS and not necessarily of any supporting program such as Excel.

3.12.2. **Rounding:** Pace-Lenexa follows the odd / even guidelines for rounding numbers:

- If the figure following the one to be retained is less than five, that figure is dropped and the retained ones are not changed (with three significant figures, 2.544 is rounded to 2.54).
- If the figure following the ones to be retained is greater than five, that figure is dropped and the last retained one is rounded up (with three significant figures, 2.546 is rounded to 2.55).
- If the figure following the ones to be retained is five and if there are no figures other than zeros beyond that five, then the five is dropped and the last figure retained is unchanged if it is even and rounded up if it is odd (with three significant figures, 2.525 is rounded to 2.52 and 2.535 is rounded to 2.54).

3.12.3. **Significant Figures**

3.12.3.1. Pace-Lenexa follows the following convention for reporting to a specified number of significant figures. Unless specified by federal, state, or local requirements or on specific request by a customer, the laboratory reports:

Values > 10 – Reported to 3 significant figures
Values ≤ 10 – Reported to 2 significant figures

3.13. Retention Time Windows

3.13.1. When chromatographic conditions are changed, retention times and analytical separations are often affected. As a result, two critical aspects of any chromatographic method are the determination and verification of retention times and analyte separation. Retention time windows must be established for the identification of target analytes. The retention times of all target analytes in all calibration verification standards must fall within the retention time windows. If an analyte falls outside the retention time window in an ICV or CCV, new absolute retention time windows must be calculated, unless instrument maintenance fixes the problem. When a new column is installed, a new retention time window study must be performed.

3.13.2. Please reference method-specific SOPs for the proper procedure for establishing retention time windows.

3.14. Analytical Method Validation and Instrument Validation

3.14.1. In some situations, Pace develops and validates methodologies that may be more applicable to a specific problem or objective. When non-standard methods are required for specific projects or analytes of interest, or when the laboratory develops or modifies a method, the laboratory validates the method prior to applying it to customer samples. Method validity is established by meeting criteria for precision and accuracy as established by the data quality objectives specified by the end user of the data. The laboratory records the validation procedure, the results obtained and a statement as to the usability of the method. The minimum requirements for method validation include evaluation of sensitivity, quantitation, precision, bias, and selectivity of each analyte of interest.

3.15. Regulatory and Method Compliance

3.15.1. It is Pace policy to disclose in a forthright manner any detected noncompliance affecting the usability of data produced by our laboratories. The laboratory will notify customers within 30 days of fully characterizing the nature of the nonconformance, the scope of the nonconformance and the impact it may have on data usability.

4.0. DOCUMENT MANAGEMENT AND CHANGE CONTROL

3.16. Document Management

3.16.1. Additional information can be found in SOP ENV-SOP-LENE-0074 **Document Control and Management** or its equivalent revision or replacement. Information on Pace's policy for electronic signatures can also be found in this SOP.

3.16.2. Pace has an established procedure for managing documents that are part of the quality system.

3.16.3. A master list of all managed documents is maintained at each facility identifying the current revision status and distribution of the controlled documents.

3.16.4. Each managed document is uniquely identified to include the date of issue, the revision identification, page numbers, the total number of pages and the issuing authorities. For complete information on document numbering, refer to SOP ENV-SOP-CORQ-0002 **Document Numbering**.

3.16.5. **Quality Assurance Manual (QAM):** The Quality Assurance Manual is the company-wide document that describes all aspects of the quality system for Pace. The base QAM template is distributed by the Corporate Environmental Quality Department to each of the SQMs/QMs. The local management personnel modify the necessary and permissible sections of the base template and submit those modifications to the Corporate Director of Environmental Quality for review. Once approved, all applicable lab staff sign the Quality Assurance Manual. Each SQM/QM is then in charge of distribution to employees, external customers or regulatory agencies and maintaining a distribution list of controlled document copies. The Quality Assurance Manual template is reviewed on an annual basis and revised accordingly by the Corporate Quality office.

3.16.6. **Standard Operating Procedures (SOPs)**

3.16.6.1. SOPs are reviewed every two years at a minimum although a more frequent review may be required by some state or federal agencies or customers. If no revisions are made based on this review, documentation of the review itself is made by the addition of new signatures on the cover page. If revisions are made, documentation of the revisions is made in the revisions section of each SOP and a new revision number is applied to the SOP. This provides a historical record of all revisions.

3.16.6.2. All copies of superseded SOPs are removed from general use and the original copy of each SOP is archived for audit or knowledge preservation purposes. This ensures that all Pace employees use the most current version of each SOP and provides the SQM/QM with a historical record of each SOP.

3.16.6.3. Additional information can be found in SOP ENV-SOP-LENE-0045 **Preparation of SOPs** or its equivalent revision or replacement.

3.17. Document Change Control

3.17.1. Additional information can be found in SOP ENV-SOP-LENE-0074 **Document Control and Management** or its equivalent revision or replacement.

3.17.2. Changes to managed documents are reviewed and approved in the same manner as the original review. Any revision to a document requires the approval of the applicable signatories. After revisions are approved, a revision number is assigned and the previous version of the document is officially retired.

3.17.3. All copies of the previous document are replaced with copies of the revised document and the superseded copies are destroyed or archived. All affected personnel are advised that there has been a revision and any necessary training is scheduled.

5.0. EQUIPMENT AND MEASUREMENT TRACEABILITY

5.1. Standards and Traceability

5.1.1. Each Pace facility retains pertinent information for standards, reagents, and chemicals to assure traceability to a national standard. This includes documentation of purchase, receipt, preparation, and use.

5.1.2. Upon receipt, all purchased standard reference materials are recorded into a standard logbook or database and assigned a unique identification number. The entries include the facility's unique identification number, the chemical name, manufacturer name, manufacturer's identification numbers, receipt date, and expiration date. Vendor's certificates of analysis for all standards, reagents, or chemicals are retained for future reference.

5.1.3. Subsequent preparations of intermediate or working solutions are also documented in a standard logbook or database. These entries include the stock standard name and lot number, the manufacturer name, the solvents used for preparation, the solvent lot number and manufacturer, the preparation steps, preparation date, expiration dates, preparer's initials, and a unique Pace identification number. This number is used in any applicable sample preparation or analysis logbook so the standard can be traced back to the standard preparation record. This process ensures traceability back to the national standard.

5.1.4. All prepared standard or reagent containers include the Pace identification number, the standard or chemical name, the date of preparation, the date of expiration, the concentration with units, and the preparer's initials, unless the container is too small to hold all of this information. This ensures traceability back to the standard preparation logbook or database.

5.1.5. All initial calibrations must be verified with a standard obtained from a second manufacturer or a separate lot prepared independently by the same manufacturer, unless client-specific QAPP requirements state otherwise.

5.1.6. Additional information concerning the procurement of standards and reagent and their traceability can be found in the SOP ENV-SOP-LENE-0068 **Standard and Reagent Management and Traceability** or its equivalent revision or replacement.

5.2. General Analytical Instrument Calibration Procedures

5.2.1. All applicable instrumentation are calibrated or checked before use to ensure proper functioning and verify that laboratory, client and regulatory requirements are met. All calibrations are performed by, or under the supervision of, an experienced analyst at scheduled intervals against either certified standards traceable to recognized national standards or reference standards whose values have been statistically validated.

5.2.2. Calibration standards for each parameter are chosen to establish the linear range of the instrument and must bracket the concentrations of those parameters measured in the samples. The lowest calibration standard is the lowest concentration for which quantitative data may be reported. Data reported below this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in a narrative. The highest calibration standard is the highest concentration for which quantitative data may be reported. Data reported above this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in the narrative.

5.2.3. Instrumentation or support equipment that cannot be calibrated to specification or is otherwise defective is clearly labeled as out-of-service until it has been repaired and tested to demonstrate it meets

the laboratory's specifications. All repair and maintenance activities including service calls are documented in the maintenance log. Equipment sent off-site for calibration testing is packed and transported to prevent breakage and is in accordance with the calibration laboratory's recommendations.

5.2.4. In the event that recalibration of a piece of test equipment indicates the equipment may have been malfunctioning during the course of sample analysis, an investigation is performed. The results of the investigation along with a summary of the information reviewed are documented and maintained by the quality manager. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed. This allows for sufficient investigation and review of documentation to determine the impact on the analytical results. Instrumentation found to be consistently out of calibration is either repaired and positively verified or taken out of service and replaced.

5.2.5. Raw data records are retained to document equipment performance. Sufficient raw data is retained to reconstruct the instrument calibration and explicitly connect the continuing calibration verification to the initial calibration.

5.3. Support Equipment Calibration and Verification Procedures

5.3.1. All support equipment is calibrated or verified at least annually using NIST traceable references over the entire range of use, as applicable. The results of calibrations or verifications must be within the specifications required or the equipment will be removed from service until brought back into control. Additional information regarding calibration and maintenance of support equipment can be found in SOP ENV-SOP-LENE-0030 **Support Equipment** or its equivalent revision or replacement.

5.3.2. On each day the support equipment is used, it is verified, as applicable, in the expected range of use with NIST traceable references in order to ensure the equipment meets laboratory specifications. These checks are documented appropriately. This applies mainly to thermometers within temperature-controlled units and balances.

5.3.3. **Analytical Balances**

5.3.3.1. Each analytical balance is calibrated or verified at least annually by a qualified service technician. The calibration of each balance is verified each day of use with weights traceable to NIST bracketing the range of use. Calibration weights are ASTM Class 1 or other class weights that have been calibrated against a NIST standard weight and are re-certified every 5 years at a minimum against a NIST traceable reference. Some accrediting agencies may require more frequent checks. If balances are calibrated by an external agency, verification of their weights must be provided. All information pertaining to balance maintenance and calibration is recorded in the individual balance logbook and/or is maintained on file in the local Quality department.

5.3.4. Thermometers

5.3.4.1. Certified, or reference, thermometers are maintained for checking calibration of working thermometers. Reference thermometers are provided with NIST traceability for initial calibration and are re-certified, at a minimum, every 3 years with equipment directly traceable to NIST.

5.3.4.2. Working thermometers are compared with the reference thermometers annually according to corporate metrology procedures (working digital thermometers are calibrated quarterly). Each thermometer is individually numbered and assigned a correction factor based on the NIST reference source. In addition, working thermometers are visually inspected by laboratory personnel prior to use and temperatures are documented.

5.3.4.3. Laboratory thermometer inventory and calibration data are maintained in the local Quality department.

5.3.5. pH/Electrometers

5.3.5.1. The meter is calibrated before use each day, using fresh buffer solutions.

5.3.6. Spectrophotometers

5.3.6.1. During use, spectrophotometer performance is checked at established frequencies in analysis sequences against initial calibration verification (ICV) and continuing calibration verification (CCV) standards.

5.3.7. Mechanical Volumetric Dispensing Devices

5.3.7.1. Mechanical volumetric dispensing devices including bottle top dispensers (those that are critical in measuring a required amount of reagent), pipettes, and burettes, excluding Class A volumetric glassware, are checked for accuracy on a quarterly basis.

5.3.7.2. Additional information regarding calibration and maintenance of laboratory support equipment can be found in SOP ENV-SOP-LENE-0030 **Support Equipment** or its equivalent revision or replacement.

5.4. Instrument/Equipment Maintenance

5.4.1. The objectives of the Pace Analytical maintenance program are twofold: to establish a system of instrument care that maintains instrumentation and equipment at required levels of calibration and sensitivity, and to minimize loss of productivity due to repairs.

5.4.2. The Operations Manager and/or department manager/supervisors are responsible for providing technical leadership to evaluate new equipment, solve equipment problems, and coordinate instrument repair and maintenance. Analysts have the primary responsibility to perform routine maintenance.

5.4.3. To minimize downtime and interruption of analytical work, preventative maintenance may routinely performed on each analytical instrument. Up-to-date instructions on the use and maintenance of equipment are available to staff in the department where the equipment is used.

5.4.4. Department manager/supervisors are responsible for maintaining an adequate inventory of spare parts required to minimize equipment downtime. This inventory includes parts and supplies that are subject to frequent failure, have limited lifetimes, or cannot be obtained in a timely manner should a failure occur.

5.4.5. All major equipment and instrumentation items are uniquely identified to allow for traceability. Equipment/instrumentation is, unless otherwise stated, identified as a system and not as individual pieces. The laboratory maintains equipment records that include the following:

- The name of the equipment and its software
- The manufacturer's name, type, and serial number
- Approximate date received and date placed into service
- Current location in the laboratory
- Condition when received (new, used, etc.)
- Copy of any manufacturer's manuals or instructions
- Dates and results of calibrations and next scheduled calibration (if known)
- Details of past maintenance activities, both routine and non-routine
- Details of any damage, modification or major repairs

5.4.6. All instrument maintenance is documented in maintenance logbooks that are assigned to each particular instrument or system.

5.4.7. The maintenance log entry must include a summary of the results of that analysis and verification by the analyst that the instrument has been returned to an in-control status. In addition, each entry must include the initials of the analyst making the entry, the dates the maintenance actions were performed, and the date the entry was made in the maintenance logbook, if different from the date(s) of the maintenance.

5.4.8. Any equipment that has been subjected to overloading or mishandling, or that gives suspect results, or has been shown to be defective, is taken out of service and clearly identified. The equipment shall not be used to analyze customer samples until it has been repaired and shown to perform satisfactorily. In the event of instrumentation failure, to avoid hold time issues, the lab may subcontract the necessary samples to another Pace lab or to an outside subcontract lab if possible.

6.0. CONTROL OF DATA

Analytical results processing, verification, and reporting are procedures employed that result in the delivery of defensible data. These processes include, but are not limited to, calculation of raw data into final concentration values, review of results for accuracy, evaluation of quality control criteria and assembly of technical reports for delivery to the data user.

All analytical data undergo a documented multi-tier review process prior to being reported to the customer. This section describes procedures used for translating raw analytical data into accurate final sample reports as well as Pace data storage policies.

When analytical, field, or product testing data is generated, it is documented appropriately. These logbooks and other laboratory records are kept in accordance with each facility's SOP for documentation storage and archival In this case, the laboratory must ensure that there are sufficient redundant electronic copies so no data is lost due to unforeseen computer issues

6.1. Primary Data Review

6.1.1. The primary analyst is responsible for initial data reduction and data review. This includes confirming compliance with required methodology, verifying calculations, evaluating quality control data, noting non-conformances in logbooks or as footnotes or narratives, and uploading analytical results into the LIMS. Data review checklists, either hardcopy or electronic, are used to document the primary data review process. The primary analyst must be clearly identified in all applicable logbooks, spreadsheets, LIMS fields, and data review checklists.

6.1.2. The primary analyst compiles the initial data for secondary data review. This compilation must include sufficient documentation for secondary data review.

6.1.3. Additional information regarding data review procedures can be found in SOP ENV-SOP-LENE-0088 **Data Reduction, Review and Reporting** or its equivalent revision or replacement, as well as in SOP ENV-SOP-LENE-0136 **Manual Integration** or its equivalent revision or replacement.

6.2. Secondary Data Review

6.2.1. Secondary data review is the process of examining data and accepting or rejecting it based on pre-defined criteria. This review step is designed to ensure that reported data are free from calculation and transcription errors, that quality control parameters are evaluated, and that any non-conformances are properly documented.

6.2.2. The completed data from the primary analyst is sent to a designated qualified secondary data reviewer (this cannot be the primary analyst). The secondary data reviewer provides an independent technical assessment of the data package and technical review for accuracy according to methods employed and laboratory protocols. This assessment involves a quality control review for use of the proper methodology and detection limits, compliance to quality control protocol and criteria, presence and completeness of required deliverables, and accuracy of calculations and data quantitation. The reviewer validates the data entered into the LIMS and documents approval of manual integrations. Data review checklists, either hardcopy or electronic, are used to document the secondary data review process.

6.2.3. Additional information regarding data review procedures can be found in SOP ENV-SOP-LENE-0088 **Data Reduction, Review and Reporting** or its equivalent revision or replacement, as

well as in SOP ENV-SOP-LENE-0136 **Manual Integration** or its equivalent revision or replacement.

6.3. Data Reporting

6.3.1. Data for each analytical fraction pertaining to a particular Pace project number are delivered to the Project Manager for assembly into the final report. All points mentioned during technical and QC reviews are included in data qualifiers on the final report or in a separate case narrative if there is potential for data to be impacted.

6.3.2. Final reports are prepared according to the level of reporting required by the customer and can be transmitted to the customer via hardcopy or electronic deliverable. Please reference SOP ENV-SOP-LENE-0088 **Data Reduction, Review and Reporting**, or its equivalent revision or replacement.

6.3.3. Any changes made to a final report shall be designated as "Revised" or equivalent wording. The laboratory must keep sufficient archived records of all laboratory reports and revisions. For higher levels of data deliverables, a copy of all supporting raw data is sent to the customer along with a final report of results. Pace will provide electronic data deliverables (EDD) as required by contracts or upon customer request.

6.3.4. Customer data that requires transmission by telephone, telex, facsimile or other electronic means undergoes appropriate steps to preserve confidentiality.

6.3.5. The following positions are the only approved signatories for Pace final reports:

- Senior General Manager
- General Manager
- Assistant General Manager
- Senior Quality Manager
- Quality Manager
- Client Services Manager
- Project Manager
- Project Coordinator

6.4. Data Security

6.4.1. All data including electronic files, logbooks, extraction/digestion/distillation worksheets, calculations, project files and reports, and any other information used to produce the technical report are maintained secured and retrievable by the Pace facility.

6.5. Data Archiving

6.5.1. All records compiled by Pace are archived in a suitable, limited-access environment to prevent loss, damage, or deterioration by fire, flood, vermin, theft, and/or environmental deterioration. Records are retained for a minimum of ten years unless superseded by federal, state, contractual, and/or accreditation requirements. TNI-related records will be made readily available to accrediting authorities. Access to archived data is documented and controlled by the SQM/QM or a designated Data Archivist.

6.5.2. Records that are computer-generated have either a hard copy or electronic backup copy. Hardware and software necessary for the retrieval of electronic data is maintained with the applicable records. Archived electronic records are stored protected against electronic and/or magnetic sources.

6.5.3. In the event of a change in ownership, accountability or liability, reports of analyses performed pertaining to accreditation will be maintained per the purchase agreement. In the event of bankruptcy, laboratory reports and/or records will be transferred to the customer and/or the appropriate regulatory entity upon request.

6.6. Data Disposal

6.6.1. Data that has been archived for the facility's required storage time may be disposed of in a secure manner by shredding, returning to customer, or utilizing some other means that does not jeopardize data confidentiality. Records of data disposal will be archived for a minimum of five years unless superseded by federal, contractual, and/or accreditation requirements. Data disposal includes any preliminary or final reports that are disposed.

7.0. QUALITY SYSTEM AUDITS AND REVIEWS

7.1. Internal Audits

7.1.1. Responsibilities

7.1.1.1. The SQM/QM is responsible for managing and/or conducting internal audits in accordance with a predetermined schedule and procedure. Since internal audits represent an independent assessment of laboratory functions, the auditor must be independent from laboratory operations to ensure objectivity. The auditor must be trained, qualified, and familiar enough with the objectives, principles, and procedures of laboratory operations to be able to perform a thorough and effective evaluation. The SQM/QM evaluates audit observations and verifies the completion of corrective actions. In addition, a periodic corporate audit will be conducted. The corporate audits will focus on the effectiveness of the Quality System as outlined in this manual but may also include other quality programs applicable to an individual laboratory.

7.1.1.2. Additional information can be found in SOP ENV-SOP-LENE-0126 **Internal and External Audits** or its equivalent revision or replacement.

7.1.2. Scope and Frequency of Internal Audits

7.1.2.1. The complete internal audit process consists of the following four sections: 1) Raw Data Reviews, 2) traditional Quality Systems internal audits (including SOP and method compliance), 3) Final Report Reviews, and 4) Corrective Action Effectiveness Follow-up.

7.1.2.2. Internal systems audits are conducted yearly at a minimum. The scope of these audits includes evaluation of specific analytical departments or a specific quality related system as applied throughout the laboratory.

7.1.2.3. Where the identification of non-conformities or departures cast doubt on the laboratory's compliance with its own policies and procedures, the lab must ensure that the appropriate areas of activity are audited as soon as possible.

7.1.2.4. Certain projects may require an internal audit to ensure laboratory conformance to site work plans, sampling and analysis plans, QAPPs, etc.

7.1.2.5. The laboratory, as part of their overall internal audit program, ensures that a review is conducted with respect to any evidence of inappropriate actions or vulnerabilities related to data integrity. Discovery and reporting of potential data integrity issues are handled in a confidential manner. All investigations that result in findings of inappropriate activity are fully documented, including the source of the problem, the samples and customers affected the impact on the data, the corrective actions taken by the laboratory, and which final reports had to be re-issued. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed.

7.1.3. Internal Audit Reports and Corrective Action Plans

7.1.3.1. A full description of the audit, including the identification of the operation audited, the date(s) on which the audit was conducted, the specific systems examined, and the observations noted are summarized in an internal audit report. Although other personnel may assist with the performance of the audit, the SQM/QM writes and issues the internal audit report identifying which audit observations are deficiencies that require corrective action.

7.1.3.2. When audit findings cast doubt on the effectiveness of the operations or on the correctness of validity of the laboratory's environmental test results, the laboratory will take timely corrective action and notify the customer in writing within three business days, if investigations show that the laboratory results may have been affected.

7.1.3.3. Additional information can be found in SOP ENV-SOP-LENE-0126 **Internal and External Audits** or its equivalent revision or replacement.

7.2. External Audits

7.2.1. Pace laboratories are audited regularly by regulatory agencies to maintain laboratory certifications and by customers to maintain appropriate specific protocols.

7.2.2. External audit teams review the laboratory to assess the effectiveness of quality systems. The SQM/QM host the external audit team and assist in facilitation of the audit process. After the audit, the external auditors will prepare a formalized audit report listing deficiencies observed and follow-up requirements for the laboratory. The laboratory staff and supervisors develop corrective action plans to address any deficiencies with the guidance of the SQM/QM, who provides a written response to the external audit team. The SQM/QM follows-up with the laboratory staff to ensure corrective actions are implemented and that the corrective action was effective.

7.3. Annual Managerial Review

7.3.1. A managerial review of Management and Quality Systems is performed on an annual basis at a minimum. This allows for assessing program effectiveness and introducing changes and/or improvements. Additional information can be found in SOP ENV-SOP-CORQ-0005 **Review of Laboratory Management System** or its equivalent revision or replacement.

7.3.2. The managerial review must include the following topics of discussion:

- Suitability of quality management policies and procedures
- Manager/Supervisor reports
- Internal audit results
- Corrective and preventive actions
- External assessment results
- Proficiency testing studies
- Sample capacity and scope of work changes
- Customer feedback, including complaints
- Recommendations for improvement,
- Other relevant factors, such as quality control activities, resources, and staffing.

7.3.3. This managerial review must be documented for future reference by the SQM/QM and copies of the report are distributed to laboratory staff. Results must feed into the laboratory planning system and must include goals, objectives, and action plans for the coming year. The laboratory shall ensure that any actions identified during the review are carried out within an appropriate and agreed upon timescale.

8.0. CORRECTIVE ACTION

Additional information can be found in SOP ENV-SOP-LENE-0033 **Corrective and Preventive Actions** or its equivalent revision or replacement.

During the process of sample handling, preparation, and analysis, or during review of quality control records, or during reviews of non-technical portions of the lab, certain occurrences may warrant the necessity of corrective actions. These occurrences may take the form of analyst errors, deficiencies in quality control, method deviations, or other unusual circumstances. The Quality System of Pace provides systematic procedures for the documentation, monitoring, completion of corrective actions, and follow-up verification of the effectiveness of these corrective actions. This can be done using Pace's LabTrack system that lists at a minimum, the deficiency by issue number, the deficiency source, responsible party, root cause, resolution, due date, and date resolved.

8.1. Corrective and Preventive Action Documentation

8.1.1. The following items are examples of sources of laboratory deviations or non-conformances that may warrant some form of documented corrective action:

- Internal Laboratory Non-Conformance Trends
- Proficiency Testing Sample Results
- Internal and External Audits
- Data or Records Review
- Client Complaints
- Client Inquiries
- Holding Time violations

8.1.2. Documentation of corrective actions may be in the form of a comment or footnote on the final report that explains the deficiency (e.g., matrix spike recoveries outside of acceptance criteria) or it may be a more formal documentation (either paper system or computerized spreadsheet). This depends on the extent of the deficiency, the impact on the data, and the method or customer requirements for documentation.

8.1.3. The person who discovers the deficiency or non-conformance initiates the corrective action documentation within the LabTrack system. The documentation must include (as applicable): the affected projects and sample numbers, the name of the applicable Project Manager, the customer name, and the sample matrix involved. The person initiating the corrective action documentation must also list the known causes of the deficiency or non-conformance as well as any corrective/preventative actions that they have taken. Preventive actions must be taken in order to prevent or minimize the occurrence of the situation.

8.1.4. **Root Cause Analysis**: Laboratory personnel and management staff will start a root cause analysis by going through an investigative process. During this process, the following general steps must be taken into account: defining the non-conformance, assigning responsibilities, determining if the condition is significant, and investigating the root cause of the nonconformance. General non-conformance investigative techniques follow the path of the sample through the process looking at each individual step in detail. The root cause must be documented within the lab's corrective action system.

8.1.5. Based on the root cause(s) determined, the lab implements applicable corrective actions and verifies their effectiveness. In the event that analytical testing or results do not conform to documented laboratory policies or procedures Project Management will notify the customer of the situation and will advise of any ramifications to data quality if impacted (with the possibility of work being recalled).

8.2. Corrective Action Completion

8.2.1. **Internal Laboratory Non-Conformance Trends**

8.2.1.1. There are several types of non-conformance trends that may occur in the laboratory that would require the initiation of a corrective action report. Laboratories may choose to initiate a corrective action for all instances of one or more of these categories if they so choose, however the intent is that each of these would be handled according to its severity; one time instances could be handled with a footnote or qualifier whereas a systemic problem with any of these categories may require an official corrective action process. These categories, as defined in the Corrective Action SOP are as follows:

- Login error
- Preparation Error
- Contamination
- Calibration Failure
- Internal Standard Failure
- LCS Failure
- Laboratory accident
- Spike Failure
- Instrument Failure
- Final Reporting error

8.2.2. PE/PT Sample Results

8.2.2.1. Any PT result assessed as "not acceptable" requires an investigation and applicable corrective actions. The operational staff is made aware of the PT failures and they are responsible for reviewing the applicable raw data and calibrations and list possible causes for error. The SQM/QM reviews their findings and initiates another external PT sample or an internal PT sample to try and correct the previous failure. Replacement PT results must be monitored by the SQM/QM and reported to the applicable regulatory authorities.

8.2.2.2. Additional information, such as requirements regarding time frames for reporting failures to states, makeup PTs, and notifications of investigations, can be found in SOP ENV-SOP-LENE-0044 **Proficiency Testing Program** or its equivalent revision or replacement.

8.2.3. Internal and External Audits

8.2.3.1. The SQM/QM is responsible for documenting all audit findings and their corrective actions. This documentation must include the initial finding, the persons responsible for the corrective action, the due date for responding to the auditing body, the root cause of the finding, and the corrective actions needed for resolution. The SQM/QM is also responsible for providing any back-up documentation used to demonstrate that a corrective action has been completed.

8.2.4. Data Review

8.2.4.1. In the course of performing primary and secondary review of data or in the case of raw data reviews (e.g., by the SQM/QM), errors may be found which require corrective actions. Any finding that affects the quality of the data requires some form of corrective action, which may include revising and re-issuing of final reports.

8.2.5. Client Complaints

8.2.5.1. Project Managers are responsible for issuing corrective action forms, when warranted, for customer complaints. As with other corrective actions, the possible causes of the problem are listed and the form is passed to the appropriate analyst or supervisor for investigation. After potential corrective actions have been determined, the Project Manager reviews the corrective action form to ensure all customer needs or concerns are being adequately addressed.

8.2.6. Client Inquiries

8.2.6.1. When an error on the customer report is discovered, the Project Manager is responsible for initiating a formal corrective action form that describes the failure (e.g., incorrect analysis reported, reporting units are incorrect, or reporting limits do not meet objectives). The Project Manager is also responsible for revising the final report if necessary and submitting it to the customer.

8.2.7. Holding Time Violations

8.2.7.1. In the event that a holding time has been missed, the analyst or supervisor must complete a formal corrective action form. The Project Manager and the SQM/QM must be made aware of all holding time violations.

8.2.7.2. The Project Manager must contact the customer in order that appropriate decisions are made regarding the hold time excursion and the ultimate resolution is then documented and included in the customer project file.

9.0. GLOSSARY

The source of some of the definitions is indicated previous to the actual definition (e.g., TNI, DoD).

Terms and Definitions	
3P Program	The Pace continuous improvement program that focuses on Process, Productivity, and Performance. Best Practices are identified that can be used by all Pace labs.
Acceptance Criteria	TNI- Specified limits placed on characteristics of an item, process, or service defined in requirement documents.
Accreditation	TNI- The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. DoD- Refers to accreditation in accordance with the DoD ELAP.
Accreditation Body (AB)	TNI- The organization having responsibility and accountability for environmental laboratory accreditation and which grants accreditation under this program. DoD- Entities recognized in accordance with the DoD-ELAP that are required to operate in accordance with ISO/IEC 17011, *Conformity assessment: General requirements for accreditation bodies accrediting conformity assessment bodies*. The AB must be a signatory, in good standing, to the International Laboratory Accreditation Cooperation (ILAC) mutual recognition arrangement (MRA) that verifies, by evaluation and peer assessment, that its signatory members are in full compliance with ISO/IEC 17011 and that its accredited laboratories comply with ISO/IEC 17025.
Accuracy	TNI- The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator.
Activity, Absolute	TNI- Rate of nuclear decay occurring in a body of material, equal to the number of nuclear disintegrations per unit time. NOTE: Activity (absolute) may be expressed in becquerels (Bq), curies (Ci), or disintegrations per minute (dpm), and multiples or submultiples of these units.
Activity, Areic	TNI- Quotient of the activity of a body of material and its associated area.
Activity, Massic	TNI- Quotient of the activity of a body of material and its mass; also called specific activity.
Activity, Volumic	TNI- Quotient of the activity of a body of material and its volume; also called activity concentration. NOTE: In this module [TNI Volume 1, Module 6], unless otherwise stated, references to activity shall include absolute activity, areic activity, massic activity, and volumic activity.
Activity Reference Date	TNI- The date (and time, as appropriate to the half-life of the radionuclide) to which a reported activity result is calculated. NOTE: The sample collection date is most frequently used as the Activity Reference Date for environmental measurements, but different programs may specify other points in time for correction of results for decay and ingrowth.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.
American Society for Testing and Materials (ASTM)	An international standards organization that develops and publishes voluntary consensus standards for a wide range of materials, products, systems and services.

Analysis	DoD- A combination of sample preparation and instrument determination.
Analysis Code (Acode)	All the set parameters of a test, such as Analytes, Method, Detection Limits and Price.
Analysis Sequence	A compilation of all samples, standards and quality control samples run during a specific amount of time on a particular instrument in the order they are analyzed.
Analyst	TNI- The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.
Analyte	TNI- A substance, organism, physical parameter, property, or chemical constituent(s) for which an environmental sample is being analyzed. DoD- The specific chemicals or components for which a sample is analyzed; it may be a group of chemicals that belong to the same chemical family and are analyzed together.
Analytical Method	DoD- A formal process that identifies and quantifies the chemical components of interest (target analytes) in a sample.
Analytical Uncertainty	TNI- A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.
Annual (or Annually)	Defined by Pace as every 12 months ± 30 days.
Assessment	TNI - The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its system to defined criteria (to the standards and requirements of laboratory accreditation). DoD- An all-inclusive term used to denote any of the following: audit, performance evaluation, peer review, inspection, or surveillance conducted on-site.
Atomic Absorption Spectrometer	Instrument used to measure concentration in metals samples.
Atomization	A process in which a sample is converted to free atoms.
Audit	TNI- A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.
Batch	TNI- Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same quality systems matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed 20 samples.

Batch, Radiation Measurements (RMB)	TNI- An RMB is composed of 1 to 20 environmental samples that are counted directly without preliminary physical or chemical processing that affects the outcome of the test (e.g., non-destructive gamma spectrometry, alpha/beta counting of air filters, or swipes on gas proportional detectors). The samples in an RMB share similar physical and chemical parameter, and analytical configurations (e.g., analytes, geometry, calibration, and background corrections). The maximum time between the start of processing of the first and last in an RMB is 14 calendar days.
Bias	TNI- The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).
Blank	TNI and DoD- A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results (See Method Blank). DoD- Blank samples are negative control samples, which typically include field blank samples (e.g., trip blank, equipment (rinsate) blank, and temperature blank) and laboratory blank samples (e.g., method blank, reagent blank, instrument blank, calibration blank, and storage blank).
Blind Sample	A sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.
BNA (Base Neutral Acid compounds)	A list of semi-volatile compounds typically analyzed by mass spectrometry methods. Named for the way they can be extracted out of environmental samples in an acidic, basic or neutral environment.
BOD (Biochemical Oxygen Demand)	Chemical procedure for determining how fast biological organisms use up oxygen in a body of water.
Calibration	TNI- A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. 1) In calibration of support equipment, the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI); 2) In calibration according to test methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.
Calibration Curve	TNI- The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.
Calibration Method	A defined technical procedure for performing a calibration.
Calibration Range	DoD- The range of values (concentrations) between the lowest and highest calibration standards of a multi-level calibration curve. For metals analysis with a single-point calibration, the low-level calibration check standard and the high standard establish the linear calibration range, which lies within the linear dynamic range.
Calibration Standard	TNI- A substance or reference material used for calibration.

Certified Reference Material (CRM)	TNI- Reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute.
Chain of Custody	An unbroken trail of accountability that verifies the physical security of samples, data, and records.
Chain of Custody Form (COC)	TNI- Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and type of containers; the mode of collection, the collector, time of collection; preservation; and requested analyses.
Chemical Oxygen Demand (COD)	A test commonly used to indirectly measure the amount of organic compounds in water.
Client (referred to by ISO as Customer)	Any individual or organization for whom items or services are furnished or work performed in response to defined requirements and expectations.
Code of Federal Regulations (CFR)	A codification of the general and permanent rules published in the Federal Register by agencies of the federal government.
Comparability	An assessment of the confidence with which one data set can be compared to another. Comparable data are produced through the use of standardized procedures and techniques.
Completeness	The percent of valid data obtained from a measurement system compared to the amount of valid data expected under normal conditions. The equation for completeness is: % Completeness = (Valid Data Points/Expected Data Points)*100
Confirmation	TNI- Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: second-column confirmation; alternate wavelength; derivatization; mass spectral interpretation; alternative detectors; or additional cleanup procedures. DoD- Includes verification of the identity and quantity of the analyte being measured by another means (e.g., by another determinative method, technology, or column). Additional cleanup procedures alone are not considered confirmation techniques.
Conformance	An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements.
Congener	A member of a class of related chemical compounds (e.g., PCBs, PCDDs).
Consensus Standard	DoD- A standard established by a group representing a cross-section of a particular industry or trade, or a part thereof.
Continuing Calibration Blank (CCB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method.
Continuing Calibration Check Compounds (CCC)	Compounds listed in mass spectrometry methods that are used to evaluate an instrument calibration from the standpoint of the integrity of the system. High variability would suggest leaks or active sites on the instrument column.
Continuing Calibration Verification	DoD- The verification of the initial calibration. Required prior to sample analysis and at periodic intervals. Continuing calibration verification applies to both external and internal standard calibration techniques, as well as to linear and non-linear calibration models.

Continuing Calibration Verification (CCV) Standard	Also referred to as a Calibration Verification Standard (CVS) in some methods, it is a standard used to verify the initial calibration of compounds in an analytical method. CCVs are analyzed at a frequency determined by the analytical method.
Continuous Emission Monitor (CEM)	A flue gas analyzer designed for fixed use in checking for environmental pollutants.
Continuous Improvement Plan (CIP)	The delineation of tasks for a given laboratory department or committee to achieve the goals of that department.
Contract Laboratory Program (CLP)	A national network of EPA personnel, commercial labs, and support contractors whose fundamental mission is to provide data of known and documented quality.
Contract Required Detection Limit (CRDL)	Detection limit that is required for EPA Contract Laboratory Program (CLP) contracts.
Contract Required Quantitation Limit (CRQL)	Quantitation limit (reporting limit) that is required for EPA Contract Laboratory Program (CLP) contracts.
Control Chart	A graphic representation of a series of test results, together with limits within which results are expected when the system is in a state of statistical control (see definition for Control Limit)
Control Limit	A range within which specified measurement results must fall to verify that the analytical system is in control. Control limit exceedances may require corrective action or require investigation and flagging of non-conforming data.
Correction	DoD- Action taken to eliminate a detected non-conformity.
Corrective Action	DoD- The action taken to eliminate the causes of an existing non-conformity, defect, or other undesirable situation in order to prevent recurrence. A root cause analysis may not be necessary in all cases.
Corrective and Preventative Action (CAPA)	The primary management tools for bringing improvements to the quality system, to the management of the quality system's collective processes, and to the products or services delivered which are an output of established systems and processes.
Critical Value	TNI- Value to which a measurement result is compared to make a detection decision (also known as critical level or decision level). NOTE: The Critical Value is designed to give a specified low probability α of false detection in an analyte-free sample, which implies that a result that exceeds the Critical Value, gives high confidence $(1 - \alpha)$ that the radionuclide is actually present in the material analyzed. For radiometric methods, α is often set at 0.05.
Customer	DoD- Any individual or organization for which products or services are furnished or work performed in response to defined requirements and expectations.
Data Integrity	TNI- The condition that exists when data are sound, correct, and complete, and accurately reflect activities and requirements.
Data Quality Objective (DQO)	Systematic strategic planning tool based on the scientific method that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use or end user.
Data Reduction	TNI- The process of transforming the number of data items by arithmetic or statistical calculation, standard curves, and concentration factors, and collating them into a more usable form.

Definitive Data	DoD- Analytical data of known quantity and quality. The levels of data quality on precision and bias meet the requirements for the decision to be made. Data that is suitable for final decision-making.
Demonstration of Capability (DOC)	TNI- A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. DoD- A procedure to establish the ability of the analyst to generate analytical results by a specific method that meet measurement quality objectives (e.g., for precision and bias).
Department of Defense (DoD)	An executive branch department of the federal government of the United States charged with coordinating and supervising all agencies and functions of the government concerned directly with national security.
Detection Limit (DL)	DoD- The smallest analyte concentration that can be demonstrated to be different than zero or a blank concentration with 99% confidence. At the DL, the false positive rate (Type 1 error) is 1%. A DL may be used as the lowest concentration for reliably reporting a detection of a specific analyte in a specific matrix with a specific method with 99% confidence.
Detection Limit (DL) for Safe Drinking Water Act (SDWA) Compliance	TNI- Laboratories that analyze drinking-water samples for SDWA compliance monitoring must use methods that provide sufficient detection capability to meet the detection limit requirements established in 40 CFR 141. The SDWA DL for radioactivity is defined in 40 CFR Part 141.25.c as the radionuclide concentration, which can be counted with a precision of plus or minus 100% at the 95% confidence level (1.96σ where σ is the standard deviation of the net counting rate of the sample).
Deuterated Monitoring Compounds (DMCs)	DoD- SIM specific surrogates as specified for GC/MS SIM analysis.
Diesel Range Organics (DRO)	A range of compounds that denote all the characteristic compounds that make up diesel fuel (range can be state or program specific).
Digestion	DoD- A process in which a sample is treated (usually in conjunction with heat and acid) to convert the target analytes in the sample to a more easily measured form.
Document Control	The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.
Documents	DoD- Written components of the laboratory management system (e.g., policies, procedures, and instructions).
Dry Weight	The weight after drying in an oven at a specified temperature.
Duplicate (also known as Replicate or Laboratory Duplicate)	The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results of duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory.
Electron Capture Detector (ECD)	Device used in GC methods to detect compounds that absorb electrons (e.g., PCB compounds).
Electronic Data Deliverable (EDD)	A summary of environmental data (usually in spreadsheet form) which clients request for ease of data review and comparison to historical results.
Eluent	A solvent used to carry the components of a mixture through a stationary phase.
Elute	To extract, specifically, to remove (absorbed material) from an absorbent by means of a solvent.

Elution	A process in which solutes are washed through a stationary phase by movement of a mobile phase.
Environmental Data	DoD- Any measurements or information that describe environmental processes, locations, or conditions; ecological or health effects and consequences; or the performance of environmental technology.
Environmental Monitoring	The process of measuring or collecting environmental data.
Environmental Protection Agency (EPA)	An agency of the federal government of the United States which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress.
Environmental Sample	A representative sample of any material (aqueous, non-aqueous, or multimedia) collected from any source for which determination of composition or contamination is requested or required. Environmental samples can generally be classified as follows: • Non Potable Water (Includes surface water, ground water, effluents, water treatment chemicals, and TCLP leachates or other extracts) • Drinking Water - Delivered (treated or untreated) water designated as potable water • Water/Wastewater - Raw source waters for public drinking water supplies, ground waters, municipal influents/effluents, and industrial influents/effluents • Sludge - Municipal sludges and industrial sludges. • Soil - Predominately inorganic matter ranging in classification from sands to clays. • Waste - Aqueous and non-aqueous liquid wastes, chemical solids, and industrial liquid and solid wastes
Equipment Blank	A sample of analyte-free media used to rinse common sampling equipment to check effectiveness of decontamination procedures.
Extracted Internal Standard Analyte	Isotopically labeled analogs of analytes of interest added to all standards, blanks and samples analyzed. Added to samples and batch QC samples prior to the first step of sample extraction and to standards and instrument blanks prior to analysis. Used for isotope dilution methods.
Facility	A distinct location within the company that has unique certifications, personnel and waste disposal identifications.
False Negative	DoD- A result that fails to identify (detect) an analyte or reporting an analyte to be present at or below a level of interest when the analyte is actually above the level of interest.
False Positive	DoD- A result that erroneously identifies (detects) an analyte or reporting an analyte to be present above a level of interest when the analyte is actually present at or below the level of interest.
Field Blank	A blank sample prepared in the field by filling a clean container with reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken.
Field Measurement	Determination of physical, biological, or radiological properties, or chemical constituents that are measured on-site, close in time and space to the matrices being sampled/measured, following accepted test methods. This testing is performed in the field outside of a fixed-laboratory or outside of an enclosed structure that meets the requirements of a mobile laboratory.
Field of Accreditation	TNI- Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.

Field of Proficiency Testing (FoPT)	TNI- Matrix, technology/method, analyte combinations for which the composition, spike concentration ranges and acceptance criteria have been established by the PTPEC.
Finding	TNI- An assessment conclusion referenced to a laboratory accreditation standard and supported by objective evidence that identifies a deviation from a laboratory accreditation standard requirement. DoD- An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive, negative, or neutral and is normally accompanied by specific examples of the observed condition. The finding must be linked to a specific requirement (e.g., this standard, ISO requirements, analytical methods, contract specifications, or laboratory management systems requirements).
Flame Atomic Absorption Spectrometer (FAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the fact that ground state metals absorb light at different wavelengths. Metals in a solution are converted to the atomic state by use of a flame.
Flame Ionization Detector (FID)	A type of gas detector used in GC analysis where samples are passed through a flame which ionizes the sample so that various ions can be measured.
Gas Chromatography (GC)	Instrumentation which utilizes a mobile carrier gas to deliver an environmental sample across a stationary phase with the intent to separate compounds out and measure their retention times.
Gas Chromatograph/ Mass Spectrometry (GC/MS)	In conjunction with a GC, this instrumentation utilizes a mass spectrometer which measures fragments of compounds and determines their identity by their fragmentation patterns (mass spectra).
Gasoline Range Organics (GRO)	A range of compounds that denote all the characteristic compounds that make up gasoline (range can be state or program specific).
Graphite Furnace Atomic Absorption Spectrometry (GFAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the absorption of light at different wavelengths that are characteristic of different analytes.
High Pressure Liquid Chromatography (HPLC)	Instrumentation used to separate, identify and quantitate compounds based on retention times which are dependent on interactions between a mobile phase and a stationary phase.
Holding Time	TNI- The maximum time that can elapse between two specified activities. 40 CFR Part 136- The maximum time that samples may be held prior to preparation and/or analysis as defined by the method and still be considered valid or not compromised. For sample prep purposes, hold times are calculated using the time of the start of the preparation procedure. DoD- The maximum time that may elapse from the time of sampling to the time of preparation or analysis, or from preparation to analysis, as appropriate.
Homogeneity	The degree to which a property or substance is uniformly distributed throughout a sample.
Homologue	One in a series of organic compounds in which each successive member has one more chemical group in its molecule than the next preceding member. For instance, methanol, ethanol, propanol, butanol, etc., form a homologous series.
Improper Actions	DoD- Intentional or unintentional deviations from contract-specified or method-specified analytical practices that have not been authorized by the customer (e.g., DoD or DOE).

Incremental Sampling Method (ISM)	Soil preparation for large volume (1 kg or greater) samples.
In-Depth Data Monitoring	TNI- When used in the context of data integrity activities, a review and evaluation of documentation related to all aspects of the data generation process that includes items such as preparation, equipment, software, calculations, and quality controls. Such monitoring shall determine if the laboratory uses appropriate data handling, data use and data reduction activities to support the laboratory's data integrity policies and procedures.
Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)	Analytical technique used for the detection of trace metals which uses plasma to produce excited atoms that emit radiation of characteristic wavelengths.
Inductively Coupled Plasma- Mass Spectrometry (ICP/MS)	An ICP that is used in conjunction with a mass spectrometer so that the instrument is not only capable of detecting trace amounts of metals and non-metals but is also capable of monitoring isotopic speciation for the ions of choice.
Infrared Spectrometer (IR)	An instrument that uses infrared light to identify compounds of interest.
Initial Calibration (ICAL)	The process of analyzing standards, prepared at specified concentrations, to define the quantitative response relationship of the instrument to the analytes of interest. Initial calibration is performed whenever the results of a calibration verification standard do not conform to the requirements of the method in use or at a frequency specified in the method.
Initial Calibration Blank (ICB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method. This blank is specifically run in conjunction with the Initial Calibration Verification (ICV) where applicable.
Initial Calibration Verification (ICV)	DoD- Verifies the initial calibration with a standard obtained or prepared from a source independent of the source of the initial calibration standards to avoid potential bias of the initial calibration.
Injection Internal Standard Analyte	Isotopically labeled analogs of analytes of interest (or similar in physiochemical properties to the target analytes but with a distinct response) to be quantitated. Added to all blanks, standards, samples and batch QC after extraction and prior to analysis.
Instrument Blank	A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination.
Instrument Detection Limits (IDLs)	Limits determined by analyzing a series of reagent blank analyses to obtain a calculated concentration. IDLs are determined by calculating the average of the standard deviations of three runs on three non-consecutive days from the analysis of a reagent blank solution with seven consecutive measurements per day.
Interference, spectral	Occurs when particulate matter from the atomization scatters incident radiation from the source or when the absorption or emission from an interfering species either overlaps or is so close to the analyte wavelength that resolution becomes impossible.
Interference, chemical	Results from the various chemical processes that occur during atomization and later the absorption characteristics of the analyte.
Internal Standard	TNI and DoD- A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.

International Organization for Standardization (ISO)	An international standard-setting body composed of representatives from various national standards organizations.
Intermediate Standard Solution	Reference solutions prepared by dilution of the stock solutions with an appropriate solvent.
International System of Units (SI)	The coherent system of units adopted and recommended by the General Conference on Weights and Measures.
Ion Chromatography (IC)	Instrumentation or process that allows the separation of ions and molecules based on the charge properties of the molecules.
Isomer	One of two or more compounds, radicals, or ions that contain the same number of atoms of the same element but differ in structural arrangement and properties. For example, hexane (C6H14) could be n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane.
Laboratory	A body that calibrates and/or tests.
Laboratory Control Sample (LCS)	TNI- (also known as laboratory fortified blank (LFB), spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes and taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst-specific precision and bias or to evaluate the performance of all or a portion of the measurement system.
Laboratory Duplicate	Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently.
Laboratory Information Management System (LIMS)	DoD- The entirety of an electronic data system (including hardware and software) that collects, analyzes, stores, and archives electronic records and documents.
LabTrack	Database used by Pace to store and track corrective actions and other laboratory issues.
Learning Management System (LMS)	A web-based database used by the laboratories to track and document training activities. The system is administered by the corporate training department and each laboratory's learn centers are maintained by a local administrator.
Legal Chain-of-Custody Protocols	TNI- Procedures employed to record the possession of samples from the time of sampling through the retention time specified by the client or program. These procedures are performed at the special request of the client and include the use of a Chain-of-Custody (COC) Form that documents the collection, transport, and receipt of compliance samples by the laboratory. In addition, these protocols document all handling of the samples within the laboratory.
Limit(s) of Detection (LOD)	TNI- The minimum result, which can be reliably discriminated from a blank with predetermined confidence level. DoD- The smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence. At the LOD, the false negative rate (Type II error) is 1%. A LOD may be used as the lowest concentration for reliably reporting a non-detect of a specific analyte in a specific matrix with a specific method at 99% confidence.

Limit(s) of Quantitation (LOQ)	TNI- The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. DoD- The smallest concentration that produces a quantitative result with known and recorded precision and bias. For DoD/DOE projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard and within the calibration range.
Linear Dynamic Range	DoD- Concentration range where the instrument provides a linear response.
Liquid chromatography/ tandem mass spectrometry (LC/MS/MS)	Instrumentation that combines the physical separation techniques of liquid chromatography with the mass analysis capabilities of mass spectrometry.
Lot	TNI- A definite amount of material produced during a single manufacturing cycle, and intended to have uniform character and quality.
Management	Those individuals directly responsible and accountable for planning, implementing, and assessing work.
Management System	System to establish policy and objectives and to achieve those objectives.
Manager (however named)	The individual designated as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual.
Matrix	TNI- The substrate of a test sample.
Matrix Duplicate	TNI- A replicate matrix prepared in the laboratory and analyzed to obtain a measure of precision.
Matrix Spike (MS) (spiked sample or fortified sample)	TNI- A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.
Matrix Spike Duplicate (MSD) (spiked sample or fortified sample duplicate)	TNI- A replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.
Measurement Performance Criteria (MPC)	DoD- Criteria that may be general (such as completion of all tests) or specific (such as QC method acceptance limits) that are used by a project to judge whether a laboratory can perform a specified activity to the defined criteria.
Measurement Quality Objective (MQO)	TNI- The analytical data requirements of the data quality objectives are project- or program-specific and can be quantitative or qualitative. MQOs are measurement performance criteria or objectives of the analytical process. Examples of quantitative MQOs include statements of required analyte detectability and the uncertainty of the analytical protocol at a specified radionuclide activity, such as the action level. Examples of qualitative MQOs include statements of the required specificity of the analytical protocol, e.g., the ability to analyze for the radionuclide of interest given the presence of interferences.

Measurement System	TNI- A method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s). DoD- A test method, as implemented at a particular laboratory, and which includes the equipment used to perform the sample preparation and test and the operator(s).
Measurement Uncertainty	DoD- An estimate of the error in a measurement often stated as a range of values that contain the true value within a certain confidence level. The uncertainty generally includes many components which may be evaluated from experimental standard deviations based on repeated observations or by standard deviations evaluated from assumed probability distributions based on experience or other information. For DoD/DOE, a laboratory's Analytical Uncertainty (such as use of LCS control limits) can be reported as the minimum uncertainty.
Method	TNI- A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.
Method Blank	TNI- A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.
Method Detection Limit (MDL)	TNI- One way to establish a Detection Limit; defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.
Method of Standard Additions	A set of procedures adding one or more increments of a standard solution to sample aliquots of the same size in order to overcome inherent matrix effects. The procedures encompass the extrapolation back to obtain the sample concentration.
Minimum Detectable Activity (MDA)	TNI- Estimate of the smallest true activity that ensures a specified high confidence, $1 - \beta$, of detection above the Critical Value, and a low probability β of false negatives below the Critical Value. For radiometric methods, β is often set at 0.05. NOTE 1: The MDS is a measure of the detection capability of a measurement process and as such, it is an a priori concept. It may be used in the selection of methods to meet specified MQOs. Laboratories may also calculate a "sample specific" MDA, which indicates how well the measurement process is performing under varying real-world measurement conditions, when sample-specific characteristics (e.g., interferences) may affect the detection capability. However, the MDA must never be used instead of the Critical Value as a detection threshold. NOTE 2: For the purpose of this Standard, the terms MDA and minimum detectable concentration (MDC) are equivalent.
MintMiner	Program used by Pace to review large amounts of chromatographic data to monitor for errors or data integrity issues.
Mobile Laboratory	TNI- A portable enclosed structure with necessary and appropriate accommodation and environmental conditions for a laboratory, within which testing is performed by analysts. Examples include but are not limited to trailers, vans, and skid-mounted structures configured to house testing equipment and personnel.

National Environmental Laboratory Accreditation Conference (NELAC)	See definition of The NELAC Institute (TNI).
National Institute of Occupational Safety and Health (NIOSH)	National institute charged with the provision of training, consultation and information in the area of occupational safety and health.
National Institute of Standards and Technology (NIST)	TNI- A federal agency of the US Department of Commerce's Technology Administration that is designed as the United States national metrology institute (or NMI).
National Pollutant Discharge Elimination System (NPDES)	A permit program that controls water pollution by regulating point sources that discharge pollutants into U.S. waters.
Negative Control	Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.
Nitrogen Phosphorus Detector (NPD)	A detector used in GC analyses that utilizes thermal energy to ionize an analyte. With this detector, nitrogen and phosphorus can be selectively detected with a higher sensitivity than carbon.
Nonconformance	An indication or judgment that a product or service has not met the requirement of the relevant specifications, contract, or regulation; also the state of failing to meet the requirements.
Not Detected (ND)	The result reported for a compound when the detected amount of that compound is less than the method reporting limit.
Operator Aid	DoD- A technical posting (such as poster, operating manual, or notepad) that assists workers in performing routine tasks. All operator aids must be controlled documents (i.e., a part of the laboratory management system).
Performance Based Measurement System (PBMS)	An analytical system wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner.
Physical Parameter	TNI- A measurement of a physical characteristic or property of a sample as distinguished from the concentrations of chemical and biological components.
Photo-ionization Detector (PID)	An ion detector which uses high-energy photons, typically in the ultraviolet range, to break molecules into positively charged ions.
Polychlorinated Biphenyls (PCB)	A class of organic compounds that were used as coolants and insulating fluids for transformers and capacitors. The production of these compounds was banned in the 1970's due to their high toxicity.
Positive Control	Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.
Post-Digestion Spike	A sample prepared for metals analyses that has analytes spike added to determine if matrix effects may be a factor in the results.
Power of Hydrogen (pH)	The measure of acidity or alkalinity of a solution.
Practical Quantitation Limit (PQL)	Another term for a method reporting limit. The lowest reportable concentration of a compound based on parameters set up in an analytical method and the laboratory's ability to reproduce those conditions.
Precision	TNI- The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.

Preservation	TNI and DoD- Any conditions under which a sample must be kept in order to maintain chemical, physical, and/or biological integrity prior to analysis.
Primary Accreditation Body (Primary AB)	TNI- The accreditation body responsible for assessing a laboratory's total quality system, on-site assessment, and PT performance tracking for fields of accreditation.
Procedure	TNI- A specified way to carry out an activity or process. Procedures can be documented or not.
Proficiency Testing (PT)	TNI- A means to evaluate a laboratory's performance under controlled conditions relative to a given set of criteria, through analysis of unknown samples provided by an external source.
Proficiency Testing Program (PT Program)	TNI- The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories.
Proficiency Testing Provider (PT Provider)	TNI- A person or organization accredited by a TNI-approved Proficiency Testing Provider Accreditor to operate a TNI-compliant PT Program.
Proficiency Testing Provider Accreditor (PTPA)	TNI- An organization that is approved by TNI to accredit and monitor the performance of proficiency testing providers.
Proficiency Testing Reporting Limit (PTRL)	TNI- A statistically derived value that represents the lowest acceptable concentration for an analyte in a PT sample, if the analyte is spiked into the PT sample. The PTRLs are specified in the TNI FoPT tables.
Proficiency Testing Sample (PT)	TNI- A sample, the composition of which is unknown to the laboratory, and is provided to test whether the laboratory can produce analytical results within the specified acceptance criteria.
Proficiency Testing (PT) Study	TNI- a) Scheduled PT Study: A single complete sequence of circulation and scoring of PT samples to all participants in a PT program. The study must have the same pre-defined opening and closing dates for all participants; b) Supplemental PT Study: A PT sample that may be from a lot previously released by a PT Provider that meets the requirements for supplemental PT samples given in Volume 3 of this Standard [TNI] but that does not have a pre-determined opening date and closing date.
Proficiency Testing Study Closing Date	TNI- a) Scheduled PT Study: The calendar date by which all participating laboratories must submit analytical results for a PT sample to a PT Provider; b) Supplemental PT Study: The calendar date a laboratory submits the results for a PT sample to the PT Provider.
Proficiency Testing Study Opening Date	TNI- a) Scheduled PT Study: The calendar date that a PT sample is first made available to all participants of the study by a PT Provider; b) Supplemental PT Study: The calendar date the PT Provider ships the sample to a laboratory.
Protocol	TNI- A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) that must be strictly followed.
Qualitative Analysis	DoD- Analysis designed to identify the components of a substance or mixture.
Quality Assurance (QA)	TNI- An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.

Quality Assurance Manual (QAM)	A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality Assurance Project Plan (QAPP)	A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.
Quality Control (QC)	TNI- The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality.
Quality Control Sample (QCS)	TNI- A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control.
Quality Manual	TNI- A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality System	TNI and DoD- A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance and quality control activities.

Quality System Matrix	TNI and DoD- These matrix definitions shall be used for purposes of batch and quality control requirements and may be different from a field of accreditation matrix: • **Air and Emissions**: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device • **Aqueous**: Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, groundwater effluents, and TCLP or other extracts. • **Biological Tissue**: Any sample of a biological origin such as fish tissue, shellfish or plant material. Such samples shall be grouped according to origin. • **Chemical Waste**: A product or by-product of an industrial process that results in a matrix not previously defined. • **Drinking Water**: Any aqueous sample that has been designated a potable or potentially potable water source. • **Non-aqueous liquid**: Any organic liquid with <15% settleable solids • **Saline/Estuarine**: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake. • **Solids**: Includes soils, sediments, sludges, and other matrices with >15% settleable solids.
Quantitation Range	DoD- The range of values (concentrations) in a calibration curve between the LOQ and the highest successively analyzed initial calibration standard used to relate instrument response to analyte concentration. The quantitation range (adjusted for initial sample volume/weight, concentration/dilution and final volume) lies within the calibration range.
Quantitative Analysis	DoD- Analysis designed to determine the amounts or proportions of the components of a substance.
Random Error	The EPA has established that there is a 5% probability that the results obtained for any one analyte will exceed the control limits established for the test due to random error. As the number of compounds measured increases in a given sample, the probability for statistical error also increases.
Raw Data	TNI- The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records.
Reagent Blank (method reagent blank)	A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps.
Reagent Grade	Analytical reagent (AR) grade, ACS reagent grade, and reagent grade are synonymous terms for reagents that conform to the current specifications of the Committee on Analytical Reagents of the American Chemical Society.
Records	DoD- The output of implementing and following management system documents (e.g., test data in electronic or hand-written forms, files, and logbooks).

Reference Material	TNI- Material or substance one or more of whose property values are sufficiently homogenized and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
Reference Method	TNI- A published method issued by an organization generally recognized as competent to do so. (When the ISO language refers to a "standard method", that term is equivalent to "reference method"). When a laboratory is required to analyze by a specified method due to a regulatory requirement, the analyte/method combination is recognized as a reference method. If there is no regulatory requirement for the analyte/method combination, the analyte/method combination is recognized as a reference method if it can be analyzed by another reference method of the same matrix and technology.
Reference Standard	TNI- Standard used for the calibration of working measurement standards in a given organization or at a given location.
Relative Percent Difference (RPD)	A measure of precision defined as the difference between two measurements divided by the average concentration of the two measurements.
Reporting Limit (RL)	The level at which method, permit, regulatory and customer-specific objectives are met. The reporting limit may never be lower than the Limit of Detection (i.e., statistically determined MDL). Reporting limits are corrected for sample amounts, including the dry weight of solids, unless otherwise specified. There must be a sufficient buffer between the Reporting Limit and the MDL. DoD- A customer-specified lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.
Reporting Limit Verification Standard (RLVS)	A standard analyzed at the reporting limit for an analysis to verify the laboratory's ability to report to that level.
Representativeness	A quality element related to the ability to collect a sample reflecting the characteristics of the part of the environment to be assessed. Sample representativeness is dependent on the sampling techniques specified in the project work plan.
Requirement	Denotes a mandatory specification; often designated by the term "shall".
Retention Time	The time between sample injection and the appearance of a solute peak at the detector.
Revocation	TNI- The total or partial withdrawal of a laboratory's accreditation by an accreditation body.
Sample	Portion of material collected for analysis, identified by a single, unique alphanumeric code. A sample may consist of portions in multiple containers, if a single sample is submitted for multiple or repetitive analysis.
Sample Condition Upon Receipt Form (SCURF)	Form used by sample receiving personnel to document the condition of sample containers upon receipt to the laboratory (used in conjunction with a COC).
Sample Delivery Group (SDG)	A unit within a single project that is used to identify a group of samples for delivery. An SDG is a group of 20 or fewer field samples within a project, received over a period of up to 14 calendar days. Data from all samples in an SDG are reported concurrently.
Sample Receipt Form (SRF)	Letter sent to the client upon login to show the tests requested and pricing.

Sample Tracking	Procedures employed to record the possession of the samples from the time of sampling until analysis, reporting and archiving. These procedures include the use of a chain-of-custody form that documents the collection, transport, and receipt of compliance samples to the laboratory. In addition, access to the laboratory is limited and controlled to protect the integrity of the samples.
Sampling	TNI- Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.
Selected Ion Monitoring (SIM)	A mode of analysis in mass spectrometry where the detector is set to scan over a very small mass range, typically one mass unit. The narrower the range, the more sensitive the detector. DoD- Using GC/MS, characteristic ions specific to target compounds are detected and used to quantify in applications where the normal full scan mass spectrometry results in excessive noise.
Selectivity	TNI- The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system.
Sensitivity	TNI- The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.
Serial Dilution	The stepwise dilution of a substance in a solution.
Shall	Denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification as long as the requirement is fulfilled.
Should	Denotes a guideline or recommendation whenever noncompliance with the specification is permissible.
Signal-to-Noise Ratio (S/N)	DoD- A measure of signal strength relative to background noise. The average strength of the noise of most measurements is constant and independent of the magnitude of the signal. Thus, as the quantity being measured (producing the signal) decreases in magnitude, S/N decreases and the effect of the noise on the relative error of a measurement increases.
Source Water	TNI- When sampled for drinking water compliance, untreated water from streams, rivers, lakes, or underground aquifers, which is used to supply private and public drinking water supplies.
Spike	A known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.
Standard (Document)	TNI- The document describing the elements of a laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies.
Standard (Chemical)	Standard samples are comprised of a known amount of standard reference material in the matrix undergoing analysis. A standard reference material is a certified reference material produced by US NIST and characterized for absolute content, independent of analytical test method.
Standard Blank (or Reagent Blank)	A calibration standard consisting of the same solvent/reagent matrix used to prepare the calibration standards without the analytes. It is used to construct the calibration curve by establishing instrument background.
Standard Method	A test method issued by an organization generally recognized as competent to do so.

Standard Operating Procedure (SOP)	TNI- A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks.
Standard Reference Material (SRM)	A certified reference material produced by the US NIST or other equivalent organization and characterized for absolute content, independent of analytical method.
Statement of Qualifications (SOQ)	A document that lists information about a company, typically the qualifications of that company to compete on a bid for services.
Stock Standard	A concentrated reference solution containing one or more analytes prepared in the laboratory using an assayed reference compound or purchased from a reputable commercial source.
Storage Blank	DoD- A sample of analyte-free media prepared by the laboratory and retained in the sample storage area of the laboratory. A storage blank is used to record contamination attributable to sample storage at the laboratory.
Supervisor	The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses.
Surrogate	DoD- A substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples and is added to them for quality control purposes.
Suspension	TNI- The temporary removal of a laboratory's accreditation for a defined period of time, which shall not exceed 6 months or the period of accreditation, whichever is longer, in order to allow the laboratory time to correct deficiencies or area of non-conformance with the Standard.
Systems Audit	An on-site inspection or assessment of a laboratory's quality system.
Target Analytes	DoD- Analytes or chemicals of primary concern identified by the customer on a project-specific basis.
Technical Director	Individual(s) who has overall responsibility for the technical operation of the environmental testing laboratory.
Technology	TNI- A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.
Test	A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate.
Test Method	DoD- A definitive procedure that determines one or more characteristics of a given substance or product.
Test Methods for Evaluating Solid Waste, Physical/ Chemical (SW-846)	EPA Waste's official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with RCRA regulations.
Test Source	TNI- A radioactive source that is tested, such as a sample, calibration standard, or performance check source. A Test Source may also be free of radioactivity, such as a Test Source counted to determine the subtraction background, or a short-term background check.

The NELAC Institute (TNI)	A non-profit organization whose mission is to foster the generation of environmental data of known and documented quality through an open, inclusive, and transparent process that is responsive to the needs of the community. Previously known as NELAC (National Environmental Laboratory Accreditation Conference).
Total Petroleum Hydrocarbons (TPH)	A term used to denote a large family of several hundred chemical compounds that originate from crude oil. Compounds may include gasoline components, jet fuel, volatile organics, etc.
Toxicity Characteristic Leaching Procedure (TCLP)	A solid sample extraction method for chemical analysis employed as an analytical method to simulate leaching of compounds through a landfill.
Traceability	TNI- The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical conditions or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.
Training Document	A training resource that provides detailed instructions to execute a specific method or job function.
Trip Blank	This blank sample is used to detect sample contamination from the container and preservative during transport and storage of the sample. A cleaned sample container is filled with laboratory reagent water and the blank is stored, shipped, and analyzed with its associated samples.
Tuning	A check and/or adjustment of instrument performance for mass spectrometry as required by the method.
Ultraviolet Spectrophotometer (UV)	Instrument routinely used in quantitative determination of solutions of transition metal ions and highly conjugated organic compounds.
Uncertainty, Counting	TNI- The component of Measurement Uncertainty attributable to the random nature of radioactive decay and radiation counting (often estimated as the square root of observed counts (MARLAP). Older references sometimes refer to this parameter as Error, Counting Error or Count Error (c.f., Total Uncertainty).
Uncertainty, Expanded	TNI- The product of the Standard Uncertainty and a coverage factor, k, which is chosen to produce an interval about the result that has a high probability of containing the value of the measurand (c.f., Standard Uncertainty). NOTE: Radiochemical results are generally reported in association with the Total Uncertainty. Either if these estimates of uncertainty can be reported as the Standard Uncertainty (one-sigma) or as an Expanded Uncertainty (k-sigma, where $k > 1$).
Uncertainty, Measurement	TNI- Parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand.
Uncertainty, Standard	TNI- An estimate of the Measurement Uncertainty expressed as a standard deviation (c.f., Expanded Uncertainty).

Uncertainty, Total	TNI- An estimate of the Measurement Uncertainty that accounts for contributions from all significant sources of uncertainty associated with the analytical preparation and measurement of a sample. Such estimates are also commonly referred to as Combined Standard Uncertainty or Total Propagated Uncertainty, and in some older references as the Total Propagated Error, among other similar items (c.f., Counting Uncertainty).
Unethical actions	DoD- Deliberate falsification of analytical or quality control results where failed method or contractual requirements are made to appear acceptable.
United States Department of Agriculture (USDA)	A department of the federal government that provides leadership on food, agriculture, natural resources, rural development, nutrition and related issues based on public policy, the best available science, and effective management.
United States Geological Survey (USGS)	Program of the federal government that develops new methods and tools to supply timely, relevant, and useful information about the Earth and its processes.
Unregulated Contaminant Monitoring Rule (UCMR)	EPA program to monitor unregulated contaminants in drinking water.
Validation	DoD- The confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.
Verification	TNI- Confirmation by examination and objective evidence that specified requirements have been met. In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.
Voluntary Action Program (VAP)	A program of the Ohio EPA that gives individuals a way to investigate possible environmental contamination, clean it up if necessary and receive a promise from the State of Ohio that no more cleanup is needed.
Whole Effluent Toxicity (WET)	The aggregate toxic effect to aquatic organisms from all pollutants contained in a facility's wastewater (effluent).

10.0. REFERENCES

10.1. "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act." Federal Register, 40 CFR Part 136, most current version.

10.2. "Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods." SW-846.

10.3. "Methods for Chemical Analysis of Water and Wastes", EPA 600-4-79-020, 1979 Revised 1983, U.S. EPA.

10.4. U.S. EPA Contract Laboratory Program Statement of Work for Organic Analysis.

10.5. U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analysis.

10.6. "Standard Methods for the Examination of Water and Wastewater." Current Edition APHA-AWWA-WPCF.

10.7. "Annual Book of ASTM Standards", Section 4: Construction, Volume 04.04: Soil and Rock; Building Stones, American Society of Testing and Materials.

10.8. "Annual Book of ASTM Standards", Section 11: Water and Environmental Technology, American Society of Testing and Materials.

10.9. "NIOSH Manual of Analytical Methods", U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, most current version.

10.10. "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water", U.S. EPA, Environmental Monitoring and Support Laboratory – Cincinnati (Sep 1986).

10.11. Quality Assurance of Chemical Measurements, Taylor, John K.; Lewis Publishers, Inc. 1987.

10.12. Methods for Non-conventional Pesticides Chemicals Analysis of Industrial and Municipal Wastewater, Test Methods, EPA-440/1-83/079C.

10.13. Environmental Measurements Laboratory (EML) Procedures Manual, HASL-300, US DOE, February, 1992.

10.14. Requirements for Quality Control of Analytical Data, HAZWRAP, DOE/HWP-65/R1, July, 1990.

10.15. Requirements for Quality Control of Analytical Data for the Environmental Restoration Program, Martin Marietta, ES/ER/TM-16, December, 1992.

10.16. Quality Assurance Manual for Industrial Hygiene Chemistry, AIHA, most current version.

10.17. National Environmental Laboratory Accreditation Conference (NELAC) Standard- most current version.

10.18. ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories- most current version.

10.19. Department of Defense Quality Systems Manual (QSM), most current version.

10.20. TNI (The NELAC Institute) Standard- most current version applicable to each lab.

10.21. UCMR Laboratory Approval Requirements and Information Document, most current version.

10.22. US EPA Drinking Water Manual, most current version.

11.0. REVISIONS

The Pace Corporate Environmental Quality Office files an electronic version of a Microsoft Word document with tracked changes detailing all revisions made to previous versions of the Quality Assurance Manual. This document is available upon request. All current revisions are summarized in the table below.

Document Number	Reason for Change	Date
Quality Assurance Manual 19.0	General: made administrative edits that do not affect the policies or procedures within the document (including revising company name to Pace Analytical Services, LLC). Cover page: removed corporate approval signature lines. Old Section 3: moved to other sections of the QAM as applicable and deleted entire section (All section references below reflect the new section numbers). Section 1.1.2: replaced with section 3.1.1. Sections 1.3, 1.4, 1.11: removed extraneous language. Sections 1.5: added language from old section 1.6. Section 1.6: revised anonymous reporting information. Section 1.7.6: added deputies per position and deleted DoD language from old section 1.7.7. Section 1.8: removed non-key personnel job descriptions. Section 2: rearranged existing sections. Section 2.4: reworded to match existing Sample Acceptance policy document. Section 4: in general, for each QC type, removed language regarding frequency and corrective actions and referenced lab-specific SOPs. Section 5: in general, removed extraneous language and Management of Change section. Section 5.1, 5.2: reorganized into Primary and Secondary Review sections and removed extraneous language. Section 6: removed extraneous language including Quarterly Report section. Section 9 (glossary): revised and added definitions based on 2016 TNI Standard. Section 10: Added EPA DW Manual and revised references as applicable. Attachment III: updated corporate organizational chart. Old Attachment IV: removed floor plan attachment. Old Attachment VII: removed COC (available in SOPs).	06Mar2017
Quality Assurance Manual 19.1	General: Updated SOP references to new Mastercontrol nomenclature. Cover page: Added applicable facility locations. Attachments: Added and revised to reflect current regional operations.	03Jan2019

ATTACHMENT I - QUALITY CONTROL CALCULATIONS

PERCENT RECOVERY (%REC)

$$\%REC = \frac{(MSConc - SampleConc)}{TrueValue} * 100$$

NOTE: The SampleConc is zero (0) for the LCS and Surrogate Calculations

PERCENT DIFFERENCE (%D)

$$\%D = \frac{MeasuredValue - TrueValue}{TrueValue} * 100$$

where:
TrueValue = Amount spiked (can also be the $\overline{CF}$ or $\overline{RF}$ of the ICAL Standards)
Measured Value = Amount measured (can also be the CF or RF of the CCV)

PERCENT DRIFT

$$\%Drift = \frac{CalculatedConcentration - TheoreticalConcentration}{TheoreticalConcentrtion} * 100$$

RELATIVE PERCENT DIFFERENCE (RPD)

$$RPD = \frac{|(R1 - R2)|}{(R1 + R2)/2} * 100$$

where:
R1 = Result Sample 1
R2 = Result Sample 2

CORRELATION COEFFICIENT (R)

$$CorrCoeff = \frac{\sum_{i=1}^{N} W_i * (X_i - \overline{X}) * (Y_i - \overline{Y})}{\sqrt{\left(\sum_{i=1}^{N} W_i * (X_i - \overline{X})^2\right) * \left(\sum_{i=1}^{N} W_i * (Y_i - \overline{Y})^2\right)}}$$

With:	N	Number of standard samples involved in the calibration
	i	Index for standard samples
	Wi	Weight factor of the standard sample no. i
	Xi	X-value of the standard sample no. i
	X(bar)	Average value of all x-values
	Yi	Y-value of the standard sample no. i
	Y(bar)	Average value of all y-values

ATTACHMENT I - QUALITY CONTROL CALCULATIONS (CONTINUED)

STANDARD DEVIATION (S)

$$S = \sqrt{\sum_{i=1}^{n} \frac{(X_i - \overline{X})^2}{(n-1)}}$$

where:
n = number of data points
X_i = individual data point
$\overline{X}$ = average of all data points

AVERAGE ($\overline{X}$)

$$\overline{X} = \frac{\sum_{n=1}^{i} X_i}{n}$$

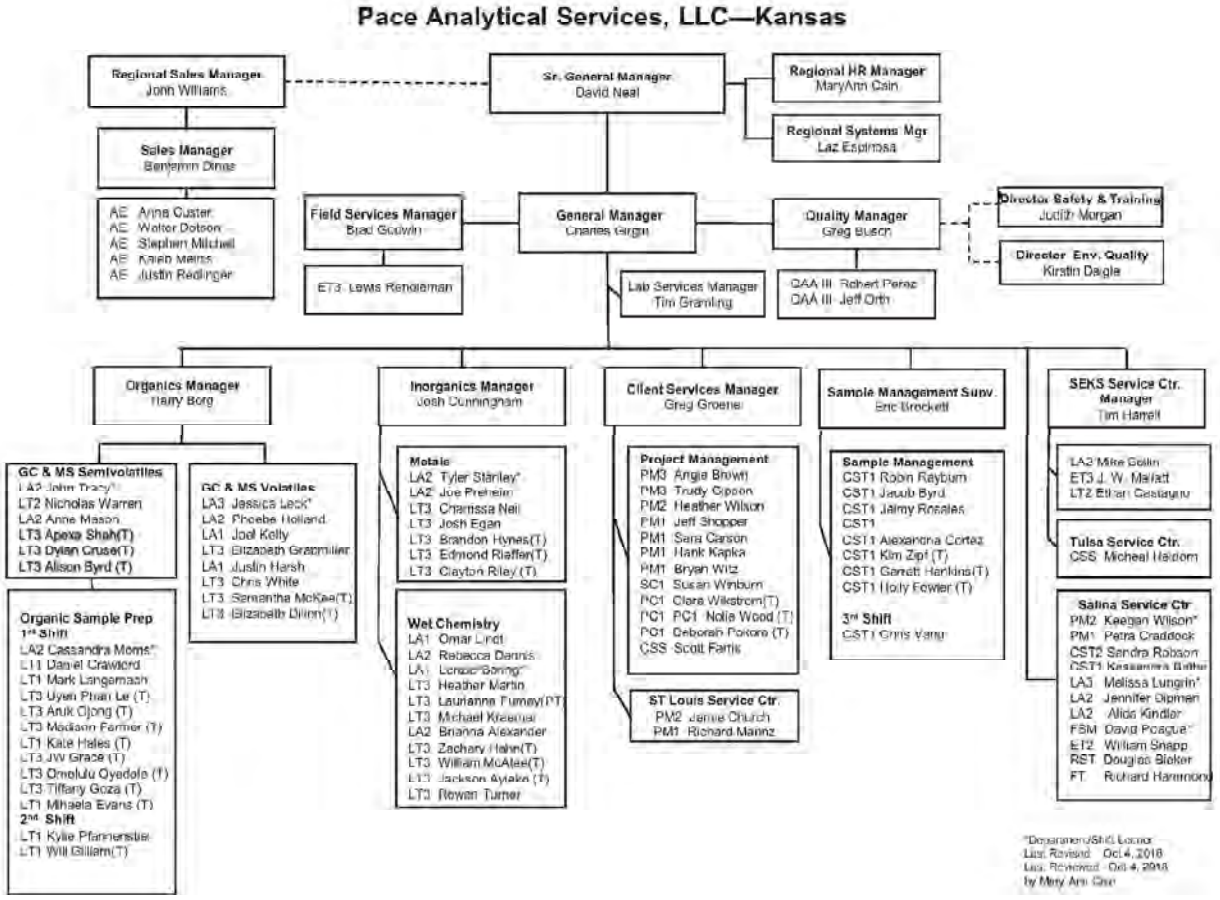
where:
n = number of data points
X_i = individual data point

RELATIVE STANDARD DEVIATION (RSD)

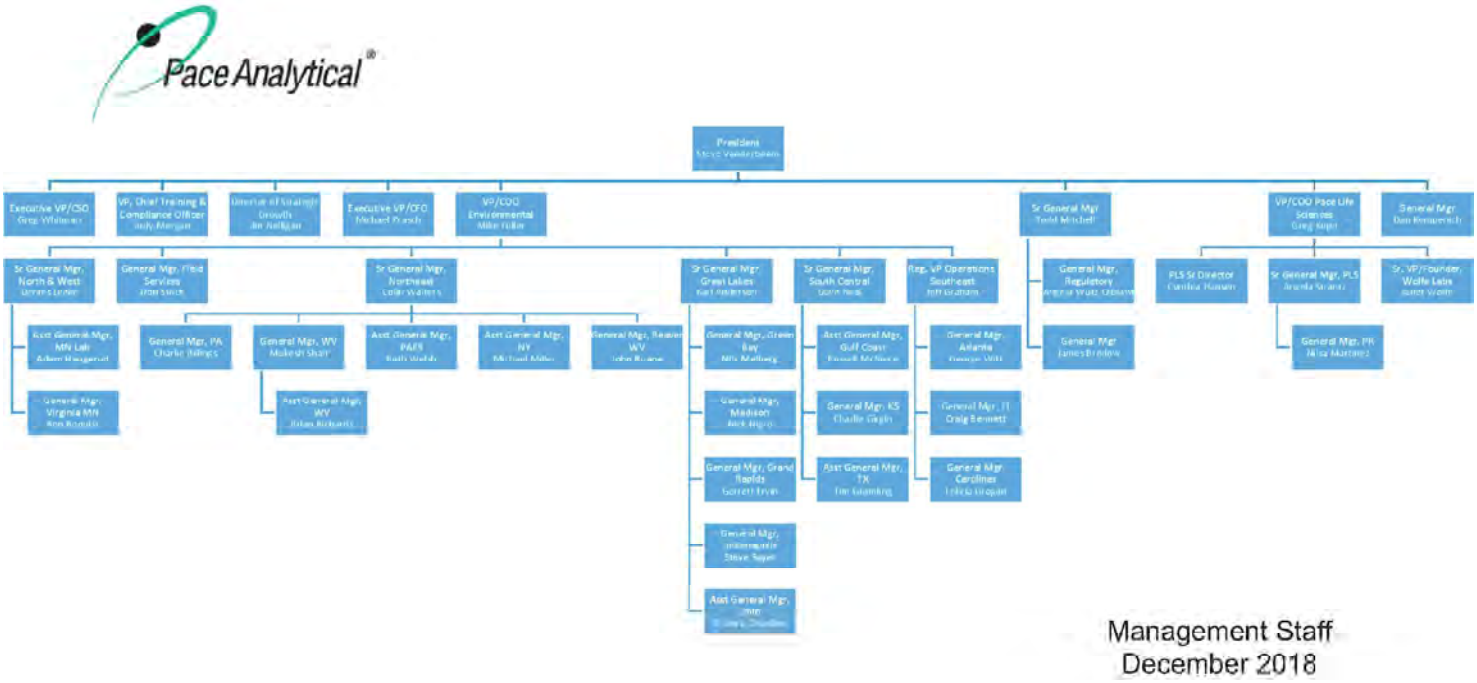
$$RSD = \frac{S}{\overline{X}} * 100$$

where:
S = Standard Deviation of the data points
$\overline{X}$ = average of all data points

ATTACHMENT II - LABORATORY ORGANIZATIONAL CHART



ATTACHMENT III - CORPORATE ORGANIZATIONAL CHART



ATTACHMENT IV – LENEXA EQUIPMENT LIST

Instrument	Age	Manufacturer	Model	Description	Analysis
60FP01	1990	Koehler	K16200	Flashpoint Tester	1010A / ASTM D92
60FP02	2010	Koehler	K16200	Flashpoint Tester	1010A / ASTM D92
60GCS8	2005	Agilent	6890	GC ECD	504.1 / 608 / 8011 / 8082
60GCS9	2008	Agilent	7890A	GC FID	8015 / OA-2 / OKDRO / TCEQ 1005
60GCSA	2009	Agilent	7890A	GC FID	8015 / OA-2 / OKDRO / TCEQ 1005
60GCSF	2013	Agilent	7890A	GC FID	8015 / OA-2 / OKDRO / TCEQ 1005
60GCSG	2013	Agilent	7890B	GC ECD	504.1 / 608 / 8011 / 8082
60GCV2	2012	Agilent	6890	GC FID	8015 / OKGRO
60HG02	2007	Perkin-Elmer	FIMS-400	Mercury Analyzer	245.1 / 7470A / 7471A / 7471B
60HG05	2017	Cetac	M7600	US16354007	245.1 / 7470A / 7471A / 7471B
60ICM1	2011	Thermo Scientific	XSeries2	ICP-MS	200.8 / 6020A
60ICP3	2009	Thermo Scientific	iCAP6500	ICP-OES	200.7 / 6010B / 6010C
60ICP4	2011	Thermo Scientific	iCAP6500	ICP-OES	200.7 / 6010B / 6010C
60MARS1	2006	CEM	Mars5	Microwave Extractor	3546
60MARS2	2013	CEM	Mars6	Microwave Extractor	3546
60MSS2	2002	Agilent	6890	GCMS	625 / 8270C / Missouri TPH-DRO/ORO
60MSS3	2008	Agilent	7890A	GCMS	625 / 8270C / Missouri TPH-DRO/ORO
60MSS4	2009	Agilent	7890A	GCMS	625 / 8270C / Missouri TPH-DRO/ORO
60MSS5	2010	Agilent	7890A	GCMS	625 / 8270C / Missouri TPH-DRO/ORO
60MSS6	2015	Agilent	7890B	GCMS	625 / 8270C / Missouri TPH-DRO/ORO
60MSV1	2009	Agilent	6850	GCMS	624 / OA-1 / 8260B / Missouri TPH-GRO
60MSV2	2007	Agilent	6850	GCMS	624 / OA-1 / 8260B / Missouri TPH-GRO
60MSV5	2002	Agilent	6890	GCMS	624 / OA-1 / 8260B / Missouri TPH-GRO
60MSV8	2007	Agilent	6850	GCMS	624 / OA-1 / 8260B / Missouri TPH-GRO
60MSV9	2008	Agilent	6850	GCMS	624 / OA-1 / 8260B / Missouri TPH-GRO
60MSVA	2010	Agilent	6850	GCMS	624 / OA-1 / 8260B / Missouri TPH-GRO
60MSVB	2010	Agilent	6850	GCMS	624 / OA-1 / 8260B / Missouri TPH-GRO
60MSVC	2014	Agilent	6850	GCMS	624 / OA-1 / 8260B / Missouri TPH-GRO
60MSVD	2016	Agilent	6850	GCMS	624 / OA-1 / 8260B / Missouri TPH-GRO
60WET1	1998	Thermo Scientific	Accumet 150	Dissolved Oxygen Meter	SM 4500-O G
60WET5	1994	Hach	43900	Turbidimeter	180.1
60WET9	1998	Fisher Scientific	09-328	Conductivity Meter	120.1 / SM 2510B
60WETC	2011	Thermo Scientific	Orion Star LogR	pH Meter	SM 4500-H+ B
60WETE	2013	Oakton	700	pH Meter	SM 4500-H+ B
60WETH	2015	Thermo Scientific	A214	pH Meter	1311 / 1312
60WETI	2015	Thermo Scientific	A214	pH Meter	1311 / 1312
60WETK	2014	Control Co.	1469	Conductivity Meter	120.1 / SM 2510B
60WETL	2015	Skalar	21088905-01	Robotic BOD Analyzer	SM 5210B
60WETM	2017	Thermo Scientific	A212	Conductivity Meter	120.1 / SM 2510B
60WTA0	2009	Lachat	QuikChem 8500	Flow Injection Analyzer	350.1 / 351.2 / / 353.2 / 365.1 / 365.4
60WTA2	2008	Dionex	ICS-2000	Ion Chromatograph	300.0 / 9056A

Instrument	Age	Manufacturer	Model	Description	Analysis
60WTA8	2006	Unity Scientific	Smartchem200	Discrete Analyzer	351.2 / 420.1 / SM 4500-CN E / 9012A
60WTA9	2008	Shimadzu	UV-1800	UV-Visible Spectrometer	COD / Cl_2 / Fe(II) / Sulfide / Cr(VI)
60WTAA	2010	GE	InnovOx	TOC Analyzer	SM 5310C
60WTAB	2011	Lachat	QuikChem 8500	Flow Injection Analyzer	350.1 / 353.2 / 365.1 / 365.4
60WTAC	2012	Dionex	ICS-1600	Ion Chromatograph	300.0 / 9056A
60WTAD	2012	Dionex	ICS-1500	Ion Chromatograph	300.0 / 9056A
60WTAE	2012	Mantech	PC-1040	Autotitrator	SM2320B
60WTAG	2013	Tekmar	Fusion	TOC Analyzer	SM 5310C
60WTAK	2016	Tanaka	apm-8	Flashpoint Tester	1010A / ASTM D92
Field	2006	YSI	556	pH / Conductivity Meter	120.1 / SM 2510B / SM 4500-H+ B
Field	2017	Mettler-Toledo	SevenGo	pH / Conductivity Meter	120.1 / SM 2510B / SM 4500-H+ B
Field	2017	Thermo Scientific	A221	pH / Conductivity Meter	120.1 / SM 2510B / SM 4500-H+ B

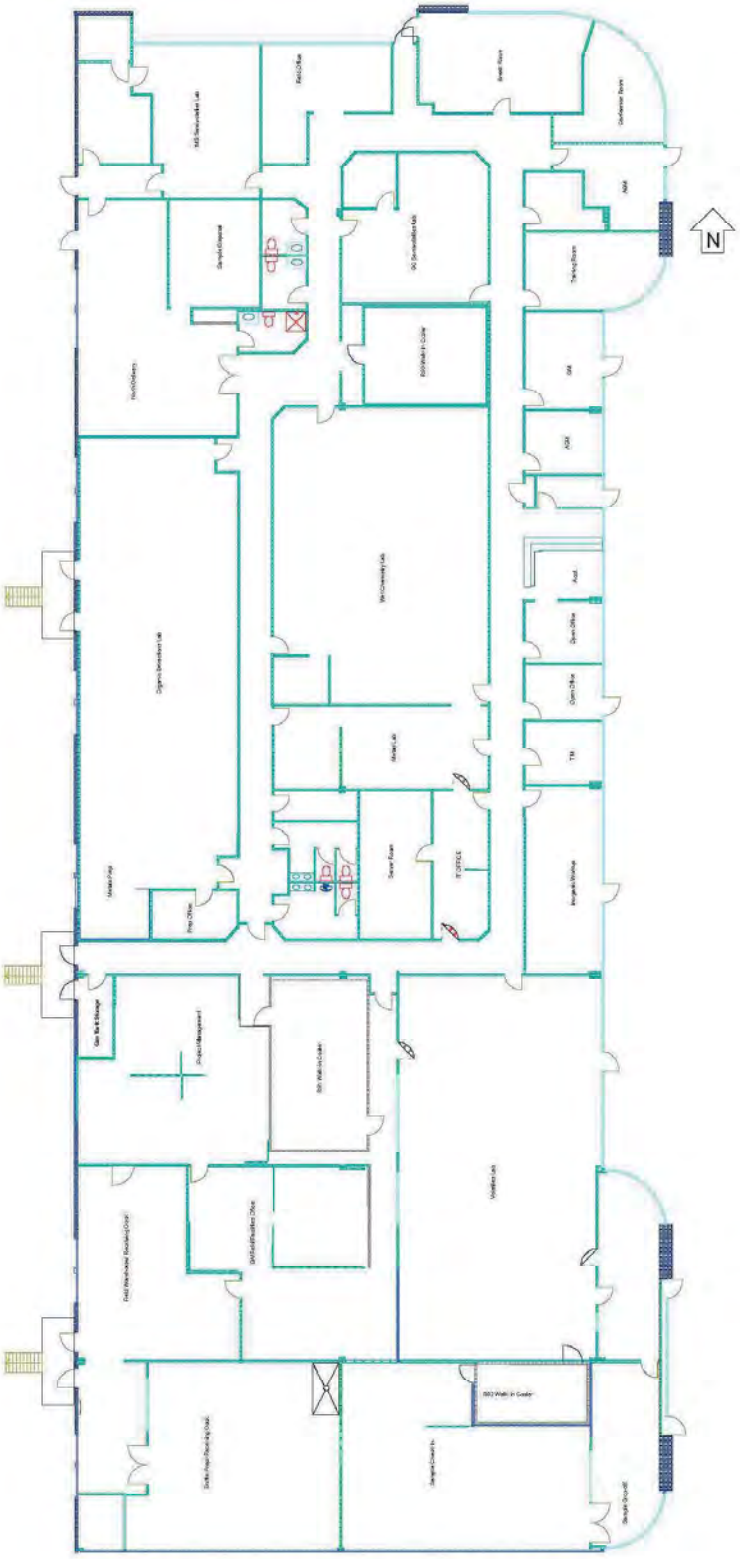
ATTACHMENT V – FRONTENAC LABORATORY EQUIPMENT LIST

Instrument	Age	Manufacturer	Model	Analysis
Autoclave	2001	Tutnauer Brinkman	3870E	N/A
Bioassay Water Baths (5 units)	2001	ISO Temp	2100	Bioassay
Conductivity Meter	2001	Accumet	AB30	120.1
Dissolved Oxygen Meter	2006	YSI	550A	4500-O G
Incubator, thermal	1995	Equatherm	C1574	Microbiology
Incubator, water bath	2002	Precision	Precision	Microbiology
pH Meter	2001	Fisher Sci.	AP61	4500-H+B
pH, LDO, Conductivity Meter	2011	Hach	HQ40d	4500-H+B, 4500-O G, 120.1

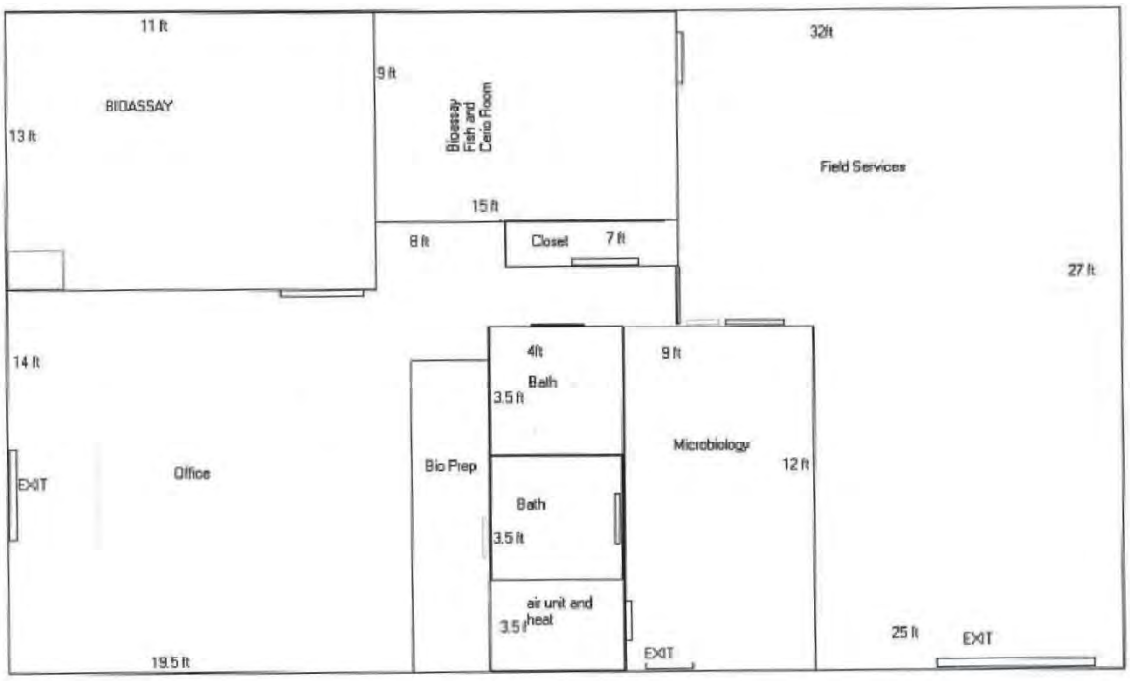
ATTACHMENT VI – SALINA LABORATORY EQUIPMENT LIST

Instrument	Age	Manufacturer	Model	Analysis
Ion Chromatograph	2011	Dionex	ICS-1600	300.0 / 9056A
Flow Injection Analyzer	1999	Lachat	QuikChem 8000	SM 4500-P E
Spectrophotometer	2001	Hach	DR/4000 U	SM 4500-Cl G / SM 4500-P E / 7196A
Spectrophotometer	2013	Hach	DR-3900	SM 4500-Cl G / SM 4500-P E / 7196A
pH Meter	2012	Oakton	pH 2700	SM 4500-H+ B / 9040 / 9045
pH Meter	2010	Thermo Scientific	Orion 2-Star	SM 4500-H+ B / 9040 / 9045
Conductivity meter	1997	Orion	162	120.1 / SM 2510B
Dissolved Oxygen Meter	2012	Hach	HQ440D	SM 4500-O G / SM 5210B
Turbidimeter	2018	Hach	2100Q	180.1

ATTACHMENT VII - LENEXA LABORATORY FLOOR PLAN



ATTACHMENT VIII - FRONTENAC LABORATORY FLOOR PLAN

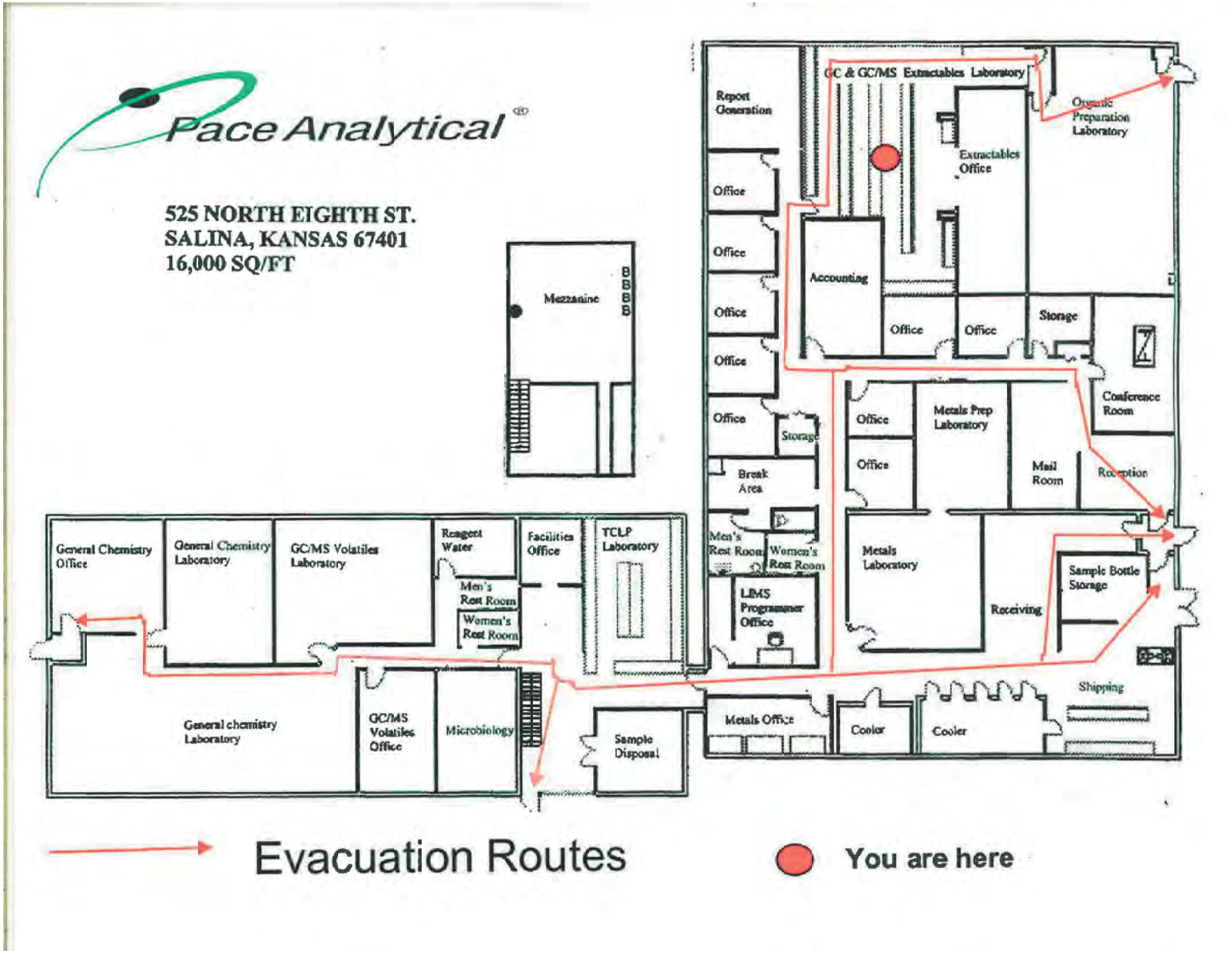


All external door do lead to a outside environment

= Door

PACE ANALYTICAL SERVICES, INC.
SOUTHEAST KANSAS SERVICE CENTER

ATTACHMENT IX - SALINA LABORATORY FLOOR PLAN



ATTACHMENT X - LABORATORY SOP LIST

SOP Number	SOP Title
ENV-MAN-LENE-0001-rev.00	Quality Manual
ENV-SOP-LENE-0001-rev.00	Review of Analytical Requests
ENV-SOP-LENE-0002-rev.01	VOCs by 624
ENV-SOP-LENE-0003-rev.00	Kansas Low Range Hydrocarbons
ENV-SOP-LENE-0004-rev.01	Waste Dilution
ENV-SOP-LENE-0005-rev.00	Microwave Soil Extraction
ENV-SOP-LENE-0006-rev.01	TPH-DRO by Method 8015B/C
ENV-SOP-LENE-0007-rev.01	Total, Amenable, and WAD Cyanide
ENV-SOP-LENE-0008-rev.01	EDB/DBCP by 504.1
ENV-SOP-LENE-0009-rev.00	Subcontracting Samples
ENV-SOP-LENE-0010-rev.00	Ferrous Iron
ENV-SOP-LENE-0011-rev.00	Total Solids
ENV-SOP-LENE-0012-rev.01	Laboratory Housekeeping
ENV-SOP-LENE-0013-rev.00	Automated Chloride
ENV-SOP-LENE-0014-rev.01	Automated Alkalinity
ENV-SOP-LENE-0015-rev.01	Dissolved Oxygen
ENV-SOP-LENE-0016-rev.00	Ammonia, Nitrogen by 350.1
ENV-SOP-LENE-0017-rev.00	Orthophosphate
ENV-SOP-LENE-0018-rev.00	ICP Metals by 6010C
ENV-SOP-LENE-0019-rev.01	HEM/SGT-HEM by 9071B
ENV-SOP-LENE-0020-rev.01	Total Phosphorus
ENV-SOP-LENE-0021-rev.00	Sample Management
ENV-SOP-LENE-0022-rev.01	Turbidity
ENV-SOP-LENE-0023-rev.00	Conductivity
ENV-SOP-LENE-0024-rev.00	Metals in Drinking Water by 200.8
ENV-SOP-LENE-0025-rev.00	Assembly of Sample Container Kits
ENV-SOP-LENE-0026-rev.00	Metals by ICP-AES
ENV-SOP-LENE-0027-rev.01	Heterotrophic Plate Count
ENV-SOP-LENE-0028-rev.01	Laboratory Security Procedures
ENV-SOP-LENE-0029-rev.00	Estimation of Uncertainty
ENV-SOP-LENE-0030-rev.01	Support Equipment
ENV-SOP-LENE-0031-rev.01	TPH-DRO/ORO by 8270C
ENV-SOP-LENE-0032-rev.01	PAHs by 8270C (SIM)
ENV-SOP-LENE-0033-rev.01	Corrective and Preventive Actions
ENV-SOP-LENE-0034-rev.00	Ignitability
ENV-SOP-LENE-0035-rev.00	Working Alone
ENV-SOP-LENE-0036-rev.01	Total Dissolved Solids
ENV-SOP-LENE-0037-rev.00	Manual Alkalinity

SOP Number	SOP Title
ENV-SOP-LENE-0038-rev.01	1,4-Dioxane by 8270C (SIM)
ENV-SOP-LENE-0039-rev.01	Separatory Funnel Extraction
ENV-SOP-LENE-0040-rev.01	Laboratory Glassware Washing
ENV-SOP-LENE-0041-rev.01	Instrument Transport
ENV-SOP-LENE-0042-rev.01	Sample Compositing
ENV-SOP-LENE-0043-rev.01	Management of Change
ENV-SOP-LENE-0044-rev.01	Proficiency Testing Program
ENV-SOP-LENE-0045-rev.01	SOP Preparation
ENV-SOP-LENE-0046-rev.01	Chemical Oxygen Demand
ENV-SOP-LENE-0047-rev.00	Total Organic Carbon
ENV-SOP-LENE-0048-rev.00	Nitrate/Nitrite by Method 353.2
ENV-SOP-LENE-0049-rev.01	Total Recoverable Phenolics
ENV-SOP-LENE-0050-rev.00	Total and Volatile Solids in Sludges
ENV-SOP-LENE-0051-rev.00	Sulfide by Iodometric Titration (SM 4500-S2F)
ENV-SOP-LENE-0052-rev.00	BOD/CBOD
ENV-SOP-LENE-0053-rev.00	SPLP by Method 1312
ENV-SOP-LENE-0054-rev.00	Organic Extraction Spike Verification
ENV-SOP-LENE-0055-rev.01	Percent Moisture in Soil
ENV-SOP-LENE-0056-rev.00	Total Residual Chlorine
ENV-SOP-LENE-0057-rev.00	pH in Water, Soil and Waste
ENV-SOP-LENE-0058-rev.00	Color Analysis
ENV-SOP-LENE-0059-rev.01	Mercury Prep and Analysis
ENV-SOP-LENE-0060-rev.01	Metals by ICPMS
ENV-SOP-LENE-0061-rev.01	Oil and Grease/TPH by 1664A
ENV-SOP-LENE-0062-rev.00	EDB/DBCP by Method 8011
ENV-SOP-LENE-0063-rev.00	PCBs in Water and Soil
ENV-SOP-LENE-0064-rev.00	Oklahoma DRO
ENV-SOP-LENE-0065-rev.00	PCBs by Method 608
ENV-SOP-LENE-0066-rev.00	BNAs by Method 625
ENV-SOP-LENE-0067-rev.00	TPH-GRO by 8260B
ENV-SOP-LENE-0068-rev.01	Standard and Reagent Preparation and Traceability
ENV-SOP-LENE-0069-rev.00	Control Chart Generation and Analysis
ENV-SOP-LENE-0070-rev.00	Total Suspended Solids
ENV-SOP-LENE-0071-rev.00	Methylene Blue Active Substances
ENV-SOP-LENE-0072-rev.00	TCLP by Method 1311
ENV-SOP-LENE-0073-rev.00	Monitoring Storage Units
ENV-SOP-LENE-0074-rev.00	Document Management
ENV-SOP-LENE-0075-rev.00	Anions by Ion Chromatography
ENV-SOP-LENE-0076-rev.00	Total Coliform and E. Coli (Colilert)
ENV-SOP-LENE-0077-rev.00	Contingency Plan

SOP Number	SOP Title
ENV-SOP-LENE-0078-rev.00	Settleable Solids
ENV-SOP-LENE-0079-rev.00	Paint Filter Liquids Test
ENV-SOP-LENE-0080-rev.00	Oxidation-Reduction Potential
ENV-SOP-LENE-0081-rev.00	BNAs by Method 8270C
ENV-SOP-LENE-0082-rev.00	EPH by Method OA-2
ENV-SOP-LENE-0083-rev.00	Oklahoma GRO
ENV-SOP-LENE-0084-rev.00	PCB Extract Cleanup
ENV-SOP-LENE-0085-rev.01	Kansas Mid- and High- Range Hydrocarbons
ENV-SOP-LENE-0086-rev.00	VOCs by 8260B
ENV-SOP-LENE-0087-rev.00	Silica Gel Cleanup
ENV-SOP-LENE-0088-rev.00	Data Reduction, Review and Reporting
ENV-SOP-LENE-0089-rev.00	Acid Digestion of Aqueous Samples
ENV-SOP-LENE-0090-rev.00	Acidity
ENV-SOP-LENE-0091-rev.00	Hexavalent Chromium
ENV-SOP-LENE-0092-rev.00	Sulfite
ENV-SOP-LENE-0093-rev.00	Specific Gravity
ENV-SOP-LENE-0094-rev.00	Acid Digestion of Soils
ENV-SOP-LENE-0095-rev.00	Suitability Test
ENV-SOP-LENE-0096-rev.00	Inhibitory Residues
ENV-SOP-LENE-0097-rev.00	Bioassay Chemical Tests
ENV-SOP-LENE-0098-rev.00	PCBs in Oil and Wipes
ENV-SOP-LENE-0099-rev.00	TPH by TCEQ 1005
ENV-SOP-LENE-0100-rev.00	A2LA Terms and Symbols
ENV-SOP-LENE-0101-rev.01	Total Kjeldahl Nitrogen
ENV-SOP-LENE-0102-rev.00	Total Volatile Solids
ENV-SOP-LENE-0103-rev.00	Cation Exchange Capacity
ENV-SOP-LENE-0104-rev.00	Fecal Coliform
ENV-SOP-LENE-0105-rev.00	Receipt and Storage of Lab Supplies
ENV-SOP-LENE-0106-rev.00	Purchasing of Lab Supplies
ENV-SOP-LENE-0107-rev.01	Field Manual
ENV-SOP-LENE-0108-rev.00	Specific Oxygen Uptake Rate
ENV-SOP-LENE-0109-rev.00	Sulfide by Methylene Blue Method (SM4500-S2D)
ENV-SOP-LENE-0110-rev.00	Training Procedures
ENV-SOP-LENE-0111-rev.00	GRO by 8015B/C
ENV-SOP-LENE-0112-rev.00	VPH by OA-1
ENV-SOP-LENE-0113-rev.00	Calibration Procedures
ENV-SOP-LENE-0114-rev.00	Microextraction of Aqueous Samples
ENV-SOP-LENE-0115-rev.00	Lab Data Filing and Archiving
ENV-SOP-LENE-0116-rev.00	Spreadsheet Validation
ENV-SOP-LENE-0117-rev.00	Limit of Detection

SOP Number	SOP Title
ENV-SOP-LENE-0118-rev.00	Vendor Qualification
ENV-SOP-LENE-0119-rev.00	Data Package Generation
ENV-SOP-LENE-0120-rev.00	Acute Aquatic Toxicity
ENV-SOP-LENE-0121-rev.00	Chronic Aquatic Toxicity
ENV-SOP-LENE-0122-rev.00	BP LaMP Project Management
ENV-SOP-LENE-0123-rev.00	New Client Setup
ENV-SOP-LENE-0124-rev.00	Acid Digestion of Wipes
ENV-SOP-LENE-0125-rev.00	Customer Complaint Resolution
ENV-SOP-LENE-0126-rev.00	Internal and External Audits
ENV-SOP-LENE-0127-rev.00	Waste Handling
ENV-SOP-LENE-0128-rev.00	Waste Management Training Requirements
ENV-SOP-LENE-0129-rev.00	Respirator Usage
ENV-SOP-LENE-0130-rev.01	Chlorinated Hydrocarbons by 8121
ENV-SOP-LENE-0131-rev.00	Reagent Water Quality
ENV-SOP-LENE-0132-rev.00	USDA Regulated Soil
ENV-SOP-LENE-0133-rev.00	Target Data Backup
ENV-SOP-LENE-0134-rev.00	Significant Figures and Rounding
ENV-SOP-LENE-0135-rev.00	Sample Homogenization and Sub-Sampling
ENV-SOP-LENE-0136-rev.00	Manual Integrations
ENV-SOP-LENE-0137-rev.00	Air Quality Monitoring and Fume Hood Monitoring
ENV-SOP-SAL1-0001-rev.00	pH in Water, Soil and Waste
ENV-SOP-SAL1-0002-rev.00	General Forms and Procedures
ENV-SOP-SAL1-0003-rev.00	Autoclaving
ENV-SOP-SAL1-0004-rev.00	Sterility Check for Sterile Filters
ENV-SOP-SAL1-0005-rev.00	Nutrient Broth
ENV-SOP-SAL1-0006-rev.00	Biological Indicators
ENV-SOP-SAL1-0007-rev.00	Sample Containers
ENV-SOP-SAL1-0008-rev.00	Materials Quality Control Checks
ENV-SOP-SAL1-0009-rev.00	UV Absorption and Transmission in Water at 254 nm
ENV-SOP-SAL1-0010-rev.00	USDA Regulated Soil
ENV-SOP-SAL1-0011-rev.00	Hexavalent Chromium
ENV-SOP-SAL1-0012-rev.01	Field pH Measurement
ENV-SOP-SAL1-0013-rev.00	Inorganic Anions by Ion Chromatography
ENV-SOP-SAL1-0014-rev.00	Hexavalent Chromium in Solid Matrices
ENV-SOP-SAL1-0015-rev.00	Fecal Coliform Bacteria by Membrane Filtration
ENV-SOP-SAL1-0016-rev.00	Heterotrophic Plate Count (Simplate)
ENV-SOP-SAL1-0017-rev.00	Total Coliform Bacteria and E.Coli
ENV-SOP-SAL1-0018-rev.01	Field, Temperature
ENV-SOP-SAL1-0019-rev.00	Field, Specific Conductance
ENV-SOP-SAL1-0020-rev.00	Field, Oxidation-Reduction Potential

SOP Number	SOP Title
ENV-SOP-SAL1-0021-rev.00	Collection of Groundwater Samples
ENV-SOP-SAL1-0022-rev.00	Collection of Surface Water Grab Samples
ENV-SOP-SAL1-0023-rev.00	Chlorine, Total Residual and Free Available
ENV-SOP-SAL1-0024-rev.00	Total Solids and Total Volatile Solids
ENV-SOP-SAL1-0025-rev.00	Biochemical Oxygen Demand and Oxygen Uptake Rate
ENV-SOP-SAL1-0026-rev.00	Nitrate + Nitrite, Nitrite, Nitrate in Water and Soil
ENV-SOP-SAL1-0027-rev.01	Production and Quality Testing of Salina Reagent Water
ENV-SOP-SAL1-0028-rev.00	Apparent Color
ENV-SOP-SAL1-0029-rev.00	Verifying Wavelength for HACH DR/4000 U Spectrometer
ENV-SOP-SAL1-0030-rev.00	Nitrite in Water and Soil - Discrete Analyzer
ENV-SOP-SAL1-0031-rev.00	Settleable Solids
ENV-SOP-SAL1-0032-rev.00	Turbidity
ENV-SOP-SAL1-0033-rev.00	Colorimetric Determination of Orthophosphate
ENV-SOP-SAL1-0034-rev.00	Waste Handling and Management
ENV-SOP-SAL1-0035-rev.00	Waste Management Training Requirements
ENV-SOP-SAL1-0036-rev.00	Collection of Grab Water Samples from Tap or Faucet
ENV-SOP-SAL1-0037-rev.00	Field - Total Residual Chlorine
ENV-SOP-SAL1-0038-rev.00	Field - Total Residual Chlorine
ENV-SOP-SAL1-0039-rev.00	Field - Analysis of Turbidity
ENV-SOP-SAL1-0040-rev.00	Field - Dissolved Oxygen
ENV-SOP-SAL1-0041-rev.00	Total Dissolved Solids
ENV-SOP-SAL1-0042-rev.00	Total Suspended Solids

ATTACHMENT XI – LENEXA LABORATORY CERTIFICATION LIST

State	Program	Accrediting Body	Certificate Number	Expiration Date
Arkansas	Hazardous Waste	Department of Environmental Quality	18-016-0	2/2/2019
Arkansas	Wastewater	Department of Environmental Quality	18-016-0	2/2/2019
Arkansas	Drinking Water	Department of Health	Letter	4/30/2019
Illinois	Non Potable Water	Environmental Protection Agency	4455	4/28/2019
Illinois	Solid and Chemical Materials	Environmental Protection Agency	4455	4/28/2019
Iowa	Solid Waste and Contaminated Sites	Department of Natural Resources	118	7/1/2020
Iowa	Underground Storage Tank	Department of Natural Resources	118	7/1/2020
Iowa	Clean Water Act	Department of Natural Resources	118	7/1/2020
Kansas	SDWA (Potable Water)	Department of Health & Environment	E-10116	4/30/2019
Kansas	CWA (Non Potable Water)	Department of Health & Environment	E-10116	4/30/2019
Kansas	RCRA (Non Potable Water)	Department of Health & Environment	E-10116	4/30/2019
Kansas	RCRA (Solid & Hazardous Material)	Department of Health & Environment	E-10116	4/30/2019
Kansas	Field	Department of Health & Environment	E-92587	1/31/2019
Louisiana	Non Potable Water	Department of Environmental Quality	3055	6/30/2019
Louisiana	Solid Chemical Materials	Department of Environmental Quality	3055	6/30/2019
Missouri	Potable Water	Department of Natural Resources	10070	4/30/2019
Nevada	CWA (Non Potable Water)	Division of Environmental Protection	KS000212019-1	7/31/2019
Nevada	RCRA (Non Potable Water)	Division of Environmental Protection	KS000212019-1	7/31/2019
Nevada	RCRA (Solid & Waste Materials)	Division of Environmental Protection	KS000212019-1	7/31/2019
Oklahoma	Non-Potable Water	Department of Environmental Quality	2018-098,-099	8/31/2019
Oklahoma	Solids	Department of Environmental Quality	2018-098	8/31/2019
Texas	Non-Potable Water	Commission on Environmental Quality	T104704407-18-11	9/30/2019
Texas	Solid & Chemical Materials	Commission on Environmental Quality	T104704407-18-11	9/30/2019
USDA	Foreign Soil Import	Animal and Plant Health Inspection Service	P330-18-00064	3/5/2021
Utah	CWA (Non Potable Water)	Department of Health	KS000212018-8	5/31/2019
Utah	RCRA (Non Potable Water)	Department of Health	KS000212018-8	5/31/2019
Utah	RCRA (Solid & Hazardous Material)	Department of Health	KS000212018-8	5/31/2019

ATTACHMENT XII – SALINA LABORATORY CERTIFICATION LIST

State	Program	Accrediting Body	Certificate Number	Expiration Date
Kansas	Field	Department of Health & Environment	E-92593	4/30/2019
Kansas	SDWA (Potable Water)	Department of Health & Environment	E-10146	4/30/2019
Kansas	CWA (Non Potable Water)	Department of Health & Environment	E-10146	4/30/2019
Kansas	RCRA (Non Potable Water)	Department of Health & Environment	E-10146	4/30/2019
Kansas	RCRA (Solid & Hazardous Material)	Department of Health & Environment	E-10146	4/30/2019
Oklahoma	Non-Potable Water	Department of Environmental Quality	2018-100	8/31/2019
Oklahoma	Solids	Department of Environmental Quality	2018-100	8/31/2019
Texas	Drinking Water	Commission on Environmental Quality	T104704246-18-10	12/31/2019
Texas	Non-Potable Water	Commission on Environmental Quality	T104704246-18-10	12/31/2019
Texas	Solid & Chemical Materials	Commission on Environmental Quality	T104704246-18-10	12/31/2019

ATTACHMENT XIII - METHOD HOLD TIME, CONTAINER AND PRESERVATION GUIDE

THE HOLDING TIME INDICATED IN THE CHART BELOW IS THE MAXIMUM ALLOWABLE TIME FROM COLLECTION TO EXTRACTION AND/OR ANALYSIS PER THE ANALYTICAL METHOD. FOR METHODS THAT REQUIRE PROCESSING PRIOR TO ANALYSIS, THE HOLDING TIME IS DESIGNATED AS 'PREPARATION HOLDING TIME/ANALYSIS HOLDING TIME'.

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Acid Base Accounting	Sobek	Solid	Plastic/Glass	None	N/A
Acidity	SM2310B	Water	Plastic/Glass	≤ 6°C	14 Days
Acid Volatile Sulfide	Draft EPA 1629	Solid	8oz Glass	≤ 6°C	14 Days
Actinides	HASL-300	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Actinides	HASL-300	Solid	Plastic/Glass	None	180 Days
Alkalinity	SM2320B/310.2	Water	Plastic/Glass (NY requires separate bottle filled to the exclusion of air)	≤ 6°C	14 Days
Alkylated PAHs		Water	1L Amber Glass	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved
Alkylated PAHs		Solid	8oz Glass	≤ 10°C	1 Year/40 Days
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0/300.1/SM4110B	Water	Plastic/Glass	≤ 6°C; EDA if bromate or chlorite run	All analytes 28 days except: NO_2, NO_3, o-Phos (48 Hours); chlorite (immediately for 300.0; 14 Days for 300.1). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0	Solid	Plastic/Glass	≤ 6°C	All analytes 28 days except: NO_2, NO_3, o-Phos (48 hours); chlorite (immediately). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4	9056	Water/ Solid	Plastic/Glass	≤ 6°C	48 hours
Aromatic and Halogenated Volatiles (see note 1)	8021	Solid	5035 vial kit	See note 1	14 days
Aromatic and Halogenated Volatiles	602/8021	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	14 Days (7 Days for aromatics if unpreserved)

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Asbestos	EPA 600/R-93/116	Solid	Plastic/Glass; bulk- 2" square; popcorn ceiling- 2tbsp; soil- 4oz	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Bacteria, Total Plate Count	SM9221D	Water	Plastic/WK	≤ 6°C; $Na_2S_2O_3$	24 Hours
Base/Neutrals and Acids	8270	Solid	8oz Glass	≤ 6°C	14/40 Days
Base/Neutrals and Acids	625/8270	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	7/40 Days
Base/Neutrals, Acids & Pesticides	525.2	Water	1L Amber Glass	pH<2 HCl; ≤ 6°C; Na sulfite if Cl_2 present	14/30 Days
Biomarkers		Water	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	≤ 6°C; pH<2 1:1 HCl (optional)
Biomarkers		Solid	≤ 10°C	1 Year/40 Days	≤ 10°C
BOD/cBOD	SM5210B	Water	Plastic/Glass	≤ 6°C	48 hours
Boiling Range Distribution of Petroleum Fractions	ASTM D2887-98	Product	10mL glass vials	≤ 6°C	N/A
BTEX/Total Hydrocarbons	TO-3	Air	Summa Canister	None	28 Days
BTEX/Total Hydrocarbons	TO-3	Air	Tedlar Bag or equivalent	None	72 Hours
Carbamates	531.1	Water	Glass	$Na_2S_2O_3$, Monochloroacetic acid pH <3; ≤ 6°C	28 Days
Carbamates	8318	Water	Glass	Monochloroacetic acid pH 4-5; ≤ 6°C	7/40 Days
Carbamates	8318	Solid	Glass	≤ 6°C	7/40 Days
Carbon Specific Isoptope Analysis (CSIA)	AM24	Water	40mL clear VOA vial with TLS	≤ 6°C, trisodium phosphate or HCl	N/A
Cation/Anion Balance	SM1030E	Water	Plastic/Glass	None	None
Cation Exchange	9081	Solid	8oz Glass	None	unknown
Cations (Ferrous Iron, Ferric Iron, Divalent Manganese)	7199 modified	Water	40mL clear VOA vials with mylar septum	≤ 6°C; HCl	48 Hours
Chloride	SM4500Cl-C,E	Water	Plastic/Glass	None	28 Days
Chlorinated Hydrocarbons in Vapor	AM4.02	Vapor	20cc vapor vial with flat septum	None	N/A

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Chlorine, Residual	SM4500Cl-D,E,G/330.5/Hach 8167	Water	Plastic/Glass	None	15 minutes
Chlorophyll	SM10200H	Water	Opaque bottle or aluminum foil	≤ 6°C	48 Hours to filtration
COD	SM5220C, D/410.4/Hach 8000	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Coliform, Fecal	SM9222D	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9222D	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	24 Hours
Coliform, Fecal	SM9221E	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9221E	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	24 Hours
Coliform, Total	SM9222B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total	SM9221B	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total, Fecal and E. coli	Colilert/ Quanti-tray	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total and E. coli	SM9223B	Drinking Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	30 Hours
Color	SM2120B,E	Water	Covered Plastic/Acid Washed Amber Glass	≤ 6°C	48 Hours
Condensable Particulate Emissions	EPA 202	Air	Solutions	None	180 Days
Cyanide, Reactive	SW846 chap.7	Water	Plastic/Glass	None	28 Days
Cyanide, Reactive	SW846 chap.7	Solid	Plastic/Glass	None	28 Days
Cyanide, Total and Amenable	SM4500CN-A,B,C,D,E,G,I,N/9010/9012/335.4	Water	Plastic/Glass	pH≥12 NaOH; ≤ 6°C; ascorbic acid if Cl_2 present	14 Days (24 Hours if sulfide present- applies to SM4500CN only)
Diesel Range Organics- AK DRO	AK102	Solid	8oz Glass	≤ 6°C	14/40 Days
Diesel Range Organics- AK DRO	AK102	Water	1L Glass	pH<2 HCl; ≤ 6°C	14/40 Days
Diesel Range Organics- TPH DRO	8015	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Diesel Range Organics- TPH DRO	8015	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	7/40 Days
Diesel Range Organics- TPH DRO	8015	Tissue	1L Amber Glass	≤ - 10°C	1 Year if frozen/40 Days
Diesel Range Organics- TPH DRO	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Diesel Range Organics- NwTPH-Dx	Nw-TPH-Dx	Solid	8oz Glass Jar	≤ 6°C	14/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Diesel Range Organics- NwTPH-Dx	Nw-TPH-Dx	Water	1L Amber Glass	pH <2 HCl; ≤ 6°C	14/40 Days; 7 Days from collection to extraction if unpreserved
Diesel Range Organics- WI DRO	WI MOD DRO	Solid	Tared 4oz Glass Jar	≤ 6°C	10/47 Days
Diesel Range Organics- WI DRO	WI MOD DRO	Water	1L Amber Glass	≤ 6°C; pH <2 HCl	14/40 Days
Dioxins and Furans	1613B	Solid	8oz Glass	≤ 6°C	1 year
Dioxins and Furans	1613B	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	1 year
Dioxins and Furans	1613B	Fish/ Tissue	Aluminum foil	≤ 6°C	1 year
Dioxins and Furans	8290	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	30/45 Days
Dioxins and Furans	8290	Solid	8oz Glass	≤ 6°C	30/45 Days
Dioxins and Furans	8290	Fish/ Tissue	Not specified	< -10°C	30/45 Days
Dioxins and Furans	TO-9	Air	PUF	None	7/40 Days
Diquat/Paraquat	549.2	Water	Amber Plastic	≤ 6°C; $Na_2S_2O_3$	7/21 Days
EDB/DBCP (8011) EDB/DBCP/1,2,3-TCP (504.1)	504.1/8011	Water	40mL vials	≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	14 Days
Endothall	548.1	Water	Amber Glass	≤ 6°C; $Na_2S_2O_3$	7/14 Days
Enterococci	EPA 1600	Water	100mL Plastic	≤ 10°C	8 Hours
Enterococci	Enterolert	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Explosives	8330/8332	Water	1L Amber Glass	≤ 6°C	7/40 Days
Explosives	8330/8332	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Water	1L Amber Glass	pH < 2 HCl; ≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Solid	4oz Glass Jar	≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	MA-EPH	Water	1L Amber Glass	pH<2 HCl; ≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	MA-EPH	Solid	4oz Glass Jar	≤ 6°C	7/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Fecal Streptococci	SM9230B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Ferrous Iron	SN3500Fe-D; Hach 8146	Water	Glass	None	Immediate
Flashpoint/ Ignitability	1010	Liquid	Plastic/Glass	None	28 Days
FL PRO	FL PRO DEP (11/1/95)	Liquid	Glass, PTFE lined cap	≤ 6°C; pH <2 H_2SO_4 or HCl	7/40 Days
Fluoride	SM4500Fl-C,D	Water	Plastic	None	28 Days
Gamma Emitting Radionuclides	901.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Gasoline Range Organics	8015	Water	40mL vials	pH<2 HCl	14 Days
Gasoline Range Organics	8015	Solid	5035 vial kit	See note 1	14 days
Gasoline Range Organics (C3-C10)	8260B modified	Water	40mL vials	≤ 6°C; HCl	14 Days
Gasoline Range Organics (C3-C10)	8260B modified	Solid	4oz Glass Jar	≤ 6°C	14 Days
Gasoline Range Organics- AK GRO	AK101	Solid	5035 vial kit	See 5035 note*	28 Days if GRO only (14 Days with BTEX)
Gasoline Range Organics- AK GRO	AK101	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Water	40mL vials	pH<2 HCl; ≤ 6°C	7 Days unpreserved; 14 Days preserved
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Solid	40mL vials	≤ 6°C; packed jars with no headspace	14 Days
Gasoline Range Organics- WI GRO	WI MOD GRO	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days
Gasoline Range Organics- WI GRO	WI MOD GRO	Solid	40mL MeOH vials	≤ 6°C in MeOH	21 Days
Glyphosate	547	Water	Glass	≤ 6°C; $Na_2S_2O_3$	14 Days (18 Months frozen)
Grain Size	ASTM D422	Solid	Not specified	Ambient	N/A
Gross Alpha (NJ 48Hr Method)	NJAC 7:18-6	Water	Plastic/Glass	pH<2 HNO_3	48 Hrs
Gross Alpha and Gross Beta	9310/900.0	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Gross Alpha and Gross Beta	9310	Solid	Glass	None	180 Days
Haloacetic Acids	552.1/552.2	Water	40mL Amber vials	NH_4Cl; ≤ 6°C	14/7 Days if extracts stored ≤ 6°C or 14/14 Days if extracts stored at ≤ -10°C

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Hardness, Total (as $CaCO_3$)	SM2340B,C/130.1	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Heterotrophic Plate Count (SPC/HPC)	SM9215B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Heterotrophic Plate Count (SPC/HPC)	SimPlate	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Herbicides, Chlorinated	8151	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Herbicides, Chlorinated	8151	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	7/40 Days
Herbicides, Chlorinated	515.1/515.3	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	14/28 Days
Hexavalent Chromium	7196/218.6/ SM3500Cr-B, C, D	Water	Plastic/Glass	≤ 6°C	24 Hours (see note 4)
Hexavalent Chromium	218.6/SM3500Cr-B, C, D	Water	Plastic/Glass	Ammonium Buffer pH 9.3-9.7	28 Days (see note 4)
Hexavalent Chromium	218.6/218.7	Drinking Water	Plastic/Glass	Ammonium buffer pH >8	14 Days (see note 4)
Hexavalent Chromium	7196 (with 3060A)	Solid		≤ 6°C	30 Days from collection to extraction and 7 days from extraction to analysis
Hydrocarbons in Vapor	AM4.02	Vapor	20cc vapor vial with flat septum	None	N/A
Hydrogen by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Hydrogen Halide and Halogen Emissions	EPA 26	Air	Solutions	None	6 Months
Ignitability of Solids	1030	Non-liquid Waste	Plastic/Glass	None	28 Days
Lead Emissions	EPA 12	Air	Filter/Solutions	None	6 Months
Light Hydrocarbons by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Light Hydrocarbons in Vapor	AM20GAx	Vapor	20cc vapor vial with flat septum	None	14 Days
Lipids	Pace Lipids	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen
Mercury, Low-Level	1631E	Solid	Glass	None	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Mercury, Low-Level	1631E	Water	Fluoropolymer bottles (Glass if Hg is only analyte being tested)	12N HCl or BrCl	48 Hours for preservation or analysis; 28 Days to preservation if sample oxidized in bottle; 90 Days for analysis if preserved
Mercury, Low-Level	1631E	Tissue	Plastic/Glass	≤ - 10°C	28 Days if frozen
Mercury	7471	Solid	8oz Glass Jar	≤ 6°C	28 Days
Mercury	7470/245.1/245.2	Water	Plastic/Glass	pH<2 HNO_3	28 Days
Mercury	7471/245.6	Tissue	Plastic/Glass	≤ - 10°C	28 Days if frozen
Metals (GFAA)	7000/200.9	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP)	NIOSH 7300A/7303	Air	Filters	None	180 Days
Metals (ICP/ICPMS)	6010/6020	Solid	8oz Glass Jar	None	180 Days
Metals (ICP/ICPMS)	6010/6020/200.7/200.8	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP/ICPMS)	6020	Tissue	Plastic/Glass	≤ -10°C	180 Days if frozen
Methane, Ethane, Ethene	8015 modified	Water	40mL vials	HCl	14 Days
Methane, Ethane, Ethene	RSK-175; PM01/AM20GAx	Water	20mL vials	HCl; or trisodium phosphate or benzalkonium chloride and ≤ 6°C	14 Days; 7 Days unpreserved
Methane, Ethane, Ethene	EPA 3C	Air	Summa Canister	None	28 Days
Methane, Ethane, Ethene	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
Methanol, Ethanol	8015 modified	Water	40mL vials	≤ 6°C	14 Days
Methanol, Ethanol	8015 modified	Solid	2oz Glass	≤ 6°C	14 Days
Methyl Mercury	1630	Water	Teflon/ fluoropolymer	Fresh water- 4mL/L HCl; Saline water- 2mL/L H_2SO_4 (must be preserved within 48 hours of collection)	6 months
Methyl Mercury	1630	Tissue	2-4oz glass jar	≤ 0°C	28 Days; ethylated distillate 48 hours
Nitrogen, Ammonia	SM4500NH3/350.1	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Total Kjeldahl (TKN)	351.2	Solid	Plastic/Glass	≤ 6°C	28 Days
Nitrogen, Total Kjeldahl (TKN)	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Nitrate	SM4500-NO3/352.1	Water	Plastic/Glass	≤ 6°C	24 Hours preferred
Nitrogen, Nitrate & Nitrite combination	353.2	Solid	Plastic/Glass	≤ 6°C	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Nitrogen, Nitrate & Nitrite combination	SM4500-NO3/353.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Nitrite or Nitrate separately	SM4500-NO2/353.2	Water	Plastic/Glass	≤ 6°C	48 Hours
Nitrogen, Organic	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Non-Methane Organics	EPA 25C	Air	Summa Canister	None	28 Days
Non-Methane Organics	EPA 25C	Air	Tedlar Bag or equivalent	None	72 Hours
Odor	SM2150B	Water	Glass	≤ 6°C	24 Hours
Oil and Grease/HEM	1664A/SM5520B/9070	Water	Glass	pH<2 H_2SO_4 or HCl; ≤ 6°C	28 Days
Oil and Grease/HEM	9071	Solid	Glass	≤ 6°C	28 Days
Oil Range Organics	8015	Solid	Glass	≤ 6°C	14/40 Days
Oil Range Organics	8015	Water	Glass	≤ 6°C	7/40 Days
Organic Matter	ASA 29-3.5.2	Solid	Plastic/Glass	None; samples air-dried and processed prior to analysis	N/A
Oxygen, Dissolved (Probe)	SM4500-O	Water	Glass	None	15 minutes
Oxygenates on Product (GCMS SIM)	1625 modified	Product	10mL glass vial	≤ 6°C	14 Days (7 Days from extraction)
PBDEs	1614	Water	1L Amber Glass	≤ 6°C	1 Year/1 Year
PBDEs	1614	Solid	Wide Mouth Jar	≤ 6°C	1 Year/1 Year
PBDEs	1614	Tissue	Aluminum Foil	≤ -10°C	1 Year/1 Year
PCBs and Pesticides, Organochlorine	TO-4/TO-10	Air	PUF	None	7/40 Days
PCBs and Pesticides, Organochlorine	608	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	Pest: 7/40 Days; PCB: 1 Year/1 Year
PCBs, Pesticides, Herbicides	508.1	Water	Glass	Na_2SO_3; pH<2 HCl; ≤ 6°C	14/30 Days
PCBs, total as Decachlorobiphenyl	508A	Water	1L Glass, TFE lined cap	≤ 6°C	14/30 Days
Perchlorate	331	Water	Plastic/Glass	≥0-6°C, field filtered with headspace	28 Days
Permanent Gases (O_2, N_2, CO_2)	RSK-175; PM01/AM20GAx	Water	40mL vials	Benzalkonium chloride and ≤ 6°C	14 Days
Permanent Gases by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Permanent Gases in Vapor	AM20GAx	Vapor	20cc vapor vial with flat septum	None	14 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Pesticides, Organochlorine	8081	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	7/40 Days
Pesticides, Organochlorine	8081	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Pesticides, Organochlorine	8081	Tissue	8oz Glass Jar	≤ -10°C	1 Year if frozen/40 Days
Pesticides, Organophosphorous	8141	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Pesticides, Organophosphorous	8141	Water	1L Amber Glass	pH 5-8 with NaOH or H_2SO_4; ≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	7/40 Days
PCBs (Aroclors)	8082	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	1 Year/1 Year
PCBs (Aroclors)	8082	Solid	8oz Glass Jar	≤ 6°C	1 Year/1 Year
PCBs (Aroclors)	8082	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen/1 Year
PCB Congeners	1668A	Water	1L Amber Glass	≤ 6°C but above freezing	1 Year/1 Year
PCB Congeners	1668A	Solid	4-8oz Glass Jar	≤ 6°C but above freezing	1 Year/1 Year
PCB Congeners	1668A	Tissue	4-8oz Glass Jar	≤ -10°C	1 Year/1 Year
Paint Filter Liquid Test	9095	Water	Plastic/Glass	None	N/A
Particle Size	ASA 15-5 modified	Solid	Plastic/Glass (100g sample)	None	N/A
Particulates	PM-10	Air	Filters	None	180 Days
Permanent Gases	EPA 3C	Air	Summa Canister	None	28 Days
Permanent Gases	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
pH	SM4500H+B/9040	Water	Plastic/Glass	None	15 minutes
pH	9045	Solid	Plastic/Glass	None	7 Days
Phenol, Total	420.1/420.4/9065/9066	Water	Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Phosphorus, Orthophosphate	SM4500P/365.1/365.3	Water	Plastic	≤ 6°C	Filter within 15 minutes, Analyze within 48 Hours
Phosphorus, Total	SM4500P/ 365.1/365.3/365.4	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Phosphorus, Total	365.4	Solid	Plastic/Glass	≤ 6°C	28 Days
Polynuclear Aromatic Hydrocarbons	TO-13	Air	PUF	None	7/40 Days
Polynuclear Aromatic Hydrocarbons	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Polynuclear Aromatic Hydrocarbons	8270 SIM	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Polynuclear Aromatic Hydrocarbons	8270 SIM	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl_2 present	7/40 Days
Polynuclear Aromatic Hydrocarbons	8270 SIM	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen/40 Days
Purgeable Organic Halides	9021	Water	Glass; no headspace	≤ 6°C	14 Days
Radioactive Strontium	905.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-226	903.0/903.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note 3)	9320/904.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note 3)	9320	Solid	Plastic/Glass		
Residual Range Organics- AK RRO	AK103	Solid	8oz Glass	≤ 6°C	14/40 Days
Saturated Hydrocarbons		Water	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	≤ 6°C; pH<2 1:1 HCl (optional)
Saturated Hydrocarbons		Solid	≤ 10°C	1 Year/40 Days	≤ 10°C
Silica, Dissolved	SM4500Si-D	Water	Plastic	≤ 6°C	28 Days
Solids, Settleable	SM2540F	Water	Glass	≤ 6°C	48 Hours
Solids, Total	SM2540B	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total	SM2540G	Solid	Plastic/Glass	≤ 6°C	7 Days
Solids, Total (FOC, OM, Ash)	ASTM D2974	Solid	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Dissolved	SM2540C	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Suspended	SM2540D/USGS I-3765-85	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Volatile	160.4/SM2540E	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Volatile	160.4	Solid	Plastic/Glass	≤ 6°C	7 Days
Specific Conductance	SM2510B/9050/120.1	Water	Plastic/Glass	≤ 6°C	28 Days
Stationary Source Dioxins and Furans	EPA 23	Air	XAD Trap	None	30/45 Days
Stationary Source Mercury	EPA 101	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source Metals	EPA 29	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source PM10	EPA 201A	Air	Filters	None	180 Days
Stationary Source Particulates	EPA 5	Air	Filter/Solutions	None	180 Days
Sulfate	SM4500SO4/9036/ 9038/375.2/ASTM D516	Water	Plastic/Glass	≤ 6°C	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Sulfide, Reactive	SW-846 Chap.7	Water	Plastic/Glass	None	28 Days
Sulfide, Reactive	SW-846 Chap.7	Solid	Plastic/Glass	None	28 Days
Sulfide, Total	SM4500S/9030	Water	Plastic/Glass	pH>9 NaOH; ZnOAc; ≤ 6°C	7 Days
Sulfite	SM4500SO3	Water	Plastic/Glass	None	15 minutes
Surfactants (MBAS)	SM5540C	Water	Plastic/Glass	≤ 6°C	48 Hours
Total Alpha Radium (see note 3)	9315/903.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Total Alpha Radium (see note 3)	9315	Solid	Plastic/Glass	None	180 days
Total Inorganic Carbon (TIC)	PM01/AM20GAx	Water	40mL VOA vial with mylar septum	≤ 6°C	14 Days
Total Organic Carbon (TOC)	SM5310B,C,D/9060	Water	Glass	pH<2 H_2SO_4 or HCl; ≤ 6°C	28 Days
Total Organic Carbon (TOC)	9060/Walkley Black/Lloyd Kahn	Solid	Glass	≤ 6°C	14 Days
Total Organic Halogen (TOX)	SM5320/9020	Water	Glass; no headspace	≤ 6°C	14 Days
Total Petroleum Hydrocarbons (aliphatic and aromatic)	TPHCWG	Water	40mL vials	pH<2 HCl, no headspace, ≤ 6°C	7 Days
Total Petroleum Hydrocarbons (aliphatic and aromatic)	TPHCWG	Solid	Glass	≤ 6°C	14 days
Tritium	906.0	Water	Glass	None	180 days
Turbidity	SM2130B/180.1	Water	Plastic/Glass	≤ 6°C	48 Hours
Total Uranium	908.0/ASTM D5174-97	Water	Plastic/Glass	pH<2 HNO_3	180 days
UCMR Metals	200.8	Water	Plastic or glass	pH<2 HNO_3	28 Days
UCMR Hexavalent Chromium	218.7	Water	HDPE or propylene	Na_2CO_3/$NaHCO_3$/ $(NH_4)_2SO_4$; pH>8	14 Days
UCMR Chlorate	300.1	Water	Plastic or glass	EDA	28 Days
UCMR Perfluorinated Compounds	537	Water	Polypropylene	Trizma	14 Days
UCMR 1,4-Dioxane	522	Water	Glass	Na_2SO_3, $NaHSO_4$; pH<4	28 Days
UV254	SM5910B	Water	Glass	≤ 6°C	48 Hours
Vermiculite	EPA 600/R-93/116	Solid	Plastic/Glass	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Volatile Fatty Acids	AM21G	Water	40mL clear VOA vials	≤ 6°C	21 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Volatile Fatty Acids (low level)	AM23G	Water	40mL clear VOA vials	≤ 6°C with benzalkonium chloride	14 Days
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days preserved
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Solid	4-8oz Glass Jar	≤ 6°C; packed jars with no headspace	7/28 Days
Volatiles	TO-14	Air	Summa Canister	None	28 Days
Volatiles	TO-14	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	TO-15	Air	Summa Canister or Tedlar Bag	None	28 Days
Volatiles	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Volatiles	TO-18/8260	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	8260	Solid	5035 vial kit	See note 1 (analyze for acrolein and acrylonitrile per local requirements)	14 days
Volatiles	8260	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl_2 present (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days
Volatiles	8260	Conc. Waste	5035 vial kit or 40mL vials	≤ 6°C	14 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Volatiles	624	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl_2 present (or unpreserved if run within 7 days of collection) (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days (7 Days for aromatics if unpreserved)
Volatiles (see note 2)	524.2	Water	40mL vials (in duplicate)	pH<2 HCl; ≤ 6°C; Ascorbic acid or $Na_2S_2O_3$ if Cl_2 present	14 Days
Whole Oil	ASTM D3328 (prep); ASTM D5739	Product	10mL glass vials	≤ 6°C	N/A

[1] **5035/5035A Note**: 5035 vial kit typically contains 2 vials water, preserved by freezing **or**, 2 vials aqueous sodium bisulfate preserved at 4°C, **and** one vial methanol preserved at ≤6°C **and** one container of unpreserved sample stored at ≤6°C.

[2] Method 524.2 lists ascorbic acid as the preservative when residual chlorine is suspected, unless gases or Table 7 compounds are NOT compounds of interest and then sodium thiosulfate is the preservative recommended.

[3] Methods 9315 and 9320 both state that if samples are unpreserved, the samples should be brought to the lab within 5 days of collection, preserved in the lab, and then allowed to sit for a minimum of 16 hours before sample preparation/analysis.

[4] The holding time for hexavalent chromium may be extended by the addition of the ammonium buffer listed in EPA 218.6 per the 2012 EPA Method Update Rule. Although Method 218.6 stipulates a different pH range (9.0 to 9.5) for buffering, this method requirement was modified in the Method Update Rule to a pH range of 9.3 to 9.7.For non-potable waters, adjust the pH of the sample to 9.3 to 9.7 during collection with the method required ammonium sulfate buffer to extend the holding time to 28 days. For potable waters, addition of the buffer during collection will extend the holding time for 14 days per EPA 218.7 and the EPA UCMR program.

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State of Kansas

Department of Health and Environment

CERTIFICATE

This is to certify that Certification No.: E-10116

Pace Analytical Services, LLC - Lenexa KS

9608 Loiret Boulevard
Lenexa, KS 66219-2406

has been accredited in accordance with K.S.A. 65-1,109a under the standards adopted in K.A.R. 28-15-36 for performing environmental analyses for the parameters listed on the most current scope of accreditation. Continuous accreditation depends on successful, ongoing participation in the program. Clients are urged to verify with this agency the laboratory's certification status for particular methods and analytes.

Effective Date: 5/1/2018

Expiration Date: 4/30/2019

Secretary
Department of Health and Environment

Section Chief
Department of Health and Environment

STATE OF KANSAS

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JEFF ANDERSEN, SECRETARY

The Kansas Department of Health and Environment encourages all clients and data users to verify the most current scope of accreditation for certification number E-10116

The analytes tested and the corresponding matrix and method which a laboratory is authorized to perform at any given time will be those indicated in the most recently issued scope of accreditation. The most recent scope of accreditation supersedes all previously issued scopes of accreditation. It is the certified laboratory's responsibility to review this document for any discrepancies. This scope of accreditation will be recalled in the event that your laboratory's certification is revoked.

Accreditation Start: 5/11/2018 Accreditation End: 4/30/2019

EPA Number: ***KS00021*** **Scope of Accreditation for Certification Number: E-10116**

Pace Analytical Services, LLC - Lenexa KS

Primary AB

Program/Matrix: ***CWA (Non Potable Water)***

Method Colilert®	
Escherichia coli	KS
Method Colilert® Quanti-Tray®	
Escherichia coli	KS
Method EPA 1000.0 - Fathead Minnow, 7-day Chronic, daily renwal, 20% DMW, 25deg C	
IC25 (ON) Growth	KS
NOEC (ON) Growth	KS
NOEC Survival	KS
Method EPA 1000.0 - Fathead Minnow, 7-day Chronic, daily renwal, MHSF, 25deg C	
IC25 (ON) Growth	KS
NOEC (ON) Growth	KS
NOEC Survival	KS
Method EPA 1002.0 - Ceriodaphnia dubia, 3-Brood Chronic, daily renewal, 20% DMW, 25 °C	
IC25 Reproduction	KS
NOEC Reproduction	KS
NOEC Survival	KS
Method EPA 1002.0 - Ceriodaphnia dubia, 3-Brood Chronic, daily renewal, MHSF, 25°C	
IC25 Reproduction	KS
NOEC Reproduction	KS
NOEC Survival	KS
Method EPA 120.1	
Conductivity	KS
Method EPA 160.4	
Residue-volatile	KS
Method EPA 1664A	

Pace Analytical Services, LLC - Lenexa KS

	Primary AB
Program/Matrix: ***CWA (Non Potable Water)***	
Oil & Grease	KS
Method EPA 180.1	
Turbidity	KS
Method EPA 200.7	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Boron	KS
Cadmium	KS
Calcium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Hardness	KS
Iron	KS
Lead	KS
Magnesium	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Potassium	KS
Selenium	KS
Silica-dissolved	KS
Silica-dissolved	KS
Silver	KS
Sodium	KS
Thallium	KS
Tin	KS
Titanium	KS
Vanadium	KS
Zinc	KS
Method EPA 200.8	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Cadmium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Iron	KS
Lead	KS
Manganese	KS

Pace Analytical Services, LLC - Lenexa KS **Primary AB**

Program/Matrix: ***CWA (Non Potable Water)***

Molybdenum	KS
Nickel	KS
Selenium	KS
Silver	KS
Thallium	KS
Uranium	KS
Vanadium	KS
Zinc	KS

Method EPA 2000.0 - Fathead Minnow Acute Toxicity

LC50	KS

Method EPA 2000.0 - Fathead Minnow, 48-hr Acute, nonrenewal, 20% DMW, 25deg C

LC50	KS

Method EPA 2000.0 - Fathead minnow, 48-hr Acute, nonrenewal, MHSF, 25deg C

LC50	KS

Method EPA 2002.0 - Ceriodaphnia Acute Toxicity

LC50	KS

Method EPA 2002.0 - Ceriodaphnia dubia, 48-hr Acute, nonrenewal, MHSF, 25deg C

LC50	KS

Method EPA 2021.0 - Daphnia magna, 48-hr Acute, nonrenewal, MHSF 25deg C

LC50	KS

Method EPA 2021.0 - Daphnia pulex, 48-hr Acute, nonrenewal, MHSF 25deg C

LC50	KS

Method EPA 245.1

Mercury	KS

Method EPA 300.0

Bromide	KS
Chloride	KS
Fluoride	KS
Nitrate	KS
Nitrite	KS
Sulfate	KS

Method EPA 350.1

Ammonia as N	KS

Method EPA 351.2

Total Kjeldahl Nitrogen (TKN)	KS

Method EPA 353.2

Nitrate	KS
Nitrate-nitrite	KS
Nitrite	KS

Method EPA 353.2 (calc.)

Organic nitrogen	KS

Method EPA 365.1

Orthophosphate as P	KS

Pace Analytical Services, LLC - Lenexa KS **Primary AB**

Program/Matrix: ***CWA (Non Potable Water)***

Method EPA 365.4	
Phosphorus, total	KS
Method EPA 410.4	
Chemical oxygen demand	KS
Method EPA 420.1	
Total phenolics	KS
Method EPA 420.4	
Total phenolics	KS
Total phenolics	KS
Method EPA 6010B	
Arsenic	KS
Cadmium	KS
Copper	KS
Lead	KS
Molybdenum	KS
Nickel	KS
Selenium	KS
Total chromium	KS
Zinc	KS
Method EPA 6020A	
Arsenic	KS
Cadmium	KS
Copper	KS
Lead	KS
Molybdenum	KS
Nickel	KS
Selenium	KS
Total chromium	KS
Uranium	KS
Zinc	KS
Method EPA 608	
Aroclor-1016 (PCB-1016)	KS
Aroclor-1221 (PCB-1221)	KS
Aroclor-1232 (PCB-1232)	KS
Aroclor-1242 (PCB-1242)	KS
Aroclor-1248 (PCB-1248)	KS
Aroclor-1254 (PCB-1254)	KS
Aroclor-1260 (PCB-1260)	KS
Method EPA 624	
1,1,1-Trichloroethane	KS
1,1,2,2-Tetrachloroethane	KS
1,1,2-Trichloroethane	KS
1,1-Dichloroethane	KS
1,1-Dichloroethylene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS

Program/Matrix: ***CWA (Non Potable Water)***

1,2-Dichloroethane (Ethylene dichloride)	KS
1,2-Dichloropropane	KS
1,3-Dichlorobenzene	KS
1,4-Dichlorobenzene	KS
2-Chloroethyl vinyl ether	KS
Acrolein (Propenal)	KS
Acrylonitrile	KS
Benzene	KS
Bromodichloromethane	KS
Bromoform	KS
Carbon tetrachloride	KS
Chlorobenzene	KS
Chlorodibromomethane	KS
Chloroethane (Ethyl chloride)	KS
Chloroform	KS
cis-1,3-Dichloropropene	KS
Ethylbenzene	KS
Methyl bromide (Bromomethane)	KS
Methyl chloride (Chloromethane)	KS
Methylene chloride (Dichloromethane)	KS
Tetrachloroethylene (Perchloroethylene)	KS
Toluene	KS
trans-1,2-Dichloroethylene	KS
trans-1,3-Dichloropropylene	KS
Trichloroethene (Trichloroethylene)	KS
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	KS
Vinyl chloride	KS

Method EPA 625

1,2,4-Trichlorobenzene	KS
2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	KS
2,4,6-Trichlorophenol	KS
2,4-Dichlorophenol	KS
2,4-Dimethylphenol	KS
2,4-Dinitrophenol	KS
2,4-Dinitrotoluene (2,4-DNT)	KS
2,6-Dinitrotoluene (2,6-DNT)	KS
2-Chloronaphthalene	KS
2-Chlorophenol	KS
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	KS
2-Nitrophenol	KS
3,3'-Dichlorobenzidine	KS
4-Bromophenyl phenyl ether	KS
4-Chloro-3-methylphenol	KS
4-Chlorophenyl phenylether	KS
4-Nitrophenol	KS
Acenaphthene	KS

Program/Matrix: ***CWA (Non Potable Water)***

Acenaphthylene	KS
Anthracene	KS
Benzidine	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
bis(2-Chloroethoxy)methane	KS
bis(2-Chloroethyl) ether	KS
Butyl benzyl phthalate	KS
Chrysene	KS
Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	KS
Dibenz(a,h) anthracene	KS
Diethyl phthalate	KS
Dimethyl phthalate	KS
Di-n-butyl phthalate	KS
Di-n-octyl phthalate	KS
Fluoranthene	KS
Fluorene	KS
Hexachlorobenzene	KS
Hexachlorobutadiene	KS
Hexachlorocyclopentadiene	KS
Hexachloroethane	KS
Indeno(1,2,3-cd) pyrene	KS
Isophorone	KS
Naphthalene	KS
Nitrobenzene	KS
n-Nitrosodimethylamine	KS
n-Nitrosodi-n-propylamine	KS
n-Nitrosodiphenylamine	KS
Pentachlorophenol	KS
Phenanthrene	KS
Phenol	KS
Pyrene	KS
Method EPA 7470A	
Mercury	KS
Method EPA 7471B	
Mercury	KS
Method SM 2120 B-2001	
Color	KS
Method SM 2310 B-1997	
Acidity, as CaCO3	KS
Method SM 2320 B-1997	
Alkalinity as CaCO3	KS

Pace Analytical Services, LLC - Lenexa KS **Primary AB**

Program/Matrix: ***CWA (Non Potable Water)***

Method SM 2340 B-2011	
Hardness	KS
Method SM 2540 B-1997	
Residue-total	KS
Method SM 2540 C-1997	
Residue-filterable (TDS)	KS
Method SM 2540 D-1997	
Residue-nonfilterable (TSS)	KS
Method SM 2540 F-1997	
Residue-settleable	KS
Method SM 2540 G-1997	
Total, fixed, and volatile residue	KS
Method SM 2550 B-2000	
Temperature, deg. C	KS
Method SM 2710 B-2009	
Specific Oxygen Uptake Rate (SOUR)	KS
Method SM 3500-Cr B-2011	
Chromium VI	KS
Method SM 3500-Fe B-2011	
Iron	KS
Method SM 4500-Cl E-2011	
Chloride	KS
Method SM 4500-Cl G-2011	
Total residual chlorine	KS
Method SM 4500-CN^- E-1999	
Total cyanide	KS
Method SM 4500-CN^- G-1999	
Available Cyanide	KS
Method SM 4500-CN^- I-2011	
Weak Acid Dissociable Cyanide	KS
Method SM 4500-H+ B-2000	
pH	KS
Method SM 4500-O G-2011	
Oxygen, dissolved	KS
Method SM 4500-$S2^-$ D-2000	
Sulfide	KS
Method SM 4500-$S2^-$ F-2000	
Sulfide	KS
Method SM 4500-$SO3^-$ B-2000	
Sulfite-SO3	KS
Method SM 5210 B-2001	
Biochemical oxygen demand	KS

Pace Analytical Services, LLC - Lenexa KS **Primary AB**

Program/Matrix: ***CWA (Non Potable Water)***

Carbonaceous BOD, CBOD	KS
Method SM 5310 C-2000	
Total organic carbon	KS
Method SM 5540 C-2000	
Surfactants - MBAS	KS
Method SM 9222 D (m-FC)-1997	
Fecal coliforms	KS

Pace Analytical Services, LLC - Lenexa KS **Primary AB**

Program/Matrix: ***RCRA (Non Potable Water)***

Method EPA 1010A	
Ignitability	KS
Method EPA 1311	
Toxicity Characteristic Leaching Procedure (TCLP)	KS
Method EPA 1312	
Synthetic Precipitation Leaching Procedure (SCLP)	KS
Method EPA 1664A	
Oil & Grease	KS
Method EPA 300.0	
Bromide	KS
Method EPA 6010B	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Boron	KS
Cadmium	KS
Calcium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Iron	KS
Lead	KS
Lithium	KS
Magnesium	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Potassium	KS
Selenium	KS
Silica as SiO2	KS
Silica as SiO2	KS
Silver	KS
Sodium	KS
Strontium	KS
Thallium	KS
Tin	KS
Titanium	KS
Vanadium	KS
Zinc	KS
Method EPA 6010C	
Cadmium	KS
Chromium	KS
Lead	KS

Program/Matrix: ***RCRA (Non Potable Water)***

Method EPA 6020A	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Cadmium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Iron	KS
Lead	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Selenium	KS
Silver	KS
Strontium	KS
Thallium	KS
Tin	KS
Titanium	KS
Titanium	KS
Vanadium	KS
Zinc	KS
Method EPA 7196A	
Chromium VI	KS
Method EPA 7470A	
Mercury	KS
Method EPA 7471B	
Mercury	KS
Method EPA 8011	
1,2-Dibromo-3-chloropropane (DBCP)	KS
1,2-Dibromoethane (EDB, Ethylene dibromide)	KS
Method EPA 8015B	
Diesel range organics (DRO)	KS
Gasoline range organics (GRO)	KS
Method EPA 8015C	
Diesel range organics (DRO)	KS
Gasoline range organics (GRO)	KS
Method EPA 8082	
Aroclor-1016 (PCB-1016)	KS
Aroclor-1221 (PCB-1221)	KS
Aroclor-1232 (PCB-1232)	KS
Aroclor-1242 (PCB-1242)	KS
Aroclor-1248 (PCB-1248)	KS

Program/Matrix: ***RCRA (Non Potable Water)***

Aroclor-1254 (PCB-1254)	KS
Aroclor-1260 (PCB-1260)	KS

Method EPA 8121

1,2,3,4-Tetrachlorobenzene	KS
1,2,3,5-Tetrachlorobenzene	KS
1,2,3-Trichlorobenzene	KS
1,2,4,5-Tetrachlorobenzene	KS
1,2,4-Trichlorobenzene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,3,5-Trichlorobenzene	KS
1,3-Dichlorobenzene	KS
1,4-Dichlorobenzene	KS
2-Chloronaphthalene	KS
alpha-BHC (alpha-Hexachlorocyclohexane)	KS
Benzal chloride	KS
Benzotrichloride	KS
Benzyl chloride	KS
beta-BHC (beta-Hexachlorocyclohexane)	KS
delta-BHC	KS
gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	KS
Hexachlorobenzene	KS
Hexachlorobutadiene	KS
Hexachlorocyclopentadiene	KS
Hexachloroethane	KS
Pentachlorobenzene	KS

Method EPA 8260B

1,1,1,2-Tetrachloroethane	KS
1,1,1-Trichloroethane	KS
1,1,2,2-Tetrachloroethane	KS
1,1,2-Trichloroethane	KS
1,1-Dichloroethane	KS
1,1-Dichloroethylene	KS
1,1-Dichloropropene	KS
1,2,3-Trichlorobenzene	KS
1,2,3-Trichloropropane	KS
1,2,4-Trichlorobenzene	KS
1,2,4-Trimethylbenzene	KS
1,2-Dibromo-3-chloropropane (DBCP)	KS
1,2-Dibromoethane (EDB, Ethylene dibromide)	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Dichloroethane (Ethylene dichloride)	KS
1,2-Dichloropropane	KS
1,3,5-Trimethylbenzene	KS
1,3-Dichlorobenzene	KS
1,3-Dichloropropane	KS
1,4-Dichlorobenzene	KS

Program/Matrix: ***RCRA (Non Potable Water)***

1,4-Dioxane (1,4- Diethyleneoxide)	KS
2,2-Dichloropropane	KS
2-Butanone (Methyl ethyl ketone, MEK)	KS
2-Chloroethyl vinyl ether	KS
2-Chlorotoluene	KS
2-Hexanone	KS
4-Chlorotoluene	KS
4-Isopropyltoluene (p-Cymene,p-Isopropyltoluene)	KS
4-Methyl-2-pentanone (MIBK)	KS
Acetone	KS
Acetonitrile	KS
Acrolein (Propenal)	KS
Acrylonitrile	KS
Benzene	KS
Bromobenzene	KS
Bromochloromethane	KS
Bromodichloromethane	KS
Bromoform	KS
Carbon disulfide	KS
Carbon tetrachloride	KS
Chlorobenzene	KS
Chlorodibromomethane	KS
Chloroethane (Ethyl chloride)	KS
Chloroform	KS
cis-1,2-Dichloroethylene	KS
cis-1,3-Dichloropropene	KS
Dibromomethane (Methylene bromide)	KS
Dichlorodifluoromethane (Freon-12)	KS
Diethyl ether	KS
Di-isopropylether (DIPE) (Isopropyl Ether)	KS
Ethylbenzene	KS
Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)	KS
Gasoline range organics (GRO)	KS
Hexachlorobutadiene	KS
Iodomethane (Methyl iodide)	KS
Isopropylbenzene	KS
Methyl bromide (Bromomethane)	KS
Methyl chloride (Chloromethane)	KS
Methyl tert-butyl ether (MTBE)	KS
Methylene chloride (Dichloromethane)	KS
m-Xylene	KS
Naphthalene	KS
n-Butylbenzene	KS
n-Propylbenzene	KS
o-Xylene	KS
p-Xylene	KS
sec-Butylbenzene	KS

Program/Matrix: ***RCRA (Non Potable Water)***

Styrene	KS
T-amylmethylether (TAME)	KS
tert-Butyl alcohol	KS
tert-Butylbenzene	KS
Tetrachloroethylene (Perchloroethylene)	KS
Toluene	KS
trans-1,2-Dichloroethylene	KS
trans-1,3-Dichloropropylene	KS
trans-1,4-Dichloro-2-butene	KS
Trichloroethene (Trichloroethylene)	KS
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	KS
Vinyl acetate	KS
Vinyl chloride	KS

Method EPA 8270C

1,2,4-Trichlorobenzene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Diphenylhydrazine	KS
1,3-Dichlorobenzene	KS
1,4-Dichlorobenzene	KS
2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	KS
2,3,4,6-Tetrachlorophenol	KS
2,4,5-Trichlorophenol	KS
2,4,6-Trichlorophenol	KS
2,4-Dichlorophenol	KS
2,4-Dimethylphenol	KS
2,4-Dinitrophenol	KS
2,4-Dinitrotoluene (2,4-DNT)	KS
2,6-Dinitrotoluene (2,6-DNT)	KS
2-Chlorophenol	KS
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	KS
2-Methylnaphthalene	KS
2-Methylphenol (o-Cresol)	KS
2-Nitroaniline	KS
2-Nitrophenol	KS
3,3'-Dichlorobenzidine	KS
3-Methylphenol (m-Cresol)	KS
3-Nitroaniline	KS
4-Bromophenyl phenyl ether	KS
4-Chloro-3-methylphenol	KS
4-Chloroaniline	KS
4-Chlorophenyl phenylether	KS
4-Methylphenol (p-Cresol)	KS
4-Nitroaniline	KS
4-Nitrophenol	KS
7,12-Dimethylbenz(a) anthracene	KS
Acenaphthene	KS

Program/Matrix: ***RCRA (Non Potable Water)***

Acenaphthylene	KS
Aniline	KS
Anthracene	KS
Benzidine	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
Benzoic acid	KS
Benzyl alcohol	KS
bis(2-Chloroethoxy)methane	KS
bis(2-Chloroethyl) ether	KS
Butyl benzyl phthalate	KS
Chrysene	KS
Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	KS
Dibenz(a, j) acridine	KS
Dibenz(a,h) anthracene	KS
Dibenzofuran	KS
Diethyl phthalate	KS
Dimethyl phthalate	KS
Di-n-butyl phthalate	KS
Di-n-octyl phthalate	KS
Fluoranthene	KS
Fluorene	KS
Hexachlorobenzene	KS
Hexachlorobutadiene	KS
Hexachlorocyclopentadiene	KS
Hexachloroethane	KS
Indeno(1,2,3-cd) pyrene	KS
Isophorone	KS
Naphthalene	KS
Nitrobenzene	KS
n-Nitroso-di-n-butylamine	KS
n-Nitrosodi-n-propylamine	KS
n-Nitrosodiphenylamine	KS
n-Nitrosomethylethalamine	KS
Pentachlorophenol	KS
Phenanthrene	KS
Phenol	KS
Pyrene	KS
Pyridine	KS
Thiophenol (Benzenethiol)	KS

Method EPA 8270C SIM

1,4-Dioxane (1,4- Diethyleneoxide)	KS

Method EPA 9012A

Pace Analytical Services, LLC - Lenexa KS **Primary AB**

Program/Matrix: ***RCRA (Non Potable Water)***

Amenable cyanide	KS
Total cyanide	KS
Method EPA 9012B	
Amenable cyanide	KS
Total cyanide	KS
Method EPA 9040B	
pH	KS
Method EPA 9045C	
pH	KS
Method EPA 9050A	
Conductivity	KS
Method EPA 9056A	
Bromide	KS
Chloride	KS
Fluoride	KS
Nitrate	KS
Nitrite	KS
Sulfate	KS
Method EPA 9060A	
Total organic carbon	KS
Method EPA 9066	
Total phenolics	KS
Method EPA 9070A	
Oil & Grease	KS
Method EPA 9071B	
Oil & Grease	KS
Method EPA 9095B	
Paint Filter Test	KS
Method KS LRH GC-FID	
Total Petroleum Hydrocarbons C5 - C8	KS
Method KS MRH/HRH GC-FID	
Total Petroleum Hydrocarbons C19 - C35	KS
Total Petroleum Hydrocarbons C9 - C18	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Method EPA 1010A	
Ignitability	KS
Method EPA 1311	
Toxicity Characteristic Leaching Procedure (TCLP)	KS
Method EPA 1312	
Synthetic Precipitation Leaching Procedure (SCLP)	KS
Method EPA 6010B	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Boron	KS
Cadmium	KS
Calcium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Iron	KS
Lead	KS
Lithium	KS
Magnesium	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Potassium	KS
Selenium	KS
Silica as SiO2	KS
Silver	KS
Sodium	KS
Strontium	KS
Thallium	KS
Tin	KS
Titanium	KS
Vanadium	KS
Zinc	KS
Method EPA 6010C	
Cadmium	KS
Chromium	KS
Lead	KS
Method EPA 6020A	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Beryllium	KS
Cadmium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Iron	KS
Lead	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Selenium	KS
Silver	KS
Strontium	KS
Thallium	KS
Tin	KS
Titanium	KS
Titanium	KS
Vanadium	KS
Zinc	KS
Method EPA 7470A	
Mercury	KS
Method EPA 7471B	
Mercury	KS
Method EPA 8015B	
Diesel range organics (DRO)	KS
Gasoline range organics (GRO)	KS
Method EPA 8015C	
Diesel range organics (DRO)	KS
Gasoline range organics (GRO)	KS
Method EPA 8082	
Aroclor-1016 (PCB-1016)	KS
Aroclor-1221 (PCB-1221)	KS
Aroclor-1232 (PCB-1232)	KS
Aroclor-1242 (PCB-1242)	KS
Aroclor-1248 (PCB-1248)	KS
Aroclor-1254 (PCB-1254)	KS
Aroclor-1260 (PCB-1260)	KS
Method EPA 8121	
1,2,3,4-Tetrachlorobenzene	KS
1,2,3,5-Tetrachlorobenzene	KS
1,2,3-Trichlorobenzene	KS
1,2,4,5-Tetrachlorobenzene	KS
1,2,4-Trichlorobenzene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,3,5-Trichlorobenzene	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

1,3-Dichlorobenzene	KS
1,4-Dichlorobenzene	KS
2-Chloronaphthalene	KS
alpha-BHC (alpha-Hexachlorocyclohexane)	KS
Benzal chloride	KS
Benzotrichloride	KS
Benzyl chloride	KS
beta-BHC (beta-Hexachlorocyclohexane)	KS
delta-BHC	KS
gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	KS
Hexachlorobenzene	KS
Hexachlorobutadiene	KS
Hexachlorocyclopentadiene	KS
Hexachloroethane	KS
Pentachlorobenzene	KS

Method EPA 8260B

1,1,1,2-Tetrachloroethane	KS
1,1,1-Trichloroethane	KS
1,1,2,2-Tetrachloroethane	KS
1,1,2-Trichloroethane	KS
1,1-Dichloroethane	KS
1,1-Dichloroethylene	KS
1,1-Dichloropropene	KS
1,2,3-Trichlorobenzene	KS
1,2,3-Trichloropropane	KS
1,2,4-Trichlorobenzene	KS
1,2,4-Trimethylbenzene	KS
1,2-Dibromo-3-chloropropane (DBCP)	KS
1,2-Dibromoethane (EDB, Ethylene dibromide)	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Dichloroethane (Ethylene dichloride)	KS
1,2-Dichloropropane	KS
1,3,5-Trimethylbenzene	KS
1,3-Dichlorobenzene	KS
1,3-Dichloropropane	KS
1,4-Dichlorobenzene	KS
1,4-Dioxane (1,4- Diethyleneoxide)	KS
2,2-Dichloropropane	KS
2-Butanone (Methyl ethyl ketone, MEK)	KS
2-Chloroethyl vinyl ether	KS
2-Chlorotoluene	KS
2-Hexanone	KS
4-Chlorotoluene	KS
4-Isopropyltoluene (p-Cymene,p-Isopropyltoluene)	KS
4-Methyl-2-pentanone (MIBK)	KS
Acetone	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Acetonitrile	KS
Acrolein (Propenal)	KS
Acrylonitrile	KS
Benzene	KS
Bromobenzene	KS
Bromochloromethane	KS
Bromodichloromethane	KS
Bromoform	KS
Carbon disulfide	KS
Carbon tetrachloride	KS
Chlorobenzene	KS
Chlorodibromomethane	KS
Chloroethane (Ethyl chloride)	KS
Chloroform	KS
cis-1,2-Dichloroethylene	KS
cis-1,3-Dichloropropene	KS
Dibromomethane (Methylene bromide)	KS
Dichlorodifluoromethane (Freon-12)	KS
Diethyl ether	KS
Di-isopropylether (DIPE) (Isopropyl Ether)	KS
Ethylbenzene	KS
Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)	KS
Gasoline range organics (GRO)	KS
Hexachlorobutadiene	KS
Iodomethane (Methyl iodide)	KS
Isopropylbenzene	KS
Methyl bromide (Bromomethane)	KS
Methyl chloride (Chloromethane)	KS
Methyl tert-butyl ether (MTBE)	KS
Methylene chloride (Dichloromethane)	KS
m-Xylene	KS
Naphthalene	KS
n-Butylbenzene	KS
n-Propylbenzene	KS
o-Xylene	KS
p-Xylene	KS
sec-Butylbenzene	KS
Styrene	KS
T-amylmethylether (TAME)	KS
tert-Butyl alcohol	KS
tert-Butylbenzene	KS
Tetrachloroethylene (Perchloroethylene)	KS
Toluene	KS
trans-1,2-Dichloroethylene	KS
trans-1,3-Dichloropropylene	KS
trans-1,4-Dichloro-2-butene	KS
Trichloroethene (Trichloroethylene)	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	KS
Vinyl acetate	KS
Vinyl chloride	KS

Method EPA 8270C

1,2,4-Trichlorobenzene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Diphenylhydrazine	KS
1,3-Dichlorobenzene	KS
1,4-Dichlorobenzene	KS
2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	KS
2,3,4,6-Tetrachlorophenol	KS
2,4,5-Trichlorophenol	KS
2,4,6-Trichlorophenol	KS
2,4-Dichlorophenol	KS
2,4-Dimethylphenol	KS
2,4-Dinitrophenol	KS
2,4-Dinitrotoluene (2,4-DNT)	KS
2,6-Dinitrotoluene (2,6-DNT)	KS
2-Chlorophenol	KS
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	KS
2-Methylnaphthalene	KS
2-Methylphenol (o-Cresol)	KS
2-Nitroaniline	KS
2-Nitrophenol	KS
3,3'-Dichlorobenzidine	KS
3-Methylphenol (m-Cresol)	KS
3-Nitroaniline	KS
4-Bromophenyl phenyl ether	KS
4-Chloro-3-methylphenol	KS
4-Chloroaniline	KS
4-Chlorophenyl phenylether	KS
4-Methylphenol (p-Cresol)	KS
4-Nitroaniline	KS
4-Nitrophenol	KS
7,12-Dimethylbenz(a) anthracene	KS
Acenaphthene	KS
Acenaphthylene	KS
Aniline	KS
Anthracene	KS
Benzidine	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
Benzoic acid	KS

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Benzyl alcohol	KS
bis(2-Chloroethoxy)methane	KS
bis(2-Chloroethyl) ether	KS
Butyl benzyl phthalate	KS
Chrysene	KS
Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	KS
Dibenz(a, j) acridine	KS
Dibenz(a,h) anthracene	KS
Dibenzofuran	KS
Diethyl phthalate	KS
Dimethyl phthalate	KS
Di-n-butyl phthalate	KS
Di-n-octyl phthalate	KS
Fluoranthene	KS
Fluorene	KS
Hexachlorobenzene	KS
Hexachlorobutadiene	KS
Hexachlorocyclopentadiene	KS
Hexachloroethane	KS
Indeno(1,2,3-cd) pyrene	KS
Isophorone	KS
Naphthalene	KS
Nitrobenzene	KS
n-Nitroso-di-n-butylamine	KS
n-Nitrosodi-n-propylamine	KS
n-Nitrosodiphenylamine	KS
n-Nitrosomethylethalamine	KS
Pentachlorophenol	KS
Phenanthrene	KS
Phenol	KS
Pyrene	KS
Pyridine	KS
Thiophenol (Benzenethiol)	KS
Method EPA 8270C SIM	
1,4-Dioxane (1,4- Diethyleneoxide)	KS
Method EPA 9012A	
Amenable cyanide	KS
Total cyanide	KS
Method EPA 9012B	
Amenable cyanide	KS
Total cyanide	KS
Method EPA 9040B	
pH	KS
Method EPA 9045C	
pH	KS

Pace Analytical Services, LLC - Lenexa KS **Primary AB**

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Method EPA 9050A	
Conductivity	KS
Method EPA 9056A	
Bromide	KS
Chloride	KS
Fluoride	KS
Nitrate	KS
Nitrite	KS
Sulfate	KS
Method EPA 9066	
Total phenolics	KS
Method EPA 9071B	
Oil & Grease	KS
Method EPA 9081	
Cation exchange capacity	KS
Method EPA 9095B	
Paint Filter Test	KS
Method KS LRH GC-FID	
Total Petroleum Hydrocarbons C5 - C8	KS
Method KS MRH/HRH GC-FID	
Total Petroleum Hydrocarbons C19 - C35	KS
Total Petroleum Hydrocarbons C9 - C18	KS

Pace Analytical Services, LLC - Lenexa KS **Primary AB**

Program/Matrix: ***SDWA (Potable Water)***

Method Colilert®	
Escherichia coli	KS
Total coliforms	KS
Method Colilert® Quanti-Tray®	
Escherichia coli	KS
Total coliforms	KS
Method EPA 150.1	
pH	KS
Method EPA 180.1	
Turbidity	KS
Method EPA 200.7	
Aluminum	KS
Barium	KS
Cadmium	KS
Calcium	KS
Chromium	KS
Copper	KS
Hardness	KS
Iron	KS
Magnesium	KS
Manganese	KS
Nickel	KS
Silver	KS
Sodium	KS
Zinc	KS
Method EPA 200.8	
Copper	KS
Lead	KS
Method EPA 245.1	
Mercury	KS
Method EPA 300.0	
Bromide	KS
Chloride	KS
Fluoride	KS
Nitrate	KS
Nitrite	KS
Sulfate	KS
Method EPA 353.2	
Nitrate	KS
Nitrite	KS
Method EPA 365.1	
Orthophosphate as P	KS
Method EPA 504.1	
1,2-Dibromo-3-chloropropane (DBCP)	KS

Pace Analytical Services, LLC - Lenexa KS **Primary AB**

Program/Matrix: ***SDWA (Potable Water)***

1,2-Dibromoethane (EDB, Ethylene dibromide)	KS
Method SM 2120 B-2001	
Color	KS
Method SM 2320 B-1997	
Alkalinity as CaCO3	KS
Method SM 2340 B-2011	
Hardness	KS
Method SM 2540 C-1997	
Residue-filterable (TDS)	KS
Method SM 2550 B-2000	
Temperature, deg. C	KS
Method SM 4500-Cl G-2011	
Total residual chlorine	KS
Method SM 4500-CN¯ E-1999	
Cyanide	KS
Method SM 4500-H+ B-2000	
pH	KS
Method SM 5310 C-2000	
Total organic carbon	KS
Method SM 9215 B (PCA)-2004	
Heterotrophic plate count	KS

End of Scope of Accreditation

APPENIDX A-5

PACE GREEN BAY, WISCONSIN

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QUALITY ASSURANCE MANUAL

Quality Assurance/Quality Control Policies and Procedures

Pace Analytical Services, LLC – Green Bay WI
1241 Bellevue Street; Green Bay, WI, 54911; 920-469-2436

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Table of Contents

1.0. INTRODUCTION AND ORGANIZATIONAL STRUCTURE

"Working together to protect our environment and improve our health"
Pace Analytical Services LLC - Mission Statement

1.1. Introduction to Pace

1.1.1. Pace Analytical Services, LLC is a privately held, full-service analytical testing firm operating a nationwide system of laboratories. Pace offers extensive services beyond standard analytical testing, including: bioassay for aquatic toxicity, air toxics, dioxins and coplanar PCB's by high resolution mass spectroscopy , radiochemical analyses, product testing, pharmaceutical testing, field services and mobile laboratory capabilities. This document defines the Quality System and Quality Assurance (QA)/Quality Control (QC) protocols.

1.1.2. Pace laboratories are capable of analyzing a full range of environmental samples from a variety of matrices, including air, surface water, wastewater, groundwater, soil, sediment, biota, and other waste products. Methods are applied from regulatory and professional sources including EPA, ASTM, USGS, NIOSH, Standard Methods, and State Agencies. Section 11 of this document is a representative listing of general analytical protocol references.

1.2. Statement of Purpose

1.2.1. To meet the business needs of our customers for high quality, cost-effective analytical measurements and services.

1.3. Quality Policy Statement and Goals of the Quality System

1.3.1. Pace management is committed to maintaining the highest possible standard of service and quality for our customers by following a documented quality system that is compliant with all current applicable state, federal, and industry standards, such as the NELAC Standard, the TNI Standard, and ISO standards and is in accordance with the stated methods and customer requirements. The overall objective of this quality system is to provide reliable data of known quality through adherence to rigorous quality assurance policies and quality control procedures as documented in this Quality Assurance Manual.

1.3.2. All personnel within the Pace network are required to be familiar with all facets of the quality system relevant to their position and implement these policies and procedures in their daily work.

1.4. Core Values

1.4.1. The following are the Pace Core Values:

- **Integrity**
- **Value Employees**
- **Know Our Customers**
- **Honor Commitments**
- **Flexible Response To Demand**
- **Pursue Opportunities**
- **Continuously Improve**

1.5. Code of Ethics and Standards of Conduct

1.5.1. **Code of Ethics**:

1.5.1.1. Each Pace employee is responsible for the propriety and consequences of his or her actions;

1.5.1.2. Each Pace employee must conduct all aspects of Company business in an ethical and strictly legal manner, and must obey the laws of the United States and of all localities, states and nations where Pace does business or seeks to do business;

1.5.1.3. Each Pace employee must reflect the highest standards of honesty, integrity and fairness on behalf of the Company with customers, suppliers, the public, and one another.

1.5.1.4. Each Pace employee must recognize and understand that our daily activities in environmental laboratories affect public health as well as the environment and that environmental laboratory analysts are a critical part of the system society depends upon to improve and guard our natural resources:

1.5.2. **Standards of Conduct:**

1.5.2.1. **Data Integrity**

1.5.2.1.1. The accuracy and integrity of the analytical results and its supporting documentation produced at Pace are the cornerstones of the company. Employees are to accurately prepare and maintain all technical records, scientific notebooks, calculations, and databases. Employees are prohibited from making false entries or misrepresentations of data for any reason.

1.5.2.1.2. Managerial staff must make every effort to ensure that personnel are free from any undue pressures that may affect the quality or integrity of their work including commercial, financial, over-scheduling, and working condition pressures.

1.5.2.1.3. The data integrity system includes in-depth, periodic monitoring of data integrity including peer data review and validation, internal raw data audits, proficiency testing studies, etc.

1.5.2.1.4. Any documentation related to data integrity issues, including any disciplinary actions involved, corrective actions taken, and notifications to customers must be retained for a minimum of five years.

1.5.2.2. **Confidentiality**

1.5.2.2.1. Pace employees must not use or disclose confidential or proprietary information except when in connection with their duties at Pace. This is effective over the course of employment and for an additional period of two years thereafter.

1.5.2.2.2. Confidential or proprietary information, belonging to either Pace and/or its customers, includes but is not limited to test results, trade secrets, research and development matters, procedures, methods, processes and standards, company-specific techniques and equipment, marketing and customer information, inventions, materials composition, etc.

1.5.2.3. **Conflict of Interest**

1.5.2.3.1. Pace employees must avoid situations that might involve a conflict of interest or could appear questionable to others. This includes participation in activities that conflict or appear to conflict with the employees' Pace responsibilities. This would also include offering or accepting anything that might influence the recipient or cause another person to believe that the recipient may be influenced to behave or in a different manner than he would normally (such as bribes, gifts, kickbacks, or illegal payments).

1.5.2.3.2. Employees are not to engage in outside business or economic activity relating to a sale or purchase by the Company. Other problematic activities include service on the Board of Directors of a competing or supplier company, significant ownership in a competing or supplier company, employment for a competing or supplier company, or participation in any outside business during the employee's work hours.

1.5.3. Strict adherence by each Pace employee to this Code of Ethics and to the Standards of Conduct is essential to the continued vitality of Pace and to continue the pursuit of our common mission to protect our environment and improve our health.

1.5.4. Failure to comply with the Code of Ethics and Standards of Conduct will result in disciplinary action up to and including termination and referral for civil or criminal prosecution where appropriate. An employee will be notified of an infraction and given an opportunity to explain, as prescribed under current disciplinary procedures.

1.5.5. Compliance: all employees undergo annual Data Integrity/Ethics training which includes the concepts listed above. All employees also sign an annual Ethic Policy statement.

1.6. Anonymous Compliance Alertline

1.6.1. An ethical and safe workplace is important to the long-term success of Pace and the well-being of its employees. Pace has a responsibility to provide a work environmental where employees feel safe and can report unethical or improper behavior in complete confidence. With this in mind, Pace has engaged Lighthouse Services, Inc. to provide all employees with access to an anonymous ethics and compliance alertline for reporting possible ethics and compliance violations. The purpose of this service is to ensure that any employee can report anonymously and without fear of retaliation.

1.6.2. Lighthouse Services provides a toll-free number along with several other reporting methods, all of which are available 24 hours a day, seven days a week for use by employees and staff.

1.6.3. Telephone: English speaking USA and Canada: (844)-970-0003.

1.6.4. Telephone: Spanish speaking North America: (800)-216-1288.

1.6.5. Website: www.lighthouse-services.com/pacelabs.

1.6.6. Email: reports@lighthouse-services.com (must include company name with report).

1.7. Laboratory Organization

1.7.1. Each laboratory within the system operates with local management, but all labs share common systems and receive support from the Corporate Office. See Attachment III for the Corporate Organizational structure.

1.7.2. A Senior General Manager (SGM) oversees all laboratories and service centers in their assigned region. Each laboratory or facility in the company is then directly managed by an SGM, a General Manager (GM), an Assistant General Manager (AGM), or an Operations Manager (OM). Quality Managers (QM) or Senior Quality Managers (SQM) at each laboratory report directly to the highest level of local laboratory management, however named, that routinely makes day-to-day decisions regarding that facility's operations. The QMs and SQMs will also receive guidance and direction from the corporate Director of Environmental Quality.

1.7.3. The SGM, GM, AGM or OM, or equivalent functionality in each facility, bears the responsibility for the laboratory operations and serves as the final, local authority in all matters. In the absence of these managers, the SQM/QM serves as the next in command, unless the manager in charge has assigned another designee. He or she assumes the responsibilities of the manager, however named, until the manager is available to resume the duties of their position. In the absence of both the manager and the SQM/QM, management responsibility of the laboratory is passed to the Technical Director, provided such a position is identified, and then to the most senior department manager until the return of the lab manager or SQM/QM. The most senior department manager in charge may include the Client Services Manager (CSM) or the Administrative Business Manager (ABM) at the discretion of the SGM/GM/AGM/OM.

1.7.4. A Technical Director who is absent for a period of time exceeding 15 consecutive calendar days shall designate another full-time staff member meeting the qualifications of the technical director to temporarily perform this function. The laboratory SGM/GM/AGM/OM or SQM/QM has the authority to make this designation in the event the existing Technical Director is unable to do so. If this absence exceeds 35 consecutive calendar days, the primary accrediting authority shall be notified in writing.

1.7.5. The SQM/QM has the responsibility and authority to ensure the Quality System is implemented and followed at all times. In circumstances where a laboratory is not meeting the established level of quality or following the policies set forth in this Quality Assurance Manual, the SQM/QM has the authority to halt laboratory operations should he or she deem such an action necessary. The SQM/QM will immediately communicate the halting of operations to the SGM/GM/AGM/OM and keep them posted on the progress of corrective actions. In the event the SGM/GM/AGM/OM and the SQM/QM are not in agreement as to the need for the suspension, the Chief Operating Officer (COO) and Director of Environmental Quality will be called in to mediate the situation.

1.7.6. The lab is required to appoint deputies for key managerial personnel. These deputies must be documented for auditing purposes. The deputies, by position, are the following:

1.7.6.1. Deputy for General Manager is the Senior General Manager

1.7.6.2. Deputy for Organics Technical Directors are the department leads.

1.7.6.3. Deputy for Inorganics Technical Director is the department lead

1.7.6.4. Deputy for Quality Manager is the General Manager

1.7.6.5. Deputy for Client Services Manager is Project Manager

1.7.6.6. Deputy for Administrative Business Manager is the General Manager

1.7.6.7. Deputies for Project Managers are Project Coordinators

1.7.7. The technical staff of the laboratory is generally organized into the following functional groups:

- Organic Sample Preparation
- Wet Chemistry Analysis
- Metals Analysis
- Volatiles Analysis
- Semi-volatiles Analysis
- Radiochemical Analysis
- Microbiological Analysis
- Bioassay Analysis

1.7.8. The organizational structure for Pace – Green Bay, WI is listed in Attachment II. In the event of a change in SGM/GM/AGM/OM, SQM/QM, or any Technical Director, the laboratory will notify its accrediting authorities per their individual required timeframes, not to exceed 30 days. The QAM will remain in effect until the next scheduled revision.

1.8. Laboratory Job Descriptions

1.8.1. Senior General Manager

- Oversees all functions of all the operations within their designated region;
- Oversees the development of local GMs/AGMs/OMs within their designated region;
- Oversees and authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Oversees the preparation of budgets and staffing plans for all operations within their designated region;
- Ensures compliance with all applicable state, federal and industry standards;
- Works closely with Regional Sales Management.

1.8.2. General Manager

- Oversees all functions of their assigned operations;
- Authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Prepares budgets and staffing plans;
- Monitors the Quality Systems of the laboratory and advises the SQM/QM accordingly;
- Presents the Ethics/Data Integrity training annually to all employees in their facilities as an instructor-led training.
- Ensures compliance with all applicable state, federal and industry standards.

1.8.4. Quality Manager

- Responsible for implementing, maintaining and improving the quality system while functioning independently from laboratory operations. Reports directly to the highest level of local laboratory facility management, however named, that routinely makes day-to-day decisions regarding laboratory operations, but receives direction and assistance from the Corporate Director of Environmental Quality. They may also report to a Senior Quality Manager (SQM);
- Ensures that communication takes place at all levels within the lab regarding the effectiveness of the quality system and that all personnel understand their contributions to the quality system;
- Monitors QA/QC activities to ensure that the laboratory achieves established standards of quality (as set forth by the Corporate Environmental Quality office). The QM is responsible for reporting the lab's level of compliance to these standards to the Corporate Director of Environmental Quality on a quarterly basis;
- Maintains records of quality control data and evaluates data quality;
- Conducts periodic internal audits and coordinates external audits performed by regulatory agencies or customer representatives;
- Reviews and maintains records of proficiency testing results;
- Maintains the document control system;
- Assists in development and implementation of appropriate training programs;
- Provides technical support to laboratory operations regarding methodology and project QA/QC requirements;
- Maintains certifications from federal and state programs;
- Ensures compliance with all applicable state, federal and industry standards;
- Maintains the laboratory training records, including those in the Learning Management System (LMS), and evaluates the effectiveness of training;
- Monitors corrective and preventive actions;
- Maintains the currency of the Quality Manual.

1.8.5. Technical Director

- Monitors the standards of performance in quality assurance and quality control data;
- Monitors the validity of analyses performed and data generated;
- Reviews tenders, contracts and QAPPs to ensure the laboratory can meet the data quality objectives for any given project;
- Serves as the manager of the laboratory in the absence of the SGM/GM/AGM/OM and SQM/QM;
- Provides technical guidance in the review, development, and validation of new methodologies.

1.8.6. Administrative Business Manager

- Responsible for financial and administrative management for the entire facility;
- Provides input relative to tactical and strategic planning activities;
- Organizes financial information so that the facility is run as a fiscally responsible business;
- Works with staff to confirm that appropriate processes are put in place to track revenues and expenses;
- Provide ongoing financial information to the SGM/GM/AGM/OM and the management team so they can better manage their business;
- Utilizes historical information and trends to accurately forecast future financial positions;
- Works with management to ensure that key measurements are put in place to be utilized for trend analysis—this will include personnel and supply expenses, and key revenue and expense ratios;
- Works with SGM/GM/AGM/OM to develop accurate budget and track on an ongoing basis;
- Works with entire management team to submit complete and justified capital budget requests and to balance requests across departments;
- Works with project management team and administrative support staff to ensure timely and accurate invoicing.

1.8.7. Client Services Manager

- Oversees all the day to day activities of the Client Services Department which includes Project Management and, possibly, Sample Control;
- Responsible for staffing and all personnel management related issues for Client Services;
- Serves as the primary senior consultant to customers on all project related issues such as set up, initiation, execution and closure;
- Performs or is capable of performing all duties listed for that of Project Manager.

1.8.8. Project Manager

- Coordinates daily activities including taking orders, reporting data and analytical results;
- Serves as the primary technical and administrative liaison between customers and Pace;
- Communicates with operations staff to update and set project priorities;
- Provides results to customers in the requested format (verbal, hardcopy, electronic, etc.);
- Works with customers, laboratory staff, and other appropriate Pace staff to develop project statements of work or resolve problems of data quality;
- Responsible for solicitation of work requests, assisting with proposal preparation and project initiation with customers and maintain customer records;
- Mediation of project schedules and scope of work through communication with internal resources and management;
- Responsible for preparing routine and non-routine quotations, reports and technical papers;
- Interfaces between customers and management personnel to achieve customer satisfaction;
- Manages large-scale complex projects;
- Supervises less experienced project managers and provide guidance on management of complex projects;
- Arranges bottle orders and shipment of sample kits to customers;
- Verifies login information relative to project requirements and field sample Chains-of-Custody.

1.8.9. Department Manager/Supervisor

- Oversees the day-to-day production and quality activities of their assigned department;
- Ensures that quality assurance and quality control criteria of analytical methods and projects are satisfied;
- Assesses data quality and takes corrective action when necessary;
- Approves and releases technical and data management reports;
- Ensures compliance with all applicable state, federal and industry standards.

1.8.10. Additional job descriptions are available upon request from the laboratory ABM.

1.9. Training and Orientation

1.9.1. Training for Pace employees is managed through a web-based training system. Employees are provided with several training activities for their particular job description and scope of duties. These training activities may include:

- Hands-on training led by supervisors;
- Job-specific training checklists and worksheets;
- Lectures and instructor-led training sessions;
- Method-specific training;
- External conferences and seminars;
- Reading Standard Operating Procedures (SOPs);
- Reading the Quality Assurance Manual and Safety Manual/Chemical Hygiene Plan;
- Core training modules (basic lab skills, etc.);

- Quality system training modules (support equipment use, corrective actions/root causes, etc.);
- Data Integrity/Ethics training;
- Specialized training by instrument manufacturers;
- On-line courses.

1.9.2. All procedures and training records are maintained and available for review during laboratory audits. Additional information can be found in SOP S-ALL-Q-020 **Training and Employee Orientation** or its equivalent revision or replacement.

1.10. Laboratory Safety and Waste

1.10.1. It is the policy of Pace to make safety and waste compliance an integral part of daily operations and to ensure that all employees are provided with safe working conditions, personal protective equipment, and requisite training to do their work without injury. Each employee is responsible for his/her own safety as well as those working in the immediate area by complying with established company rules and procedures. These rules and procedures as well as a more detailed description of the employees' responsibilities are contained in the local Safety Manual/Chemical Hygiene Plan.

1.11. Security and Confidentiality

1.11.1. Security is maintained by controlled access to laboratory buildings. Exterior doors to laboratory buildings remain either locked or continuously monitored by Pace staff.

1.11.2. Additional security is provided where necessary, (e.g., specific secure areas for sample, data, and customer report storage), as requested by customers, or cases where national security is of concern. These areas are lockable within the facilities, or are securely offsite. Access is limited to specific individuals or their designees.

1.11.3. All information pertaining to a particular customer, including national security concerns will remain confidential. Data will be released to outside agencies only with written authorization from the customer or where federal or state law requires the company to do so.

1.12. Communications

1.12.1. Management within each lab bears the responsibility of ensuring that appropriate communication processes are established and that communication takes place regarding the effectiveness of the management/quality system. These communication processes may include email, regular staff meetings, senior management meetings, etc.

1.12.2. Corporate management bears the responsibility of ensuring that appropriate communication processes are established within the network of facilities and that communication takes place at a company-wide level regarding the effectiveness of the management/quality systems of all Pace facilities. These communication processes may include email, quarterly continuous improvement conference calls for all lab departments, and annual continuous improvement meetings for all department supervisors, quality managers, client services managers, and other support positions.

2.0. SAMPLE CUSTODY

2.1. Project Initiation

2.1.1. Prior to accepting new work, the laboratory reviews its performance capability. The laboratory confirms that sufficient personnel, equipment capacity, analytical method capability, etc., are available to complete the required work. Customer needs, certification requirements, and data quality objectives are defined and the appropriate sampling and analysis plan is developed to meet the project requirements by project managers or sales representatives. Members of the management staff review current instrument capacity, personnel availability and training, analytical procedures capability, and projected sample load. Management then informs the sales and client services personnel whether or not the laboratory can accept the new project via written correspondence, email, and/or daily operations meetings.

2.1.2. Additional information regarding specific procedures for reviewing new work requests can be found in SOP S-GB-C-012 **Review of Analytical Requests** or its equivalent revision or replacement.

2.2. Sampling Materials and Support

2.2.1. Each individual Pace laboratory provides shipping containers, properly preserved sample containers, custody documents, and field quality control samples to support field-sampling events. Guidelines for sample container types, preservatives, and holding times for a variety of methods are listed in Attachment VII. Note that all analyses listed are not necessarily performed at all Pace laboratories and there may be additional laboratory analyses performed that are not included in these tables. Customers are encouraged to contact their local Pace Project Manager for questions or clarifications regarding sample handling. Pace may provide pick-up and delivery services to their customers when needed

2.2.2. Some Pace facilities provide sampling support through a Field Services department. Field Services operates under the Pace Corporate Quality System, with applicable and necessary provisions to address the activities, methods, and goals specific to Field Services. All procedures and methods used by Field Services are documented in SOPs and Procedure Manuals.

2.3. Chain of Custody

2.3.1. A chain of custody (COC) provides the legal documentation of samples from time of collection to completion of analysis.

2.3.2. Field personnel or client representatives must complete a COC for all samples that are received by the laboratory. Samplers are required to properly complete a COC. This is critical to efficient sample receipt and to ensure the requested methods are used to analyze the correct samples. If sample shipments are not accompanied by the correct documentation, the Sample Receiving department notifies a Project Manager. The Project Manager then obtains the correct documentation/information from the customer in order for analysis of samples to proceed.

2.3.3. The COC is filled out completely and legibly with indelible ink. Errors are corrected by drawing a single line through the initial entry and initialing and dating the change. All transfers of samples are recorded on the chain of custody in the "relinquished" and "received by" sections. All information except signatures is printed.

2.3.4. Additional information can be found in SOP S-GC-C-010 **Sample Management** or its equivalent revision or replacement.

2.4. Sample Acceptance Policy

2.4.1. In accordance with regulatory guidelines, Pace complies with the following sample acceptance policy for all samples received.

2.4.2. If the samples do not meet the sample receipt acceptance criteria outlined below, the laboratory is required to document all non-compliances, contact the customer, and either reject the samples or fully document any decisions to proceed with analyses of samples which do not meet the criteria. Any results reported from samples not meeting these criteria are appropriately communicated to the client.

2.4.3. Sample Acceptance Policy requirements:

- Sample containers must have unique client identification designations that are clearly marked with indelible ink on durable, water-resistant labels. The client identifications must match those on the chain-of-custody (COC).
- There must be clear documentation on the COC, or related documents, that lists the unique sample identification, sampling site location, date and time of sample collection, and name of the sample collector.
- There must be clear documentation on the COC, or related documents, that lists the requested analyses, the preservatives used, and any special remarks concerning the samples (i.e., data deliverables, samples are for evidentiary purposes, field filtration, etc.).
- Samples must be in appropriate sample containers. If the sample containers show signs of damage (i.e., broken or leaking) or if the samples show signs of contamination, the samples will not be processed without prior client approval.
- Samples must be correctly preserved upon receipt, unless the method requested allows for laboratory preservation. If the samples are received with inadequate preservation, and the samples cannot be preserved by the lab appropriately, the samples will not be processed without prior client approval.

- Samples must be received within required holding time. Any samples with hold times that are exceeded will not be processed without prior client approval.
- Samples must be received with sufficient sample volume or weight to proceed with the analytical testing. If insufficient sample volume or weight is received, analysis will not proceed without client approval.
- All samples that require thermal preservation are considered acceptable if they are received at a temperature within 2°C of the required temperature, or within the method-specified range. For samples with a required temperature of 4°C, samples with a temperature ranging from just above freezing to 6°C are acceptable. Samples that are delivered to the lab on the same day they are collected are considered acceptable if the samples are received on ice. Any samples that are not received at the required temperature will not be processed without prior client approval.
- Samples for **drinking water** analyses will be rejected at the time of receipt if they are not received in a secure manner, are received in inappropriate containers, are received outside the required temperature range, are received outside the recognized holding time, are received with inadequate identification on sample containers or COC, or are improperly preserved (with the exception of VOA samples- tested for pH at time of analysis and TOC- tested for pH in the field).
- Some specific clients may require custody seals. **For these clients**, samples or coolers that are not received with the proper custody seals will not be processed without prior client approval.

Note 1: Temperature will be read and recorded based on the precision of the measuring device. For example, temperatures obtained from a thermometer graduated to 0.1°C will be read and recorded to ± 0.1°C. Measurements obtained from a thermometer graduate to 0.5°C will be read to ± 0.5°C. Measurements read at the specified precision are not to be rounded down to meet the ≤ 6°C limit. Please reference the Support Equipment SOP for more information.

Note 2: Some microbiology methods allow sample receipt temperatures of up to 10°C. Consult the specific method for microbiology samples received above 6°C prior to initiating corrective action for out of temperature preservation conditions.

Note 3: Biological Tissue Samples must be received at the following temperature based on program and contract: cooled to ≤ 6°C during the first 24 hours after collection; then samples must be kept frozen at ≤ - 10°C. TNI rules also apply if the samples are brought straight from the field; they are acceptable if evidence of cooling is present (i.e., received on ice).

2.4.4. Upon sample receipt, the following items are also checked and recorded:

- Presence of custody seals or tapes on the shipping containers;
- Sample condition: Intact, broken/leaking, bubbles in VOA samples;
- Sample holding time;
- Sample pH and residual chlorine when required;
- Appropriate containers.

2.4.5. Additional information can be found in SOP S-GB-C-010 **Sample Management** or its equivalent revision or replacement.

2.5. Sample Log-in

2.5.1. After sample inspection, all sample information on the COC is entered into the Laboratory Information Management System (LIMS). The lab's permanent records for samples received include the following information:

- Customer name and contact
- Customer number
- Pace Analytical project number
- Pace Analytical Project Manager
- Sample descriptions
- Due dates
- List of analyses requested
- Date and time of laboratory receipt
- Field ID code
- Date and time of collection
- Any comments resulting from inspection for sample rejection

2.5.2. If the time collected for any sample is unspecified and Pace is unable to obtain this information from the customer, the laboratory will use 12:01am as the time sampled. All hold times will be based on this sampling time and qualified accordingly if exceeded.

2.5.3. The LIMS automatically generates a unique identification number for each sample created in the system. The LIMS sample number follows the general convention of 40-XXXXXX-YYY. The 40 represents the laboratory identification within Pace's laboratory network. The 6 digit "X" number represents the project number followed by a 3 digit sample number. The project number is a sequential number that is assigned as a new project is created. The sample number corresponds to the number of samples submitted by the client. In addition to the unique sample ID, there is a sample container ID that consists of the sample number, the container type (ex. BP1U), and bottle 1 of Y, where Y represents the total number of containers of that particular type. Together the sample LIMs number and sample container ID number create a unique barcode encryption that can be linked to the sample analysis requested by the client. This unique identification number is placed on the sample container as a durable label and becomes the link between the laboratory's sample management system and the customer's field identification; it will be a permanent reference number for all future interactions.

2.5.4. Sample labels are printed from the LIMS and affixed to each sample container.

2.5.5. Additional information can be found in SOP S-GB-C-010 **Sample Management** or its equivalent revision or replacement.

2.6. Sample Storage

2.6.1. Additional information on sample storage can be found in SOP S-GB-C-001 **Sample Management** or its equivalent revision or replacement and in SOP S-GB-W-002 **Waste Handling and Management** or its equivalent revision or replacement.

2.6.2. **Storage Conditions**

2.6.2.1. Samples are stored away from all standards, reagents, or other potential sources of contamination. Samples are stored in a manner that prevents cross contamination. Volatile samples are stored separately from other samples. All sample fractions, extracts, leachates, and

other sample preparation products are stored in the same manner as actual samples or as specified by the analytical method.

2.6.2.2. Storage blanks are stored with volatile samples and are used to measure cross-contamination acquired during storage. Laboratories must have documented procedures and criteria for evaluating storage blanks, appropriate to the types of samples being stored.

2.6.2.3. Additional information can be found in SOP S-GB-Q-028 **Monitoring Temperature Controlled Units** or its equivalent revision or replacement.

2.6.3. **Temperature Monitoring**

2.6.3.1. Samples are taken to the appropriate storage location immediately after sample receipt and check-in procedures are completed.

2.6.3.2. The temperature of each refrigerated storage area is maintained at ≤ 6°C (but above freezing) unless state, method or program requirements differ. The temperature of each freezer storage area is maintained at ≤ -10°C unless state, method or program requirements differ. The temperature of each storage area is checked and documented each day of use (each calendar day). Additional information, including corrective actions for temperatures outside of acceptance limits, can be found in SOP S-GB-Q-028 **Monitoring Temperature Controlled Units** or its equivalent revision or replacement.

2.6.4. **Hazardous Materials**

2.6.4.1. Samples designated by clients upon receipt as pure product or potentially heavily contaminated samples, or samples found to be designated as such following analysis, must be tagged as "hazardous" or "lab pack" and stored separately from other samples.

2.6.5. **Foreign/Quarantined Soils**

2.6.5.1. Foreign soils and soils from USDA regulated areas must be adequately segregated to enable proper sample disposal. The USDA requires these samples to be treated by an approved procedure. Additional information regarding USDA regulations and sample handling can be found in the laboratory's SOP for **Regulated Soil Handling** S-GB-S-001, or its equivalent revision or replacement.

2.7. Subcontracting Analytical Services

2.7.1. Every effort is made to perform all analyses for Pace customers within the laboratory that receives the samples. When subcontracting to a laboratory other than the receiving laboratory, whether inside or outside the Pace network, becomes necessary, a preliminary verbal communication with that laboratory is undertaken. Customers are notified in writing of the laboratory's intention to subcontract any portion of the testing to another laboratory. Work performed under specific protocols may involve special considerations. When possible, subcontracting will be to a TNI-accredited laboratory.

2.7.2. Potential subcontract laboratories must be approved by Pace based on the criteria listed in SOP S-GB-C-009 **Subcontracting Samples** or its equivalent revision or replacement. All sample reports from the subcontracted labs are appended to the applicable Pace final reports.

2.7.3. Any Pace Analytical work sent to other labs within the Pace network is handled as inter-regional work and all final reports are labeled clearly with the name of the laboratory performing the work. Any

non-TNI work is clearly identified. Pace will not be responsible for analytical data if the subcontract laboratory was designated by the customer.

2.7.4. Additional information can be found in SOP S-GB-C-009 **Subcontracting Samples** or its equivalent revision or replacement.

2.8. Sample Retention and Disposal

2.8.1. Samples, extracts, digestates, and leachates must be retained by the laboratory for the period of time necessary to protect the interests of the laboratory and the customer.

2.8.2. The minimum sample retention time is 45 days from receipt of the samples. Samples requiring thermal preservation may be stored at ambient temperature when the hold time is expired, the report has been delivered, and/or allowed by the customer, program, or contract. Samples requiring storage beyond the minimum sample retention time due to special requests or contractual obligations may be stored at ambient temperature unless the laboratory has sufficient capacity and their presence does not compromise the integrity of other samples.

2.8.3. After this period expires, non-hazardous samples are properly disposed of as non-hazardous waste. The preferred method for disposition of **hazardous** samples is to return the excess sample to the customer. If it is not feasible to return samples, or the customer requires Pace to dispose of excess samples, proper arrangements will be made for disposal by an approved contractor.

2.8.4. Additional information can be found in SOP S-GB-W-002 **Waste Handling and Management** and SOP S-GB-C-010 **Sample Management** or their equivalent revisions or replacements.

3.0. QUALITY CONTROL PROCEDURES

3.1. Quality Control Samples

3.1.1. The quality control samples described in this section are analyzed per batch as applicable to the method used. Acceptance criteria must be established for all quality control samples and if the acceptance criteria are not met, corrective actions must be performed and samples reanalyzed, or final reports must be appropriately qualified.

3.1.2. Quality control samples must be processed in the same manner as associated client samples.

3.1.3. Please reference the glossary of this Quality Manual for definitions of all quality control samples mentioned in this section.

3.1.4. Any deviations to the policies and procedures governing quality control samples must be approved by the QM/SQM.

3.2. Method Blank

3.2.1. A method blank is a negative control used to assess the preparation/analysis system for possible contamination and is processed through all preparation and analytical steps with its associated client samples. The method blank is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples. Method blanks are not applicable for certain analyses (i.e., pH, flash point, temperature, etc.).

3.2.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for method blanks.

3.3. Laboratory Control Sample

3.3.1. The Laboratory Control Sample (LCS) is a positive control used to assess the performance of the entire analytical system including preparation and analysis. The LCS is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples.

3.3.2. The LCS contains **all** analytes required by a specific method or by the customer or regulatory agency, which may include full list of target compounds, with certain exceptions. The lab must ensure that all target components are included in the spike mixture for the LCS over a two (2) year period. In the absence of specified components, the laboratory will spike the LCS with the following compounds:

- For multi-peak analytes (e.g. PCBs, technical chlordane, toxaphene), a representative standard will be processed.
- For methods with long lists of analytes, a representative number of target analytes may be chosen. The following criteria is used to determine the number of LCS compounds used:
  - For methods with 1-10 target compounds, the laboratory will spike with all compounds;
  - For methods with 11-20 target compounds, the laboratory will spike with at least 10 compounds or 80%, whichever is greater;
  - For methods with greater than 20 compounds, the laboratory will spike with at least 16 compounds.

3.3.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for LCSs.

3.3.4. For LCSs containing a large number of analytes, it is statistically likely that a few recoveries will be outside of control limits. This does not necessarily mean that the system is out of control, and therefore no corrective action would be necessary (except for proper documentation). TNI has allowed for a minimum number of marginal exceedances, defined as recoveries that are beyond the LCS control limits (3X the standard deviation) but within than the marginal exceedance limits (4X the standard deviation). The number of allowable exceedances depends on the number of compounds in the LCS. If more analyte recoveries exceed the LCS control limits than is allowed (see below) or if any one analyte exceeds the marginal exceedance limits, then the LCS is considered non-compliant and corrective actions are necessary. The number of allowable exceedances is as follows:

- >90 analytes in the LCS- 5 analytes
- 71-90 analytes in the LCS- 4 analytes
- 51-70 analytes in the LCS- 3 analytes
- 31-50 analytes in the LCS- 2 analytes
- 11-30 analytes in the LCS- 1 analyte
- <11 analytes in the LCS- no analytes allowed out)

Note: the use of marginal exceedances is not approved for work from the state of South Carolina.

3.3.5. A matrix spike (MS) can be used in place of a non-compliant LCS in a batch as long as the MS passes the LCS acceptance criteria (this is a TNI allowance). Note: the use of the MS to replace a non-compliant LCS is not approved for work from the state of South Carolina. When this happens, full documentation must be made available to the data user. If this is not allowed by a customer or regulatory body, the associated samples must be rerun with a compliant LCS (if possible) or reported with appropriate data qualifiers.

3.4. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

3.4.1. A matrix spike (MS) is a positive control used to determine the effect of the sample matrix on compound recovery for a particular method. A matrix spike/matrix spike duplicate (MS/MSD) set or matrix spike/sample duplicate set is processed at a frequency specified in a particular method or as determined by a specific customer request. The MS and MSD consist of the sample matrix that is spiked with known concentrations of target analytes.

3.4.2. The MS and MSD contain all analytes required by a specific method or by the customer or regulatory agency. In the absence of specified components, the laboratory will spike the MS/MSD with the same number of compounds as previously discussed in the LCS section. However, the lab must ensure that all targeted components are included in the spike mixture for the MS/MSD over a two (2) year period.

3.4.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for MS/MSDs.

3.5. Sample Duplicate

3.5.1. A sample duplicate is a second portion of sample that is prepared and analyzed in the laboratory along with the first portion. It is used to measure the precision associated with preparation and analysis. A sample duplicate is processed at a frequency specified by the particular method or as determined by a specific customer.

3.5.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for sample duplicates.

3.6. Surrogates

3.6.1. Surrogates are compounds that reflect the chemistry of target analytes and are typically added to samples for organic analyses to measure the extraction or purge efficiency and to monitor the effect of the sample matrix on compound recovery.

3.6.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for surrogates.

3.7. Internal Standards

3.7.1. Internal Standards are method-specific analytes that are added, as applicable, to every standard, QC sample, and client sample at a known concentration, prior to analysis for the purpose of adjusting the response factor used in quantifying target analytes..

3.7.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for internal standards.

3.8. Limit of Detection (LOD)

3.8.1. Pace laboratories use a documented procedure to determine a limit of detection (LOD) for each analyte of concern in each matrix reported. Unless otherwise noted in a published method, the procedure used by Pace laboratories to determine LODs is based on the Method Detection Limit (MDL) procedure outlined in 40 CFR Part 136, Appendix B. All sample processing steps of the preparation and analytical methods are included in the LOD determination including any clean ups.

3.8.2. Additional information can be found in SOP S-GB-Q-020 **Determination of LOD and LOQ** or its equivalent revision or replacement.

3.9. Limit of Quantitation (LOQ)

3.9.1. A limit of quantitation (LOQ) for every analyte of concern must be determined. For Pace laboratories, this LOQ is referred to as the RL, or Reporting Limit. Results reported below the reporting limit are not allowed to be reported without qualification. For methods with a determined LOD, results can be reported out below the LOQ but above the LOD if they are properly qualified (e.g., J flag).

3.9.2. Additional information can be found in SOP S-GB-Q-020 **Determination of LOD and LOQ** or its equivalent revision or replacement.

3.10. Estimate of Analytical Uncertainty

3.10.1. Pace laboratories can provide an estimation of uncertainty for results generated by the laboratory. The estimate quantifies the error associated with any given result at a 95% confidence interval. This estimate does not include bias that may be associated with sampling. The laboratory has a procedure in place for making this estimation. In the absence of a regulatory or customer-specific procedure, Pace laboratories base this estimation on the recovery data obtained from the Laboratory Control Samples. The uncertainty is a function of the standard deviation of the recoveries multiplied by the appropriate Student's t Factor at 95% confidence. Additional information pertaining to the estimation of uncertainty and the exact manner in which it is derived are contained in the SOP S-GB-Q-010 **Estimation of Measurement Uncertainty** or its equivalent revision or replacement.

3.10.2. The measurement of uncertainty is provided only on request by the customer, as required by specification or regulation and when the result is used to determine conformance within a specification limit.

3.11. Proficiency Testing (PT) Studies

3.11.1. Pace laboratories participate in a defined proficiency testing (PT) program. PT samples are obtained from NIST approved providers and analyzed and reported at a minimum of two times per year for the relevant fields of testing per matrix.

3.11.2. Additional information can be found in SOP S-GB-Q-021 **Proficiency Testing Program** or its equivalent revision or replacement.

3.12. Rounding and Significant Figures

3.12.1. In general, the Pace laboratories report data to no more than three significant figures. Therefore, all measurements made in the analytical process must reflect this level of precision. In the event that a parameter that contributes to the final result has less than three significant figures of precision, the final result must be reported with no more significant figures than that of the parameter in question. The rounding rules listed below are descriptive of the LIMS and not necessarily of any supporting program such as Excel.

3.12.2. **Rounding:** Pace-Green Bay WI follows the odd / even guidelines for rounding numbers:

- If the figure following the one to be retained is less than five, that figure is dropped and the retained ones are not changed (with three significant figures, 2.544 is rounded to 2.54).
- If the figure following the ones to be retained is greater than five, that figure is dropped and the last retained one is rounded up (with three significant figures, 2.546 is rounded to 2.55).
- If the figure following the ones to be retained is five and if there are no figures other than zeros beyond that five, then the five is dropped and the last figure retained is unchanged if it is even and rounded up if it is odd (with three significant figures, 2.525 is rounded to 2.52 and 2.535 is rounded to 2.54).

3.12.3. **Significant Figures**

3.12.3.1. Pace-Green Bay WI follows the following convention for reporting to a specified number of significant figures. Unless specified by federal, state, or local requirements or on specific request by a customer, the laboratory reports:

Values > 10 – Reported to 3 significant figures
Values ≤ 10 – Reported to 2 significant figures

3.13. Retention Time Windows

3.13.1. When chromatographic conditions are changed, retention times and analytical separations are often affected. As a result, two critical aspects of any chromatographic method are the determination and verification of retention times and analyte separation. Retention time windows must be established for the identification of target analytes. The retention times of all target analytes in all calibration verification standards must fall within the retention time windows. If an analyte falls outside the retention time window in an ICV or CCV, new absolute retention time windows must be calculated, unless instrument maintenance fixes the problem. When a new column is installed, a new retention time window study must be performed.

3.13.2. Please reference method-specific SOPs for the proper procedure for establishing retention time windows.

3.14. Analytical Method Validation and Instrument Validation

3.14.1. In some situations, Pace develops and validates methodologies that may be more applicable to a specific problem or objective. When non-standard methods are required for specific projects or analytes of interest, or when the laboratory develops or modifies a method, the laboratory validates the method prior to applying it to customer samples. Method validity is established by meeting criteria for precision and accuracy as established by the data quality objectives specified by the end user of the data. The laboratory records the validation procedure, the results obtained and a statement as to the usability of the method. The minimum requirements for method validation include evaluation of sensitivity, quantitation, precision, bias, and selectivity of each analyte of interest.

3.15. Regulatory and Method Compliance

3.15.1. It is Pace policy to disclose in a forthright manner any detected noncompliance affecting the usability of data produced by our laboratories. The laboratory will notify customers within 30 days of fully characterizing the nature of the nonconformance, the scope of the nonconformance and the impact it may have on data usability.

4.0. DOCUMENT MANAGEMENT AND CHANGE CONTROL

4.1. Document Management

4.1.1. Additional information can be found in SOP S-GB-Q-029 **Document Control and Management** or its equivalent revision or replacement. Information on Pace's policy for electronic signatures can also be found in this SOP.

4.1.2. Pace has an established procedure for managing documents that are part of the quality system.

4.1.3. A master list of all managed documents is maintained at each facility identifying the current revision status and distribution of the controlled documents

4.1.4. Each managed document is uniquely identified to include the date of issue, the revision identification, page numbers, the total number of pages and the issuing authorities. For complete information on document numbering, refer to SOP S-ALL-Q-003 **Document Numbering**.

4.1.5. **Quality Assurance Manual (QAM):** The Quality Assurance Manual is the company-wide document that describes all aspects of the quality system for Pace. The base QAM template is distributed by the Corporate Environmental Quality Department to each of the SQMs/QMs. The local management personnel modify the necessary and permissible sections of the base template and then all applicable lab staff sign the Quality Assurance Manual. Each SQM/QM is then in charge of distribution to employees, external customers or regulatory agencies and maintaining a distribution list of controlled document copies. The Quality Assurance Manual template is reviewed on an annual basis and revised accordingly by the Corporate Quality office.

4.1.6. **Standard Operating Procedures (SOPs)**

4.1.6.1. SOPs are reviewed every two years at a minimum although a more frequent review may be required by some state or federal agencies or customers. If no revisions are made based on this review, documentation of the review itself is made by the addition of new signatures on the cover page. If revisions are made, documentation of the revisions is made in the revisions section of each SOP and a new revision number is applied to the SOP. This provides a historical record of all revisions.

4.1.6.2. All copies of superseded SOPs are removed from general use and the original copy of each SOP is archived for audit or knowledge preservation purposes. This ensures that all Pace employees use the most current version of each SOP and provides the SQM/QM with a historical record of each SOP.

4.1.6.3. Additional information can be found in SOP S-GB-Q-017 **Preparation of SOPs** or its equivalent revision or replacement.

4.2. Document Change Control

4.2.1. Additional information can be found in SOP S-GB-Q-029 **Document Control and Management** or its equivalent revision or replacement.

4.2.2. Changes to managed documents are reviewed and approved in the same manner as the original review. Any revision to a document requires the approval of the applicable signatories. After revisions are approved, a revision number is assigned and the previous version of the document is officially retired.

4.2.3. All copies of the previous document are replaced with copies of the revised document and the superseded copies are destroyed or archived. All affected personnel are advised that there has been a revision and any necessary training is scheduled.

5.0. EQUIPMENT AND MEASUREMENT TRACEABILITY

5.1. Standards and Traceability

5.1.1. Each Pace facility retains pertinent information for standards, reagents, and chemicals to assure traceability to a national standard. This includes documentation of purchase, receipt, preparation, and use.

5.1.2. Upon receipt, all purchased standard reference materials are recorded into a standard logbook or database and assigned a unique identification number. The entries include the facility's unique identification number, the chemical name, manufacturer name, manufacturer's identification numbers, receipt date, and expiration date. Vendor's certificates of analysis for all standards, reagents, or chemicals are retained for future reference.

5.1.3. Subsequent preparations of intermediate or working solutions are also documented in a standard logbook or database. These entries include the stock standard name and lot number, the manufacturer name, the solvents used for preparation, the solvent lot number and manufacturer, the preparation steps, preparation date, expiration dates, preparer's initials, and a unique Pace identification number. This number is used in any applicable sample preparation or analysis logbook so the standard can be traced back to the standard preparation record. This process ensures traceability back to the national standard.

5.1.4. All prepared standard or reagent containers include the Pace identification number, the standard or chemical name, the date of preparation, the date of expiration, the concentration with units, and the preparer's initials, unless the container is too small to hold all of this information. This ensures traceability back to the standard preparation logbook or database.

5.1.5. All initial calibrations must be verified with a standard obtained from a second manufacturer or a separate lot prepared independently by the same manufacturer, unless client-specific QAPP requirements state otherwise.

5.1.6. Additional information concerning the procurement of standards and reagent and their traceability can be found in the SOP S-GB-Q-026 **Standard and Reagent Management and Traceability** or its equivalent revision or replacement.

5.2. General Analytical Instrument Calibration Procedures

5.2.1. All applicable instrumentation are calibrated or checked before use to ensure proper functioning and verify that laboratory, client and regulatory requirements are met. All calibrations are performed by, or under the supervision of, an experienced analyst at scheduled intervals against either certified standards traceable to recognized national standards or reference standards whose values have been statistically validated.

5.2.2. Calibration standards for each parameter are chosen to establish the linear range of the instrument and must bracket the concentrations of those parameters measured in the samples. The lowest calibration standard is the lowest concentration for which quantitative data may be reported. Data reported below this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in a narrative. The highest calibration standard is the highest concentration for which quantitative data may be reported. Data reported above this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in the narrative.

5.2.3. Instrumentation or support equipment that cannot be calibrated to specification or is otherwise defective is clearly labeled as out-of-service until it has been repaired and tested to demonstrate it meets the laboratory's specifications. All repair and maintenance activities including service calls are documented in the maintenance log. Equipment sent off-site for calibration testing is packed and transported to prevent breakage and is in accordance with the calibration laboratory's recommendations.

5.2.4. In the event that recalibration of a piece of test equipment indicates the equipment may have been malfunctioning during the course of sample analysis, an investigation is performed. The results of the investigation along with a summary of the information reviewed are documented and maintained by the quality manager. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed. This allows for sufficient investigation and review of documentation to determine the impact on the analytical results. Instrumentation found to be consistently out of calibration is either repaired and positively verified or taken out of service and replaced.

5.2.5. Raw data records are retained to document equipment performance. Sufficient raw data is retained to reconstruct the instrument calibration and explicitly connect the continuing calibration verification to the initial calibration.

5.3. Support Equipment Calibration and Verification Procedures

5.3.1. All support equipment is calibrated or verified at least annually using NIST traceable references over the entire range of use, as applicable. The results of calibrations or verifications must be within the specifications required or the equipment will be removed from service until brought back into control. Additional information regarding calibration and maintenance of support equipment can be found in SOP S-GB-Q-030 **Support Equipment** or its equivalent revision or replacement.

5.3.2. On each day the support equipment is used, it is verified, as applicable, in the expected range of use with NIST traceable references in order to ensure the equipment meets laboratory specifications. These checks are documented appropriately. This applies mainly to thermometers within temperature-controlled units and balances.

5.3.3. **Analytical Balances**

5.3.3.1. Each analytical balance is calibrated or verified at least annually by a qualified service technician. The calibration of each balance is verified each day of use with weights traceable to NIST bracketing the range of use. Calibration weights are ASTM Class 1 or other class weights that have been calibrated against a NIST standard weight and are re-certified every 5 years at a minimum against a NIST traceable reference. Some accrediting agencies may require more frequent checks. If balances are calibrated by an external agency, verification of their weights must be provided. All information pertaining to balance maintenance and calibration is recorded in the individual balance logbook and/or is maintained on file in the local Quality department.

5.3.4. Thermometers

5.3.4.1. Certified, or reference, thermometers are maintained for checking calibration of working thermometers. Reference thermometers are provided with NIST traceability for initial calibration and are re-certified, at a minimum, every 3 years with equipment directly traceable to NIST.

5.3.4.2. Working thermometers are compared with the reference thermometers annually according to corporate metrology procedures (working digital thermometers are calibrated quarterly). Each thermometer is individually numbered and assigned a correction factor based on the NIST reference source. In addition, working thermometers are visually inspected by laboratory personnel prior to use and temperatures are documented.

5.3.4.3. Laboratory thermometer inventory and calibration data are maintained in the local Quality department.

5.3.5. pH/Electrometers

5.3.5.1. The meter is calibrated before use each day, using fresh buffer solutions.

5.3.6. Spectrophotometers

5.3.6.1. During use, spectrophotometer performance is checked at established frequencies in analysis sequences against initial calibration verification (ICV) and continuing calibration verification (CCV) standards.

5.3.7. Mechanical Volumetric Dispensing Devices

5.3.7.1. Mechanical volumetric dispensing devices including bottle top dispensers (those that are critical in measuring a required amount of reagent), pipettes, and burettes, excluding Class A volumetric glassware, are checked for accuracy on a quarterly basis.

5.3.7.2. Additional information regarding calibration and maintenance of laboratory support equipment can be found in SOP S-GB-Q-030 **Support Equipment** or its equivalent revision or replacement.

5.4. Instrument/Equipment Maintenance

5.4.1. The objectives of the Pace Analytical maintenance program are twofold: to establish a system of instrument care that maintains instrumentation and equipment at required levels of calibration and sensitivity, and to minimize loss of productivity due to repairs.

5.4.2. The Operations Manager and/or department manager/supervisors are responsible for providing technical leadership to evaluate new equipment, solve equipment problems, and coordinate instrument repair and maintenance. Analysts have the primary responsibility to perform routine maintenance.

5.4.3. To minimize downtime and interruption of analytical work, preventative maintenance may routinely performed on each analytical instrument. Up-to-date instructions on the use and maintenance of equipment are available to staff in the department where the equipment is used.

5.4.4. Department manager/supervisors are responsible for maintaining an adequate inventory of spare parts required to minimize equipment downtime. This inventory includes parts and supplies that are subject to frequent failure, have limited lifetimes, or cannot be obtained in a timely manner should a failure occur.

5.4.5. All major equipment and instrumentation items are uniquely identified to allow for traceability. Equipment/instrumentation is, unless otherwise stated, identified as a system and not as individual pieces. The laboratory maintains equipment records that include the following:

- The name of the equipment and its software
- The manufacturer's name, type, and serial number
- Approximate date received and date placed into service
- Current location in the laboratory
- Condition when received (new, used, etc.)
- Copy of any manufacturer's manuals or instructions
- Dates and results of calibrations and next scheduled calibration (if known)
- Details of past maintenance activities, both routine and non-routine
- Details of any damage, modification or major repairs

5.4.6. All instrument maintenance is documented in maintenance logbooks that are assigned to each particular instrument or system.

5.4.7. The maintenance log entry must include a summary of the results of that analysis and verification by the analyst that the instrument has been returned to an in-control status. In addition, each entry must include the initials of the analyst making the entry, the dates the maintenance actions were performed, and the date the entry was made in the maintenance logbook, if different from the date(s) of the maintenance.

5.4.8. Any equipment that has been subjected to overloading or mishandling, or that gives suspect results, or has been shown to be defective, is taken out of service and clearly identified. The equipment shall not be used to analyze customer samples until it has been repaired and shown to perform satisfactorily. In the event of instrumentation failure, to avoid hold time issues, the lab may subcontract the necessary samples to another Pace lab or to an outside subcontract lab if possible.

6.0. CONTROL OF DATA

Analytical results processing, verification, and reporting are procedures employed that result in the delivery of defensible data. These processes include, but are not limited to, calculation of raw data into final concentration values, review of results for accuracy, evaluation of quality control criteria and assembly of technical reports for delivery to the data user.

All analytical data undergo a documented multi-tier review process prior to being reported to the customer. This section describes procedures used for translating raw analytical data into accurate final sample reports as well as Pace data storage policies.

When analytical, field, or product testing data is generated, it is documented appropriately. These logbooks and other laboratory records are kept in accordance with each facility's SOP for documentation storage and archival In this case, the laboratory must ensure that there are sufficient redundant electronic copies so no data is lost due to unforeseen computer issues

6.1. Primary Data Review

6.1.1. The primary analyst is responsible for initial data reduction and data review. This includes confirming compliance with required methodology, verifying calculations, evaluating quality control data, noting non-conformances in logbooks or as footnotes or narratives, and uploading analytical results into the LIMS. Data review checklists, either hardcopy or electronic, are used to document the primary data review process. The primary analyst must be clearly identified in all applicable logbooks, spreadsheets, LIMS fields, and data review checklists.

6.1.2. The primary analyst compiles the initial data for secondary data review. This compilation must include sufficient documentation for secondary data review.

6.1.3. Additional information regarding data review procedures can be found in SOP S-GB-Q-032 **Data Review** or its equivalent revision or replacement, as well as in SOP S-ALL-Q-016 **Manual Integration** or its equivalent revision or replacement.

6.2. Secondary Data Review

6.2.1. Secondary data review is the process of examining data and accepting or rejecting it based on pre-defined criteria. This review step is designed to ensure that reported data are free from calculation and transcription errors, that quality control parameters are evaluated, and that any non-conformances are properly documented.

6.2.2. The completed data from the primary analyst is sent to a designated qualified secondary data reviewer (this cannot be the primary analyst). The secondary data reviewer provides an independent technical assessment of the data package and technical review for accuracy according to methods employed and laboratory protocols. This assessment involves a quality control review for use of the proper methodology and detection limits, compliance to quality control protocol and criteria, presence and completeness of required deliverables, and accuracy of calculations and data quantitation. The reviewer validates the data entered into the LIMS and documents approval of manual integrations. Data review checklists, either hardcopy or electronic, are used to document the secondary data review process.

6.2.3. Additional information regarding data review procedures can be found in SOP S-GB-Q-032 **Data Review** or its equivalent revision or replacement, as well as in SOP S-ALL-Q-016 **Manual Integration** or its equivalent revision or replacement.

6.3. Data Reporting

6.3.1. Data for each analytical fraction pertaining to a particular Pace project number are delivered to the Project Manager for assembly into the final report. All points mentioned during technical and QC reviews are included in data qualifiers on the final report or in a separate case narrative if there is potential for data to be impacted.

6.3.2. Final reports are prepared according to the level of reporting required by the customer and can be transmitted to the customer via hardcopy or electronic deliverable. Please reference **Final Reports and Deliverables SOP S-GB-Q-035**, or its equivalent revision or replacement.

6.3.3. Any changes made to a final report shall be designated as "Revised" or equivalent wording. The laboratory must keep sufficient archived records of all laboratory reports and revisions. For higher levels of data deliverables, a copy of all supporting raw data is sent to the customer along with a final report of results. Pace will provide electronic data deliverables (EDD) as required by contracts or upon customer request.

6.3.4. Customer data that requires transmission by telephone, telex, facsimile or other electronic means undergoes appropriate steps to preserve confidentiality.

6.3.5. The following positions are the only approved signatories for Pace final reports:

- Senior General Manager
- General Manager
- Assistant General Manager
- Senior Quality Manager
- Quality Manager
- Client Services Manager
- Project Manager
- Project Coordinator

6.4. Data Security

6.4.1. All data including electronic files, logbooks, extraction/digestion/distillation worksheets, calculations, project files and reports, and any other information used to produce the technical report are maintained secured and retrievable by the Pace facility.

6.5. Data Archiving

6.5.1. All records compiled by Pace are archived in a suitable, limited-access environment to prevent loss, damage, or deterioration by fire, flood, vermin, theft, and/or environmental deterioration. Records are retained for a minimum of five years unless superseded by federal, state, contractual, and/or accreditation requirements. TNI-related records will be made readily available to accrediting authorities. Access to archived data is documented and controlled by the SQM/QM or a designated Data Archivist.

6.5.2. Records that are computer-generated have either a hard copy or electronic backup copy. Hardware and software necessary for the retrieval of electronic data is maintained with the applicable records. Archived electronic records are stored protected against electronic and/or magnetic sources.

6.5.3. In the event of a change in ownership, accountability or liability, reports of analyses performed pertaining to accreditation will be maintained per the purchase agreement. In the event of bankruptcy, laboratory reports and/or records will be transferred to the customer and/or the appropriate regulatory entity upon request.

6.6. Data Disposal

6.6.1. Data that has been archived for the facility's required storage time may be disposed of in a secure manner by shredding, returning to customer, or utilizing some other means that does not jeopardize data confidentiality. Records of data disposal will be archived for a minimum of five years unless superseded by federal, contractual, and/or accreditation requirements. Data disposal includes any preliminary or final reports that are disposed.

7.0. QUALITY SYSTEM AUDITS AND REVIEWS

7.1. Internal Audits

7.1.1. Responsibilities

7.1.1.1. The SQM/QM is responsible for managing and/or conducting internal audits in accordance with a predetermined schedule and procedure. Since internal audits represent an independent assessment of laboratory functions, the auditor must be independent from laboratory operations to ensure objectivity. The auditor must be trained, qualified, and familiar enough with the objectives, principles, and procedures of laboratory operations to be able to perform a thorough and effective evaluation. The SQM/QM evaluates audit observations and verifies the completion of corrective actions. In addition, a periodic corporate audit will be conducted. The corporate audits will focus on the effectiveness of the Quality System as outlined in this manual but may also include other quality programs applicable to an individual laboratory.

7.1.1.2. Additional information can be found in SOP S-GB-Q-022 **Internal and External Audits** or its equivalent revision or replacement.

7.1.2. Scope and Frequency of Internal Audits

7.1.2.1. The complete internal audit process consists of the following four sections: 1) Raw Data Reviews, 2) traditional Quality Systems internal audits (including SOP and method compliance), 3) Final Report Reviews, and 4) Corrective Action Effectiveness Follow-up.

7.1.2.2. Internal systems audits are conducted yearly at a minimum. The scope of these audits includes evaluation of specific analytical departments or a specific quality related system as applied throughout the laboratory.

7.1.2.3. Where the identification of non-conformities or departures cast doubt on the laboratory's compliance with its own policies and procedures, the lab must ensure that the appropriate areas of activity are audited as soon as possible.

7.1.2.4. Certain projects may require an internal audit to ensure laboratory conformance to site work plans, sampling and analysis plans, QAPPs, etc.

7.1.2.5. The laboratory, as part of their overall internal audit program, ensures that a review is conducted with respect to any evidence of inappropriate actions or vulnerabilities related to data integrity. Discovery and reporting of potential data integrity issues are handled in a confidential manner. All investigations that result in findings of inappropriate activity are fully documented, including the source of the problem, the samples and customers affected the impact on the data, the corrective actions taken by the laboratory, and which final reports had to be re-issued. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed.

7.1.3. Internal Audit Reports and Corrective Action Plans

7.1.3.1. A full description of the audit, including the identification of the operation audited, the date(s) on which the audit was conducted, the specific systems examined, and the observations noted are summarized in an internal audit report. Although other personnel may assist with the

performance of the audit, the SQM/QM writes and issues the internal audit report identifying which audit observations are deficiencies that require corrective action.

7.1.3.2. When audit findings cast doubt on the effectiveness of the operations or on the correctness of validity of the laboratory's environmental test results, the laboratory will take timely corrective action and notify the customer in writing within three business days, if investigations show that the laboratory results may have been affected.

7.1.3.3. Additional information can be found in SOP S-GB-Q-022 **Internal and External Audits** or its equivalent revision or replacement.

7.2. External Audits

7.2.1. Pace laboratories are audited regularly by regulatory agencies to maintain laboratory certifications and by customers to maintain appropriate specific protocols.

7.2.2. External audit teams review the laboratory to assess the effectiveness of quality systems. The SQM/QM host the external audit team and assist in facilitation of the audit process. After the audit, the external auditors will prepare a formalized audit report listing deficiencies observed and follow-up requirements for the laboratory. The laboratory staff and supervisors develop corrective action plans to address any deficiencies with the guidance of the SQM/QM, who provides a written response to the external audit team. The SQM/QM follows-up with the laboratory staff to ensure corrective actions are implemented and that the corrective action was effective.

7.3. Annual Managerial Review

7.3.1. A managerial review of Management and Quality Systems is performed on an annual basis at a minimum. This allows for assessing program effectiveness and introducing changes and/or improvements. Additional information can be found in SOP S-ALL-Q-015 **Review of Laboratory Management System** or its equivalent revision or replacement.

7.3.2. The managerial review must include the following topics of discussion:

- Suitability of quality management policies and procedures
- Manager/Supervisor reports
- Internal audit results
- Corrective and preventive actions
- External assessment results
- Proficiency testing studies
- Sample capacity and scope of work changes
- Customer feedback, including complaints
- Recommendations for improvement,
- Other relevant factors, such as quality control activities, resources, and staffing.

7.3.3. This managerial review must be documented for future reference by the SQM/QM and copies of the report are distributed to laboratory staff. Results must feed into the laboratory planning system and must include goals, objectives, and action plans for the coming year. The laboratory shall ensure that any actions identified during the review are carried out within an appropriate and agreed upon timescale.

8.0. CORRECTIVE ACTION

Additional information can be found in SOP S-GB-Q-027 **Corrective and Preventive Actions** or its equivalent revision or replacement.

During the process of sample handling, preparation, and analysis, or during review of quality control records, or during reviews of non-technical portions of the lab, certain occurrences may warrant the necessity of corrective actions. These occurrences may take the form of analyst errors, deficiencies in quality control, method deviations, or other unusual circumstances. The Quality System of Pace provides systematic procedures for the documentation, monitoring, completion of corrective actions, and follow-up verification of the effectiveness of these corrective actions. This can be done using Pace's LabTrack system that lists at a minimum, the deficiency by issue number, the deficiency source, responsible party, root cause, resolution, due date, and date resolved.

8.1. Corrective and Preventive Action Documentation

8.1.1. The following items are examples of sources of laboratory deviations or non-conformances that may warrant some form of documented corrective action:

- Internal Laboratory Non-Conformance Trends
- Proficiency Testing Sample Results
- Internal and External Audits
- Data or Records Review
- Client Complaints
- Client Inquiries
- Holding Time violations

8.1.2. Documentation of corrective actions may be in the form of a comment or footnote on the final report that explains the deficiency (e.g., matrix spike recoveries outside of acceptance criteria) or it may be a more formal documentation (either paper system or computerized spreadsheet). This depends on the extent of the deficiency, the impact on the data, and the method or customer requirements for documentation.

8.1.3. The person who discovers the deficiency or non-conformance initiates the corrective action documentation within the lab's corrective action system. The documentation must include (as applicable): the affected projects and sample numbers, the name of the applicable Project Manager, the customer name, and the sample matrix involved. The person initiating the corrective action documentation must also list the known causes of the deficiency or non-conformance as well as any corrective/preventative actions that they have taken. Preventive actions must be taken in order to prevent or minimize the occurrence of the situation.

8.1.4. **Root Cause Analysis**: Laboratory personnel and management staff will start a root cause analysis by going through an investigative process. During this process, the following general steps must be taken into account: defining the non-conformance, assigning responsibilities, determining if the condition is significant, and investigating the root cause of the nonconformance. General non-conformance investigative techniques follow the path of the sample through the process looking at each individual step in detail. The root cause must be documented within the lab's corrective action system.

8.1.5. Based on the root cause(s) determined, the lab implements applicable corrective actions and verifies their effectiveness. In the event that analytical testing or results do not conform to documented laboratory policies or procedures Project Management will notify the customer of the situation and will advise of any ramifications to data quality if impacted (with the possibility of work being recalled).

8.2. Corrective Action Completion

8.2.1. Internal Laboratory Non-Conformance Trends

8.2.1.1. There are several types of non-conformance trends that may occur in the laboratory that would require the initiation of a corrective action report. Laboratories may choose to initiate a corrective action for all instances of one or more of these categories if they so choose, however the intent is that each of these would be handled according to its severity; one time instances could be handled with a footnote or qualifier whereas a systemic problem with any of these categories may require an official corrective action process. These categories, as defined in the Corrective Action SOP are as follows:

- Login error
- Preparation Error
- Contamination
- Calibration Failure
- Internal Standard Failure
- LCS Failure
- Laboratory accident
- Spike Failure
- Instrument Failure
- Final Reporting error

8.2.2. PE/PT Sample Results

8.2.2.1. Any PT result assessed as "not acceptable" requires an investigation and applicable corrective actions. The operational staff is made aware of the PT failures and they are responsible for reviewing the applicable raw data and calibrations and list possible causes for error. The SQM/QM reviews their findings and initiates another external PT sample or an internal PT sample to try and correct the previous failure. Replacement PT results must be monitored by the SQM/QM and reported to the applicable regulatory authorities.

8.2.2.2. Additional information, such as requirements regarding time frames for reporting failures to states, makeup PTs, and notifications of investigations, can be found in SOP S-GB-Q-021 **Proficiency Testing Program** or its equivalent revision or replacement.

8.2.3. Internal and External Audits

8.2.3.1. The SQM/QM is responsible for documenting all audit findings and their corrective actions. This documentation must include the initial finding, the persons responsible for the corrective action, the due date for responding to the auditing body, the root cause of the finding, and the corrective actions needed for resolution. The SQM/QM is also responsible for providing any back-up documentation used to demonstrate that a corrective action has been completed.

8.2.4. Data Review

8.2.4.1. In the course of performing primary and secondary review of data or in the case of raw data reviews (e.g., by the SQM/QM), errors may be found which require corrective actions. Any finding that affects the quality of the data requires some form of corrective action, which may include revising and re-issuing of final reports.

8.2.5. Client Complaints

8.2.5.1. Project Managers are responsible for issuing corrective action forms, when warranted, for customer complaints. As with other corrective actions, the possible causes of the problem are listed and the form is passed to the appropriate analyst or supervisor for investigation. After potential corrective actions have been determined, the Project Manager reviews the corrective action form to ensure all customer needs or concerns are being adequately addressed.

8.2.6. Client Inquiries

8.2.6.1. When an error on the customer report is discovered, the Project Manager is responsible for initiating a formal corrective action form that describes the failure (e.g., incorrect analysis reported, reporting units are incorrect, or reporting limits do not meet objectives). The Project Manager is also responsible for revising the final report if necessary and submitting it to the customer.

8.2.7. Holding Time Violations

8.2.7.1. In the event that a holding time has been missed, the analyst or supervisor must complete a formal corrective action form. The Project Manager and the SQM/QM must be made aware of all holding time violations.

8.2.7.2. The Project Manager must contact the customer in order that appropriate decisions are made regarding the hold time excursion and the ultimate resolution is then documented and included in the customer project file.

9.0. GLOSSARY

The source of some of the definitions is indicated previous to the actual definition (e.g., TNI, DoD).

Terms and Definitions	
3P Program	The Pace continuous improvement program that focuses on Process, Productivity, and Performance. Best Practices are identified that can be used by all Pace labs.
Acceptance Criteria	TNI- Specified limits placed on characteristics of an item, process, or service defined in requirement documents.
Accreditation	TNI- The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. DoD- Refers to accreditation in accordance with the DoD ELAP.
Accreditation Body (AB)	TNI- The organization having responsibility and accountability for environmental laboratory accreditation and which grants accreditation under this program. DoD- Entities recognized in accordance with the DoD-ELAP that are required to operate in accordance with ISO/IEC 17011, *Conformity assessment: General requirements for accreditation bodies accrediting conformity assessment bodies*. The AB must be a signatory, in good standing, to the International Laboratory Accreditation Cooperation (ILAC) mutual recognition arrangement (MRA) that verifies, by evaluation and peer assessment, that its signatory members are in full compliance with ISO/IEC 17011 and that its accredited laboratories comply with ISO/IEC 17025.
Accuracy	TNI- The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator.
Activity, Absolute	TNI- Rate of nuclear decay occurring in a body of material, equal to the number of nuclear disintegrations per unit time. NOTE: Activity (absolute) may be expressed in becquerels (Bq), curies (Ci), or disintegrations per minute (dpm), and multiples or submultiples of these units.
Activity, Areic	TNI- Quotient of the activity of a body of material and its associated area.
Activity, Massic	TNI- Quotient of the activity of a body of material and its mass; also called specific activity.
Activity, Volumic	TNI- Quotient of the activity of a body of material and its volume; also called activity concentration. NOTE: In this module [TNI Volume 1, Module 6], unless otherwise stated, references to activity shall include absolute activity, areic activity, massic activity, and volumic activity.
Activity Reference Date	TNI- The date (and time, as appropriate to the half-life of the radionuclide) to which a reported activity result is calculated. NOTE: The sample collection date is most frequently used as the Activity Reference Date for environmental measurements, but different programs may specify other points in time for correction of results for decay and ingrowth.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.

American Society for Testing and Materials (ASTM)	An international standards organization that develops and publishes voluntary consensus standards for a wide range of materials, products, systems and services.
Analysis	DoD- A combination of sample preparation and instrument determination.
Analysis Code (Acode)	All the set parameters of a test, such as Analytes, Method, Detection Limits and Price.
Analysis Sequence	A compilation of all samples, standards and quality control samples run during a specific amount of time on a particular instrument in the order they are analyzed.
Analyst	TNI- The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.
Analyte	TNI- A substance, organism, physical parameter, property, or chemical constituent(s) for which an environmental sample is being analyzed. DoD- The specific chemicals or components for which a sample is analyzed; it may be a group of chemicals that belong to the same chemical family and are analyzed together.
Analytical Method	DoD- A formal process that identifies and quantifies the chemical components of interest (target analytes) in a sample.
Analytical Uncertainty	TNI- A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.
Annual (or Annually)	Defined by Pace as every 12 months ± 30 days.
Assessment	TNI - The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its system to defined criteria (to the standards and requirements of laboratory accreditation). DoD- An all-inclusive term used to denote any of the following: audit, performance evaluation, peer review, inspection, or surveillance conducted on-site.
Atomic Absorption Spectrometer	Instrument used to measure concentration in metals samples.
Atomization	A process in which a sample is converted to free atoms.
Audit	TNI- A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.

Batch	TNI- Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same quality systems matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed 20 samples.
Batch, Radiation Measurements (RMB)	TNI- An RMB is composed of 1 to 20 environmental samples that are counted directly without preliminary physical or chemical processing that affects the outcome of the test (e.g., non-destructive gamma spectrometry, alpha/beta counting of air filters, or swipes on gas proportional detectors). The samples in an RMB share similar physical and chemical parameter, and analytical configurations (e.g., analytes, geometry, calibration, and background corrections). The maximum time between the start of processing of the first and last in an RMB is 14 calendar days.
Bias	TNI- The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).
Blank	TNI and DoD- A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results (See Method Blank). DoD- Blank samples are negative control samples, which typically include field blank samples (e.g., trip blank, equipment (rinsate) blank, and temperature blank) and laboratory blank samples (e.g., method blank, reagent blank, instrument blank, calibration blank, and storage blank).
Blind Sample	A sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.
BNA (Base Neutral Acid compounds)	A list of semi-volatile compounds typically analyzed by mass spectrometry methods. Named for the way they can be extracted out of environmental samples in an acidic, basic or neutral environment.
BOD (Biochemical Oxygen Demand)	Chemical procedure for determining how fast biological organisms use up oxygen in a body of water.

Calibration	TNI- A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. 1) In calibration of support equipment, the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI); 2) In calibration according to test methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.
Calibration Curve	TNI- The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.
Calibration Method	A defined technical procedure for performing a calibration.
Calibration Range	DoD- The range of values (concentrations) between the lowest and highest calibration standards of a multi-level calibration curve. For metals analysis with a single-point calibration, the low-level calibration check standard and the high standard establish the linear calibration range, which lies within the linear dynamic range.
Calibration Standard	TNI- A substance or reference material used for calibration.
Certified Reference Material (CRM)	TNI- Reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute.
Chain of Custody	An unbroken trail of accountability that verifies the physical security of samples, data, and records.
Chain of Custody Form (COC)	TNI- Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and type of containers; the mode of collection, the collector, time of collection; preservation; and requested analyses.
Chemical Oxygen Demand (COD)	A test commonly used to indirectly measure the amount of organic compounds in water.
Client (referred to by ISO as Customer)	Any individual or organization for whom items or services are furnished or work performed in response to defined requirements and expectations.
Code of Federal Regulations (CFR)	A codification of the general and permanent rules published in the Federal Register by agencies of the federal government.
Comparability	An assessment of the confidence with which one data set can be compared to another. Comparable data are produced through the use of standardized procedures and techniques.
Completeness	The percent of valid data obtained from a measurement system compared to the amount of valid data expected under normal conditions. The equation for completeness is: % Completeness = (Valid Data Points/Expected Data Points)*100

Confirmation	TNI- Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: second-column confirmation; alternate wavelength; derivatization; mass spectral interpretation; alternative detectors; or additional cleanup procedures. DoD- Includes verification of the identity and quantity of the analyte being measured by another means (e.g., by another determinative method, technology, or column). Additional cleanup procedures alone are not considered confirmation techniques.
Conformance	An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements.
Congener	A member of a class of related chemical compounds (e.g., PCBs, PCDDs).
Consensus Standard	DoD- A standard established by a group representing a cross-section of a particular industry or trade, or a part thereof.
Continuing Calibration Blank (CCB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method.
Continuing Calibration Check Compounds (CCC)	Compounds listed in mass spectrometry methods that are used to evaluate an instrument calibration from the standpoint of the integrity of the system. High variability would suggest leaks or active sites on the instrument column.
Continuing Calibration Verification	DoD- The verification of the initial calibration. Required prior to sample analysis and at periodic intervals. Continuing calibration verification applies to both external and internal standard calibration techniques, as well as to linear and non-linear calibration models.
Continuing Calibration Verification (CCV) Standard	Also referred to as a Calibration Verification Standard (CVS) in some methods, it is a standard used to verify the initial calibration of compounds in an analytical method. CCVs are analyzed at a frequency determined by the analytical method.
Continuous Emission Monitor (CEM)	A flue gas analyzer designed for fixed use in checking for environmental pollutants.
Continuous Improvement Plan (CIP)	The delineation of tasks for a given laboratory department or committee to achieve the goals of that department.
Contract Laboratory Program (CLP)	A national network of EPA personnel, commercial labs, and support contractors whose fundamental mission is to provide data of known and documented quality.
Contract Required Detection Limit (CRDL)	Detection limit that is required for EPA Contract Laboratory Program (CLP) contracts.
Contract Required Quantitation Limit (CRQL)	Quantitation limit (reporting limit) that is required for EPA Contract Laboratory Program (CLP) contracts.
Control Chart	A graphic representation of a series of test results, together with limits within which results are expected when the system is in a state of statistical control (see definition for Control Limit)

Control Limit	A range within which specified measurement results must fall to verify that the analytical system is in control. Control limit exceedances may require corrective action or require investigation and flagging of non-conforming data.
Correction	DoD- Action taken to eliminate a detected non-conformity.
Corrective Action	DoD- The action taken to eliminate the causes of an existing non-conformity, defect, or other undesirable situation in order to prevent recurrence. A root cause analysis may not be necessary in all cases.
Corrective and Preventative Action (CAPA)	The primary management tools for bringing improvements to the quality system, to the management of the quality system's collective processes, and to the products or services delivered which are an output of established systems and processes.
Critical Value	TNI- Value to which a measurement result is compared to make a detection decision (also known as critical level or decision level). NOTE: The Critical Value is designed to give a specified low probability α of false detection in an analyte-free sample, which implies that a result that exceeds the Critical Value, gives high confidence (1 – α) that the radionuclide is actually present in the material analyzed. For radiometric methods, α is often set at 0.05.
Customer	DoD- Any individual or organization for which products or services are furnished or work performed in response to defined requirements and expectations.
Data Integrity	TNI- The condition that exists when data are sound, correct, and complete, and accurately reflect activities and requirements.
Data Quality Objective (DQO)	Systematic strategic planning tool based on the scientific method that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use or end user.
Data Reduction	TNI- The process of transforming the number of data items by arithmetic or statistical calculation, standard curves, and concentration factors, and collating them into a more usable form.
Definitive Data	DoD- Analytical data of known quantity and quality. The levels of data quality on precision and bias meet the requirements for the decision to be made. Data that is suitable for final decision-making.
Demonstration of Capability (DOC)	TNI- A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. DoD- A procedure to establish the ability of the analyst to generate analytical results by a specific method that meet measurement quality objectives (e.g., for precision and bias).
Department of Defense (DoD)	An executive branch department of the federal government of the United States charged with coordinating and supervising all agencies and functions of the government concerned directly with national security.
Detection Limit (DL)	DoD- The smallest analyte concentration that can be demonstrated to be different than zero or a blank concentration with 99% confidence. At the DL, the false positive rate (Type 1 error) is 1%. A DL may be used as the lowest concentration for reliably reporting a detection of a specific analyte in a specific matrix with a specific method with 99% confidence.

Detection Limit (DL) for Safe Drinking Water Act (SDWA) Compliance	TNI- Laboratories that analyze drinking-water samples for SDWA compliance monitoring must use methods that provide sufficient detection capability to meet the detection limit requirements established in 40 CFR 141. The SDWA DL for radioactivity is defined in 40 CFR Part 141.25.c as the radionuclide concentration, which can be counted with a precision of plus or minus 100% at the 95% confidence level (1.96σ where σ is the standard deviation of the net counting rate of the sample).
Deuterated Monitoring Compounds (DMCs)	DoD- SIM specific surrogates as specified for GC/MS SIM analysis.
Diesel Range Organics (DRO)	A range of compounds that denote all the characteristic compounds that make up diesel fuel (range can be state or program specific).
Digestion	DoD- A process in which a sample is treated (usually in conjunction with heat and acid) to convert the target analytes in the sample to a more easily measured form.
Document Control	The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.
Documents	DoD- Written components of the laboratory management system (e.g., policies, procedures, and instructions).
Dry Weight	The weight after drying in an oven at a specified temperature.
Duplicate (also known as Replicate or Laboratory Duplicate)	The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results of duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory.
Electron Capture Detector (ECD)	Device used in GC methods to detect compounds that absorb electrons (e.g., PCB compounds).
Electronic Data Deliverable (EDD)	A summary of environmental data (usually in spreadsheet form) which clients request for ease of data review and comparison to historical results.
Eluent	A solvent used to carry the components of a mixture through a stationary phase.
Elute	To extract, specifically, to remove (absorbed material) from an absorbent by means of a solvent.
Elution	A process in which solutes are washed through a stationary phase by movement of a mobile phase.
Environmental Data	DoD- Any measurements or information that describe environmental processes, locations, or conditions; ecological or health effects and consequences; or the performance of environmental technology.
Environmental Monitoring	The process of measuring or collecting environmental data.
Environmental Protection Agency (EPA)	An agency of the federal government of the United States which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress.

Environmental Sample	A representative sample of any material (aqueous, non-aqueous, or multimedia) collected from any source for which determination of composition or contamination is requested or required. Environmental samples can generally be classified as follows: • Non Potable Water (Includes surface water, ground water, effluents, water treatment chemicals, and TCLP leachates or other extracts) • Drinking Water - Delivered (treated or untreated) water designated as potable water • Water/Wastewater - Raw source waters for public drinking water supplies, ground waters, municipal influents/effluents, and industrial influents/effluents • Sludge - Municipal sludges and industrial sludges. • Soil - Predominately inorganic matter ranging in classification from sands to clays. • Waste - Aqueous and non-aqueous liquid wastes, chemical solids, and industrial liquid and solid wastes
Equipment Blank	A sample of analyte-free media used to rinse common sampling equipment to check effectiveness of decontamination procedures.
Extracted Internal Standard Analyte	Isotopically labeled analogs of analytes of interest added to all standards, blanks and samples analyzed. Added to samples and batch QC samples prior to the first step of sample extraction and to standards and instrument blanks prior to analysis. Used for isotope dilution methods.
Facility	A distinct location within the company that has unique certifications, personnel and waste disposal identifications.
False Negative	DoD- A result that fails to identify (detect) an analyte or reporting an analyte to be present at or below a level of interest when the analyte is actually above the level of interest.
False Positive	DoD- A result that erroneously identifies (detects) an analyte or reporting an analyte to be present above a level of interest when the analyte is actually present at or below the level of interest.
Field Blank	A blank sample prepared in the field by filling a clean container with reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken.
Field Measurement	Determination of physical, biological, or radiological properties, or chemical constituents that are measured on-site, close in time and space to the matrices being sampled/measured, following accepted test methods. This testing is performed in the field outside of a fixed-laboratory or outside of an enclosed structure that meets the requirements of a mobile laboratory.
Field of Accreditation	TNI- Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.
Field of Proficiency Testing (FoPT)	TNI- Matrix, technology/method, analyte combinations for which the composition, spike concentration ranges and acceptance criteria have been established by the PTPEC.

Finding	TNI- An assessment conclusion referenced to a laboratory accreditation standard and supported by objective evidence that identifies a deviation from a laboratory accreditation standard requirement. DoD- An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive, negative, or neutral and is normally accompanied by specific examples of the observed condition. The finding must be linked to a specific requirement (e.g., this standard, ISO requirements, analytical methods, contract specifications, or laboratory management systems requirements).
Flame Atomic Absorption Spectrometer (FAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the fact that ground state metals absorb light at different wavelengths. Metals in a solution are converted to the atomic state by use of a flame.
Flame Ionization Detector (FID)	A type of gas detector used in GC analysis where samples are passed through a flame which ionizes the sample so that various ions can be measured.
Gas Chromatography (GC)	Instrumentation which utilizes a mobile carrier gas to deliver an environmental sample across a stationary phase with the intent to separate compounds out and measure their retention times.
Gas Chromatograph/ Mass Spectrometry (GC/MS)	In conjunction with a GC, this instrumentation utilizes a mass spectrometer which measures fragments of compounds and determines their identity by their fragmentation patterns (mass spectra).
Gasoline Range Organics (GRO)	A range of compounds that denote all the characteristic compounds that make up gasoline (range can be state or program specific).
Graphite Furnace Atomic Absorption Spectrometry (GFAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the absorption of light at different wavelengths that are characteristic of different analytes.
High Pressure Liquid Chromatography (HPLC)	Instrumentation used to separate, identify and quantitate compounds based on retention times which are dependent on interactions between a mobile phase and a stationary phase.
Holding Time	TNI- The maximum time that can elapse between two specified activities. 40 CFR Part 136- The maximum time that samples may be held prior to preparation and/or analysis as defined by the method and still be considered valid or not compromised. For sample prep purposes, hold times are calculated using the time of the start of the preparation procedure. DoD- The maximum time that may elapse from the time of sampling to the time of preparation or analysis, or from preparation to analysis, as appropriate.
Homogeneity	The degree to which a property or substance is uniformly distributed throughout a sample.
Homologue	One in a series of organic compounds in which each successive member has one more chemical group in its molecule than the next preceding member. For instance, methanol, ethanol, propanol, butanol, etc., form a homologous series.
Improper Actions	DoD- Intentional or unintentional deviations from contract-specified or method-specified analytical practices that have not been authorized by the customer (e.g., DoD or DOE).
Incremental Sampling Method (ISM)	Soil preparation for large volume (1 kg or greater) samples.

In-Depth Data Monitoring	TNI- When used in the context of data integrity activities, a review and evaluation of documentation related to all aspects of the data generation process that includes items such as preparation, equipment, software, calculations, and quality controls. Such monitoring shall determine if the laboratory uses appropriate data handling, data use and data reduction activities to support the laboratory's data integrity policies and procedures.
Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)	Analytical technique used for the detection of trace metals which uses plasma to produce excited atoms that emit radiation of characteristic wavelengths.
Inductively Coupled Plasma- Mass Spectrometry (ICP/MS)	An ICP that is used in conjunction with a mass spectrometer so that the instrument is not only capable of detecting trace amounts of metals and non-metals but is also capable of monitoring isotopic speciation for the ions of choice.
Infrared Spectrometer (IR)	An instrument that uses infrared light to identify compounds of interest.
Initial Calibration (ICAL)	The process of analyzing standards, prepared at specified concentrations, to define the quantitative response relationship of the instrument to the analytes of interest. Initial calibration is performed whenever the results of a calibration verification standard do not conform to the requirements of the method in use or at a frequency specified in the method.
Initial Calibration Blank (ICB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method. This blank is specifically run in conjunction with the Initial Calibration Verification (ICV) where applicable.
Initial Calibration Verification (ICV)	DoD- Verifies the initial calibration with a standard obtained or prepared from a source independent of the source of the initial calibration standards to avoid potential bias of the initial calibration.
Injection Internal Standard Analyte	Isotopically labeled analogs of analytes of interest (or similar in physiochemical properties to the target analytes but with a distinct response) to be quantitated. Added to all blanks, standards, samples and batch QC after extraction and prior to analysis.
Instrument Blank	A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination.
Instrument Detection Limits (IDLs)	Limits determined by analyzing a series of reagent blank analyses to obtain a calculated concentration. IDLs are determined by calculating the average of the standard deviations of three runs on three non-consecutive days from the analysis of a reagent blank solution with seven consecutive measurements per day.
Interference, spectral	Occurs when particulate matter from the atomization scatters incident radiation from the source or when the absorption or emission from an interfering species either overlaps or is so close to the analyte wavelength that resolution becomes impossible.
Interference, chemical	Results from the various chemical processes that occur during atomization and later the absorption characteristics of the analyte.
Internal Standard	TNI and DoD- A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.

International Organization for Standardization (ISO)	An international standard-setting body composed of representatives from various national standards organizations.
Intermediate Standard Solution	Reference solutions prepared by dilution of the stock solutions with an appropriate solvent.
International System of Units (SI)	The coherent system of units adopted and recommended by the General Conference on Weights and Measures.
Ion Chromatography (IC)	Instrumentation or process that allows the separation of ions and molecules based on the charge properties of the molecules.
Isomer	One of two or more compounds, radicals, or ions that contain the same number of atoms of the same element but differ in structural arrangement and properties. For example, hexane (C6H14) could be n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane.
Laboratory	A body that calibrates and/or tests.
Laboratory Control Sample (LCS)	TNI- (also known as laboratory fortified blank (LFB), spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes and taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst-specific precision and bias or to evaluate the performance of all or a portion of the measurement system.
Laboratory Duplicate	Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently.
Laboratory Information Management System (LIMS)	DoD- The entirety of an electronic data system (including hardware and software) that collects, analyzes, stores, and archives electronic records and documents.
LabTrack	Database used by Pace to store and track corrective actions and other laboratory issues.
Learning Management System (LMS)	A web-based database used by the laboratories to track and document training activities. The system is administered by the corporate training department and each laboratory's learn centers are maintained by a local administrator.
Legal Chain-of-Custody Protocols	TNI- Procedures employed to record the possession of samples from the time of sampling through the retention time specified by the client or program. These procedures are performed at the special request of the client and include the use of a Chain-of-Custody (COC) Form that documents the collection, transport, and receipt of compliance samples by the laboratory. In addition, these protocols document all handling of the samples within the laboratory.
Limit(s) of Detection (LOD)	TNI- The minimum result, which can be reliably discriminated from a blank with predetermined confidence level. DoD- The smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence. At the LOD, the false negative rate (Type II error) is 1%. A LOD may be used as the lowest concentration for reliably reporting a non-detect of a specific analyte in a specific matrix with a specific method at 99% confidence.

Limit(s) of Quantitation (LOQ)	TNI- The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. DoD- The smallest concentration that produces a quantitative result with known and recorded precision and bias. For DoD/DOE projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard and within the calibration range.
Linear Dynamic Range	DoD- Concentration range where the instrument provides a linear response.
Liquid chromatography/ tandem mass spectrometry (LC/MS/MS)	Instrumentation that combines the physical separation techniques of liquid chromatography with the mass analysis capabilities of mass spectrometry.
Lot	TNI- A definite amount of material produced during a single manufacturing cycle, and intended to have uniform character and quality.
Management	Those individuals directly responsible and accountable for planning, implementing, and assessing work.
Management System	System to establish policy and objectives and to achieve those objectives.
Manager (however named)	The individual designated as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual.
Matrix	TNI- The substrate of a test sample.
Matrix Duplicate	TNI- A replicate matrix prepared in the laboratory and analyzed to obtain a measure of precision.
Matrix Spike (MS) (spiked sample or fortified sample)	TNI- A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.
Matrix Spike Duplicate (MSD) (spiked sample or fortified sample duplicate)	TNI- A replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.
Measurement Performance Criteria (MPC)	DoD- Criteria that may be general (such as completion of all tests) or specific (such as QC method acceptance limits) that are used by a project to judge whether a laboratory can perform a specified activity to the defined criteria.
Measurement Quality Objective (MQO)	TNI- The analytical data requirements of the data quality objectives are project- or program-specific and can be quantitative or qualitative. MQOs are measurement performance criteria or objectives of the analytical process. Examples of quantitative MQOs include statements of required analyte detectability and the uncertainty of the analytical protocol at a specified radionuclide activity, such as the action level. Examples of qualitative MQOs include statements of the required specificity of the analytical protocol, e.g., the ability to analyze for the radionuclide of interest given the presence of interferences.

Measurement System	TNI- A method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s). DoD- A test method, as implemented at a particular laboratory, and which includes the equipment used to perform the sample preparation and test and the operator(s).
Measurement Uncertainty	DoD- An estimate of the error in a measurement often stated as a range of values that contain the true value within a certain confidence level. The uncertainty generally includes many components which may be evaluated from experimental standard deviations based on repeated observations or by standard deviations evaluated from assumed probability distributions based on experience or other information. For DoD/DOE, a laboratory's Analytical Uncertainty (such as use of LCS control limits) can be reported as the minimum uncertainty.
Method	TNI- A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.
Method Blank	TNI- A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.
Method Detection Limit (MDL)	TNI- One way to establish a Detection Limit; defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.
Method of Standard Additions	A set of procedures adding one or more increments of a standard solution to sample aliquots of the same size in order to overcome inherent matrix effects. The procedures encompass the extrapolation back to obtain the sample concentration.
Minimum Detectable Activity (MDA)	TNI- Estimate of the smallest true activity that ensures a specified high confidence, $1 - \beta$, of detection above the Critical Value, and a low probability β of false negatives below the Critical Value. For radiometric methods, β is often set at 0.05. NOTE 1: The MDS is a measure of the detection capability of a measurement process and as such, it is an a priori concept. It may be used in the selection of methods to meet specified MQOs. Laboratories may also calculate a "sample specific" MDA, which indicates how well the measurement process is performing under varying real-world measurement conditions, when sample-specific characteristics (e.g., interferences) may affect the detection capability. However, the MDA must never be used instead of the Critical Value as a detection threshold. NOTE 2: For the purpose of this Standard, the terms MDA and minimum detectable concentration (MDC) are equivalent.
MintMiner	Program used by Pace to review large amounts of chromatographic data to monitor for errors or data integrity issues.

Mobile Laboratory	TNI- A portable enclosed structure with necessary and appropriate accommodation and environmental conditions for a laboratory, within which testing is performed by analysts. Examples include but are not limited to trailers, vans, and skid-mounted structures configured to house testing equipment and personnel.
National Environmental Laboratory Accreditation Conference (NELAC)	See definition of The NELAC Institute (TNI).
National Institute of Occupational Safety and Health (NIOSH)	National institute charged with the provision of training, consultation and information in the area of occupational safety and health.
National Institute of Standards and Technology (NIST)	TNI- A federal agency of the US Department of Commerce's Technology Administration that is designed as the United States national metrology institute (or NMI).
National Pollutant Discharge Elimination System (NPDES)	A permit program that controls water pollution by regulating point sources that discharge pollutants into U.S. waters.
Negative Control	Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.
Nitrogen Phosphorus Detector (NPD)	A detector used in GC analyses that utilizes thermal energy to ionize an analyte. With this detector, nitrogen and phosphorus can be selectively detected with a higher sensitivity than carbon.
Nonconformance	An indication or judgment that a product or service has not met the requirement of the relevant specifications, contract, or regulation; also the state of failing to meet the requirements.
Not Detected (ND)	The result reported for a compound when the detected amount of that compound is less than the method reporting limit.
Operator Aid	DoD- A technical posting (such as poster, operating manual, or notepad) that assists workers in performing routine tasks. All operator aids must be controlled documents (i.e., a part of the laboratory management system).
Performance Based Measurement System (PBMS)	An analytical system wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner.
Physical Parameter	TNI- A measurement of a physical characteristic or property of a sample as distinguished from the concentrations of chemical and biological components.
Photo-ionization Detector (PID)	An ion detector which uses high-energy photons, typically in the ultraviolet range, to break molecules into positively charged ions.
Polychlorinated Biphenyls (PCB)	A class of organic compounds that were used as coolants and insulating fluids for transformers and capacitors. The production of these compounds was banned in the 1970's due to their high toxicity.
Positive Control	Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.
Post-Digestion Spike	A sample prepared for metals analyses that has analytes spike added to determine if matrix effects may be a factor in the results.
Power of Hydrogen (pH)	The measure of acidity or alkalinity of a solution.

Practical Quantitation Limit (PQL)	Another term for a method reporting limit. The lowest reportable concentration of a compound based on parameters set up in an analytical method and the laboratory's ability to reproduce those conditions.
Precision	TNI- The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.
Preservation	TNI and DoD- Any conditions under which a sample must be kept in order to maintain chemical, physical, and/or biological integrity prior to analysis.
Primary Accreditation Body (Primary AB)	TNI- The accreditation body responsible for assessing a laboratory's total quality system, on-site assessment, and PT performance tracking for fields of accreditation.
Procedure	TNI- A specified way to carry out an activity or process. Procedures can be documented or not.
Proficiency Testing (PT)	TNI- A means to evaluate a laboratory's performance under controlled conditions relative to a given set of criteria, through analysis of unknown samples provided by an external source.
Proficiency Testing Program (PT Program)	TNI- The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories.
Proficiency Testing Provider (PT Provider)	TNI- A person or organization accredited by a TNI-approved Proficiency Testing Provider Accreditor to operate a TNI-compliant PT Program.
Proficiency Testing Provider Accreditor (PTPA)	TNI- An organization that is approved by TNI to accredit and monitor the performance of proficiency testing providers.
Proficiency Testing Reporting Limit (PTRL)	TNI- A statistically derived value that represents the lowest acceptable concentration for an analyte in a PT sample, if the analyte is spiked into the PT sample. The PTRLs are specified in the TNI FoPT tables.
Proficiency Testing Sample (PT)	TNI- A sample, the composition of which is unknown to the laboratory, and is provided to test whether the laboratory can produce analytical results within the specified acceptance criteria.
Proficiency Testing (PT) Study	TNI- a) Scheduled PT Study: A single complete sequence of circulation and scoring of PT samples to all participants in a PT program. The study must have the same pre-defined opening and closing dates for all participants; b) Supplemental PT Study: A PT sample that may be from a lot previously released by a PT Provider that meets the requirements for supplemental PT samples given in Volume 3 of this Standard [TNI] but that does not have a pre-determined opening date and closing date.
Proficiency Testing Study Closing Date	TNI- a) Scheduled PT Study: The calendar date by which all participating laboratories must submit analytical results for a PT sample to a PT Provider; b) Supplemental PT Study: The calendar date a laboratory submits the results for a PT sample to the PT Provider.
Proficiency Testing Study Opening Date	TNI- a) Scheduled PT Study: The calendar date that a PT sample is first made available to all participants of the study by a PT Provider; b) Supplemental PT Study: The calendar date the PT Provider ships the sample to a laboratory.

Protocol	TNI- A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) that must be strictly followed.
Qualitative Analysis	DoD- Analysis designed to identify the components of a substance or mixture.
Quality Assurance (QA)	TNI- An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.
Quality Assurance Manual (QAM)	A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality Assurance Project Plan (QAPP)	A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.
Quality Control (QC)	TNI- The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality.
Quality Control Sample (QCS)	TNI- A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control.
Quality Manual	TNI- A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality System	TNI and DoD- A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance and quality control activities.

Quality System Matrix	TNI and DoD- These matrix definitions shall be used for purposes of batch and quality control requirements and may be different from a field of accreditation matrix: • **Air and Emissions**: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device • **Aqueous**: Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, groundwater effluents, and TCLP or other extracts. • **Biological Tissue**: Any sample of a biological origin such as fish tissue, shellfish or plant material. Such samples shall be grouped according to origin. • **Chemical Waste**: A product or by-product of an industrial process that results in a matrix not previously defined. • **Drinking Water**: Any aqueous sample that has been designated a potable or potentially potable water source. • **Non-aqueous liquid**: Any organic liquid with <15% settleable solids • **Saline/Estuarine**: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake. • **Solids**: Includes soils, sediments, sludges, and other matrices with >15% settleable solids.
Quantitation Range	DoD- The range of values (concentrations) in a calibration curve between the LOQ and the highest successively analyzed initial calibration standard used to relate instrument response to analyte concentration. The quantitation range (adjusted for initial sample volume/weight, concentration/dilution and final volume) lies within the calibration range.
Quantitative Analysis	DoD- Analysis designed to determine the amounts or proportions of the components of a substance.
Random Error	The EPA has established that there is a 5% probability that the results obtained for any one analyte will exceed the control limits established for the test due to random error. As the number of compounds measured increases in a given sample, the probability for statistical error also increases.
Raw Data	TNI- The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records.
Reagent Blank (method reagent blank)	A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps.
Reagent Grade	Analytical reagent (AR) grade, ACS reagent grade, and reagent grade are synonymous terms for reagents that conform to the current specifications of the Committee on Analytical Reagents of the American Chemical Society.
Records	DoD- The output of implementing and following management system documents (e.g., test data in electronic or hand-written forms, files, and logbooks).

Reference Material	TNI- Material or substance one or more of whose property values are sufficiently homogenized and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
Reference Method	TNI- A published method issued by an organization generally recognized as competent to do so. (When the ISO language refers to a "standard method", that term is equivalent to "reference method"). When a laboratory is required to analyze by a specified method due to a regulatory requirement, the analyte/method combination is recognized as a reference method. If there is no regulatory requirement for the analyte/method combination, the analyte/method combination is recognized as a reference method if it can be analyzed by another reference method of the same matrix and technology.
Reference Standard	TNI- Standard used for the calibration of working measurement standards in a given organization or at a given location.
Relative Percent Difference (RPD)	A measure of precision defined as the difference between two measurements divided by the average concentration of the two measurements.
Reporting Limit (RL)	The level at which method, permit, regulatory and customer-specific objectives are met. The reporting limit may never be lower than the Limit of Detection (i.e., statistically determined MDL). Reporting limits are corrected for sample amounts, including the dry weight of solids, unless otherwise specified. There must be a sufficient buffer between the Reporting Limit and the MDL. DoD- A customer-specified lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.
Reporting Limit Verification Standard (RLVS)	A standard analyzed at the reporting limit for an analysis to verify the laboratory's ability to report to that level.
Representativeness	A quality element related to the ability to collect a sample reflecting the characteristics of the part of the environment to be assessed. Sample representativeness is dependent on the sampling techniques specified in the project work plan.
Requirement	Denotes a mandatory specification; often designated by the term "shall".
Retention Time	The time between sample injection and the appearance of a solute peak at the detector.
Revocation	TNI- The total or partial withdrawal of a laboratory's accreditation by an accreditation body.
Sample	Portion of material collected for analysis, identified by a single, unique alphanumeric code. A sample may consist of portions in multiple containers, if a single sample is submitted for multiple or repetitive analysis.
Sample Condition Upon Receipt Form (SCURF)	Form used by sample receiving personnel to document the condition of sample containers upon receipt to the laboratory (used in conjunction with a COC).
Sample Delivery Group (SDG)	A unit within a single project that is used to identify a group of samples for delivery. An SDG is a group of 20 or fewer field samples within a project, received over a period of up to 14 calendar days. Data from all samples in an SDG are reported concurrently.

Sample Receipt Form (SRF)	Letter sent to the client upon login to show the tests requested and pricing.
Sample Tracking	Procedures employed to record the possession of the samples from the time of sampling until analysis, reporting and archiving. These procedures include the use of a chain-of-custody form that documents the collection, transport, and receipt of compliance samples to the laboratory. In addition, access to the laboratory is limited and controlled to protect the integrity of the samples.
Sampling	TNI- Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.
Selected Ion Monitoring (SIM)	A mode of analysis in mass spectrometry where the detector is set to scan over a very small mass range, typically one mass unit. The narrower the range, the more sensitive the detector. DoD- Using GC/MS, characteristic ions specific to target compounds are detected and used to quantify in applications where the normal full scan mass spectrometry results in excessive noise.
Selectivity	TNI- The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system.
Sensitivity	TNI- The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.
Serial Dilution	The stepwise dilution of a substance in a solution.
Shall	Denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification as long as the requirement is fulfilled.
Should	Denotes a guideline or recommendation whenever noncompliance with the specification is permissible.
Signal-to-Noise Ratio (S/N)	DoD- A measure of signal strength relative to background noise. The average strength of the noise of most measurements is constant and independent of the magnitude of the signal. Thus, as the quantity being measured (producing the signal) decreases in magnitude, S/N decreases and the effect of the noise on the relative error of a measurement increases.
Source Water	TNI- When sampled for drinking water compliance, untreated water from streams, rivers, lakes, or underground aquifers, which is used to supply private and public drinking water supplies.
Spike	A known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.
Standard (Document)	TNI- The document describing the elements of a laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies.
Standard (Chemical)	Standard samples are comprised of a known amount of standard reference material in the matrix undergoing analysis. A standard reference material is a certified reference material produced by US NIST and characterized for absolute content, independent of analytical test method.

Standard Blank (or Reagent Blank)	A calibration standard consisting of the same solvent/reagent matrix used to prepare the calibration standards without the analytes. It is used to construct the calibration curve by establishing instrument background.
Standard Method	A test method issued by an organization generally recognized as competent to do so.
Standard Operating Procedure (SOP)	TNI- A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks.
Standard Reference Material (SRM)	A certified reference material produced by the US NIST or other equivalent organization and characterized for absolute content, independent of analytical method.
Statement of Qualifications (SOQ)	A document that lists information about a company, typically the qualifications of that company to compete on a bid for services.
Stock Standard	A concentrated reference solution containing one or more analytes prepared in the laboratory using an assayed reference compound or purchased from a reputable commercial source.
Storage Blank	DoD- A sample of analyte-free media prepared by the laboratory and retained in the sample storage area of the laboratory. A storage blank is used to record contamination attributable to sample storage at the laboratory.
Supervisor	The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses.
Surrogate	DoD- A substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples and is added to them for quality control purposes.
Suspension	TNI- The temporary removal of a laboratory's accreditation for a defined period of time, which shall not exceed 6 months or the period of accreditation, whichever is longer, in order to allow the laboratory time to correct deficiencies or area of non-conformance with the Standard.
Systems Audit	An on-site inspection or assessment of a laboratory's quality system.
Target Analytes	DoD- Analytes or chemicals of primary concern identified by the customer on a project-specific basis.
Technical Director	Individual(s) who has overall responsibility for the technical operation of the environmental testing laboratory.
Technology	TNI- A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.
Test	A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate.
Test Method	DoD- A definitive procedure that determines one or more characteristics of a given substance or product.

Test Methods for Evaluating Solid Waste, Physical/ Chemical (SW-846)	EPA Waste's official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with RCRA regulations.
Test Source	TNI- A radioactive source that is tested, such as a sample, calibration standard, or performance check source. A Test Source may also be free of radioactivity, such as a Test Source counted to determine the subtraction background, or a short-term background check.
The NELAC Institute (TNI)	A non-profit organization whose mission is to foster the generation of environmental data of known and documented quality through an open, inclusive, and transparent process that is responsive to the needs of the community. Previously known as NELAC (National Environmental Laboratory Accreditation Conference).
Total Petroleum Hydrocarbons (TPH)	A term used to denote a large family of several hundred chemical compounds that originate from crude oil. Compounds may include gasoline components, jet fuel, volatile organics, etc.
Toxicity Characteristic Leaching Procedure (TCLP)	A solid sample extraction method for chemical analysis employed as an analytical method to simulate leaching of compounds through a landfill.
Traceability	TNI- The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical conditions or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.
Training Document	A training resource that provides detailed instructions to execute a specific method or job function.
Trip Blank	This blank sample is used to detect sample contamination from the container and preservative during transport and storage of the sample. A cleaned sample container is filled with laboratory reagent water and the blank is stored, shipped, and analyzed with its associated samples.
Tuning	A check and/or adjustment of instrument performance for mass spectrometry as required by the method.
Ultraviolet Spectrophotometer (UV)	Instrument routinely used in quantitative determination of solutions of transition metal ions and highly conjugated organic compounds.
Uncertainty, Counting	TNI- The component of Measurement Uncertainty attributable to the random nature of radioactive decay and radiation counting (often estimated as the square root of observed counts (MARLAP). Older references sometimes refer to this parameter as Error, Counting Error or Count Error (c.f., Total Uncertainty).

Uncertainty, Expanded	TNI- The product of the Standard Uncertainty and a coverage factor, k, which is chosen to produce an interval about the result that has a high probability of containing the value of the measurand (c.f., Standard Uncertainty). NOTE: Radiochemical results are generally reported in association with the Total Uncertainty. Either if these estimates of uncertainty can be reported as the Standard Uncertainty (one-sigma) or as an Expanded Uncertainty (k-sigma, where k > 1).
Uncertainty, Measurement	TNI- Parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand.
Uncertainty, Standard	TNI- An estimate of the Measurement Uncertainty expressed as a standard deviation (c.f., Expanded Uncertainty).
Uncertainty, Total	TNI- An estimate of the Measurement Uncertainty that accounts for contributions from all significant sources of uncertainty associated with the analytical preparation and measurement of a sample. Such estimates are also commonly referred to as Combined Standard Uncertainty or Total Propagated Uncertainty, and in some older references as the Total Propagated Error, among other similar items (c.f., Counting Uncertainty).
Unethical actions	DoD- Deliberate falsification of analytical or quality control results where failed method or contractual requirements are made to appear acceptable.
United States Department of Agriculture (USDA)	A department of the federal government that provides leadership on food, agriculture, natural resources, rural development, nutrition and related issues based on public policy, the best available science, and effective management.
United States Geological Survey (USGS)	Program of the federal government that develops new methods and tools to supply timely, relevant, and useful information about the Earth and its processes.
Unregulated Contaminant Monitoring Rule (UCMR)	EPA program to monitor unregulated contaminants in drinking water.
Validation	DoD- The confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.
Verification	TNI- Confirmation by examination and objective evidence that specified requirements have been met. In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.
Voluntary Action Program (VAP)	A program of the Ohio EPA that gives individuals a way to investigate possible environmental contamination, clean it up if necessary and receive a promise from the State of Ohio that no more cleanup is needed.
Whole Effluent Toxicity (WET)	The aggregate toxic effect to aquatic organisms from all pollutants contained in a facility's wastewater (effluent).

10.0. REFERENCES

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10.11. Quality Assurance of Chemical Measurements, Taylor, John K.; Lewis Publishers, Inc. 1987.

10.12. Methods for Non-conventional Pesticides Chemicals Analysis of Industrial and Municipal Wastewater, Test Methods, EPA-440/1-83/079C.

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10.15. Requirements for Quality Control of Analytical Data for the Environmental Restoration Program, Martin Marietta, ES/ER/TM-16, December, 1992.

10.16. Quality Assurance Manual for Industrial Hygiene Chemistry, AIHA, most current version.

10.17. National Environmental Laboratory Accreditation Conference (NELAC) Standard- most current version.

10.18. ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories- most current version.

10.19. Department of Defense Quality Systems Manual (QSM), most current version.

10.20. TNI (The NELAC Institute) Standard- most current version applicable to each lab.

10.21. UCMR Laboratory Approval Requirements and Information Document, most current version.

10.22. US EPA Drinking Water Manual, most current version.

11.0. REVISIONS

The Pace Corporate Environmental Quality Office files an electronic version of a Microsoft Word document with tracked changes detailing all revisions made to previous versions of the Quality Assurance Manual. This document is available upon request. All current revisions are summarized in the table below.

Document Number	Reason for Change	Date
Quality Assurance Manual 19.0	General: made administrative edits that do not affect the policies or procedures within the document (including revising company name to Pace Analytical Services, LLC). Added Pace Green Bay WI lab specific information as required. Cover page: removed corporate approval signature lines. Old Section 3: moved to other sections of the QAM as applicable and deleted entire section (All section references below reflect the new section numbers). Section 1.1.2: replaced with section 3.1.1. Sections 1.3, 1.4, 1.11: removed extraneous language. Sections 1.5: added language from old section 1.6. Section 1.6: revised anonymous reporting information. Section 1.7.6: added deputies per position and deleted DoD language from old section 1.7.7. Section 1.8: removed non-key personnel job descriptions. Section 2: rearranged existing sections. Section 2.4: reworded to match existing Sample Acceptance policy document. Section 4: in general, for each QC type, removed language regarding frequency and corrective actions and referenced lab-specific SOPs. Section 5: in general, removed extraneous language and Management of Change section. Section 5.1, 5.2: reorganized into Primary and Secondary Review sections and removed extraneous language. Section 6: removed extraneous language including Quarterly Report section. Section 9 (glossary): revised and added definitions based on 2016 TNI Standard. Section 10: Added EPA DW Manual and revised references as applicable. Attachment III: updated corporate organizational chart. Old Attachment IV: removed floor plan attachment. Old Attachment VII: removed COC (available in SOPs).	06Mar2017
Quality Assurance Manual 19.1	Section 2.5.3: Updated LIMs sample identification description. Attachments II-VI: Updated to current listing.	28Jun2018

ATTACHMENT I- QUALITY CONTROL CALCULATIONS

PERCENT RECOVERY (%REC)

$$\%REC = \frac{(MSConc - SampleConc)}{TrueValue} * 100$$

NOTE: The SampleConc is zero (0) for the LCS and Surrogate Calculations

PERCENT DIFFERENCE (%D)

$$\%D = \frac{MeasuredValue - TrueValue}{TrueValue} * 100$$

where:
TrueValue = Amount spiked (can also be the $\overline{CF}$ or $\overline{RF}$ of the ICAL Standards)
Measured Value = Amount measured (can also be the CF or RF of the CCV)

PERCENT DRIFT

$$\%Drift = \frac{CalculatedConcentration - TheoreticalConcentration}{TheoreticalConcentrtion} * 100$$

RELATIVE PERCENT DIFFERENCE (RPD)

$$RPD = \frac{|(R1 - R2)|}{(R1 + R2)/2} * 100$$

where:
R1 = Result Sample 1
R2 = Result Sample 2

CORRELATION COEFFICIENT (R)

$$CorrCoeff = \frac{\sum_{i=1}^{N} W_i * (X_i - \overline{X}) * (Y_i - \overline{Y})}{\sqrt{\left(\sum_{i=1}^{N} W_i * (X_i - \overline{X})^2\right) * \left(\sum_{i=1}^{N} W_i * (Y_i - \overline{Y})^2\right)}}$$

With:	N	Number of standard samples involved in the calibration
	i	Index for standard samples
	Wi	Weight factor of the standard sample no. i
	Xi	X-value of the standard sample no. i
	X(bar)	Average value of all x-values
	Yi	Y-value of the standard sample no. i
	Y(bar)	Average value of all y-values

ATTACHMENT I- QUALITY CONTROL CALCULATIONS (CONTINUED)

STANDARD DEVIATION (S)

$$S = \sqrt{\sum_{i=1}^{n} \frac{(X_i - \overline{X})^2}{(n-1)}}$$

where:
n = number of data points
X_i = individual data point
$\overline{X}$ = average of all data points

AVERAGE ($\overline{X}$)

$$\overline{X} = \frac{\sum_{n=1}^{i} X_i}{n}$$

where:
n = number of data points
X_i = individual data point

RELATIVE STANDARD DEVIATION (RSD)

$$RSD = \frac{S}{\overline{X}} * 100$$

where:
S = Standard Deviation of the data points
$\overline{X}$ = average of all data points

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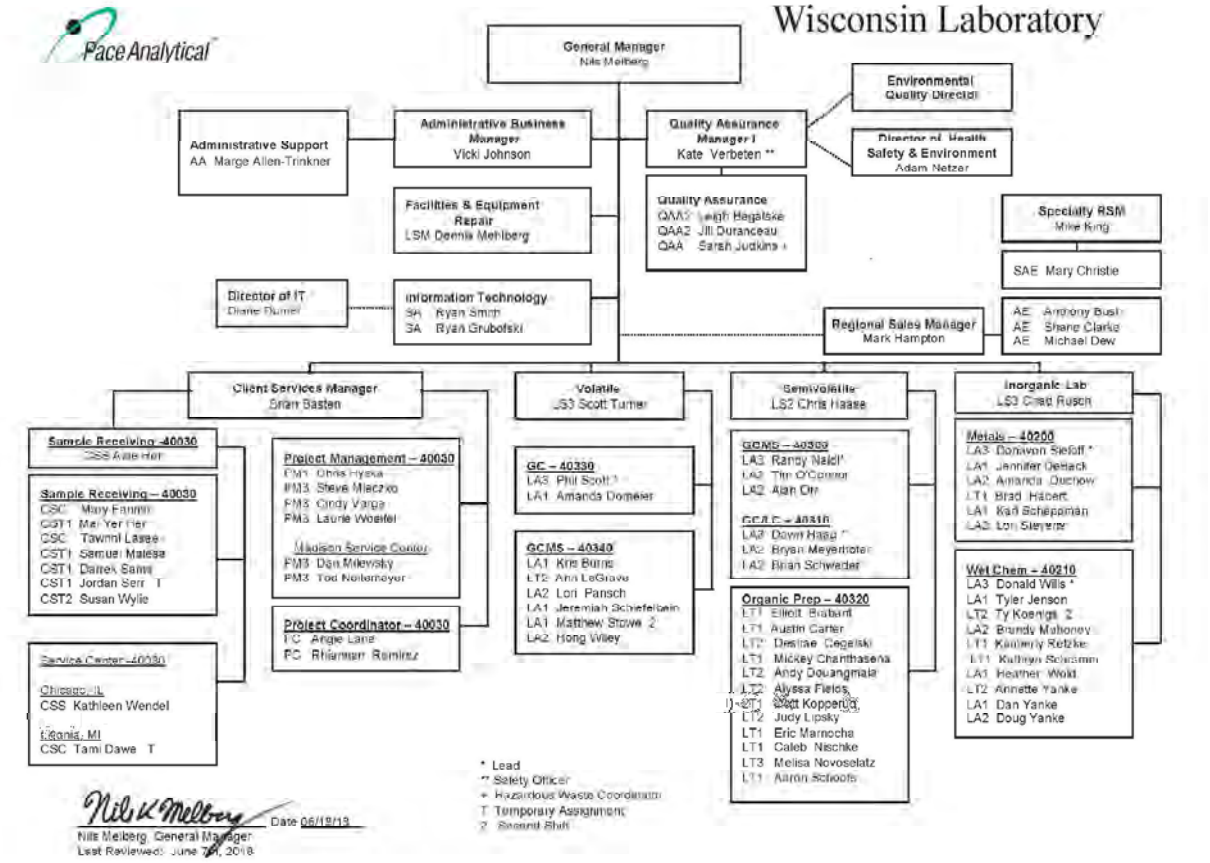
ATTACHMENT II- LABORATORY ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



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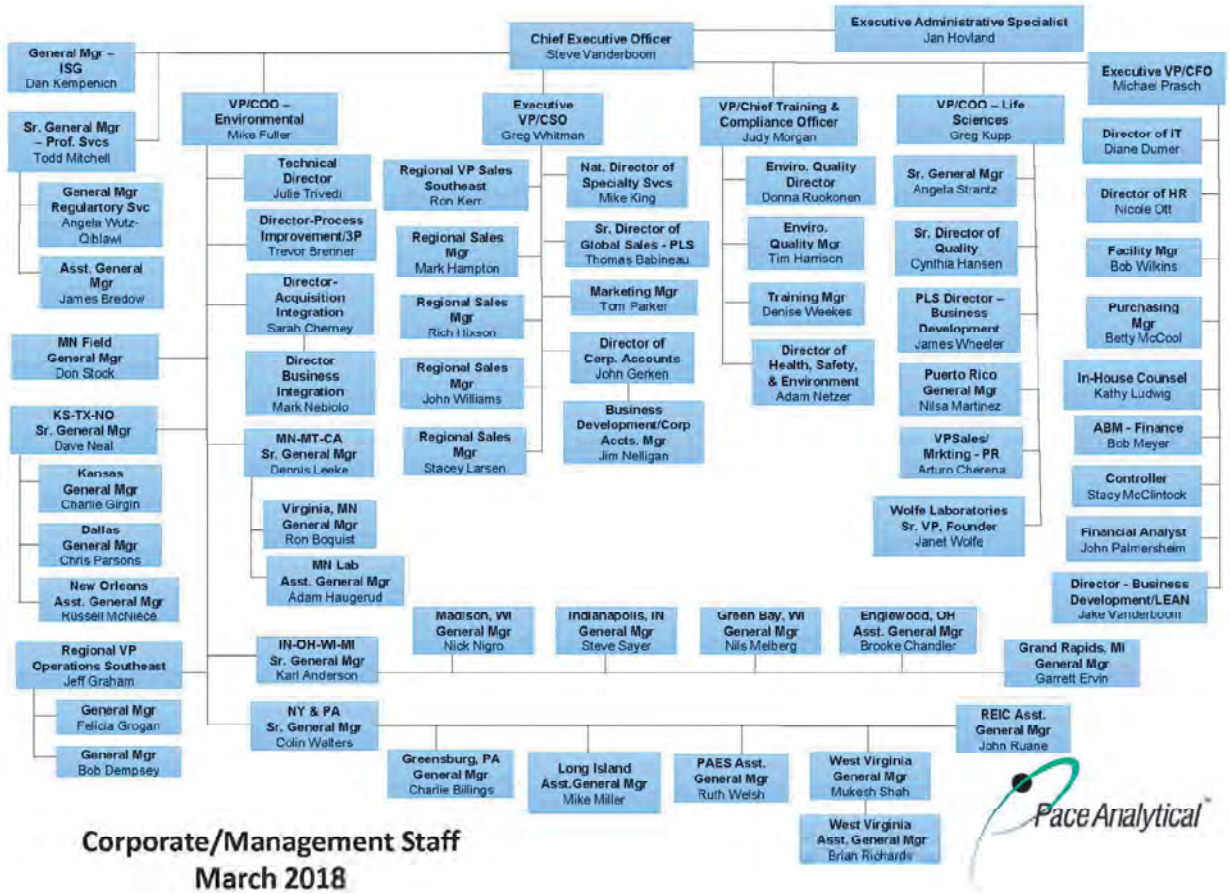
ATTACHMENT III- CORPORATE ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



ATTACHMENT IV- EQUIPMENT LIST (CURRENT AS OF ISSUE DATE)

DEPT	INSTRUMENT	INSTRUMENT NAME	MANUFACTURER	MODEL NUMBER	DETECTOR	SERVICE ANALYSIS
MBIO	Hellige Colony Counter	-	Hellige	-	-	
MBIO	Stereomaster Stereoscope	-	Fisher	FW 99-20-1385	-	
MBIO	Steril-Quick Autoclave	-	National	704-9000-D	-	
MET	Hot Block Metals Digestion System	40HB04	Environmental Express	SC100	-	6010/6020
MET	Hot Block Metals Digestion System	40HB06	Environmental Express	SC154	-	6010/6020
MET	LLHg Hot Block Metals Digestion System	40HB07	Environmental Express	SC100	-	6010/6020
MET	Hot Block Metals Digestion System	40HB08	Environmental Express	SC196	-	6010/6020
MET	Hot Block Metals Digestion System	40HB09	Environmental Express	SC154	-	6010/6020
MET	Quick Trace Mercury Analyzer	40HG2	Cetac	M-7500		7470/7471
MET	DMA-80 Direct Mercury Analyzer	40HG4	Milestone	DMA-80	-	7473
MET	Chiller	40ICM2	Neslab/Thermo	Merlin M75	-	6020
MET	ICPMS	40ICM2	Thermo	X Series 2	-	6020
MET	UPS	40ICM2	Toshiba	1600EP		6020
MET	Vacuum Pump	40ICM2	Sogevac	SV40BI		6020
MET	Chiller	40ICM3	Neslab/Thermo	2500	-	6020
MET	ICPMS	40ICM3	Thermo	X Series 2	-	6020
MET	UPS	40ICM3	Toshiba	1600EP		6020
MET	Vacuum Pump	40ICM3	Sogevac	SV40BI		6020
MET	Chiller	40ICP2	Neslab/Thermo	Flex 900	-	6010
MET	ICP	40ICP2	Thermo	ICAP 6500	-	6010
MET	Low-level Mercury Analyzer	40LHG1	Tekran	2500	2500	1631E
MET	Low Level Mercury Analyzer	40LHG4	Analytik Jena	Mercur	-	1631E
MET	Low Level Mercury Analyzer	40LHG5	Cetac	M-8000	-	1631E
MET	Hot Water Bath	40WB05	Thermo Fisher Scientific	2841	-	
QA	Hot Wire Anemometer	40HWA02	Control Company	4330	-	Air Flow Velocity
SVOA	Tube Heaters	-	Kontes	-	-	
SVOA	Extraction Mixer	40EXT1	-	-	-	-
SVOA	Extraction Mixer	40EXT2	-	-	-	-
SVOA	Extraction Mixer	40EXT3	-	-	-	-
SVOA	Extraction Mixer	40EXT4	-	-	-	-
SVOA	Extraction Mixer	40EXT5	-	-	-	-
SVOA	GC	40GCS1	Hewlett-Packard	5890 Series II	FID	WI-DRO/8015
SVOA	GC	40GCS7	Agilent	6890N	ECD/ECD	8082
SVOA	GC	40GCS8	Hewlett-Packard	6890	ECD/ECD	8081
SVOA	GC	40GCS9	Hewlett-Packard	6890	ECD/ECD	8082
SVOA	GC	40GCSB	Agilent	6890	ECD/ECD	8082
SVOA	GC	40GCSC	Hewlett-Packard	6890	ECD/ECD	8082
SVOA	GC	40GCSF	Agilent	7890	FID	WI-DRO/8015
SVOA	GC	40GCSG	Agilent	7890B	Dual MicroECD	8081
SVOA	GC	40GCSH	Hewlett-Packard	6890N	ECD/ECD	8081
SVOA	GC	40GCSI	Hewlett-Packard	6890N	ECD/ECD	8082 Screener
SVOA	GC	40GCSJ	Agilent 6890N	G1530N	ECD/ECD	8082
SVOA	Accuprep MPS GPC Cleanup System (Jane)	40GPC1	J2 Scientific	-	-	SW846 3640A
SVOA	Accuprep MPS GPC Cleanup System (John)	40GPC2	J2 Scientific	-	-	SW846 3640A
SVOA	Mars Xtraction Microwave System	40MIC1	CEM	907501	-	SW846 3546
SVOA	GC/MS	40MSS1	Hewlett-Packard	5890	HP 5972	Screener
SVOA	GC/MS	40MSS2	Hewlett-Packard	6890	HP 5973	8270C-SIM
SVOA	GC/MS	40MSS3	Hewlett-Packard	6890	HP 5973	Screener
SVOA	GC/MS	40MSS4	Hewlett-Packard	6890	HP 5973	8270C-SIM
SVOA	GC/MS	40MSS5	Hewlett-Packard	5890	HP 5972	Screener
SVOA	GC/MS	40MSS6	Hewlett-Packard	5890	HP 5972	8270C
SVOA	GC/MS	40MSS7	Agilent	7890A	HP 5975	8270C SIM
SVOA	GC/MS	40MSS8	Agilent	7890A	HP 5975C	8270C/625
SVOA	GC/MS	40MSS9	Agilent	6890N	HP 5975C	8270C SIM
SVOA	GC/MS	40MSSA	Agilent	7890B	HP 5977A	Method Development
SVOA	Separatory Funnel Extractor	40SFE1	Lab Line	-	-	SW846 3510C
SVOA	Separatory Funnel Extractor	40SFE2	Lab Line	-	-	SW846 3510C
SVOA	Separatory Funnel Extractor	40SFE3	Lab Line	-	-	SW846 3510C
SVOA	Shaker	40SKR2	Thermo Scientific	SHKE2000	-	-
SVOA	Sonifier Cell Disruptors with Horns	40SON1	Misonix	3000	-	SW846 3550B
SVOA	Sonifier Cell Disruptors with Horns	40SON2	Misonix	S-4000	-	SW846 3550B
SVOA	Sonicator	40SON6	Elma (Lab Line)	S180H	-	WI DRO
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOX3	Gerhardt Soxtherm	SE-30	-	SW846 3541
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOX4	Gerhardt Soxtherm	SE-30	-	SW846 3541
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOX5	Gerhardt Soxtherm	SE-416	-	SW846 3541
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOX6	Gerhardt Soxtherm	SE-416	-	SW846 3541
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOX7	Gerhardt Soxtherm	SE-416	-	SW846 3541
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOX8	Gerhardt Soxtherm	SE-416	-	SW846 3541
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOX9	Gerhardt Soxtherm	SE-416	-	SW846 3541
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOXA	Gerhardt Soxtherm	SE-416	-	SW846 3541
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOXB	Gerhardt Soxtherm	SE-416		SW846 3541
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOXC	Gerhardt Soxtherm	SE-416		SW846 3541
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOXD	Gerhardt Soxtherm	SE-416		SW846 3541
SVOA	Soxtherm Accelerated Soxhlet Extractor	40SOXE	Gerhardt Soxtherm	SE-416		SW846 3541

DEPT	INSTRUMENT	INSTRUMENT NAME	MANUFACTURER	MODEL NUMBER	DETECTOR	SERVICE ANALYSIS
SVOA	Soxhlet heater mantles and Glassware	40SXT1	-	-	-	SW846 3540C
SVOA	Soxhlet heater mantles and Glassware	40SXT2	-	-	-	SW846 3540C
SVOA	Soxhlet heater mantles and Glassware	40SXT3	-	-	-	SW846 3540C
SVOA	Soxhlet heater mantles and Glassware	40SXT4	-	-	-	SW846 3540C
SVOA	Soxhlet heater mantles and Glassware	40SXT5	-	-	-	SW846 3540C
SVOA	Soxhlet heater mantles and Glassware	40SXT6	-	-	-	SW846 3540C
SVOA	Soxhlet heater mantles and Glassware	40SXT7	-	-	-	SW846 3540C
SVOA	Soxhlet heater mantles and Glassware	40SXT8	-	-	-	SW846 3540C
SVOA	TurboVap II Concentration Workstation	40TVC1	Zymark	-	-	SW846 3510C
SVOA	TurboVap II Concentration Workstation	40TVC2	Zymark	-	-	SW846 3510C
SVOA	TurboVap II Concentration Workstation	40TVC3	Zymark	-	-	SW846 3510C
SVOA	TurboVap II Concentration Workstation	40TVC4	Zymark	-	-	SW846 3510C
SVOA	TurboVap II Concentration Workstation	40TVC5	Zymark	-	-	SW846 3510C
SVOA	TurboVap	40TVC6	Zymark	ZW640-3		SW846 3541
SVOA	TurboVap II	40TVC7	Zymark	46368/A		SW846 3541
SVOA	TurboVap II	40TVC8	Caliper LifeScience	103187/0		SW846 3541
SVOA	TurboVap II	40TVC9	Caliper LifeScience	103187/0		SW846 3541
SVOA	Water Baths	40WB02	-	-	-	3540C Tissue
SVOA	Water Baths	40WB03	Boekel Scientific	1494	-	3510C Extraction
SVOA	Centrifudge	40CENT2	Clay Adams Brand Compact II	420225		SW846 3541
SVOA	Sonifier Cell Disruptors with Horns	Sonicator #2	-	-	-	SW846 3550B
SVOA	Water Baths	40WB08	Organomation	8125	-	SW846 3546
SVOA	Water Baths	40WB09	In-house	-	-	SW846 3510C
SVOA	Water Baths	40WB10	In-house	-	-	SW846 3540C/3541/3550B
VOA	GC	40GCV1	Hewlett-Packard	5890	Agilent 5975	SW846 8021/WI MOD GRO
VOA	GC	40GCV2	Hewlett-Packard	5890	PID/FID	SW846 8021/WI MOD GRO
VOA	GC	40GCV3	Hewlett-Packard	5890	PID/FID	SW846 8021/WI MOD GRO
VOA	GC	40GCV4	Hewlett-Packard	5890	PID/FID	SW846 8021/WI MOD GRO
VOA	GC	40GCV5	Hewlett-Packard	5890	PID/FID	SW846 8021/WI MOD GRO
VOA	GC	40GCV8	Hewlett-Packard	5890	FID	SW846 8015 - MEE
VOA	GC/MS	40MSV1	Hewlett-Packard	5890	HP 5972	SW846 8260B/5030
VOA	GC/MS	40MSV2	Hewlett-Packard	6890	HP 5973	SW846 8260B/624/5030B
VOA	GC/MS	40MSV3	Agilent	6850	Agilent 5975	SW846 8260B/624/5030B
VOA	GC/MS	40MSV5	Hewlett-Packard	6890	HP 5973	SW846 8260B/624/5030B
VOA	GC/MS	40MSV7	Hewlett-Packard	6890	HP 5973	SW846 8260B/624/5030B
VOA	GC/MS	40MSV8	Agilent	6850	Agilent 5975B	SW846 8260B/624/5030B
VOA	GC/MS	40MSVA	Hewlett-Packard	7890	Agilent 5975C	SW846 8260B/624/5030B
VOA	GC/MS	40MSVB	Hewlett-Packard	7890A	Agilent 5975C	SW846 8260B/624/5030B
VOA	GC/MS	40MSVC	Hewlett-Packard	7890B	Agilent 5977A	SW846 8260B/624/5030B
VOA	GC/MS	40MSVD	Hewlett-Packard	7890B	Agilent 5977A	SW846 8260B/624/5030B
VOA	GC	40SCREEN1	Hewlett-Packard	5890	FID	Screener
VOA	GC	40SCREEN2	Hewlett-Packard	5890	FID	Screener
VOA	SNOOP	40SCREEN3	Research Engineers	-	-	Screener
VOA	Sonicator	40SON4	LabLine	9314	-	VOA Prep
VOA	Sonicator	40SON5	LabLine	9333	-	VOA Prep
VOA	Sonicator	40SON7	Elma	Elmasonic P70H		
WET	Biuret	40BUR1	KIMAX	253	-	
WET	Biuret	40BUR2	Pyrex	2103	-	
WET	Centrifudge	40CENT1	International Equipment Co	H260	-	Metal Prep
WET	COD Reactor	40COD1	Hach	45600	-	410.4
WET	COD Reactor	40COD2	Bioscience INC	100-003	-	410.4
WET	Block Digestion System	40HB01	Westco Scientific	40/20	-	365.4, 351.2
WET	Block Digestion System	40HB02	Tecator	2040	-	365.4, 351.2
WET	Hot Block Digestion System	40HB03	Environmental Express	SC100	-	6010/6020
WET	Hot Block Digestion System	40HB04	Seal Analytical	BD 50s	-	365.4, 351.2
WET	Hot Block Digestion System	40HB05	Seal Analytical	BD 50s	-	365.4, 351.2
WET	MICRO DIST Rapid Distillation System	40MD1	Lachat	-	-	350.1, 9012A
WET	MICRO DIST Rapid Distillation System	40MD2	Lachat	-	-	350.1, 9012A
WET	MICRO DIST Rapid Distillation System	40MD3	Lachat	-	-	350.1, 9012A
WET	Sonicator	40SON6	Branson	8210	-	
WET	TCLP Tumbler	40TBL1	Environmental Express	-	-	1311, 1312, ASTM D3987
WET	Reaction Vessel Tumbler	40TBL3	Reaction Vessel	-	-	1311, 1312, ASTM D3987
WET	TCLP Tumbler	40TBL4	Environmental Express	-	-	1311, 1312, ASTM D3987
WET	TCLP Tumbler	40TBL5	-	3740-12-BRE	-	1311, 1312, ASTM D3987
WET	TCLP Tumbler	40TBL6	-	3740-12-BRE	-	1311, 1312, ASTM D3987
WET	Hot Water Bath	40WB07	Isotemp GPD 28	FSGPD2S	-	1311, 1312, ASTM D3987
WET	Radiometer	40WET0	Titration	TIM840		Alkalinity - 2320B
WET	Oxygen Meter	40WET2	YSI	5000		SM 5210B--01, SM 4500-O G
WET	Flashpoint Instrument A	40WET4	Precision	Not Provided	-	EPA 1010A

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DEPT	INSTRUMENT	INSTRUMENT NAME	MANUFACTURER	MODEL NUMBER	DETECTOR	SERVICE ANALYSIS
WET	Flashpoint Instrument B	40WET5	Fisher (Pensky-Martens Flash Tester)	Not Provided	-	EPA 1010A
WET	Turbidimeter	40WET6	Hach	2100P	-	EPA 180.1, SM2130B
WET	Conductivity Meter	40WET7	Accumet	30	-	EPA 120.1
WET	pH Meter	40WET8	Orion	720A	-	pH Meter
WET	EH Meter	40WET9	Accumet	AB15	-	EH Meter
WET	pH Meter	40WETB	Symphony	SB20	-	1311, 1312, ASTM D3987
WET	pH Meter	40WETC	Orion	720A	-	pH Meter
WET	pH Meter	40WETD	Corning	320	-	pH Meter
WET	BOD AUTOEZ	40WETE	Thermo/Orion	10060020	-	SM 5210B
WET	pH Meter	40WETF	Orion Star	A211	-	pH Meter
WET	pH Meter	40WETG	Orion Star	A211	-	pH Meter
WET	Flashpoint Instrument	40WETH	TANAKA	apm-8fc		EPA 1010A
WET	Direct Reading Spectrophotometer	40WTA1	Hach	DR 2000	-	EPA 410.4, SM3500Cr-B, Hach 8146, Walkley Black TOC
WET	Ion Chromatograph	40WTA3	Dionex	DX-120	-	EPA 300.0, 9056A
WET	Apollo	40WTA5	Tekmar/Dohrmann	Apollo 9000	-	EPA 9060 - Screener Only
WET	Fusion	40WTA7	Teledyne	14-9600-100	-	EPA 9060, SM 5310C
WET	SmartChem	40WTA9	Westco Scientific	Smartchem 200		EPA 365.4, 350.1, 9012
WET	Analytik Jena	40WTAA	Analytik Jenna	Multi EA 4000	-	EPA 9060, SM 5310C
WET	Ion Chromatograph	40WTAB	Thermo Scientific	ICS-110	-	EPA 300.0, 9056A
WET	Quik Chem 8500 Series 2	40WTAC	Lachat	8500 Series 2	-	EPA 353.2, 350.1
WET	Ion Chromatograph	40WTAD	Thermo Scientific (Dionex)	ICS-1100	-	EPA 300.0, 9056A
WET	Quik Chem 8500 Series 2	40WTAE	Lachat	8500 Series 2	-	350.1, 365.4, 9012A, 310.2, 351.2, 353.2
WET	Ion Chromatograph	40WTAF	Thermo Scientific	Aquion	-	EPA 300.0, 9056A
WET	Analytik Jena	40WTAG	Analytik Jenna	Multi EA 4000	-	EPA 9060, SM 5310C

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ATTACHMENT V- LABORATORY SOP LIST (CURRENT AS OF ISSUE DATE)

SOP Number	Rev.	SOP Name
S-ALL-O-038	02	Processing Tentatively Identified Compounds (TICs) for GC/MS
S-GB-C-001	06	Procedure to Preserve Samples for Volatile Organic Analysis of Solid Matrices by Method 5035
S-GB-C-005	07	Maintenance of Ice Chests and Shipping Containers
S-GB-C-007	05	Laboratory Tracking of Samples
S-GB-C-008	05	Measurement of Percent Moisture in Soils and Solids
S-GB-C-009	07	Subcontracting Samples
S-GB-C-010	08	Sample Management
S-GB-C-011	04	Bottle Preparation
S-GB-C-012	04	Review of Analytical Requests
S-GB-I-001	11	Total Sulfide, Iodometric Titration
S-GB-I-002	10	Flash Point (Pensky-Martens Closed Cup Method For Ignitability
S-GB-I-009	08	Ion Chromatography- Sulfate, Nitrate, Flouride (EPA 300.0)
S-GB-I-010	05	Wet Chemistry Glassware Cleaning
S-GB-I-013	05	Free Liquids (Paint Filter)
S-GB-I-016	05	Specific Gravity
S-GB-I-017	05	Ferrous Iron
S-GB-I-020	06	Color Determination in Aqueous Samples
S-GB-I-027	05	Dissolved Oxygen
S-GB-I-030	05	Turbidity (Nephelometric)
S-GB-I-037	06	The Determination of Total Organic Carbon Using the Walkley-Black Procedure
S-GB-I-045	07	Chromium, Hexavalent-Colorimetric
S-GB-I-047	06	Total Kjeldahl Nitrogen using Block Digestion and Analyzed by Lachat 8000 Flow Injection following EPA Method 351.2
S-GB-I-048	05	Ammonia using Micro-Distillation and Analyzed by Lachat 8000 Flow Injection following EPA Method 350.1
S-GB-I-051	07	Nitrate and Nitrite Analyzed by Lachat 8000 Flow Injection
S-GB-I-052	09	Chemical Oxygen Demand, Colorimetric, Manual (Chemetric Vials)
S-GB-I-053	04	Acid Volatile Sulfide / Simultaneously Extracted Metals
S-GB-I-061	04	Total Phosphorus using Block Digestion and Analyzed by SmartChem
S-GB-I-063	06	The Determination of Total Organic Carbon Using the Teledyne Tekmar Fusion Instrumen
S-GB-I-064	04	Cyanide by SmartChem
S-GB-I-066	03	Measurement of Specific Conductance in Water
S-GB-I-067	04	TCLP - Toxicity Characteristic Leaching Procedure, SPLP - Synthetic Precipitation Leaching Procedure and ASTM - ASTM D 3987-85
S-GB-I-068	06	Measurement of Volatile Solids and Solids in Water
S-GB-I-069	03	Alkalinity by Titration using the Radiometer TIM840 - SM 2320B
S-GB-I-070	03	Alkalinity by SmartChem (EPA 310.2)
S-GB-I-071	02	Measurement of pH in Water, Soil, and Waste
S-GB-I-072	03	Acidity by Titration using the Radiometer TIM840 - SM 2310B 305.1
S-GB-I-073	02	The Determination of Total Organic Carbon Using the EA4000 Instrument (EPA 9060/A)
S-GB-I-074	02	Biochemical Oxygen Demand by Auto EZ Instrument
S-GB-I-076	02	The Determination of Total Organic Carbon Using the EA4000 Instrument (Lloyd Kahn)
S-GB-I-078	00	Ammonia using Micro-Distillation and Analyzed by Lachat 8000 Flow Injection following EPA Method 350.1 in Line Distillation
S-GB-M-005	08	Determination of Metals by Inductively Coupled Plasma (ICP) Spectroscopy by 6010B-C, 200.7
S-GB-M-006	07	Determination of Trace Metals in Waters and Wastes by Inductively Coupled Plasma Mass Spectroscopy - 6020A, 200.8
S-GB-M-015	05	Mercury Analysis by Cold-Vapor Atomic Fluorescence Spectrometry (1631E)- Analytik Jena
S-GB-M-016	03	Determination of Mercury in Solids by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometr
S-GB-M-017	04	The Determination of Mercury by Cold Vapor Atomic Absorption Spectroscopy - CETAC M-7500 (7470A/7471B, 245.1)
S-GB-M-018	01	The Determination of Mercury in Biological Samples by Cold Vapor Atomic Absorption Spectroscopy - CETAC M-7500 (245.6)
S-GB-M-019	01	Mercury Analysis by Cold-Vapor Atomic Fluorescence Spectrometry CETAC M-8000 (1631E)
S-GB-M-020	04	Solids Digestion by EPA 3050B
S-GB-M-021	01	Acid Digestion of Aqueous Samples by EPA 3010A, EPA 200.7 and EPA 200.8
S-GB-M-022	02	Acid Digestion of Biological Tissue by EPA 3050B Modified
S-GB-MB-001	02	Fecal Coliform Determination Using the Membrane Filter Technique
S-GB-MB-002	02	Heterotropic Plate Count
S-GB-MB-003	02	Colisure Presence/Absence Test for Detection and Identification of Coliform Bacteria and *Escherichia coli* in Drinking Waters
S-GB-O-005	05	Soil/Semisolid Sample Preparation for the Analysis of Gasoline Range Organics and Petroleum Volatile Organics by Wisconsin Modified GRO
S-GB-O-006	06	Modified Method for Determination of Gasoline Range Organics
S-GB-O-008	06	Total Petroleum Hydrocarbons - Gasoline by Gas Chromatography Using Flame-Ionization Detector
S-GB-O-009	05	Aromatic Volatiles by Gas Chromatography Using Photo-Ionization Detectors
S-GB-O-010	05	Aqueous Sample Preparation for the Analysis of Gas Range Organics and Petroleum Volatile Organics
S-GB-O-015	07	Cleaning of Glassware Used in the Analysis of Semivolatile Range Organics
S-GB-O-017	05	Analysis of Dissolved Methane, Ethane, and Ethene in Ground Water by Static Headspace and Gas Chromatography
S-GB-O-018	06	Extraction of Wisconsin Modified DRO Solid Samples
S-GB-O-019	07	WI Modified Method for Determination of Diesel Range Organics
S-GB-O-023	07	Total Petroleum Hydrocarbons - Diesel
S-GB-O-026	08	Analysis of Polychlorinated Biphenyls (PCBs) by Gas Chromatography by 8082
S-GB-O-027	08	Analysis of Organochlorine Pesticides by Gas Chromatography by 8081

SOP Number	Rev.	SOP Name
S-GB-O-028	06	Preparation of Anhydrous Sodium Sulfate and Sand for Extraction Purposes
S-GB-O-031	06	Extraction of Biological Samples for Organochlorine Pesticides/PCBs
S-GB-O-032	05	Gel Permeation Chromatography
S-GB-O-033	04	Extraction of Biological Samples for Base Neutral/Acid and PAH-SIM Analysis
S-GB-O-034	06	Sulfuric Acid Cleanup
S-GB-O-036	06	Florisil Column Cleanup for PCB, Toxaphene, and BNA Sample Extracts
S-GB-O-037	07	Florisil Cartridge Cleanup for Organochlorine Pesticide Samples
S-GB-O-038	06	Silica Gel Cleanup for Organic Analysis
S-GB-O-039	05	Copper Cleanup for the Removal of Sulfur from PCB and Toxaphene Samples
S-GB-O-040	06	Extraction of Wipes and Oil for PCB Analysis
S-GB-O-041	07	Extraction of PCBs Using the Automated Soxhlet 3541
S-GB-O-044	03	Determination of Low Level PAHs by GC/MS-SIM in Solid and Biological Matrices:8270SIMPAH
S-GB-O-045	09	Microwave Extraction for the Determination of Polynuclear Aromatic Hydrocarbons, Base/Neutral/Acids, and Total Petroleum Hydrocarbons in Solid Matrices by 3546
S-GB-O-047	05	Analysis of Polychlorinated Biphenyls (PCBs) by Gas Chromatography following 8082A
S-GB-O-048	04	Analysis of Fox River Polychlorinated Biphenyls (PCBs) by Gas Chromatography
S-GB-O-049	07	Determination of Semi-Volatile Organics by GC/MS (8270)
S-GB-O-050	04	Determination of Semi-Volatile Organics by GC/MS (Selective Ion Monitoring - 8270C SIM)
S-GB-O-052	03	Extraction of PCBs In Tissue Using the Automated Soxhlet
S-GB-O-053	06	Separatory Funnel Extraction by 3510C
S-GB-O-054	03	Ultrasonic Extraction by 3550B
S-GB-O-057	02	Analysis of Toxaphene by Gas Chromotography Using St.John's River Waste Management Department (SJRWMD) Protocol
S-GB-O-058	01	Analysis of Toxaphene by Gas Chromotography Using Hercules 97 and Total Area Under the Curve (TAUC)
S-GB-O-061	01	Analysis ofTetrachlorobiphenyls (TCBs) by Gas Chromatography/Mass Spectroscopy
S-GB-O-062	02	SVOA Sample Screening
S-GB-O-065	00	Determination of Semi-Volatile Organics by GC/MS (8270D)
S-GB-O-066	00	Determination of Semi-Volatile Organics by GC/MS (Selective Ion Monitoring - 8270D SIM)
S-GB-O-067	01	Determination of Polychlorinated Biphenyls (PCBs) Aroclors (NY Method)
S-GB-O-068	01	Extraction of PCBs and Extraction and Determination of Percent Lipids for Fish and Biota Materials (NY Method
S-GB-O-001	09	Sample Screening Volatile Organics Prior to Preparation
S-GB-O-012	06	Cleaning of Syringes Used in the Analysis of Volatile Organics
S-GB-O-056	11	Determination of Volatile Organics by GC/MS 8260
S-GB-O-069	00	Determination of Volatile Organics by GC/MS 624.1
S-ALL-Q-003	11	Document Numbering
S-ALL-Q-009	07	Laboratory Documentation
S-ALL-Q-014	07	Quarterly Quality Report
S-ALL-Q-015	03	Review of Laboratory Management System
S-ALL-Q-016	08	Manual Integration
S-ALL-Q-020	06	Orientation and Training Procedures
S-ALL-Q-028	04	Use and Operation of Lab Track System
S-ALL-Q-029	03	MintMiner Data File Review
S-ALL-Q-030	05	Operation of Data Checker for Epic Pro
S-ALL-Q-035	03	Data Recall
S-ALL-Q-047	00	Method Validation and Instrument Verification
S-GB-Q-001	05	Employee Master Signature Log
S-GB-Q-005	05	Precision and Accuracy Measurement and Evaluation
S-GB-Q-007	07	Method of Syringe Technique
S-GB-Q-008	07	Preventative, routine, and non-routine maintenance
S-GB-Q-010	07	Estimation of Measurement Uncertainty
S-GB-Q-012	03	Purchasing of Laboratory Supplies
S-GB-Q-013	03	Receipt and Storage of Laboratory Supplies
S-GB-Q-016	02	Management of Change
S-GB-Q-017	04	Preparation of SOPs
S-GB-Q-018	02	Evaluation and Qualification of Vendors
S-GB-Q-019	04	Software Validation
S-GB-Q-020	03	Determination of LOD and LOQ
S-GB-Q-021	04	Proficiency Testing Program
S-GB-Q-022	04	Internal and External Audits
S-GB-Q-023	03	MCL Violation Reporting
S-GB-Q-025	03	Sample Homogenization and Sub-Sampling
S-GB-Q-026	03	Standard and Reagent Management and Traceability
S-GB-Q-027	03	Corrective Action / Preventative Action Process
S-GB-Q-028	05	Monitoring Storage Units
S-GB-Q-029	03	Document Management
S-GB-Q-030	02	Support Equipment
S-GB-Q-031	02	Control Charting and Trend Analysis
S-GB-Q-032	02	Data Review Process
S-GB-Q-033	01	New Instrument Installation Procedure
S-GB-Q-034	01	Data and Records Archival

SOP Number	Rev.	SOP Name
S-GB-Q-035	00	Final Report and Data Deliverable Contents
S-ALL-S-001	06	Hazard Assessment
S-ALL-S-005	00	Air Quality Monitoring and Fume Hood Monitoring
S-GB-S-001	10	Regulated Soil Handling
S-GB-S-002	05	Control of Hazardous Energy Program - Lockout/Tagout
S-GB-S-004	05	Rescue Alert System Operation
S-GB-S-007	02	Label Destruction
S-GB-S-008	02	Air Quality Monitoring and Fume Hood Monitoring
S-GB-W-001	04	Waste Handling and Management
S-GB-W-002	04	Waste Management Training Requirements
S-GB-E-001	03	Use and Maintenance of the NANOpure Infinity Water Purification System
S-GB-E-002	04	Operation of Waste Disposal Equipment
S-GB-L-001	10	Biological Tissue, Plant, and Synthetic Material Preparation
S-GB-L-002	04	Small Rodent Handling and Homogenization
S-GB-L-003	06	The Determination of Lipids in Tissues, Fats, and Plants
S-GB-L-004	05	Determination of Percent Solids in Tissue Samples
S-GB-L-005	01	Reagent Water Quality
S-GB-L-007	02	Cleaning of Equipment Used in the Process of Homogenizing Biological Tissue, Plant, and Synthetic Materials
S-GB-L-008	02	Multiincrement Soil Sampling
S-GB-L-009	01	Tissue Preparation/Homogenization for Biota & Plant Matrices For GE Hudson River Monitoring Programs

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ATTACHMENT VI- LABORATORY CERTIFICATION LIST (CURRENT AS OF ISSUE DATE) SCOPE AND APPLICATION CERTIFICATES ARE MAINTAINED AND FILED IN THE LOCAL QUALITY DEPARTMENT

GREEN BAY LABORATORY				
Accrediting Authority	Program Category	Accrediting Agency	Certification #	Expiration Date
Florida (NELAP)	Biological Tissue	Dept of Health, Bureau of Laboratories	E87948	6/30/2019
Florida (NELAP)	Hazardous Waste - Solid	Dept of Health, Bureau of Laboratories	E87948	6/30/2019
Florida (NELAP)	Waste Water	Dept of Health, Bureau of Laboratories	E87948	6/30/2019
Georgia	Waste Water -NELAP stipulation	Environmental Protection Division	E87948	6/30/2019
Georgia	Waste Water - NELAP stipulation	Environmental Protection Division	E87948	6/30/2019
Illinois (NELAP)	Hazardous Waste - Solid	Illinois EPA	200050	8/3/2018
Illinois (NELAP)	Waste Water	Illinois EPA	200050	8/3/2018
Kentucky	UST	Environmental and Public Protection Cabinet	82	6/30/2019
Louisiana (NELAP)	Hazardous Waste - Solid	Department of Environmental Quality	04168	6/30/2019
Louisiana (NELAP)	Waste Water	Department of Environmental Quality	04168	6/30/2019
Louisiana (NELAP)	Biological Tissue	Department of Environmental Quality	04168	6/30/2019
Minnesota	Hazardous Waste	Dept of Health	055-999-334	12/31/2018
Minnesota	Waste Water	Dept of Health	055-999-334	12/31/2018
Minnesota	UST	Department of Health	055-999-334	12/31/2018
New York (NELAP)	Solid - Hazardous Waste	Dept of Health	12064	4/1/2019
New York (NELAP)	Waste Water	Dept of Health	12064	4/1/2019
North Dakota	Hazardous Waste	Dept of Health Chemistry Division	R-150	6/30/2019
North Dakota	Waste Water	Dept of Health Chemistry Division	R-150	6/30/2019
South Carolina	Waste Water	Dept of Hlth & Environmental Control	83006001	6/30/2019
Texas	Waste Water	Texas Commission on Environmental Quality	T104704529-14-1	4/30/2019
US Dept of Agriculture	Foreign Soil Permit	Dept of Agriculture	S-76505	4/27/2020
Virginia	Biological Tissue	Dept of General Services	5537	6/30/2019
Wisconsin	Drinking Water	Dept of Natural Resources	405132750	8/31/2018
Wisconsin	Drinking Water	Dept of Agriculture, Trade & Consumer Protection	105-444	12/31/2018
Wisconsin	Hazardous Waste	Dept of Natural Resources	405132750	8/31/2018
Wisconsin	Waste Water	Dept of Natural Resources	405132750	8/31/2018

ATTACHMENT VII- METHOD HOLD TIME, CONTAINER AND PRESERVATION GUIDE (CURRENT AS OF ISSUE DATE)

THE HOLDING TIME INDICATED IN THE CHART BELOW IS THE MAXIMUM ALLOWABLE TIME FROM COLLECTION TO EXTRACTION AND/OR ANALYSIS PER THE ANALYTICAL METHOD. FOR METHODS THAT REQUIRE PROCESSING PRIOR TO ANALYSIS, THE HOLDING TIME IS DESIGNATED AS 'PREPARATION HOLDING TIME/ANALYSIS HOLDING TIME'.

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Acid Base Accounting	Sobek	Solid	Plastic/Glass	None	N/A
Acidity	SM2310B	Water	Plastic/Glass	≤ 6°C	14 Days
Acid Volatile Sulfide	Draft EPA 1629	Solid	8oz Glass	≤ 6°C	14 Days
Actinides	HASL-300	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Actinides	HASL-300	Solid	Plastic/Glass	None	180 Days
Alkalinity	SM2320B/310.2	Water	Plastic/Glass (NY requires separate bottle filled to the exclusion of air)	≤ 6°C	14 Days
Alkylated PAHs		Water	1L Amber Glass	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved
Alkylated PAHs		Solid	8oz Glass	≤ 10°C	1 Year/40 Days
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0/300.1/SM4110B	Water	Plastic/Glass	≤ 6°C; EDA if bromate or chlorite run	All analytes 28 days except: NO_2, NO_3, o-Phos (48 Hours); chlorite (immediately for 300.0; 14 Days for 300.1). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0	Solid	Plastic/Glass	≤ 6°C	All analytes 28 days except: NO_2, NO_3, o-Phos (48

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
					hours); chlorite (immediately). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4	9056	Water/ Solid	Plastic/Glass	≤ 6°C	48 hours
Aromatic and Halogenated Volatiles (see note 1)	8021	Solid	5035 vial kit	See note 1	14 days
Aromatic and Halogenated Volatiles	602/8021	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present	14 Days (7 Days for aromatics if unpreserved)
Asbestos	EPA 600/R-93/116	Solid	Plastic/Glass; bulk- 2" square; popcorn ceiling- 2tbsp; soil- 4oz	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Bacteria, Total Plate Count	SM9221D	Water	Plastic/WK	≤ 6°C; $Na_2S_2O_3$	24 Hours
Base/Neutrals and Acids	8270	Solid	8oz Glass	≤ 6°C	14/40 Days
Base/Neutrals and Acids	625/8270	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Base/Neutrals, Acids & Pesticides	525.2	Water	1L Amber Glass	pH<2 HCl; ≤ 6°C; Na sulfite if Cl present	14/30 Days
Biomarkers		Water	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	≤ 6°C; pH<2 1:1 HCl (optional)
Biomarkers		Solid	≤ 10°C	1 Year/40 Days	≤ 10°C
BOD/cBOD	SM5210B	Water	Plastic/Glass	≤ 6°C	48 hours
Boiling Range Distribution of Petroleum Fractions	ASTM D2887-98	Product	10mL glass vials	≤ 6°C	N/A
BTEX/Total Hydrocarbons	TO-3	Air	Summa Canister	None	28 Days
BTEX/Total Hydrocarbons	TO-3	Air	Tedlar Bag or equivalent	None	72 Hours
Carbamates	531.1	Water	Glass	$Na_2S_2O_3$,	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
				Monochloroacetic acid pH <3; ≤ 6°C	
Carbamates	8318	Water	Glass	Monochloroacetic acid pH 4-5; ≤ 6°C	7/40 Days
Carbamates	8318	Solid	Glass	≤ 6°C	7/40 Days
Carbon Specific Isoptope Analysis (CSIA)	AM24	Water	40mL clear VOA vial with TLS	≤ 6°C, trisodium phosphate or HCl	N/A
Cation/Anion Balance	SM1030E	Water	Plastic/Glass	None	None
Cation Exchange	9081	Solid	8oz Glass	None	unknown
Cations (Ferrous Iron, Ferric Iron, Divalent Manganese)	7199 modified	Water	40mL clear VOA vials with mylar septum	≤ 6°C; HCl	48 Hours
Chloride	SM4500Cl-C,E	Water	Plastic/Glass	None	28 Days
Chlorinated Hydrocarbons in Vapor	AM4.02	Vapor	20cc vapor vial with flat septum	None	N/A
Chlorine, Residual	SM4500Cl-D,E,G/330.5/Hach 8167	Water	Plastic/Glass	None	15 minutes
Chlorophyll	SM10200H	Water	Opaque bottle or aluminum foil	≤ 6°C	48 Hours to filtration
COD	SM5220C, D/410.4/Hach 8000	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Coliform, Fecal	SM9222D	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9222D	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	24 Hours
Coliform, Fecal	SM9221E	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9221E	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	24 Hours
Coliform, Total	SM9222B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total	SM9221B	Solid	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total, Fecal and E. coli	Colilert/ Quanti-tray	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Coliform, Total and E. coli	SM9223B	Drinking Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	30 Hours

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Color	SM2120B,E	Water	Covered Plastic/Acid Washed Amber Glass	≤ 6°C	48 Hours
Condensable Particulate Emissions	EPA 202	Air	Solutions	None	180 Days
Cyanide, Reactive	SW846 chap.7	Water	Plastic/Glass	None	28 Days
Cyanide, Reactive	SW846 chap.7	Solid	Plastic/Glass	None	28 Days
Cyanide, Total and Amenable	SM4500CN-A,B,C,D,E,G,I,N/9010/ 9012/335.4	Water	Plastic/Glass	pH≥12 NaOH; ≤ 6°C; ascorbic acid if Cl present	14 Days (24 Hours if sulfide present-applies to SM4500CN only)
Diesel Range Organics- Alaska DRO	AK102	Solid	8oz Glass	≤ 6°C	14/40 Days
Diesel Range Organics- Alaska DRO	AK102	Water	1L Glass	pH<2 HCl; ≤ 6°C	14/40 Days
Diesel Range Organics- TPH DRO	8015	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Diesel Range Organics- TPH DRO	8015	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Diesel Range Organics- TPH DRO	8015	Tissue	1L Amber Glass	≤ - 10°C	1 Year if frozen/40 Days
Diesel Range Organics- TPH DRO	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Diesel Range Organics- NwTPH-Dx	Nw-TPH-Dx	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Diesel Range Organics- NwTPH-Dx	Nw-TPH-Dx	Water	1L Amber Glass	pH <2 HCl; ≤ 6°C	14/40 Days; 7 Days from collection to extraction if unpreserved
Diesel Range	WI MOD DRO	Solid	Tared 4oz	≤ 6°C	10/47 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Organics- Wisconsin DRO			Glass Jar		
Diesel Range Organics- Wisconsin DRO	WI MOD DRO	Water	1L Amber Glass	≤ 6°C; pH <2 HCl	14/40 Days
Dioxins and Furans	1613B	Solid	8oz Glass	≤ 6°C	1 year
Dioxins and Furans	1613B	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	1 year
Dioxins and Furans	1613B	Fish/ Tissue	Aluminum foil	≤ 6°C	1 year
Dioxins and Furans	8290	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	30/45 Days
Dioxins and Furans	8290	Solid	8oz Glass	≤ 6°C	30/45 Days
Dioxins and Furans	8290	Fish/ Tissue	Not specified	< -10°C	30/45 Days
Dioxins and Furans	TO-9	Air	PUF	None	7/40 Days
Diquat/Paraquat	549.2	Water	Amber Plastic	≤ 6°C; $Na_2S_2O_3$	7/21 Days
EDB/DBCP (8011) EDB/DBCP/1,2,3-TCP (504.1)	504.1/8011	Water	40mL vials	≤ 6°C; $Na_2S_2O_3$ if Cl present	14 Days
Endothall	548.1	Water	Amber Glass	≤ 6°C; $Na_2S_2O_3$	7/14 Days
Enterococci	EPA 1600	Water	100mL Plastic	≤ 10°C	8 Hours
Enterococci	Enterolert	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Explosives	8330/8332	Water	1L Amber Glass	≤ 6°C	7/40 Days
Explosives	8330/8332	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Water	1L Amber Glass	pH < 2 HCl; ≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Solid	4oz Glass Jar	≤ 6°C	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	MA-EPH	Water	1L Amber Glass	pH<2 HCl; ≤ 6°C	14/40 Days
Extractable	MA-EPH	Solid	4oz Glass Jar	≤ 6°C	7/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Petroleum Hydrocarbons (aliphatic and aromatic)					
Fecal Streptococci	SM9230B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Ferrous Iron	SN3500Fe-D; Hach 8146	Water	Glass	None	Immediate
Flashpoint/ Ignitability	1010	Liquid	Plastic/Glass	None	28 Days
Florida PRO	FL PRO DEP (11/1/95)	Liquid	Glass, PTFE lined cap	≤ 6°C; pH <2 H_2SO_4 or HCl	7/40 Days
Fluoride	SM4500Fl-C,D	Water	Plastic	None	28 Days
Gamma Emitting Radionuclides	901.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Gasoline Range Organics	8015	Water	40mL vials	pH<2 HCl	14 Days
Gasoline Range Organics	8015	Solid	5035 vial kit	See note 1	14 days
Gasoline Range Organics (C3-C10)	8260B modified	Water	40mL vials	≤ 6°C; HCl	14 Days
Gasoline Range Organics (C3-C10)	8260B modified	Solid	4oz Glass Jar	≤ 6°C	14 Days
Gasoline Range Organics- Alaska GRO	AK101	Solid	5035 vial kit	See 5035 note*	28 Days if GRO only (14 Days with BTEX)
Gasoline Range Organics- Alaska GRO	AK101	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Water	40mL vials	pH<2 HCl; ≤ 6°C	7 Days unpreserved; 14 Days preserved
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Solid	40mL vials	≤ 6°C; packed jars with no headspace	14 Days
Gasoline Range Organics- Wisconsin GRO	WI MOD GRO	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days
Gasoline Range Organics- Wisconsin GRO	WI MOD GRO	Solid	40mL MeOH vials	≤ 6°C in MeOH	21 Days
Glyphosate	547	Water	Glass	≤ 6°C; $Na_2S_2O_3$	14 Days (18 Months frozen)

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Grain Size	ASTM D422	Solid	Not specified	Ambient	N/A
Gross Alpha (NJ 48Hr Method)	NJAC 7:18-6	Water	Plastic/Glass	pH<2 HNO_3	48 Hrs
Gross Alpha and Gross Beta	9310/900.0	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Gross Alpha and Gross Beta	9310	Solid	Glass	None	180 Days
Haloacetic Acids	552.1/552.2	Water	40mL Amber vials	NH_4Cl; ≤ 6°C	14/7 Days if extracts stored ≤ 6°C or 14/14 Days if extracts stored at ≤ -10°C
Hardness, Total ($CaCO_3$)	SM2340B,C/130.1	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Heterotrophic Plate Count (SPC/HPC)	SM9215B	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Heterotrophic Plate Count (SPC/HPC)	SimPlate	Water	100mL Plastic	≤ 10°C; $Na_2S_2O_3$	8 Hours
Herbicides, Chlorinated	8151	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Herbicides, Chlorinated	8151	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Herbicides, Chlorinated	515.1/515.3	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	14/28 Days
Hexavalent Chromium	7196/218.6/ SM3500Cr-B, C, D	Water	Plastic/Glass	≤ 6°C	24 Hours (see note 4)
Hexavalent Chromium	218.6/SM3500Cr-B, C, D	Water	Plastic/Glass	Ammonium Buffer pH 9.3-9.7	28 Days (see note 4)
Hexavalent Chromium	218.6/218.7	Drinking Water	Plastic/Glass	Ammonium Buffer pH >8	14 Days (see note 4)
Hexavalent Chromium	7196 (with 3060A)	Solid		≤ 6°C	30 Days from collection to extraction and 7 days from extraction to analysis
Hydrocarbons in Vapor	AM4.02	Vapor	20cc vapor vial with flat septum	None	N/A
Hydrogen by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Hydrogen Halide	EPA 26	Air	Solutions	None	6 Months

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
and Halogen Emissions					
Ignitability of Solids	1030	Non-liquid Waste	Plastic/Glass	None	28 Days
Lead Emissions	EPA 12	Air	Filter/Solutions	None	6 Months
Light Hydrocarbons by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Light Hydrocarbons in Vapor	AM20GAx	Vapor	20cc vapor vial with flat septum	None	14 Days
Lipids	Pace Lipids	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen
Mercury, Low-Level	1631E	Solid	Glass	None	28 Days
Mercury, Low-Level	1631E	Water	Fluoropolymer bottles (Glass if Hg is only analyte being tested)	12N HCl or BrCl	48 Hours for preservation or analysis; 28 Days to preservation if sample oxidized in bottle; 90 Days for analysis if preserved
Mercury, Low-Level	1631E	Tissue	Plastic/Glass	≤ - 10°C	28 Days if frozen
Mercury	7471	Solid	8oz Glass Jar	≤ 6°C	28 Days
Mercury	7470/245.1/245.2	Water	Plastic/Glass	pH<2 HNO_3	28 Days
Mercury	7471/245.6	Tissue	Plastic/Glass	≤ - 10°C	28 Days if frozen
Metals (GFAA)	7000/200.9	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP)	NIOSH 7300A/7303	Air	Filters	None	180 Days
Metals (ICP/ICPMS)	6010/6020	Solid	8oz Glass Jar	None	180 Days
Metals (ICP/ICPMS)	6010/6020/200.7/200.8	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP/ICPMS)	6020	Tissue	Plastic/Glass	≤ -10°C	180 Days if frozen
Methane, Ethane, Ethene	8015 modified	Water	40mL vials	HCl	14 Days
Methane, Ethane,	RSK-175;	Water	20mL vials	HCl; or trisodium	14 Days; 7

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Ethene	PM01/AM20GAx			phosphate or benzalkonium chloride and ≤ 6°C	Days unpreserved
Methane, Ethane, Ethene	EPA 3C	Air	Summa Canister	None	28 Days
Methane, Ethane, Ethene	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
Methanol, Ethanol	8015 modified	Water	40mL vials	≤ 6°C	14 Days
Methanol, Ethanol	8015 modified	Solid	2oz Glass	≤ 6°C	14 Days
Methyl Mercury	1630	Water	Teflon/ fluoropolymer	Fresh water- 4mL/L HCl; Saline water- 2mL/L H_2SO_4 (must be preserved within 48 hours of collection)	6 months
Methyl Mercury	1630	Tissue	2-4oz glass jar	≤ 0°C	28 Days; ethylated distillate 48 hours
Nitrogen, Ammonia	SM4500NH3/350.1	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Total Kjeldahl (TKN)	351.2	Solid	Plastic/Glass	≤ 6°C	28 Days
Nitrogen, Total Kjeldahl (TKN)	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Nitrate	SM4500-NO3/352.1	Water	Plastic/Glass	≤ 6°C	24 Hours preferred
Nitrogen, Nitrate & Nitrite combination	353.2	Solid	Plastic/Glass	≤ 6°C	28 Days
Nitrogen, Nitrate & Nitrite combination	SM4500-NO3/353.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Nitrogen, Nitrite or Nitrate separately	SM4500-NO2/353.2	Water	Plastic/Glass	≤ 6°C	48 Hours
Nitrogen, Organic	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Non-Methane Organics	EPA 25C	Air	Summa Canister	None	28 Days
Non-Methane Organics	EPA 25C	Air	Tedlar Bag or equivalent	None	72 Hours
Odor	SM2150B	Water	Glass	≤ 6°C	24 Hours
Oil and Grease/HEM	1664A/SM5520B/9070	Water	Glass	pH<2 H_2SO_4 or HCl; ≤ 6°C	28 Days
Oil and Grease/HEM	9071	Solid	Glass	≤ 6°C	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Oil Range Organics	8015	Solid	Glass	≤ 6°C	14/40 Days
Oil Range Organics	8015	Water	Glass	≤ 6°C	7/40 Days
Organic Matter	ASA 29-3.5.2	Solid	Plastic/Glass	None; samples air-dried and processed prior to analysis	N/A
Oxygen, Dissolved (Probe)	SM4500-O	Water	Glass	None	15 minutes
Oxygenates on Product (GCMS SIM)	1625 modified	Product	10mL glass vial	≤ 6°C	14 Days (7 Days from extraction)
PBDEs	1614	Water	1L Amber Glass	≤ 6°C	1 Year/1 Year
PBDEs	1614	Solid	Wide Mouth Jar	≤ 6°C	1 Year/1 Year
PBDEs	1614	Tissue	Aluminum Foil	≤ -10°C	1 Year/1 Year
PCBs and Pesticides, Organochlorine (OC)	TO-4/TO-10	Air	PUF	None	7/40 Days
PCBs and Pesticides, Organochlorine (OC)	608	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	Pest: 7/40 Days; PCB: 1 Year/1 Year
PCBs, Pesticides (OC), Herbicides	508.1	Water	Glass	Na2SO3; pH<2 HCl; ≤ 6°C	14/30 Days
PCBs, total as Decachlorobiphenyl	508A	Water	1L Glass, TFE lined cap	≤ 6°C	14/30 Days
Perchlorate	331	Water	Plastic/Glass	≥0-6°C, field filtered with headspace	28 Days
Permanent Gases (O2, N2, CO2)	RSK-175; PM01/AM20GAx	Water	40mL vials	benzalkonium chloride and ≤ 6°C	14 Days
Permanent Gases by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Permanent Gases in Vapor	AM20GAx	Vapor	20cc vapor vial with flat septum	None	14 Days
Pesticides, Organochlorine (OC)	8081	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Pesticides, Organochlorine (OC)	8081	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Pesticides, Organochlorine (OC)	8081	Tissue	8oz Glass Jar	≤ -10°C	1 Year if frozen/40 Days
Pesticides, Organophosphorous (OP)	8141	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Pesticides, Organophosphorous (OP)	8141	Water	1L Amber Glass	pH 5-8 with NaOH or H_2SO_4; ≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
PCBs (Aroclors)	8082	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	1 Year/1 Year
PCBs (Aroclors)	8082	Solid	8oz Glass Jar	≤ 6°C	1 Year/1 Year
PCBs (Aroclors)	8082	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen/1 Year
PCB Congeners	1668A	Water	1L Amber Glass	≤ 6°C but above freezing	1 Year/1 Year
PCB Congeners	1668A	Solid	4-8oz Glass Jar	≤ 6°C but above freezing	1 Year/1 Year
PCB Congeners	1668A	Tissue	4-8oz Glass Jar	≤ -10°C	1 Year/1 Year
Paint Filter Liquid Test	9095	Water	Plastic/Glass	None	N/A
Particle Size	ASA 15-5 modified	Solid	Plastic/Glass (100g sample)	None	N/A
Particulates	PM-10	Air	Filters	None	180 Days
Permanent Gases	EPA 3C	Air	Summa Canister	None	28 Days
Permanent Gases	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
pH	SM4500H+B/9040	Water	Plastic/Glass	None	15 minutes
pH	9045	Solid	Plastic/Glass	None	7 Days
Phenol, Total	420.1/420.4/9065/9066	Water	Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Phosphorus, Orthophosphate	SM4500P/365.1/365.3	Water	Plastic	≤ 6°C	Filter within 15 minutes, Analyze within 48 Hours
Phosphorus, Total	SM4500P/ 365.1/365.3/365.4	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6°C	28 Days
Phosphorus, Total	365.4	Solid	Plastic/Glass	≤ 6°C	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Polynuclear Aromatic Hydrocarbons (PAH)	TO-13	Air	PUF	None	7/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Solid	8oz Glass Jar	≤ 6°C	14/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Water	1L Amber Glass	≤ 6°C; $Na_2S_2O_3$ if Cl present	7/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Tissue	Plastic/Glass	≤ -10°C	1 Year if frozen/40 Days
Purgeable Organic Halides (POX)	9021	Water	Glass; no headspace	≤ 6°C	14 Days
Radioactive Strontium	905.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-226	903.0/903.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note 3)	9320/904.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note 3)	9320	Solid	Plastic/Glass		
Residual Range Organics- Alaska RRO	AK103	Solid	8oz Glass	≤ 6°C	14/40 Days
Saturated Hydrocarbons		Water	≤ 6°C; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	≤ 6°C; pH<2 1:1 HCl (optional)
Saturated Hydrocarbons		Solid	≤ 10°C	1 Year/40 Days	≤ 10°C
Silica, Dissolved	SM4500Si-D	Water	Plastic	≤ 6°C	28 Days
Solids, Settleable	SM2540F	Water	Glass	≤ 6°C	48 Hours
Solids, Total	SM2540B	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total	SM2540G	Solid	Plastic/Glass	≤ 6°C	7 Days
Solids, Total (FOC, OM, Ash)	ASTM D2974	Solid	Plastic/Glass	≤ 6°C	7 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Solids, Total Dissolved	SM2540C	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Suspended	SM2540D/USGS I-3765-85	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Volatile	160.4/SM2540E	Water	Plastic/Glass	≤ 6°C	7 Days
Solids, Total Volatile	160.4	Solid	Plastic/Glass	≤ 6°C	7 Days
Specific Conductance	SM2510B/9050/120.1	Water	Plastic/Glass	≤ 6°C	28 Days
Stationary Source Dioxins and Furans	EPA 23	Air	XAD Trap	None	30/45 Days
Stationary Source Mercury	EPA 101	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source Metals	EPA 29	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source PM10	EPA 201A	Air	Filters	None	180 Days
Stationary Source Particulates	EPA 5	Air	Filter/Solutions	None	180 Days
Sulfate	SM4500SO4/9036/9038/375.2/ASTM D516	Water	Plastic/Glass	≤ 6°C	28 Days
Sulfide, Reactive	SW-846 Chap.7	Water	Plastic/Glass	None	28 Days
Sulfide, Reactive	SW-846 Chap.7	Solid	Plastic/Glass	None	28 Days
Sulfide, Total	SM4500S/9030	Water	Plastic/Glass	pH>9 NaOH; ZnOAc; ≤ 6°C	7 Days
Sulfite	SM4500SO3	Water	Plastic/Glass	None	15 minutes
Surfactants (MBAS)	SM5540C	Water	Plastic/Glass	≤ 6°C	48 Hours
Total Alpha Radium (see note 3)	9315/903.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Total Alpha Radium (see note 3)	9315	Solid	Plastic/Glass	None	180 days
Total Inorganic Carbon (TIC)	PM01/AM20GAx	Water	40mL VOA vial with mylar septum	≤ 6°C	14 Days
Total Organic Carbon (TOC)	SM5310B,C,D/9060	Water	Glass	pH<2 H_2SO_4 or HCl; ≤ 6°C	28 Days
Total Organic Carbon (TOC)	9060/Walkley Black/Lloyd Kahn	Solid	Glass	≤ 6°C	14 Days
Total Organic Halogen (TOX)	SM5320/9020	Water	Glass; no headspace	≤ 6°C	14 Days
Total Petroleum Hydrocarbons (aliphatic and	TPHCWG	Water	40mL vials	pH<2 HCl, no headspace, ≤ 6°C	7 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
aromatic)					
Total Petroleum Hydrocarbons (aliphatic and aromatic)	TPHCWG	Solid	Glass	≤ 6°C	14 days
Tritium	906.0	Water	Glass	None	180 days
Turbidity	SM2130B/180.1	Water	Plastic/Glass	≤ 6°C	48 Hours
Total Uranium	908.0/ASTM D5174-97	Water	Plastic/Glass	pH<2 HNO_3	180 days
UCMR Metals	200.8	Water	Plastic or glass	pH<2 HNO_3	28 Days
UCMR Hexavalent Chromium	218.7	Water	HDPE or propylene	Na_2CO_3/$NaHCO_3$/ $(NH_4)_2SO_4$; pH>8	14 Days
UCMR Chlorate	300.1	Water	Plastic or glass	EDA	28 Days
UCMR Perfluorinated Compounds	537	Water	Polypropylene	Trizma	14 Days
UCMR 1, 4 Dioxane	522	Water	Glass	Na_2SO_3, $NaHSO_4$; pH<4	28 Days
UV254	SM5910B	Water	Glass	≤ 6°C	48 Hours
Vermiculite	EPA 600/R-93/116	Solid	Plastic/Glass	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Volatile Fatty Acids	AM21G	Water	40mL clear VOA vials	≤ 6°C	21 Days
Volatile Fatty Acids (low level)	AM23G	Water	40mL clear VOA vials	≤ 6°C with benzalkonium chloride	14 Days
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days preserved
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Solid	4-8oz Glass Jar	≤ 6°C; packed jars with no headspace	7/28 Days
Volatiles	TO-14	Air	Summa Canister	None	28 Days
Volatiles	TO-14	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	TO-15	Air	Summa Canister or	None	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
			Tedlar Bag		
Volatiles	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6°C but above freezing	28 Days
Volatiles	TO-18/8260	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	8260	Solid	5035 vial kit	See note 1 (analyze for acrolein and acrylonitrile per local requirements)	14 days
Volatiles	8260	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days
Volatiles	8260	Conc. Waste	5035 vial kit or 40mL vials	≤ 6°C	14 Days
Volatiles	624	Water	40mL vials	pH<2 HCl; ≤ 6°C; $Na_2S_2O_3$ if Cl present (or unpreserved if run within 7 days of collection) (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days (7 Days for aromatics if unpreserved)
Volatiles (see note 2)	524.2	Water	40mL vials (in duplicate)	pH<2 HCl; ≤ 6°C; Ascorbic acid or $Na_2S_2O_3$ if Cl present[2]	14 Days
Whole Oil	ASTM D3328 (prep); ASTM D5739	Product	10mL glass vials	≤ 6°C	N/A

[1] **5035/5035A Note**: 5035 vial kit typically contains 2 vials water, preserved by freezing **or**, 2 vials aqueous sodium bisulfate preserved at 4°C, **and** one vial methanol preserved at ≤6°C **and** one container of unpreserved sample stored at ≤6°C.

[2] Method 524.2 lists ascorbic acid as the preservative when residual chlorine is suspected, unless gases or Table 7 compounds are NOT compounds of interest and then sodium thiosulfate is the preservative recommended.

[3] Methods 9315 and 9320 both state that if samples are unpreserved, the samples should be brought to the lab within 5 days of collection, preserved in the lab, and then allowed to sit for a minimum of 16 hours before sample preparation/analysis.

[4] The holding time for hexavalent chromium may be extended by the addition of the ammonium buffer listed in EPA 218.6 per the 2012 EPA Method Update Rule. Although Method 218.6 stipulates a different pH range (9.0 to 9.5) for buffering, this method requirement was modified in the Method Update Rule to a pH range of 9.3 to 9.7.For non-potable waters, adjust the pH of the sample to 9.3 to 9.7 during collection with the method required ammonium sulfate buffer to extend the holding time to 28 days. For potable waters, addition of the buffer during collection will extend the holding time for 14 days per EPA 218.7 and the EPA UCMR program.

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S Webster St
PO Box 7921
Madison, WI 53707-7921

Scott Walker, Governor
Daniel L. Meyer, Secretary
Telephone 608-266-2621
Fax 608-267-3579
TTY Access via relay - 711

August 1, 2018

FID: 405132750

MS. KATE VERBETEN
PACE ANALYTICAL SERVICES,LLC-GREEN BAY WI
1241 BELLEVUE STREET
GREEN BAY, WI 54302

Dear Ms. Kate Verbeten:

Enclosed is your new Laboratory Certification or Registration certificate. This certificate supersedes all previous certificates.

YOUR CERTIFICATE IS AN IMPORTANT DOCUMENT. PLEASE REVIEW IT CAREFULLY FOR ERRORS AND COMPARE IT TO YOUR PREVIOUS YEAR'S CERTIFICATE. MAKE SURE THAT THIS CERTIFICATE REFLECTS THE TESTS FOR WHICH YOU APPLIED TO BE CERTIFIED. If you believe your certificate contains errors, contact the Laboratory Certification and Registration Program immediately at (608) 267-7633 or by e-mail at DNRLabCert@wisconsin.gov.

Sincerely,

Steven Geis, Chief
Environmental Science Services

State of Wisconsin
Department of Natural Resources

recognizes

Wisconsin Certification under NR 149

of

Pace Analytical Services,LLC-Green Bay WI

Laboratory Id: **405132750**

as a laboratory licensed to perform environmental sample analysis in support of covered environmental programs (ch. NR149.02 Note) for the parameter(s) specified in the attached Scope of Accreditation.

August 31, 2019

Expiration Date

August 1, 2018

Issued on

Steven Geis, Chief
Environmental Science Services

Daniel L. Meyer, Secretary
Department of Natural Resources

This certificate does not guarantee validity of data generated, but indicates the methodology, equipment, quality control practices, records, and proficiency of the laboratory have been reviewed and found to satisfy the requirements of ch. NR 149, Wis. Adm. Code.

Scope of Accreditation

Pace Analytical Services,LLC-Green Bay WI
1241 Bellevue Street
Green Bay, WI 54302

Laboratory Id: **405132750**
Expiration Date: **08/31/19**
Issued Date: **08/01/18**

Wisconsin Certification under NR 149
Matrix: Aqueous (Non-potable Water)

Class: General Chemistry

Acidity as CaCO3 *by Titration*
Alkalinity *by Titration*
Ammonia as N *by Colorimetry*
Biochemical Oxygen Demand (BOD) *by 5-d Assay*
Bromide *by IC*
Carbonaceous Oxygen Demand (cBOD) *by 5-d Assay*
Chemical Oxygen Demand (COD) *by Colorimetry*
Chloride *by IC*
Cyanide, Total *by Colorimetry*
Fluoride *by IC*
Hardness, Total as CaCO3 *by ICP*
Kjeldahl Nitrogen, Total *by Colorimetry*
Nitrate *by IC*
Nitrate + Nitrite *by Colorimetry*
Nitrate + Nitrite *by IC*
Nitrite *by IC*
Organic Carbon, Total (TOC) *by Comb-Ox*
Phosphorus, Total *by Colorimetry*
Residue, Filterable (TDS) *by Grav*
Residue, Nonfilterable (TSS) *by Grav*
Residue, Total *by Grav*
Residue, Volatile (TVS) *by Grav*
Residue, Volatile, Nonfilterable (TVSS) *by Grav*
Sulfate *by IC*
Sulfide *by Titration*
Sulfides, Acid-Soluble and Acid-Insoluble *by Titration*

Class: Metals

Aluminum *by ICP*
Aluminum *by ICP-MS*
Antimony *by ICP*
Antimony *by ICP-MS*
Arsenic *by ICP*
Arsenic *by ICP-MS*
Barium *by ICP*
Barium *by ICP-MS*
Beryllium *by ICP*
Beryllium *by ICP-MS*
Boron *by ICP*
Cadmium *by ICP*
Cadmium *by ICP-MS*
Calcium *by ICP*
Calcium *by ICP-MS*
Chromium (Hexavalent) *by Colorimetry*
Chromium (Total) *by ICP*
Chromium (Total) *by ICP-MS*

Class: Metals

Cobalt *by ICP*
Cobalt *by ICP-MS*
Copper *by ICP*
Copper *by ICP-MS*
Iron *by ICP*
Iron *by ICP-MS*
Lead *by ICP*
Lead *by ICP-MS*
Magnesium *by ICP*
Magnesium *by ICP-MS*
Manganese *by ICP*
Manganese *by ICP-MS*
Mercury *by Hyd-CVAA*
Mercury *by ICP-MS*
Mercury *by UltraLow*
Molybdenum *by ICP*
Molybdenum *by ICP-MS*
Nickel *by ICP*
Nickel *by ICP-MS*
Potassium *by ICP*
Potassium *by ICP-MS*
Selenium *by ICP*
Selenium *by ICP-MS*
Silver *by ICP*
Silver *by ICP-MS*
Sodium *by ICP*
Sodium *by ICP-MS*
Strontium *by ICP*
Thallium *by ICP*
Thallium *by ICP-MS*
Tin *by ICP*
Titanium *by ICP*
Vanadium *by ICP*
Vanadium *by ICP-MS*
Zinc *by ICP*
Zinc *by ICP-MS*

Class: BNA Semivolatiles

SEMIVOLATILES [BNA] (group) *by GC/MS*

Class: Pesticides, Organochlorine

PESTICIDES, ORGANOCHLORINE (group) *by GC*

Class: Petroleum Hydrocarbons

PVOC - Petroleum VOCs *by GC*
PVOC - Petroleum VOCs *by GC/MS*

The laboratory named above is hereby licensed under ch. NR 149, Wis. Adm. Code for the parameters listed in this attachment.
* Analyte groups are defined and listed at http://dnr.wi.gov by searching keywords "Lab Certification:".

Scope of Accreditation

Pace Analytical Services,LLC-Green Bay WI
1241 Bellevue Street
Green Bay, WI 54302

Laboratory Id: **405132750**
Expiration Date: **08/31/19**
Issued Date: **08/01/18**

Wisconsin Certification under NR 149
Matrix: Aqueous (Non-potable Water)

Class: Petroleum Hydrocarbons
Diesel Range Organics (DRO) *by GC*
Gasoline Range Organics (GRO) *by GC*
Class: PCBs as Aroclors
PCB as AROCLORS (group) *by GC*
Class: Volatile Organics
VOLATILE ORGANICS [VOC] (group) *by GC/MS*

The laboratory named above is hereby licensed under ch. NR 149, Wis. Adm. Code for the parameters listed in this attachment.
* Analyte groups are defined and listed at http://dnr.wi.gov by searching keywords "Lab Certification:".

Scope of Accreditation

Pace Analytical Services,LLC-Green Bay WI
1241 Bellevue Street
Green Bay, WI 54302

Laboratory Id: **405132750**
Expiration Date: **08/31/19**
Issued Date: **08/01/18**

Wisconsin Certification under NR 149
Matrix: Potable Water (Drinking Water)

Class: SDWA - Primary Non-metals
Nitrate + Nitrite - EPA 300.0
Nitrate - EPA 300.0
Nitrite - EPA 300.0

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* Analyte groups are defined and listed at http://dnr.wi.gov by searching keywords "Lab Certification:".

Scope of Accreditation

Pace Analytical Services,LLC-Green Bay WI
1241 Bellevue Street
Green Bay, WI 54302

Laboratory Id: **405132750**
Expiration Date: **08/31/19**
Issued Date: **08/01/18**

Wisconsin Certification under NR 149
Matrix: Solid (Waste, Soil & Tissue)

Class: General Chemistry
- Ammonia as N *by Colorimetry*
- Bromide *by IC*
- Chloride *by IC*
- Cyanide, Total *by Colorimetry*
- Fluoride *by IC*
- Kjeldahl Nitrogen, Total *by Colorimetry*
- Nitrate *by IC*
- Nitrate + Nitrite *by Colorimetry*
- Nitrate + Nitrite *by IC*
- Nitrite *by IC*
- Organic Carbon, Total (TOC) *by Comb-Ox*
- Phosphorus, Total *by Colorimetry*
- Residue, Total *by Grav*
- Sulfate *by IC*
- Sulfide *by Titration*
- Sulfides, Acid-Soluble and Acid-Insoluble *by Titration*

Class: Metals
- Aluminum *by ICP*
- Aluminum *by ICP-MS*
- Antimony *by ICP*
- Antimony *by ICP-MS*
- Arsenic *by ICP*
- Arsenic *by ICP-MS*
- Barium *by ICP*
- Barium *by ICP-MS*
- Beryllium *by ICP*
- Beryllium *by ICP-MS*
- Boron *by ICP*
- Cadmium *by ICP*
- Cadmium *by ICP-MS*
- Calcium *by ICP*
- Calcium *by ICP-MS*
- Chromium (Total) *by ICP*
- Chromium (Total) *by ICP-MS*
- Cobalt *by ICP*
- Cobalt *by ICP-MS*
- Copper *by ICP*
- Copper *by ICP-MS*
- Iron *by ICP*
- Iron *by ICP-MS*
- Lead *by ICP*
- Lead *by ICP-MS*
- Magnesium *by ICP*
- Magnesium *by ICP-MS*
- Manganese *by ICP*

Class: Metals
- Manganese *by ICP-MS*
- Mercury *by Hyd-CVAA*
- Mercury *by ICP-MS*
- Mercury *by UltraLow*
- Molybdenum *by ICP*
- Molybdenum *by ICP-MS*
- Nickel *by ICP*
- Nickel *by ICP-MS*
- Potassium *by ICP*
- Potassium *by ICP-MS*
- Selenium *by ICP*
- Selenium *by ICP-MS*
- Silver *by ICP*
- Silver *by ICP-MS*
- Sodium *by ICP*
- Sodium *by ICP-MS*
- Strontium *by ICP*
- Thallium *by ICP*
- Thallium *by ICP-MS*
- Tin *by ICP*
- Titanium *by ICP*
- Vanadium *by ICP*
- Vanadium *by ICP-MS*
- Zinc *by ICP*
- Zinc *by ICP-MS*

Class: BNA Semivolatiles
- ## SEMIVOLATILES [BNA] (group) *by GC/MS*

Class: Pesticides, Organochlorine
- ## PESTICIDES, ORGANOCHLORINE (group) *by GC*

Class: Petroleum Hydrocarbons
- ## PVOC - Petroleum VOCs *by GC*
- ## PVOC - Petroleum VOCs *by GC/MS*
- Diesel Range Organics (DRO) *by GC*
- Gasoline Range Organics (GRO) *by GC*

Class: PCBs as Aroclors
- ## PCB as AROCLORS (group) *by GC*

Class: Volatile Organics
- ## VOLATILE ORGANICS [VOC] (group) *by GC/MS*

Class: Waste Characterization Extractions
- Reagent Water Shake Extraction (ASTM Leach Test) *by Waste Extractions*
- SPLP Extraction *by Waste Extractions*

The laboratory named above is hereby licensed under ch. NR 149, Wis. Adm. Code for the parameters listed in this attachment.
* Analyte groups are defined and listed at http://dnr.wi.gov by searching keywords "Lab Certification:".

Scope of Accreditation

Pace Analytical Services,LLC-Green Bay WI
1241 Bellevue Street
Green Bay, WI 54302

Laboratory Id: **405132750**
Expiration Date: **08/31/19**
Issued Date: **08/01/18**

Wisconsin Certification under NR 149
Matrix: Solid (Waste, Soil & Tissue)

Class: Waste Characterization Extractions TCLP Extraction *by Waste Extractions*
Class: Waste Characterization Assays Ignitability, Pensky-Martens Closed Cup *by Waste Assays*

The laboratory named above is hereby licensed under ch. NR 149, Wis. Adm. Code for the parameters listed in this attachment.
* Analyte groups are defined and listed at http://dnr.wi.gov by searching keywords "Lab Certification:".

APPENIDX A-6

EARTH EXPLORATION, INDIANAPOLIS, INDIANA

AASHTO ACCREDITED

CERTIFICATE OF ACCREDITATION

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
AASHTO

Terracon Consultants, Inc.

in

Indianapolis, Indiana, USA

has demonstrated proficiency for the testing of construction materials and has conformed to the requirements established in AASHTO R 18 and the AASHTO Accreditation policies established by the AASHTO Committee on Materials and Pavements.

The scope of accreditation can be viewed on the Directory of AASHTO Accredited Laboratories (aashtoresource.org).

Jim Tymon,
AASHTO Executive Director

Moe Jamshidi,
AASHTO COMP Chair

This certificate was generated on 11/01/2019 at 8:44 AM Eastern Time. Please confirm the current accreditation status of this laboratory at aashtoresource.org/aap/accreditation-directory

Scope of AASHTO Accreditation for:

Terracon Consultants, Inc.

in Indianapolis, Indiana, USA

Quality Management System

Standard:		Accredited Since:
R18	Establishing and Implementing a Quality System for Construction Materials Testing Laboratories	05/15/1999
C1077 (Aggregate)	Laboratories Testing Concrete and Concrete Aggregates	01/10/2011
C1077 (Concrete)	Laboratories Testing Concrete and Concrete Aggregates	01/10/2011
D3666 (Asphalt Mixture)	Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials	01/10/2011
D3740 (Soil)	Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction	01/10/2011
E329 (Asphalt Mixture)	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction	02/22/2019
E329 (Soil)	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction	04/05/2019

Scope of AASHTO Accreditation for:

Terracon Consultants, Inc.

in Indianapolis, Indiana, USA

Asphalt Mixture

Standard:		Accredited Since:
R47	Reducing Samples of Hot-Mix Asphalt to Testing Size	09/29/2011
R68	Preparation of Asphalt Mixtures by Means of the Marshall Apparatus	05/15/1999
T30	Mechanical Analysis of Extracted Aggregate	05/15/1999
T164 (Mineral Matter Not Determined)	Quantitative Extraction of Asphalt Binder from Hot Mix Asphalt (HMA) - Plant Control	05/15/1999
T166	Bulk Specific Gravity of Compacted Hot Mix Asphalt Using Saturated Surface-Dry Specimens	05/15/1999
T209	Maximum Specific Gravity of Hot Mix Asphalt Paving Mixtures	05/15/1999
T245	Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus	05/15/1999
T269	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures	05/15/1999
T329	Moisture Content of Hot-Mix Asphalt (HMA) by Oven Method	09/29/2011
D2041	Maximum Specific Gravity of Hot Mix Asphalt Paving Mixtures	11/25/2013
D2172 (Mineral Matter Not Determined)	Quantitative Extraction of Asphalt Binder from Hot Mix Asphalt (HMA) - Plant Control	05/15/1999
D2726	Bulk Specific Gravity of Compacted Hot Mix Asphalt Using Saturated Surface-Dry Specimens	05/15/1999
D3203	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures	05/15/1999
D5444	Mechanical Analysis of Extracted Aggregate	05/15/1999
D6926	Preparation of Asphalt Mixtures by Means of the Marshall Apparatus	05/15/1999
D6927	Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus	05/15/1999

Scope of AASHTO Accreditation for:

Terracon Consultants, Inc.

in Indianapolis, Indiana, USA

Soil

Standard:		Accredited Since:
R58	Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test	10/15/1999
T88	Particle Size Analysis of Soils by Hydrometer	10/15/1999
T89	Determining the Liquid Limit of Soils (Atterberg Limits)	10/15/1999
T90	Plastic Limit of Soils (Atterberg Limits)	10/15/1999
T99	The Moisture-Density Relations of Soils Using a 5.5 lb [2.5 kg] Rammer and a 12 in. [305 mm] Drop	10/15/1999
T100	Specific Gravity of Soils	10/15/1999
T180	Moisture-Density Relations of Soils Using a 10 lb [4.54 kg] Rammer and an 18 in. [457 mm] Drop	10/15/1999
T193	The California Bearing Ratio	10/15/1999
T208	Unconfined Compressive Strength of Cohesive Soil	10/15/1999
T216	One-Dimensional Consolidation Properties of Soils Using Incremental Loading	10/15/1999
T265	Laboratory Determination of Moisture Content of Soils	10/15/1999
T289	pH of Soils for Corrosion Testing	02/23/2016
T296	Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression	10/15/1999
T297	Consolidated-Undrained Triaxial Compression Test on Cohesive Soils	10/15/1999
T310	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)	10/15/1999
D422	Particle Size Analysis of Soils by Hydrometer	10/15/1999
D698	The Moisture-Density Relations of Soils Using a 5.5 lb [2.5 kg] Rammer and a 12 in. [305 mm] Drop	10/15/1999
D1140	Amount of Material in Soils Finer than the No. 200 (75-µm) Sieve	10/15/1999
D1557	Moisture-Density Relations of Soils Using a 10 lb [4.54 kg] Rammer and an 18 in. [457 mm] Drop	10/15/1999
D1883	The California Bearing Ratio	10/15/1999
D2166	Unconfined Compressive Strength of Cohesive Soil	10/15/1999
D2216	Laboratory Determination of Moisture Content of Soils	10/15/1999
D2435	One-Dimensional Consolidation Properties of Soils Using Incremental Loading	10/15/1999

Scope of AASHTO Accreditation for:

Terracon Consultants, Inc.

in Indianapolis, Indiana, USA

Soil (Continued)

Standard:		Accredited Since:
D2487	Classification of Soils for Engineering Purposes (Unified Soil Classification System)	10/15/1999
D2850	Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression	10/15/1999
D4318	Determining the Liquid Limit of Soils (Atterberg Limits)	10/15/1999
D4318	Plastic Limit of Soils (Atterberg Limits)	10/15/1999
D4767	Consolidated-Undrained Triaxial Compression Test on Cohesive Soils	10/15/1999
D5084	Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter	10/15/1999
D6938	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)	10/15/1999

Scope of AASHTO Accreditation for:

Terracon Consultants, Inc.

in Indianapolis, Indiana, USA

Aggregate

Standard:		Accredited Since:
R76	Reducing Samples of Aggregate to Testing Size	06/15/1999
T11	Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing	06/15/1999
T21	Organic Impurities in Fine Aggregates for Concrete	06/15/1999
T27	Sieve Analysis of Fine and Coarse Aggregates	06/15/1999
T84	Specific Gravity (Relative Density) and Absorption of Fine Aggregate	06/15/1999
T85	Specific Gravity and Absorption of Coarse Aggregate	06/15/1999
T255	Total Moisture Content of Aggregate by Drying	06/15/1999
C40	Organic Impurities in Fine Aggregates for Concrete	06/15/1999
C117	Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing	06/15/1999
C127	Specific Gravity and Absorption of Coarse Aggregate	06/15/1999
C128	Specific Gravity (Relative Density) and Absorption of Fine Aggregate	06/15/1999
C136	Sieve Analysis of Fine and Coarse Aggregates	06/15/1999
C566	Total Moisture Content of Aggregate by Drying	06/15/1999
C702	Reducing Samples of Aggregate to Testing Size	06/15/1999

Scope of AASHTO Accreditation for:

Terracon Consultants, Inc.

in Indianapolis, Indiana, USA

Concrete

Standard:		Accredited Since:
M201	Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the testing of Hydraulic Cements and Concretes	08/18/2012
R60	Sampling Freshly Mixed Concrete	06/15/1999
T22	Compressive Strength of Cylindrical Concrete Specimens	06/15/1999
T23	Making and Curing Concrete Test Specimens in the Field	06/15/1999
T97	Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)	06/15/1999
T119	Slump of Hydraulic Cement Concrete	06/15/1999
T121	Density (Unit Weight), Yield, and Air Content of Concrete	06/15/1999
T152	Air Content of Freshly Mixed Concrete by the Pressure Method	06/15/1999
T196	Air Content of Freshly Mixed Concrete by the Volumetric Method	06/15/1999
T231 (7000 psi and below)	Capping Cylindrical Concrete Specimens	07/07/2017
T309	Temperature of Freshly Mixed Portland Cement Concrete	06/15/1999
C31	Making and Curing Concrete Test Specimens in the Field	06/15/1999
C39	Compressive Strength of Cylindrical Concrete Specimens	06/15/1999
C78	Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)	06/15/1999
C138	Density (Unit Weight), Yield, and Air Content of Concrete	06/15/1999
C143	Slump of Hydraulic Cement Concrete	06/15/1999
C172	Sampling Freshly Mixed Concrete	06/15/1999
C173	Air Content of Freshly Mixed Concrete by the Volumetric Method	06/15/1999
C231	Air Content of Freshly Mixed Concrete by the Pressure Method	06/15/1999
C511	Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the testing of Hydraulic Cements and Concretes	08/18/2012
C617 (7000 psi and below)	Capping Cylindrical Concrete Specimens	07/07/2017
C1064	Temperature of Freshly Mixed Portland Cement Concrete	06/15/1999
C1231 (7000 psi and below)	Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinders	08/18/2012

APPENDIX A-7

MATERIAL AND CHEMISTRY LABORATORY, LLC., OAK RIDGE, TENNESSEE

UNCONTROLLED COPY

Quality Assurance Plan
MCL-7701

Materials and Chemistry Laboratory, Inc.
161 Mitchell Road
Oak Ridge, Tennessee 37830-7919

Issued Revision 13
Revision 13.1, December 6, 2013
Revision 13.2, April 7, 2014
Revision 13.3, November 24, 2014
Revision 13.4, February 5, 2015
Revision 14, September 2015
Revision 14.1, April 7, 2016
Revision 14.2, August 1, 2016
Revision 14.3, November 22, 2016
Revision 14.4, December 20, 2016
Revision 14.5, May 3, 2017
Revision 14.6, December 2017
Revision 14.8, December 2018
Revision 15, June 2019

_____	June 3, 2019
MCLinc President	Date
_____	June 3, 2019
Quality Assurance Manager	Date

Controlled Copy No. _____

Table of Contents

1.0. ORGANIZATION

1.1. Introduction

Materials and Chemistry Laboratory, Inc. (MCLinc) provides technical support to a variety of customers and programs. Work done may be classified at levels up to U.S. Department of Energy (DOE) "Q" or "QX" (S-RD [level: secret – Category: Restricted Data]), and may involve radioactive, special nuclear materials (SNM), and/or hazardous materials. Scope of work includes, but is not limited to, characterization studies, research projects, development efforts, lab-to-bench-to-pilot scale processes, process optimization, and methodology development. Quality is inherent in all aspects of MCLinc work. This plan and the references herein, ensure that a management framework is defined for the establishment of quality MCLinc practices. The MCLinc Organization Chart is in Appendix A.

It is noted that this plan does not specifically address all aspects of the Industrial Hygiene Analysis Laboratory (IHL) within MCLinc. The IHL is an American Industrial Hygiene Association Program (AIHA) Laboratory Accreditation Program (LAP), LLC (AIHA-LAP) accredited laboratory. The latest AIHA assessment was done under the requirements of International Organization for Standardization/International Engineering Consortium (ISO/IEC) 17025 international standard. The IHL operates under a stand-alone quality plan, MCLinc, "Industrial Hygiene Laboratory Quality Assurance Manual," MCL-7719. The information contained within the MCLinc Quality Assurance Plan (QAP) will still apply to the overall operation of all IHL functions, but will not specifically address some of the AIHA-required details that are unique to the IHL. This document and other supporting Standard Operating Procedures (SOPs) will apply to all MCLinc AIHA accreditations.

1.2. Quality System and its Processes

This Quality Assurance Plan, MCL-7701, provides the details of our Quality Management System and the processes that assure this implementation meets ISO/IEC 17025:2017, needs of our major DOE clients and commercial clients. The degrees of implementation may vary with the client, but the goal is to meet the quality objectives and that the results of the processes are the highest quality that meets or exceeds the client needs. MCLinc is currently an approved DOECAP-AP by Perry Johnson Laboratory accreditation per requirements of ISO/IEC 17025:2005. A cross reference of MCLinc QAP, MCL – 7701 to ISO/IEC 17025:2017 is presented in Appendix B.

Any changes to the process must be evaluated for risk by those assigned the responsibilities and authority of each process included. All opportunities must be not only evaluated against our capabilities but any associated risk to assure that any changes to the processes achieve their intended results.

1.3. Commitment to Quality

The managers, owners, and employees of MCLinc, and employee-owned company, are committed to a policy whereby all personnel are free of any undue internal or external commercial, financial, or other pressures shall report this concern immediately to the Laboratory Manager (LM), Technical Director (TD), Quality Assurance Manager (QAM), or the MCLinc President for investigation and corrective action.

As noted under the Facilities Section, the facility is secure and the staff is knowledgeable in the handling of confidential information for the DOE. This same approach is extended to all clients in that client confidential information or proprietary rights are maintained in confidence and all such documents or electronic files are stored in locked files or in computers password-protected and accessible only to authorized staff. See Section 6.2.6, Classified Materials. The MCLinc reputation and success depends on the high integrity of the staff. MCLinc's policy is that technical and business competence, impartiality, judgment, risk assessment and data quality and operational integrity must be maintained at all times. These elements are key to maintaining the quality of our efforts. The employees therefore must be aware of their contributions to maintaining the management quality system.

The MCLinc management staff has the responsibility and authority to provide the resources to complete the above and through staff and project meetings and other communications tools (i.e., e-mail) encourage the staff to communicate their assessment of the management system. The MCLinc management also has the responsibility for training, implementation, maintenance and improvement of the management system and to identify and correct variances from the system. The QAM, TD, LM, Project Manager (PM), and Quality Assurance (QA) assessments are key in identifying any variance from this policy which must be investigated and corrective action taken including disciplinary action.

2.0. REFERENCES

The references found in Section 9 are referred to in this document and constitutes requirements of this document. For dated references only that edition applies for undated references the latest edition applies.

3.0. IMPARTIALITY

- MCLinc's management and staff are committed to impartiality.
- MCLinc is impartial in hiring, promoting, and client arrangements.
- MCLinc is not influenced improperly by its clients or others that may compromise impartiality.
- MCLinc requires its staff to identify any signs of impartiality and identifies the risk on an on-going basis.
- As risks to impartiality are identified, a member of senior management will evaluate the risks on the company and take appropriate action to eliminate or minimize the risks.

4.0. CONFIDENTIALITY

MCLinc is responsible for maintaining all data and reports with client confidentiality. Even if one is with the same company as the client, information will not be released until the specific client contact approves.

If MCLinc is required by law or court action to release any client information, the client will be notified immediately.

Any information about a client from other sources shall not be shared with the client and maintained as business confidential.

Only MCLinc personal with a need to know will have access to business confidential information which includes data and reports. Many of MCLinc Personnel have security clearances with the DOE.

5.0. STRUCTRUAL REQUIREMENTS

5.1. Facility/Security Attributes

MCLinc is leasing a building at 161 Mitchell Road in Oak Ridge, Tennessee. The brick facility is approximately 42,000 square feet (ft^2). The area available to MCLinc under its lease with the Laboratory Holding Company, LLC is approximately 25,000 ft^2. The facility is designed to be a modern laboratory facility meeting all safety standards and security requirements. There is approximately 15,000 ft^2 of laboratory space and 10,000 ft^2 of office space within the MCLinc facility. The facility is dedicated to handling virtually any type of environmental contaminant and is operated by multidisciplinary staff qualified to address technical issues pertaining to radiological and hazardous materials.

Although MCLinc is a private commercial entity, it still has some operational restrictions based upon where and what type of business it does. As part of the basis for MCLinc to continue to be authorized to perform classified work, a graded approach to physical security had to be implemented. The physical security, and hence the main basis for the security infrastructure of the MCLinc facility, is based upon at least three layers of access control. The first layer is that access to the building is controlled by proximity card readers. All visitors must be admitted by MCLinc employees and must be properly badged per DOE requirements. A second layer is for access to the laboratory due to the requirement for both a proximity card and entry of a correct key pad code. A third layer of security is available thru controlled key access to the individual labs. The Facility Security Officer (FSO) will assign keys. All assigned keys will be physically controlled by the individual. Lost keys will be reported to the FSO immediately. This graded approach to physical security provides the required control over facility access for security issues as well as for proper chain of custody (COC) of certain materials and samples.

5.2. Functional Responsibilities

The MCLinc President provides daily guidance and administrative support to the MCLinc staff and is committed to ensuring compliance to this QAP and ISO/IEC Standard 17025:2017, DOE, AIHA, and other quality requirements of our customers. The MCLinc President is supported by the TD and the LM. These positions provide routine assistance to personnel and customers on the capabilities and application of MCLinc resources to solve problems. Appendix C is a list of support function assignments.

The TD has responsibility to provide technical direction to the PM and technical assistance to our clients. The LM has responsibilities for the day-to-day operation of the laboratories and to make sure resources are available to meet the needs of our clients and this plan. The Quality Assurance Specialist (QAS) performs quality duties as assigned by the QAM. The QAS is the designated alternate for the QAM in his absence.

All staff members of MCLinc are responsible for ensuring that customer objectives (i.e., quality, time frame, budget, applicability) are met in accordance with this plan and any other applicable documentation. The work performed by any and all staff members is necessary to meet our management quality objectives and those of our clients. A staff member is empowered to stop work due to any safety issue or when the quality of the product is endangered and report such concerns to the QAM. Appendix C lists MCLinc personnel and their support functions which will help ensure the quality objectives of MCLinc and its customers are met. The QAM is the point of contact for the implementation and

enforcement of quality-based procedures. Conflicts in operating methods and procedures will be resolved by the QAM with support from the appropriate management personnel. The QAM is committed to compliance to this QAP and ISO/IEC Standard 17025 and other quality requirements of our customers. The QAM, as necessary, develops and issues SOPs or QA Directives in memo format to further define or explain items covered by this QAP or other areas needing procedures defined.

The QAM has the authority to stop work at any time to assess a reported problem or investigate a quality system failure or trend.

The PM is either self-appointed or is selected by the LM or MCLinc President based upon the nature of the project. The PM is the person responsible for the control and coordination of all activities associated with the successful completion of a customer task.

6.0. RESOURCE REQUIREMENTS

6.1. General

MCLinc Senior Management continues to evaluate needs for personnel, facilities, equipment, systems and support services necessary to manage and perform its laboratory services.

6.2. Personnel

6.2.1. Personnel Training and Qualifications

MCLinc selects personnel thru a multi-layer interview process including management review of resume, a phone interview, determination to move forward with an on-site interview and a follow-up if necessary, prior to selection of a candidate. The major factors for a candidate are basic chemistry and computer knowledge, strong work ethic, interest in the job and MCLinc and people relationships skills. The training program below prepares the individual for the job area needed. Other experience and skills are always a plus for the candidate.

MCLinc personnel are qualified to perform their job duties based upon a combination of one or more of the following criteria:

- Formal education
- On-the-job training
- Formal training (vendor courses, site and customer-specific training, etc.)

Training is performance based and proof of successful completion and understanding of the material must be demonstrated and documented. The training and qualification needs of the individual MCLinc staff members are determined by either the TD, or LM. For any new procedure the LM and TD will establish training requirements and have the analyst perform a Demonstration of Capability (DOC). This DOC procedure is explained on a DOC form available from the QAM.

6.2.2. Training

Personnel shall be in compliance with required training. Formal training classes will be used for the majority of the baseline and/or job-specific required training. MCLinc staff/safety meetings will be used

to supplement education in safety- and technical-related issues. Off-site training (vendor schools, short courses, seminars, and conferences) can be used for continuing technical and professional training.

Training for procedure or guideline-based methods is performed using required reading assignments and topical review in follow-up staff meetings. On-the-job training can be used to supplement any job performance activity. Details of MCLinc's Training Program are located in "MCL Training Program," MCL-7778.

Training records will be maintained for active laboratory personnel. The current training records for each member of the MCLinc staff will be maintained by the Document Control Coordinator (DCC).

New employees receive training in the following areas:

- QA/Quality Control (QC)
- Chemical Hygiene Plan
- Health and Safety
- Radiochemistry
- Security
- Ethics and Data Integrity
- SOPs
- Computer Security
- Work Place Substance Abuse Policy
- Non-conformances

The level of this training will be dependent on employee job assignments, but all training will be documented and placed in their training files.

On-going updated training will be provided to all employees as required. Employees are required to read all SOPs issued to them and ask the QAM any questions or clarifications. On-going SOP training will be provided when significant changes ae made to the SOP. The MCLinc staff is encouraged to suggest any *training they need* to better perform their jobs. Also, each *year* during annual quality assessment, the need for additional training will be reviewed and the effectiveness of current training evaluated.

6.2.3. Certification of Qualifications

In addition to specific training requirements, there are several areas of MCLinc operations that require special/specific qualifications. If required by the project, this qualification must be further documented and clearly identify the area of qualification and the basis including, as required, any supporting documentation. See example Certificate of Qualification in Appendix E

6.2.4. Instrument Operator Qualifications

Operator status will be determined and confirmed by either the TD or the LM. Appendix D lists the instrumentation which requires approval and the MCLinc personnel that are authorized (as of the date shown) as operators. The QAM is responsible for maintaining and distributing updates for the authorized operator listing.

6.2.5. Radiological Materials

MCLinc staff members must meet the training and authorization requirements as defined by the Radiation Safety Officer (RSO). The specific requirements for radiological materials handling and use authorization are defined in the Tennessee Department of Environment and Conservation, Division of Radiological health. MCLinc maintains a Radioactive Material License.

6.2.6. Classified Materials

MCLinc staff members must meet all of the requirements specified in the "Facility Security Plan," MCL-7706. The most important criterion is the need-to-know. This aspect of control over the unauthorized distribution of classified and controlled information will be fully enforced within all aspects of MCLinc business practice. The FSO will maintain all associated documentation and records that are required for compliance with the Facility Security Plan.

6.2.7. Data Review and Evaluation

The LM or QAM will define the level of data review required to meet the project quality objectives and customer's expectations. The MCLinc minimum standard for data review is a two-level review consisting of an initial (level one) review by the analyst/instrument operator assuring that the analyses were properly performed, calculations are checked and the acceptance criteria for the method were met. The QAM or QA designee, another analyst or LM will perform a second review (level 2 review) of the parameters listed plus the final report.

During any step in the data review and quality analysis process, any quality data outside of the method or project set criteria must be evaluated for appropriate corrective action. If the analyst sees a QC failure, they shall rerun the QC sample. If it fails again, the results are presented to QA and the following evaluation must occur:

a) If the QC is biased high (continuing calibration verification [CCV], laboratory control sample [LCS], or matrix spike [MS]), and the sample results are below the reporting limit, report the results with a qualifier noted in the report.

b) If the QC recoveries are biased low even after being reanalyzed; the samples after the last acceptable QC sample should be re-prepped and reanalyzed, if possible. Industrial hygiene (IH) samples or samples consumed in the initial prep should be reported with the anomaly described in the case narrative. For low IH or MS recoveries, perform a post digestion spike to evaluate the cause (i.e., was it a matrix effect).

c) If the blank is contaminated above ½ of the reporting limit, but not detected in the samples, report the data and note the anomaly in the case narrative. The possible cause of the blank contamination shall be investigated and corrective action taken. If the samples appear to be contaminated when analyzed without dilution, then the samples and QC shall be re-prepped and reanalyzed. IH samples or samples consumed in the initial prep should be reported with the anomaly described in the case narrative and reported with a B qualifier. If one or more of the samples have a high concentration of the analyte requiring dilution to analyze, the sample is most

likely the cause of the blank cross contamination and the results should be reviewed with QA for appropriate action prior to reporting.

d) An exception to the above requirement for re-prep and re-analysis is the case where such action would cause missing the client's turnaround time (TAT). In this case the Laboratory Manager (LM) or QAM should contact the client to discuss the issue and take the action agreed upon. Also, if insufficient sample is available to re-prep, the data must be qualified.

Additional internal data review (level three) will be provided by appropriate senior technical staff as warranted per the subject matter of the data and/or the requirements of the project. In no instance will data be reported without review. Information reported prior to completion of the review/evaluation process must be clearly identified as "preliminary data."

Computer programs that are used to produce test data or calculate test data must be self-checking or verified per "Verification of Data Software, "MCL-7728.

6.3. Facilities and Environmental Conditions

6.3.1. Facility Maintenance

The housekeeping and maintenance of each MCLinc office or laboratory facility is the direct responsibility of all MCLinc personnel. MCLinc facilities should be kept clean and orderly and the temperature and humidity controlled to meet the needs of the testing instruments. If the MCLinc staff member responsible for an area is temporarily or permanently unable to comply with this standard, he or she should advise management of the problem. Specific health and safety requirements are outlined in the "Chemical Hygiene Plan," MCL-7702 and the "Health and Safety Plan," MCL-7717. Specific requirements for maintenance and facility documentation are provided in the "Calibration, Maintenance and Inspection Plan," MCL-7711.

6.3.2. Work Environment

MCLinc maintains a safe and clean working environment. All laboratory areas and materials are maintained in a clean and orderly fashion to ensure the work performed will not be compromised by the local environment of the laboratory facility. The MCLinc personnel performing work are responsible for ensuring that all cleanliness requirements are met prior to commencing work. The "Chemical Hygiene Plan," MCL-7702, provides additional detail.

In the new MCLinc laboratory with new environmental monitoring and controls, it will be easier to maintain a controlled environment.

The laboratories are now separate by type of preparation of samples and by the type of analyses to be performed. This will minimize contamination and provide an effective separator of any incompatible laboratory activities.

6.4. Equipment

6.4.1. Instrumentation and Maintenance

MCLinc has a variety of laboratory instrumentation ranging from very complex (e.g., transmission electron microscope) to standard laboratory instrumentation (e.g., pH meter). The level of the

documentation required for the standardized use of instrumentation is decided by the LM. The instrumentation listed in Appendix D requires some level of QA and/or operational guidance. The use and control of the general laboratory equipment is provided in "Calibration, Maintenance and Inspection Plan," MCL-7711, technology specific SOPs (e.g., MCL-7708, "Electron Microscope Operations Plan"), project specific QA plans, vendor manuals, and other customer specific documentation. MCLinc staff members using an instrument are responsible for documenting non-routine maintenance and repairs, and maintaining an inventory of consumables and commonly needed parts.

All new and critical instrumentation have maintenance contracts or call-in repair personnel.

6.4.2. Calibration

Instrument and equipment performance evaluation, maintenance, and documentation are the responsibility of the instrument owner. Appendix D lists the responsible Owner and authorized operator for the major instrumentation with the MCL facility. These instruments have specific QA documents that outline the minimum calibration requirements. For the general or common data acquisition laboratory equipment (e.g., balances, pH meters) the "Calibration, Maintenance and Inspection Plan," MCL-7711, outlines the calibration and documentation requirements for those components which may influence the work being performed. When there is a need for outside calibration of laboratory equipment, the vendor/material used must be traceable to national standard setting bodies such as National Institute of Standards and Technology (NIST) or ISO approved.

Prior to analysis or after movement or changes to the instrument, the calibration is checked and if necessary, recalibrated per the SOP. Calibration should be performed with certified standards traceable to the primary standard calibration records should maintain by project. Instrument logs should be maintained for each analytical instrument and contain any maintenance or calibration issues.

6.5. Metrological Traceability

6.5.1. Standards and Reference Materials

MCLinc has a need for a variety of standards and reference materials. Where possible, these standards and reference materials must be purchased from an ISO/IEC 17025 or ISO Guide 17034 certified vendor. Traceability of these standards must also be demonstrated on the Certificate of Analyses of the standard. The standards and reference material must be handled, stored and used per the manufacturer's specification to avoid contamination and deterioration.

Many standard methods require use of second source standards to check primary standards (i.e., organics and metals). The DOECAP "Quality Systems for Analytical Services" (QSAS) requires radiation calibration standards to be verified prior to use and annually as follows:

- At least three verification measurements of a standard are used to determine and mean value and standard deviation of verification results.
- Mean value is within 5 percent (%) of certified value.
- Two sigma deviations are less than 10% of the mean value.

If specifications are not met, corrective actions must be evaluated and implemented.

6.5.2. Calibration Standards

Standards used for calibration and quality control samples must have the preparation document and traceable to the primary standard certificates that are maintained by the QAM or Microscopy Department. Distinct numbers are assigned to each to allow traceability.

6.6. Externally Provided Products and Services

6.6.1. Laboratory Supplies

These materials are stored and controlled based upon the hazardous nature of the material. Individual personnel are responsible for ensuring that the integrity of the laboratory supplies is adequate to meet MCLinc and the customer's expectations. The ordering, reporting and tracking of chemicals is addressed in the "Chemical Hygiene Plan," MCL-7702 and the "Procurement Control Plan," MCL-7727. The ordering, reporting, and tracking of radiological materials are addressed in the "Implementation SOP for the Radiation Protection Plan," MCL-7715.

6.6.2. Procurement

Procurement planning begins with the PM evaluating the needs of the project including the specifications of the required items. These needs are then compared to the approved sources/vendors.

Procurement will then be done through a qualified and established vendor. When a new vendor must be used prior to qualification, the vendor must provide and/or meet any requested technical and operation specifications that may influence quality, safety, and/or environmental concerns. These specifications are reviewed with the QAM and will become part of the final project documentation. The Purchaser, at the direction of the QAM, maintains a list of approved vendors (in the MCLinc purchasing software database). For QC standards and reagents, the QAM has a list of approved vendors that meet the certification requirements for the material such as ISO/IEC 17025; ISO/IEC 17034 or NIST approved.

Using a MCLinc Purchase Requisition, the PM documents the desired product that meets the project or use required specifications by catalog or identification number. In cases where it is necessary to assure the quality of the product, the specifications required are defined in the purchase order. The purchase order is used to confirm the material or service upon receipt.

Documentation for project related purchases are maintained in the project files and the PM is responsible to assure the specifications of products received meet project needs.

Upon receipt, the procured items are checked by the PM or his designee, against the ordered item for compliance prior to use. The desired quality will be checked during initial use for critical consumables, supplies and services that affect the quality of MCLinc services. Any identified quality issue must be immediately report to the QAM for investigation or root cause and determination of corrective action.

For the purposes of Nuclear Quality Assurance (NQA)-1 requirements, MCLinc does not purchase materials for direct Nuclear Facility-Related use. All day-to-day procurements are via purchase order and are commercial grade items with specifications clearly defined by the vendor. If a unique item is required, the PM under the direction of the QAM/TD reviews the design and/or specifications and seeks and evaluates qualified vendors or sources. Any new vendor must be approved by the QAM.

Further details of the procurement process are defined in "Procurement Control," MCL-7727.

7.0. PROCESS REQUIREMENTS

7.1. Review of Requests, Tenders and Contracts.

7.1.1. Pre-Project Activities

Consideration will be given to the quality, safety and environmental impacts on project performance during the project conception, bidding, procurement, and initiation phases. These areas will be addressed either informally or formally for all MCLinc work. These issues will be documented when dealing with a customer whose work scope is estimated to take more than 80 man-hours to complete. This consideration will help ensure that all customer and MCLinc data quality objectives can be established and met during the successful completion of the work scope.

7.1.2. Project Conception

Project ideas will be reviewed by MCLinc staff members to determine if the work being requested or proposed is within the capabilities of the MCLinc staff, facility, and resource allocation. Consideration as to resources, facility requirements, waste generation/disposal, and total project life cycle costs and requirements will be considered. Discrepancies or concerns will be presented to either the MCLinc President or LM to obtain resolution on the discrepancies or concerns.

7.1.3. Bidding

When providing a cost estimate or quote for a specific set of services to a customer, the PM will have the cost estimate reviewed by either the MCLinc President, TD, or LM. The internal cost breakdown analysis will demonstrate that consideration has been provided to meet the customer's quality, documentation, reporting, sample management, procurement, and waste disposal requirements within the cost estimate being provided.

7.1.4. Project Acceptance

Before a project is accepted and begun, the PM will meet with the LM and assigned staff to make sure that all required MCLinc resources will be available and can be allocated for the successful completion of the customer work package. This includes a review of any possible procurement of goods and services to complete the project.

7.1.5. Project Documentation and Communication

At the discretion of the PM and the customer, the amount of project specific QA documentation and procedures will be determined. These documents are used as guidance and can be informally approved and accepted between the PM and the customer. The documents will be part of the permanent project file and are the responsibility of the PM to ensure that all proper documentation is archived. The project specific documentation may include but is not limited to:

- QAP,
- Data package/reporting requirements including concentration units,
- Specific technical procedures or operational methods,
- Enhanced COC procedures,

- Calibration and/or certification requirements,
- Environment, health and safety (EH&S) guidance,
- Budget, schedule, and deadline information,
- Correspondence.

A key element of the MCLinc Project is effective communication to the client not only of the project problems or issues, but progress and significant achievements. This communication also allows an opportunity for input to the project from the client on technical matters, opinions and interpretations of the results. In most cases this input is best received during the project than after the fact. The mode of this communication is best dictated by the client and may mean phone calls, meetings, e-mail or other written progress reports. Document all oral communication to assure your understanding of the discussion.

7.1.6. Reporting and Project Closure

Report structure, detail, organization, and media selection will be determined by the PM and customer. The PM will ensure that all data review, data tabulations, laboratory work, and customer requests have fully completed and documented prior to the compilation of the final report. Any non-conformity with the customer's request will be communicated and documented as soon as possible with the customer. Documented resolution will be noted within the project notes and summary. The PM will ensure that a complete data set, laboratory notebook reference list, data location listing, and final copy of the customer report are maintained in their files. A copy of the final customer report will be maintained within the MCLinc project files. If a report is to be amended, the report is either reissued or marked as a new revision version, or a clearly defined amendment to the report is issued. In both cases, the new document is sent to the same distribution as the original report.

Upon completion of the project, the PM must place or reference all applicable documents in the project file, make sure any non-routine or special wastes generated during the project are properly stored and/or disposed per "Waste Management Plan," MCL-7718, and that all samples and residues are properly stored for disposal or returned to the client per the contract.

7.1.7. Subcontracting

When MCLinc uses a subcontractor for support services or testing services that it does not provide, or for workload overflow; the client is informed of this approach and competent pre-approved subcontractor is used. The subcontractor must meet any certifications required by the project, (i.e., AIHA).

The need for subcontract services is identified in the project planning stage and if the services required are not available through a previous approved subcontractor a new subcontractor will be sought. This involves definition of the requirements for the services needed, along with any certifications required and solicitation of the supporting documentation from potential vendors. The PM will review the documentation and make a recommendation to the QAM/LM for final approval.

7.1.8. Technical Programs

Since the vast majority of MCLinc's technical programs are non-routine or first-time research driven activities, the work is performed based on the work plan or scope of work (SOW) agreed upon with the client. The guidance to execution of their work is found in the MCLinc SOPs including Project

Management and Instrument Operation Guides. The MCLinc President and the QAM must approve MCLinc SOPs including Operator Aids. All laboratory work is documented in preparation sheets or laboratory notebooks to assure recreation of the process followed. The other various guidelines, procedures, and plans that form the basis for the operations and quality performance of MCLinc are listed in the Reference Section of MCLinc's Control Documents, Volumes I, II and III.

7.2. Selection, Verification and Validation of Methods

7.2.1. Selection and Verification of Methods

MCLinc has a wide variety of SOPs based on U.S. Environmental Protection Agency (EPA), DOE, American Society for Testing and Materials (ASTM), Occupational Safety and Health Administration (OSHA), National Institute of Occupational Safety and Health (NIOSH) procedures. The methods are verified thru Method Detection Limit (MDL) studies, LCSs and spiked samples which must meet the SOP defined criteria. The SOPs are reviewed annually and any suggested changes are reviewed by QA for appropriateness prior to a change and reevaluated, if necessary. MCLinc will discuss with the client the method requested or suggest or suggest a method that will best provide the data needed. Quality Control (QC) samples are analyzed with the samples to verify the method for the samples. If changes are required, those will normally be recorded as an Operator Aid which maybe project specific and then verified with client samples. The client is made aware of the final method used.

7.2.2. Validation of Methods

Non-standard or lab developed methods maybe required for non-routine samples by MCLinc. Quality Assurance and the PM will review the proposed method and develop an Operator Aid to use in the validation process.

7.2.3. QC Samples

QC samples are initially analyzed to evaluate the performance criteria for precision and accuracy and if necessary, modified further to meet criteria for the new procedure.

7.2.4. Validated QC Sample

The validated QC Operator Aid will be made a controlled document and a qualified analyst will be selected to use the procedure. The final report will reference the Operator Aid and if requested sent to the client. The project will include the data used to validate the procedure and describe any issues encountered and resulting performance data.

7.3. Sampling

7.3.1. Sampling and Sample Preparation

In MCLinc projects where actual sampling of the process is required, the details of the sampling process and procedures to follow must be defined in a project sampling plan or scope of work. All samplers must be trained on the procedures and understand the critical importance of the sample to the project. The resultant sample must represent the source being sampled and the PM must define steps to be taken to best approximate a homogenized sample. This is also a critical step in sub-sampling samples received at the laboratory for testing.

The staff member responsible for the analysis shall determine sample preparation techniques utilized. Sample preparation techniques shall be documented. Good laboratory notebook protocols or approved sample preparation documents will be used when documenting the laboratory, data, and/or project activities. Additional quality, safety, and environmental aspects of sample preparation are provided in," Sample Preparation Plan," MCL-7710.

7.3.2. Material and Sample Receipt

Samples and materials are received at the MCLinc facility from various sources and require various levels of oversight and control. Sample login, tracking, documentation, archival, disposal, and/or return procedures are detailed in "Project Management Plan," MCL-7704 and Operator Aid Appendix O in MCL-7756, "Operator Aids." This procedure provides guidance on issues such as non-conformance reports (NCR), cross contamination, inspection log sheets, sample tracking and management, and laboratory records associated with sample management. The "Procurement Control Plan," MCL-7727 and Section 6.6.2 provide details on the QC checks and documentation required for receipt of materials.

7.4. Handling of Test Samples

The MCLinc SOP MCL-7704, "Project Management," describes in detail the handling of test samples including:

- Use of chain of custody
- Sample storage:
  - Classified samples
  - Radioactive samples
  - Non-radioactive samples
  - Sample identifier with unique sample identification (ID) and project number
  - Sample handling
  - Sample return to client
  - Sample archival
  - Sample and residue disposal.

7.5. Technical Records

7.5.1. QA Records

Records that show or demonstrate evidence of quality or a quality system are deemed quality records. They are to be legible, identifiable and retrievable. Quality Assurance records may be hard copy or electronic media files. Quality records are maintained by the DCC and QAM and include the following:

- Current and historical controlled documents
- Laboratory notebooks
- Laboratory/instrument logbooks
- Training files/records
- Instrument output, results, notes, design documents and calculations
- Standards traceability documentation
- Radiochemical inventory documentation (maintained by RSO)

- Non-conformance reports
- Demonstration of Capability Form (DOC)

All Management system documents including Quality Assurance documents must be controlled or uniquely identified to assure that approved documents are being used. QA will document them on the SOP Status List. The PM maintains QA Records that are specific to a project such as standard runs, daily calibrations, calculations and results in the project files.

7.5.2. Project Records

All technical records with a project constitute Project Records and are maintained accessible to the project staff during the project and are considered client proprietary. The technical records are maintained by the Sample Reporting Management Staff (SRMS) in the designated project files and the business records by the Accountant in the Administrative Office files. Examples of Project Records are:

- Work plans or SOW documents
- Project QAPs
- Project correspondence including phone logs
- Interim and final reports
- Computer files of project information
- Proposals, contracts and change orders
- Communication – written or verbal motes

Further details on records are outlined in "Quality Assurance Records," MCL-7729.

7.5.3. Record Retention

Record retention is the key to assuring our clients that information if needed in the future is retrievable. Project records are maintained for five (5) years or as otherwise defined in the project contract. QA Records not associated with a project are considered lifetime or permanent records and will be maintained for the usable life of the item. All records are maintained within the secure MCLinc facility in clean, dry areas with access controlled by the Sample/Report Management Staff (SRMS). The SRMS receives project documents from the MCLinc staff and places the records into appropriate filing cabinets or new storage boxes and logs the contents into a records storage log which is then used to track the documents for future retrieval. All documents in storage are accessible only through the SRMS or QAM. Computer records are stored on the server and the cloud.

7.5.4. Notebooks

A critical document in use within MCLinc to record day-to-day work efforts, analyses, and experimentation is the laboratory notebook. Laboratory notebooks are issued by the DCC to individual personnel as needed. These notebooks are assigned with a unique identification number and are maintained by the individual MCLinc personnel. The notebook is the responsibility of the individual user. It is good practice to maintain an index in the front of the book to track the time frames associated with various customers and/or projects which have documentation in the notebook. If it is felt that a section or entry into the logbook should be witnessed, the logbook owner is responsible for providing another cognizant MCLinc staff member to read, verify, and sign the logbook pages that the material has been properly documented and dated. Notebooks, when completed or retired, are returned to the DCC for safe storage. Notebook(s) will be randomly reviewed for compliance to the SOP, "Good Notebook

Keeping Practices," MCL-7724, during the year as part of each internal assessment by QA or the TD. Preparation Sheets can be a substitute for notebooks in reporting all of the information involved in the preparation of samples for analyses.

7.6. Evaluation of Measure of Uncertainty

The MCLinc SOP, MCL-7735, describes the DOE and AIHA procedure used to determine uncertainty of a result. Since MCLinc is not involved with the initial sampling, the recalculations will only include the sub-sampling error performed by the laboratory. MCLinc only reports the uncertainty for an analyte at the request of the client.

For radiological samples, the instrument software processes the data to determine uncertainty of result. MCLinc will determine uncertainty when requested by the client.

7.7. Ensuring the Validity of Results

7.7.1. Quality Control Samples and Assessment of Data

Since the vast majority of the projects performed by MCLinc are non-routine or the application of a routine procedure to a non-routine use, the measurement quality objectives vary significantly. The basic objective of all MCLinc measurements/analyses are to assure: (1) the procedure measures the parameter of interest, (2) the instrument/system is calibrated and operating properly, (3) the sample was properly prepared and handled in a way to minimize contamination, and (4) the data is calculated, reviewed and reported properly. Depending on the procedure or technique utilized MCLinc achieves the above by using QC samples. These QC samples include one or more of the following:

- Method Blank
- Instrument Blank
- Calibration Check Standards
- Laboratory Control Samples (Duplicates)
- Matrix Spike and/or Matrix Spike Duplicate
- Duplicate Sample
- Certified Sample

In many cases the QC sample requirements, if not defined by the procedure, are defined by the client and MCLinc at the time of project inception. Any anomalies or failures of QC samples must be evaluated and if persistent reported as a non-conformance requirement corrective action.

The LCSs shall be used by the analyst to evaluate method performance. In cases where the method is run infrequently (less than 20 samples per month), the analyst shall evaluate LCS recoveries against criteria in the method or use a default of 100 % plus or minus (±) 25 % recovery. Corrective action will include rerun of the LCS and if it still fails evaluation by the QAM verses client project needs.

For analytical methods requiring LCSs and run frequently (more than 20 samples per month), LCS data shall be tabulated for review by the analyst to see trends with calculation of the standard deviation (sigma). The data points generated for each samples set should be evaluated as follows: QAM verses client project needs.

For analytical methods requirement LCSs and run frequently (more than 20 samples per month), LCS data shall be tabulated for review by the analyst to see trends with calculation of the standard deviation (sigma). The data points generated for each sample set should be evaluated as follows:

± 1 Sigma shall contain 2/3 of the points
± 2 Sigma shall contain 19/20 filter points
± 3 Sigma shall contain ALL of the points

If not, corrective action as noted above shall be taken.

Shewhart type control charts may also be used to display and assess the data. These are especially useful for single analyte analyses.

The QAM will maintain a list of those methods using control tables or charts.

If required by the project, the results of the QC samples may be utilized to calculate and estimation of uncertainty for the reported data in SOP MCL-7735, "Estimation of Uncertainty of Measurement."

7.7.2. Performance Evaluation (PE) and Performance Testing (PT)

MCLinc will participate in PE and PT programs as necessary to evaluate the quality performance of the laboratory. MCLinc currently participates in Mixed Analyte Performance Evaluation Program (MAPEP) (Inorganic and Rad – soil and water); AIHA for metals, air asbestos, beryllium, beryllium oxide, hexavalent chromium, and bulk asbestos; internal PTs for mercury tubes, transmission electron microscope (TEM) and a third-party asbestos program. Others will be added as needed. Any non-passing score in these programs will be investigated and a written report submitted to the QAM within 21 calendar days. Supplemental PE samples are hexavalent chromium in water, anions in water and soil, and polychlorinated biphenyls (PCBs) in oil, on a bi-annual basis. The QAM will approve and follow-up on the corrective actions, as needed.

7.8. Reporting of Results

7.8.1. General

7.8.1.1. Data Review and Evaluation

The LM or QAM will define the level of data review required to meet the project quality objectives and customer's expectations. The MCLinc minimum standard for data review is a two-level review of an initial (level one) review by the analyst/instrument operator assuring that the analyses were properly performed, calculations are checked and the acceptance criteria for the method were met. The QAM, another analyst, or LM will perform a second review (level 2 review) of the parameters listed plus the final report.

During any step in the data review and quality analysis process, any quality data outside of the method or project set criteria must be evaluated for appropriate corrective action. If the analyst sees a QC failure, they shall rerun the QC sample. Details of the review process is in Section 6.2.7.

7.8.2. Common Requirements of Reports

Based on specific client requests MCLinc Test Reports contents may vary from just presentation of the data to a data package with copies of all information developed in processing the sample. At a minimum, the report case narrative includes:

a. Title
b. Name and location of the laboratory where the analysis was performed.
c. Laboratory IDs and Client IDs of samples.
d. Name and contact information of client.
e. Method used.
f. Number of samples and condition upon receipt.
g. Date of Report.
h. Sampling information if known.
i. Statement that results relate only to sample received.
j. Date of sample receipt.
k. Results with unit of measurement defined.
l. Any changes in methods or anomalies.
m. Signature authorizing the report.
n. Clear ID of any subcontracted analyses and results.
o. Any data qualifiers.

The report results shall be provided accurately, clearly unambiguously and objectively and the test report shall include all information requested by the client. MCLinc provides hard copies and electronic copies. At the request of the client, MCLinc will report "preliminary data" that has not been put in report form and reviewed.

7.8.3. Report Opinions and Interpretation

MCLinc does not provide any opinions or interpretation in the normal report. If requested by the client, opinions or interpretations of the results by the appropriate technical staff will be included in the report.

7.8.4. Amendments to Reports

When necessary to correct an error, change measurement units or clarify a point for the client, a revised report will be issued. This also includes adding additional information to the report.

The report will be revised and included will be the revision number, reason for revision and the report will be totally reviewed and resigned.

7.9. Complaints

7.9.1. Client Complaints

MCLinc welcomes feedback from clients, be it positive or negative. Despite the efforts to the contrary, the probability exists that the client may express concerns or disfavor with the project to MCLinc staff. Anyone aware of such a complaint must report it to the appropriate QAM, PM, or TD for follow-up. It is critical that MCLinc understands completely both sides of the complaint, the root cause and take immediate corrective action. The complaint will be documented with a nonconformance or corrective action memo per MCL-7722, "Procedure for Reporting Preventive Actions, Problems, Non-

conformances, and Associated Actions." The QAM will review this corrective action and discuss with client as necessary. Since the majority of our projects include direct contact with the client, discussions concerning satisfaction or dissatisfaction with our work can be held one on one with any staff member.

7.10. Non-conforming Work

During the course of normal business activities, problems may arise that potentially impact the quality of the work and/or MCLinc's ability to meet our client's requirements. These problems must be reported by the individual identifying the problem in a timely manner to responsible staff (QAM, TD, LM, or MCLinc President).

The problem will then be investigated and appropriate corrective action taken to resolve and eliminate future reoccurrence as required by 10 Code of Federal Regulations (CFR) 21, "Reporting of Defects and Non-compliance." The goal of each investigation is to determine where possible the root cause or real source of the error variance. When found, this "root cause" must be documented and become part of the lessons learned information passed on to management and staff. The QAM ill randomly assess the documentation and implementation of corrective actions on quality related issues. Consideration will be given during the investigation to any preventive actions necessary to avoid future issues (e.g., change SOP or perform process spot check, etc.).

The MCLinc quality program encourages each staff member to be proactive and point out potential problem areas. Management will implement this preventive action with the same priority as any corrective action.

The non-conformance process and Problem/Action Report format is detailed in "Procedure for Reporting Problems, Non-Conformances, and Associated Actions, MCL-7722."

7.11. Control of Data and Information Management

MCLinc does not have a Laboratory Information Data System (LIMS) but records all log-in data, analytical data, and reports on secure computers password protected and monitored by PAXIS Technologies (PAXIS), our information technologies (IT) provider. The above information is collected on a dual server system and backed up in the cloud. Access to this system by MCLinc staff is only on a need to know basis.

8.0. MANAGEMENT SYSTEM REQUIREMENTS

8.1. Option A:

8.2. Management System Documentation

8.2.1. MCLinc management has developed, documented and maintains policies and objectives that meet the requirements of ISO/IEC 17025:2017 and then seeks to ensure that the laboratory staff acknowledge, implement and implement these policies and objectives.

8.2.2. The MCLinc management team has the responsibility that policies and objectives address the competence impartiality and consistent system of the laboratory and that they are enforced.

8.2.3. The laboratory staff are made aware of the policies, procedures and objectives through training and monitored through QA review of reports and internal assessments.

8.2.4. All documentation, procedures and records related to fulfilment of the above requirements are part of the MCLinc management system.

8.2.5. The MCLinc staff have access to all parts of the management system documents and the related information.

8.3. Control of Management System Documents

Documents will be managed to ensure that a consistent record of activities exists to allow for a detailed review of current practices to determine if any modifications would permit the improvement of any process, in part or in whole. Documents which are determined to be important to the operation and control of materials and information within MCLinc will be controlled. Controlled documents will be maintained with respect to "Document Control," MCL-7703. Examples of controlled documents are

- QAPs
- Quality Documents prepared for clients
- SOPs
- Chemical Hygiene Plans
- Waste Management Plans
- Operator Aids
- Forms

During the annual internal audit by the QAM, all controlled documents will be reviewed and if revisions are necessary, they will be scheduled and implemented. Those not revised will be marked "Reviewed without Revision" with the date in the Controlled Document Status form.

8.3.1. Changes to Controlled Documents

Changes to controlled documents may be initiated by anyone using the document to clarify or correct an error or reflect a change in the procedure. Changes shall be reviewed and approved by the same functions that approved the original document. Information needed to evaluate the requested change, if necessary, should be provided along with the MCLinc Change Form (Example in SOP "Document Control," MCL-7703). The changes shall be noted on the change form and if required for clarity attachment of the revised document pages. Once signature approval is complete the DCC will issue a controlled copy of the change form and any attachments to all recipients of the original controlled document.

8.4. Control of Records

The procedure from maintaining control of records is in MCLinc SOP MCL-7703. MCLinc maintains all records for at least 5 years and longer if required by a client. Laboratory Notebooks are retained for up to 50 years.

8.5. Actions to Address Risks and Opportunities

MCLinc is concerned with the risk and opportunities of laboratory activities. The management is evaluated to determine its effectiveness in meeting goals and intended results. New opportunities for work are evaluated to assure they are within the realm of our capabilities or what needs to be added to meet those capabilities. Management has the responsibly to prevent or reduce undesired impacts and potential failures in the laboratory activities. This is achieved through safety and project planning, communication to employees of their roles and responsibilities and the requirement for ethical behavior and concern for data integrity. MCLinc will take immediate action to correct a data integrity issue including employee dismissal. MCLinc continues through its management system and QA program to improve and exceed our client needs.

8.6. Improvement

8.6.1. Improvement

Key to improvement is an understanding of your corporate goals and the client needs. Critical to this is feedback from the client. Since MCLinc has a small client base, satisfaction surveys have been completed in the past but clients don't necessary repeat them. Our main source of client input is thru one on one contact and follow-up on client issues. The second key item for improvement is the annual management review or assessment. The senior management working with the staff evaluate the improvement needs and assign each to management for implementation. The MCLinc major client, UCOR, provides quarterly evaluation of several operational areas with a defined score. These areas include turnaround time, holding time, QA parameters, validation, and sample disposal. This data along with the Proficiency Samples fosters improvement at all levels.

The MCLinc quality systems recognize the need for quality improvement across all areas including hiring, training, quality objectives, meeting client needs, risk assessment in all areas, and providing and meeting turnaround times, but not at the expense of quality. It is the responsibility of the QA Team to achieve this goal.

8.6.2. Quality Objectives and Planning to Achieve Them

The key quality objects to meet and support our QMS are outlined below:

- Develop and maintain verified methodology.
  When necessary MCLinc uses EPA, DOE, ASTM and other standard methods, however in many cases the samples received require modification of the methods to achieve the required results. The use of QC samples is used to evaluate the modifications.

- Monitor the quality with quality control samples.
  MCLinc performs the required QC samples based on the client needs or contract. The results are reviewed by the analyst and QA to assure acceptance and if not, corrective action is taken.

- Have multiple reviews of data and reports.
  The data and reports are reviewed by the analyst and 100% by QA and if a PM driven project by the PM. Any errors are corrected and discussed with the analyst.

- Document and learn from non-conformances.

All employees are requested to notify QA either in documented or oral form and QA will investigate the issue and prepare a final NCR which is discussed with the analyst or reporting party. If the report has gone to the client, the client, the client is notified and a revised report sent. If it is a follow-up of a client complaint, they are kept aware of the actions taken by MCLinc as they occur.

- Understand client needs.
  Key to any project is to understand the client's needs and this usually requires discussions with the client on non-routine projects to make sure both parties understand the process.

- Communicate client needs to appropriate analysts.
  For non-routine analyses the LM will communicate with those involved in the project the client needs and the analytical approach MCLinc is planning on using.

- Update objectives as needed.

MCLinc realizes as business changes or quality requirements change, the quality objectives may change and thus will need to be implemented.

8.7. Corrective Actions

Any corrective action needed is reported to QA and then a NCR is prepared after investigation. Changes will be included in the Management System Documents. The procedure is in MCLinc SOP MCL-7722. "Procedure for Reporting Problems, Non-conformances and Associated Actions."

8.8. Internal Independent Assessments

The QAM, on an annual basis, will schedule and initiate at least one internal quality assessment of the internal quality systems of all laboratory operations using a checklist approach and documenting all findings and observations. The Internal Audits/Assessments will be performed by personnel that have no direct responsibility for the activities being performed. Formal internal assessments will be performed using a checklist either AIHA, DOE Consolidated Audit Program (DOECAP), Perry Johnson Laboratory Accreditation, Inc. (PJLA), or one composed by the QAM. The QAM will approve the corrective actions and follow up as necessary to assure corrective performing an audit. The training will include review of the purpose of the audit and appropriate checklist and evaluation of any previous findings or observations. The QAM or designee will do spot assessments as needed to follow up on nonconformances.

Clients may utilize other organizations, independent of the day-to-day operations of the MCLinc facility, to provide an assessment, safety, and environmental activities within the MCLinc facility. MCLinc will provide a safety orientation to the members of the independent assessment team at the beginning of the assessment kick-off meeting.

All documentation generated by the independent assessment will be addressed in a closeout report that will be generated by the appropriate MCLinc staff per the time requirements of the independent assessment results are presented to management. Corrective actions will be documented and their effort

on the deficiency tracked and noted. If it is felt that the corrective action has had a significant impact on other areas of operation, the corrective action documentation will be used by the appropriate MCLinc staff to compile a positive lesson learned document to ensure that all portions of the MCLinc organization is aware of the potential positive influence of the corrective action. MCLinc may initiate a third-party additional audit for specific areas of laboratory or total laboratory operation.

8.9. Management Assessments

Ultimate responsibility for QA/QC and ES&H compliance within MCLinc rests with the MCLinc President. Unresolved MCLinc issues will be resolved by MCLinc management. MCLinc evaluates its performance in January for the previous year with an Annual Management Quality Assessment in January of each year. During this Annual Management Quality Assessment, issues are raised, resolved and documented. The purpose of the Annual Management Quality Assessment is to provide a means to understand the effectiveness of the management system, make recommendations for improvement to top management and implement the improvements. Tools like the quality policy, client and laboratory QA objectives, PT sample results and internal and external assessments are used to allow these improvements while maintaining the integrity of the system.

As part of the MCLinc Annual Management Quality Assessment, the MCLinc management review shall take account of:

- Quality objectives of management met.
- Changes relevant to the laboratory.
- The suitability of policies and procedures.
- Status of actions from previous management review.
- Results of internal or third-party audits/assessments.
- Corrective and preventive actions.
- Changes in volume and type of work.
- Client feedback or complaints.
- Effectiveness of any implemented improvements.
- Adequacy of resources -Manpower/equipment needs.
- Staff recommendations for improvement.
- Results of risk identification.
- Outcome of assurance of the validity of results (PT programs and QC samples).
- Other relevant factors such as QC activities resources and staff training.

Upon completion of the draft Annual Management Quality Assurance Review, the document is submitted to the MCLinc President/Chief Executive Off (CEO) and LM, for review and determination of any findings. Any findings resulting from this management review will be defined with a designated person responsible and an agreed upon time schedule. The management assessment will be documented by the QAM.

9.0. REFERENCES

ANSI/ASQC E4-1994, “Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs.”

ASME NQA-1-2000, Edition, "Quality Assurance Program Requirements for Nuclear Facilities."

DOD/DOE, "Consolidated Quality Systems Manual for Environmental Laboratories Latest Revision."

UCOR – 4413/R2 Analytical Master Specifications for Analytical Laboratory Services, URS/CH^{2}M

Energy, Nuclear Safety Management, Quality Assurance Requirements, Scope, 10 CFR Part 830.120.

Energy Reporting Defects and Noncompliance, 10 CFR Part 21.

ISO/IEC Standard 17025:2017 – "General Requirements for the Competence of Testing and Calibration Laboratories, 2017."

MCL-7702, "Chemical Hygiene Plan."

MCL-7703, "Document Control."

MCL-7704, "Project Management Guide."

MCL-7705, "Nuclear Materials Control and Accountability Plan."

MCL-7706, "Facility Security Plan."

MCL-7708, "Electron Microscopy Operation Guide."

MCL-7710, "Sample Preparation Guide."

MCL-7711, "Calibration, Inspection, and Maintenance Guide." MCL-7715, "Radiation Protection Plan."

MCL-7717, "Health and Safety Plan."

MCL-7718, "Waste Management Plan."

MCL-7719, "Asbestos Laboratory Quality Assurance Manual."

MCL-7722, "Procedure for Reporting Problems, Non-Conformances, and Associated Actions."

MCL-7724, "Good Notebook Keeping Practices."

MCL-7727, "Procurement Control."

MCL-7728, "Verification of Data Software."

MCL-7729, "Quality Assurance Records."

MCL-7735, "Estimation of Uncertainty of Measurement (EUM)."

MCL-7756, "Operator Aids."

MCLinc's Controlled Documents, Volumes, I, II, and III.

"National Environmental Laboratory Accreditation Conference Standards," Latest Approved Edition

10.0. ACCRONYMS

%	percent
±	plus or minus
AIHA	American Industrial Hygiene Association Program
AIHA-LAP	American Industrial Hygiene Association Program – Laboratory Accreditation Program

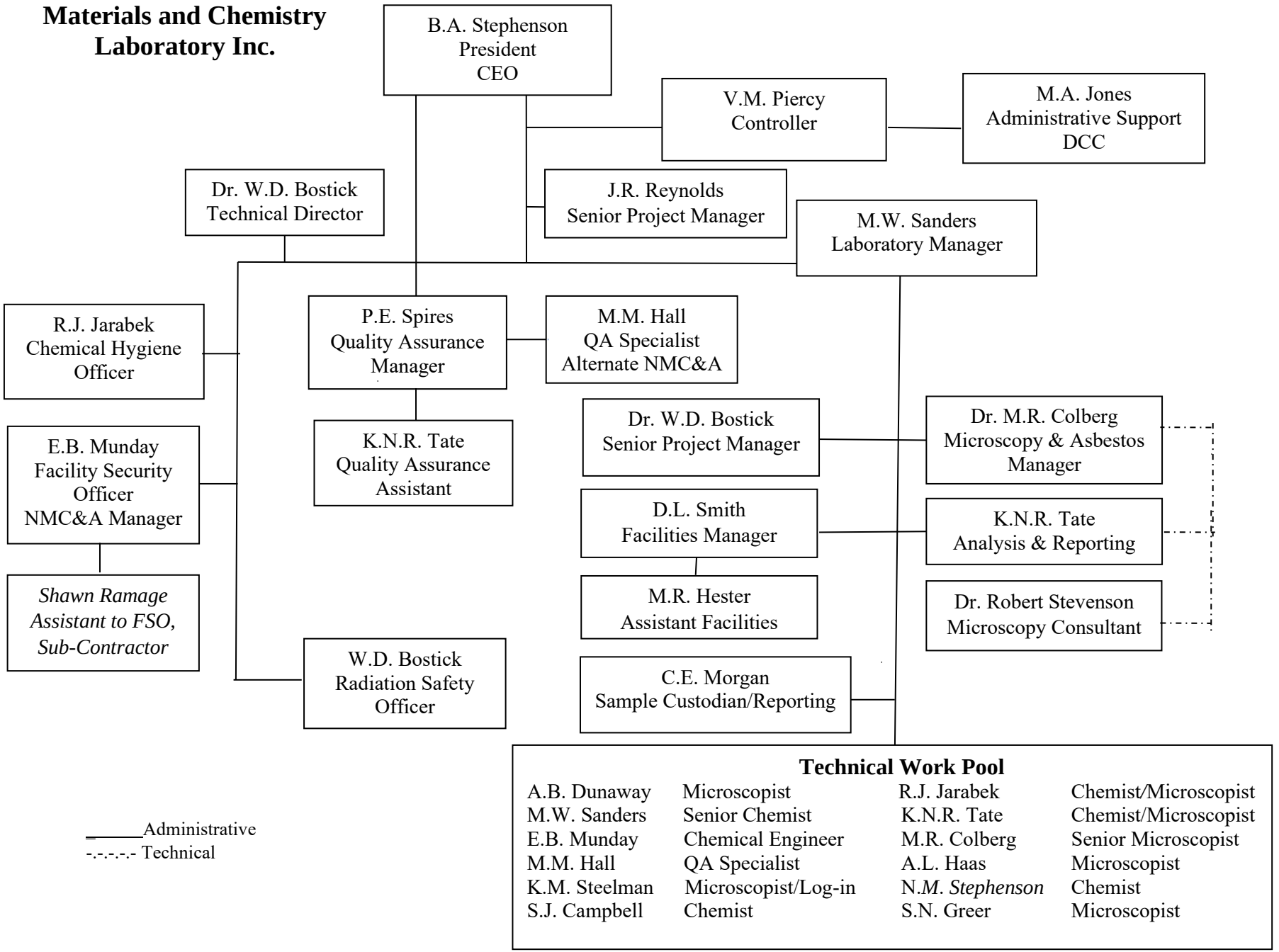
ASTM	American Society for Testing and Materials
CCV	continuing calibration verification
CFR	Code of Federal Regulations
COC	chain of custody
DCC	Document Control Coordinator
DOC	Demonstration of Capability
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ES&H	Environmental, Safety & Health
FSO	Facility Security Officer
ft^2	square feet
ID	identification
IH	industrial Hygiene
IHL	Industrial Hygiene Analysis Laboratory
ISO/IEC	International Organization for Standardization/International Engineering Consortium
IT	Information Technology
LCS	laboratory control sample
LIMS	Laboratory Information Data System
LM	Laboratory Manager
MAPEP	Mixed Analyte Performance Evaluation Program
MCLinc	Materials and Chemistry Laboratory, Inc.
MDL	method detection limit
MS	matrix spike
NIOSH	National Institute of Occupational Safety and Health
NIST	National Institute of Standards and Technology
NQA	Nuclear Quality Assurance
NCR	non-conformance report
OSHA	Occupational Safety and Health Administration
PAXIS	PAXIX Technology
PCB	polychlorinated biphenyl(s)
PE	performance evaluation
PM	Project Manager
PT	performance testing
QA	quality assurance
QAM	Quality Assurance Manager
QAP	Quality Assurance Plan
QAS	Quality Assurance Specialist
QC	quality control
QSAS	Quality Systems for Analytical Services
RSO	Radiation Safety Officer
S-RD	level: secret – Category: Restricted Data
SNM	special nuclear material
SOP	standard operating procedure
SOW	scope of work

SRM	Standard Reference Material
SRMS	Sample/Report Management Staff
TAT	turnaround time
TD	technical director
TEM	Transmission Electron Microscope

APPENDIX A. CROSS REFERENCE

Requirements of ISO/IEC 17025	MCLinc QAP Section	DoD/DOE QSM 5.3
1. Scope	1. Organization	4.1 Organization
2. Normative references	2. References	2.0 Normative references
3. Terms and definitions	Not clearly referenced	3.1 Additional Terms and Definitions
4. General requirements	Not clearly referenced	4.0 Management Requirements 5.0 Technical Requirements
4.1. Impartiality	3. Impartiality	Not clearly referenced
4.2. Confidentiality	4. Confidentiality	4.7 Service to the Client
5. Structural requirements	5. Structural Requirements	5.1 Technical Requirements - General
6. Resource requirements	6. Resource Requirements	5.1 Technical Requirements - General
6.1. General	6.1. General	5.1 Technical Requirements - General
6.2. Personnel	6.2. Personnel	5.2 Personnel
6.3. Facilities and environmental conditions	6.3. Facilities and Environmental Conditions	5.3 Accommodation and Environmental Conditions
6.4. Equipment	6.4. Equipment	Not clearly referenced
6.5. Metrological traceability	6.5. Metrological Traceability	5.5 Calibration Requirements
6.6. Externally provided products and services	6.6. Externally Provided Products and Services	4.5 Subcontracting of Environmental Tests 4.6 Purchasing Services and Supplies
7. Process requirements	7. Process Requirements	Not clearly referenced
7.1. Review of requests, tenders and contracts	7.1. Review of Requests Tenders and Contracts	Nor clearly referenced
7.2. Selection, verification and validation of methods	7.2. Selection, Verification and Validation of Methods	5.4 Environmental Methods and Method Validation
7.3. Sampling	7.3. Sampling	5.7 Collection of Sampling
7.4. Handling of test or calibration items	7.4. Handling of Test Samples	5.8 Handling Samples and Test Items
7.5. Technical records	7.5. Technical Records	4.13 Control of Records
7.6. Evaluation of measurement uncertainty	7.6. Evaluation of Measurement of Uncertainty	5.4.6 Module 2
7.7. Ensuring the validity of results	7.7. Ensuring the Validity of Results	5.6 Measurement Traceability
7.8. Reporting of results	7.8. Reporting of Results	5.10 Reporting the Results
7.9. Complaints	7.9. Complaints	4.8 Complaints
7.10.Nonconforming work	7.10. Non-conforming Work	4.9 Control of Nonconforming Environmental Testing Work
7.11.Control of data and information management	7.11. Control of Data and Information Management	4.13 Control of Records
8. Management system requirements	8. Management System Requirements	4.0 Management Requirements
8.1. Options	8.1. Option A.	Not clearly referenced
8.2. Management system documentation (Option A)	8.2. Management System Documented	4.0 Management Requirements
8.3. Control of management system documents (Option A)	8.3. Control of Management System Documents	4.3 Document Control
8.4. Control of records (Option A)	8.4. Control of Records	4.13 Control of Records
8.5. Actions to address risks and opportunities (Option A)	8.5. Actions to Address Risks and Opportunities	4.7 Service to the Client 4.8 Complaints
8.6. Improvement (Option A)	8.6. Improvement	4.10 Improvements
8.7. Corrective actions (Option A)	8.7. Corrective Actions	4.11 Corrective Actions
8.8. Internal audits (Option A)	8.8. Internal Independent Assessments	4.14 Internal Audits
8.9. Management reviews (Option A)	8.9. Management Assessments	4.15 Management Reviews

Materials and Chemistry Laboratory Inc.



APPENDIX C. MCLINC SUPPORT FUNCTION ASSIGNMENTS

Position	Personnel
Company Controller	V. Monique Piercy
Chemical Hygiene Officer	Robert J. Jarabek
Classified Information Systems Security Site Manager	Barry A. Stephenson
Classified Information Systems Security Officer	Earl B. Munday
Classified Document Custodian	Earl B. Munday
Unclassified Document Control Coordinator	Molly A. Jones
Facility Security Officer	Earl B. Munday
Assistant Facility Security Officer	*Shawn Ramage*
MBA Custodian	Robert J. Jarabek
NMC&A Manager	Earl B. Munday
NMC&A Alternate Manager	Mary M. Hall
OPSEC Manager	*Shawn Ramage*
OPSEC Alternate Manager	Earl B. Munday
MCLinc President	Barry A. Stephenson
Laboratory Manager	Michele W. Sanders
QA Officer	Preston E. Spires
QA Officer-Alternate	Mary M. Hall
Radiological Safety Officer	William D. Bostick
Radiological Safety Officer - Alternate	Michele Sanders
Radiological Safety Officer - In Training	Adam L. Haas
Security Container Custodian, K-SEC-339	Earl B. Munday
Security Container Alternate Custodian, K-SEC-339	William D. Bostick
Security Container Custodian, K-SEC-1351	Earl B. Munday
Security Container Alternate Custodian, K-SEC-1351	William D. Bostick
Security Container Custodian, K-SEC-941	William D. Bostick
Security Container Alternate Custodian, K-SEC-941	Earl B. Munday
Security Container Custodian, K-SEC-1059	Earl B. Munday
Security Container Alternate Custodian, K-SEC-1059	Mark R. Colberg
Security Container Custodian, K-SEC-1247	Earl B. Munday
Security Container Alternate Custodian, K-SEC-1247	Mark R. Colberg
Security Container Custodian, K-SEC-1317	Earl B. Munday
Security Container Alternate Custodian, K-SEC-1317	Mark R. Colberg
Technical Director	William D. Bostick

APPENDIX D. INSTRUMENTATION WITH RESPONSIBLE OWNER AND AUTHORIZED OPERATOR

Type	Model	Manufacturer	MCLinc Owner
FTIR	Nicolet 6700	Thermo Scientific	Bostick / Tate
GC - ECD (2)	7890A Nexis 2030	Hewlett Packard Shimadzu	Campbell / Sanders / Tate / *N. Stephenson*
GC - FID	8610C	SRI	Spires / Campbell*
IC – Hexavalent Chromium (2)	Dionex ICS-1100 Dionex Aquion	Thermo Scientific	*N. Stephenson* / Sanders
IC - Anions	Dionex ICS-1100	Thermo Scientific	*N. Stephenson* / Sanders
ICP-OES (2)	Optima 2000 AVIO 200	Perkin Elmer	Campbell /Sanders / Jarabek / *N. Stephenson**
ICP-MS (2)	Elan 9000 NexION 2000	Perkin Elmer	Sanders / Campbell*
Cold Vapor AA - Mercury (2)	410 410	Buck	Campbell / *N. Stephenson*
Low Level Mercury (2)	Hydro C Hydro II AF Gold	Teledyne-Lehman	
Optical Microscopes	Various	Various	Colberg / Jarabek / Tate / Steelman / Greer
Rad Spectroscopy	Various	Various	Jarabek / Bostick
SEM (2)	840 5800	JEOL	Colberg / Dunaway
TEM (2)	H600 2010	Hitachi JEOL	Colberg / Dunaway
XRD (2)	MiniFlex II MiniFlex 6A	Rigaku	Colberg / Dunaway / Haas
TGA/DTA+MS+GC	*TGA 55* *Discovery MS*	*TA Instruments*	Sanders / Tate

*In training

TGA	Thermogravimetric Analysis	AA	Atomic Absorption
DTA	Differential Thermal Analyzer	XRD	X-Ray Diffraction
ECD	Electron Capture Detector	FID	Flame Ionization Detector
FTIR	Fourier Transform Infrared Spectroscopy	GC	Gas Chromatography
IC	Ion Chromatography	ICP	Inductively Coupled Plasma
MS	Mass Spectroscopy	SEM	Scanning Electron Microscope
TEM	Transmission Electron Microscope	OES	Optical Emission Spectroscopy

APPENDIX E. CERTIFICATE OF QUALIFICATION AND AUTHORIZATION

MCLinc CERTIFICATE OF QUALIFICATION

Certification of: _____

Certified to Perform:

_____

_____

_____

Certification based on:

- ❑ Education
- ❑ Indoctrination
- ❑ Experience
- ❑ Training
- ❑ Test Results (Attach)
- ❑ Capability Demonstration:

  (Observed by: _____)

Certification Level (I, II, III, per NQA-1): _____

Technical Director/QAM Approval: _____

Date of Certification: _____

Expiration Date: _____

Results of Periodic Evaluation:

_____

_____

_____

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

Materials and Chemistry Laboratory, Inc. (MCLinc)

2010 Highway 58, Suite 1000, Oak Ridge, TN 37830

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005) "General Requirements for the competence of Testing and Calibration Laboratories" and the DOE Quality Systems Manual for Environmental Laboratories Version 5.1.1, 2018 and is accredited is accordance with the:

United States Department of Energy Consolidated Audit Program-Accreditation Program (DOECAP-AP)

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system
(as outlined by the joint ISO-ILAC-IAF Communiqué dated April 2017):

Industrial Hygiene and Environmental Testing
(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Initial Accreditation Date:	*Issue Date:*	*Expiration Date:*
July 27, 2018	July 27, 2018	August 31, 2020

Accreditation No.:	*Certificate No.:*
99882	L18-352

Tracy Szerszen
President/Operations Manager

Perry Johnson Laboratory Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DOECAP-AP

Materials and Chemistry Laboratory, Inc. (MCLinc)

2010 Highway, Suite 1000, Oak Ridge, TN 37830

Contact Name: Jack R. Hall Phone: 865-576-4138

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Filters and Wipes	NIOSH 7902, MCL-7775 Appendix 29	Specific Ion Electrode	Fluorides
Liquids	EPA 3620B, MCL-7740, EPA 8082	Florisil Cleanup	PCBs
Liquids	EPA 3665A, MCL-7740 and EPA 8082	Sulfuric Acid Cleanup	PCBs
Solids, liquids, filters ,and wipes	EPA 6020 and EPA 6010, and *related ASTM methods	ICP/OES and ICP/MS	Metals Assay
Solids	Internal Published Method referenced in MCL-7738	Pyrolysis Apparatus	Anion Prep
Solids	SM 2450	Drying, filtering	Solids
Solids	UCOR Method	Radionuclides and Metals	Acid Leachates
Water	EPA 100.2; and *related ASTM methods	Transmission Electron Microscopy	Asbestos
Water	SM 4500-Cl modified for micro	Microtitrator	Total Residual Chlorine
Liquids, Filters, and Wipes	EPA 900, ASTM 2459,D 7902, MCL-7734	Gas Proportional Counting	Gross Alpha/Beta
Liquids and Solids	ASTM C-1771; MCL-7768	ICP/MS of Hydrolyzed Uranium Hexafluoride	Boron Silica and Tc-99
Liquids and Solids	*Related ASTM methods, Client	Thermal Gravimetric Analysis (TGA)/MS	Weight Loss on heating Compound ID
Liquids and Solids	ASTM C-1267, MCL-7737, MCL7737A	Davies-Gray Titration	Total Uranium
Liquids and Solids	DOE Methods Compendium RP550 and MCL-7754	Liquid Scintillation Counting	Tc-99
Liquids and Solids	EPA 1311, MCL-7743	TCLP	Leachates
Liquids and Solids	EPA 6020M, MCL-7768 and *related ASTM methods	ICP/MS	Tc-99
Liquids and Solids	M -EPA 6020, MCL-7768	ICP/MS	Lithium Isotopic
Liquids and Solids	M-EPA 6020, MCL-7768	ICP/MS	Boron Isotopic
Liquid, Solids, Filters and Wipes	EPA 3050B, MCL-7746 and MCL-7752	Acid Digestion Hot Block	Metals Sample Preparation
Liquid, Solids, Filters and Wipes	EPA 6010; ASTM D-1076, MCL-7751	Inductively Coupled Plasma - Optical Emission Spectroscopy	Metals
Liquid, Solids, Filters and Wipes	EPA-8082; NIOSH 5503; ASTM 5175, MCL-7740	GC/EC	PCBs
Solids, Filters and Wipes	*Related ASTM methods, Client specified	Scanning Electron Microscopy/EDS	Elemental Analysis
Solids, Filters and Wipes	NIOSH 7400, MCL-7721	Phase Contrast Microscopy	Asbestos
Solids, Filters and Wipes	NIOSH 7402, MCL-7708	Transmission Electron Microscopy	Asbestos
Solids, Filters and Wipes	NIOSH 7500; and *related ASTM methods	X-Ray Diffraction	Silica

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DOECAP-AP

Materials and Chemistry Laboratory, Inc. (MCLinc)

2010 Highway, Suite 1000, Oak Ridge, TN 37830
Contact Name: Jack R. Hall Phone: 865-576-4138

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Water and Solids	SM 2310, 2320	pH meter	pH, titrations
Water, Liquids, and Solids	MCL-7748,ASTM 412, D7042 and Instrument Manuals	Regular and Micro Kinematic Viscosity	Viscosity
Water, Liquids, and Solids	Modified EPA 1010; ASTM D3278, ASTM D3828	Micro Flashpoint, closed cup	Flashpoint
Water, Liquids, and Solids	Nicolet, *related ASTM methods	Fourier Transform Infrared (FTIR)	Organic Analysis
Water, Solids, Filter and Wipes	EPA 300; 9056; ASTM D-808; NIOSH 7903 and MCL-7739	Ion Chromatography	Anions
Water, Solids, Filter and Wipes	EPA 6010, MCL-7751 OSHA ID-125G	Inductively Coupled Plasma - Optical Emission Spectroscopy	Beryllium Testing + BeO
Water, Solids, Filter and Wipes	EPA 6020, MCL-7768	Inductively Coupled Plasma - Mass Spectroscopy	Beryllium Testing + BeO
Water, Solids, Filter and Wipes	EPA 6020, MCL-7768 NIOSH 7303	Inductively Coupled Plasma - Mass Spectroscopy	Metals
Water, Solids, Filter and Wipes	NIOSH 6009, EPA and *related ASTM methods	Cold Vapor Atomic Absorption	Mercury
Water, Solids, Filter and Wipes	NIOSH 7300, NIOSH 7301, NIOSH 7303, MCL-7751	Inductively Coupled Plasma - Optical Emission Spectroscopy	Metals
Water, Solids, Filter and Wipes	NIOSH 9002, MCL-7720	Polarized Light Microscopy	Asbestos
Water, Solids, Filter and Wipes	OSHA-215, ASTM 5267, EPA 7199, and MCL-7770	Ion Chromatography	Hexavalent Chromium
Water, Liquids, Solids, Filters and Wipes	EPA 6020, ASTM C-1345, C1474, MCL-7769	Inductively Coupled Plasma - Mass Spectrometry	Isotopic Uranium
Water, Liquids, Solids, Filters and Wipes	MCL-7759, ASTM D7283, C1539, D4922, ANSI 42.15 and EPA 913	Liquid Scintillation Counting	Gross Alpha/Beta

1. * "Accreditation is granted through a technology based flexible scope criteria. Additional methods other than listed above may fall under the accreditation of the laboratory. A complete listing of method capabilities can be derived from the laboratory upon request."

PERRY JOHNSON LABORATORY ACCREDITATION, INC .
755 West Big Beaver Road, Suite 1325
Troy, MI 48084

CONTRACT AMENDMENT

As evidenced by the signatures of the parties below, Perry Johnson Laboratory Accreditation, Inc., (PJLA) and Materials and Chemistry Laboratory, Inc. (MCLinc) (ORGANIZATION), agree to amend certain terms of their contract for services dated 02/13/2018. All terms of the contract not referenced below remain in full force and effect as if fully restated herein.

CONTRACT SECTION(s) TO BE AMENDED:

Section(s)	Amendment to read:
ALL	During the 2019 Surveillance assessment, laboratory will be transitioning to QSM 5.2. No additional time is required and current contracted time will remain the same. However, a $285.00 accreditation fee will be applied to this assessment.

This amendment must be signed and returned within 14 business days or it will become invalid.
Effective date for amendments: 04/11/2019

Tracy Szerszen 04/11/2019
Signatory
Perry Johnson Laboratory Accreditation, Inc.

(Signature) 4/15/19 (Date)
For ORGANIZATION

Reviewed by:_____

APPENDIX A-8

ALS ENVIRONMENTAL SIMI VALLEY, CALIFORNIA

ALS Environmental

Uncontrolled Copy

QUALITY ASSURANCE MANUAL

ALS Environmental – Simi Valley Facility
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QUALITY ASSURANCE MANUAL

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1) Introduction and Scope

The purpose of this Quality Assurance Manual is to outline the quality system for the Simi Valley location of ALS Environmental (ALS Group USA Corp. dba ALS Environmental). ALS Environmental is a professional analytical services laboratory which performs chemical and microbiological analyses on a wide variety of sample matrices, including drinking water, groundwater, surface water, wastewater, soil, sludge, sediment, tissue, industrial and hazardous waste, air, and other material. Refer to Appendix J for a list of analytical capabilities specific to the Simi Valley location and corresponding accreditation status.

Quality Control (QC) procedures are used to continually assess performance of the laboratory and quality systems. ALS Environmental maintains control of analytical results by adhering to written standard operating procedures (SOPs), using analytical control parameters with all analyses, and by observing sample custody requirements. All analytical results are calculated and reported in units consistent with project specifications to allow comparability of data. Appendix H includes a list of data qualifiers and acronyms.

This QAM is applicable to the facility listed on the title page. The information in this QAM has been organized according to requirements found in the National Environmental Laboratory Accreditation Program (NELAP) Quality Systems Standards (2009 and 2016), DoD Quality Systems Manual, Naval Sea Systems Command Laboratory Accreditation Program (NAVSEA-LAP), the EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, USEPA, 2001; and *General Requirements for the Competence of Testing and Calibration Laboratories*, ISO/IEC 17025:2005 and ISO/IEC 17025:2017.

2) Organization

2.1 Laboratory Organizational Structure

ALS Environmental – Simi Valley is legally identifiable as ALS Group USA, Corp., dba ALS Environmental. ALS Group USA Corp. is a component of ALS Limited, a publicly held Australian company. The ALS global website may be referred to for corporate ownership information (www.alsglobal.com). Organizational charts detailing the operational structure and reporting relationships in the laboratory are provided in Appendix B.

2.2 Avoiding Conflict of Interest through Organizational Structure

2.2.1 Through application of the policies and procedure outlined in this QA Manual and use of a defined organizational structure, the laboratory assures that it is impartial and that personnel are free from undue commercial, financial, or other undue pressures that might influence their technical judgment.

2.2.2 Policies are in place to prevent outside pressures or involvement in activities that may affect competence, impartiality, judgment, operational integrity, or the quality of the work performed at the laboratory.

2.2.3 Management and technical personnel have the authority and resources to carry out their duties and have procedures to identify and correct departures from the laboratory's management system.

2.2.4 Personnel understand the relevance and importance of their duties as related to the maintenance of the laboratory's management system. Ethics and data integrity procedure ensure that personnel do not engage in activities that diminish confidence in the laboratory's capabilities. Procedures and policies are also established to ensure confidentiality is maintained.

3) Management

The purpose of the QA program at ALS Environmental is to ensure that our clients are provided with analytical data that is scientifically sound, legally defensible, and of known and documented quality.

3.1 Quality Policy Statement

The policy at ALS is to use good professional practices, to maintain quality, to uphold the highest standard of service, and to operate in accordance with these requirements and those of regulatory agencies, accrediting authorities, and certifying organizations. We recognize that quality assurance requires a commitment to quality by everyone in the organization - individually, within each operating unit, and throughout the entire laboratory. Laboratory management is committed to ensuring the effectiveness of its quality systems and to ensure that all tests are carried out in accordance to customer requirements. Key elements of this commitment are set forth in the *SOP for Laboratory Ethics and Data Integrity* and in this Quality Assurance Manual (QAM). ALS Environmental is committed to operate in accordance with these requirements and those of regulatory agencies, accrediting authorities, and certifying organizations. The laboratory also strives for improvement through varying continuous improvement initiatives and projects.

Quality Management Systems are established, implemented and maintained by management. Policies and procedures are established in order to meet requirements of accreditation bodies and applicable programs as well as client's quality objectives. The laboratory's management is committed to complying with the National Environmental Laboratory Accreditation Program (NELAP) Quality Systems Standards (2009 and 2016 TNI standards), ISO/IEC 17025:2005 and ISO/IEC 17025:2017, Naval Sea System Command Laboratory Accreditation Program (NAVSEA-LAP), and the Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories. Systems are designed so that there will be sufficient Quality Assurance (QA) activities conducted in the laboratory to ensure that all analytical data generated and processed will be scientifically sound, legally defensible, of known and documented quality, and will accurately reflect the material being tested. Quality Systems are applicable to all fields of testing in which the laboratory is involved. All personnel involved with environmental testing and calibration activities must familiarize themselves with the quality documentation and implement the policies and procedures in their work.

3.2 Quality Management Systems

The laboratory has developed a Quality Management System to ensure all products and services meet our client's needs. The system is implemented and maintained by the Quality Assurance Manager (QA Manager) with corporate oversight by the Corporate Quality Assurance Manager (CQAM). These systems are based upon ISO/IEC 17025:2005 and ISO/IEC 17025:2017 standards, upon which fundamental programs (TNI/NELAP, NAVSEA-LAP, and DoD QSM) are based. Implementation and documentation against these standards are communicated in corporate policy statements, this QAM, and SOPs. Actual procedures, actions and documentation are defined in both administrative and technical SOPs. Figure 3-1 shows the relationships of the quality systems and associated documentation. Quality systems include:

- Standard Operating Procedures
- Sample Management and Chain of Custody procedures
- Statistical Control Charting
- Standards Traceability

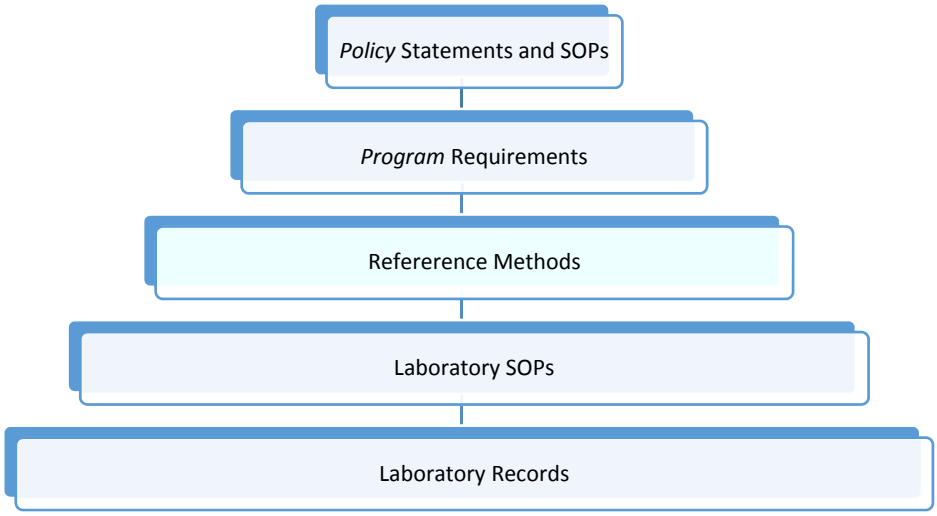
- Ethics Training
- Document Control
- Corrective Action Program
- Management Reviews
- Demonstration of Capability

The effectiveness of the quality system is assessed in several ways, including:

- Internal and External Audits covering all aspects of the organization
- Annual Management Reviews
- Analysis of Customer Feedback
- Internal and External Proficiency Testing

Figure 3-1

Relationships of Quality Management Systems and Documentation



3.3 Management System Requirements

The laboratory has selected ISO/IEC 17025:2017 Option A as a management system. This QA Manual addresses management systems and demonstrates compliance with Option A. This document and addresses:

- document control system ensures the latest versions are used;
- electronic and hardcopy control of records, ensure testing can be reproduced;
- actions to assess risks and opportunities;
- improvements of the management system and laboratory activities;
- corrective actions to correct nonconformities as appropriate;
- internal audit program to discover weaknesses;
- management review process to support activities of the laboratory.

3.4 Management System Documentation

This manual describes the policies and objective of the ALS management system. The laboratory procedures describe the details on how objectives are accomplished.

3.4.1 Policies and objectives of the management system address how competence is demonstrated and assessed, how testing is objectively reviewed and how consistent operations are accomplished. These are addressed in various procedure that define the process used.

3.4.2 Evidence of commitment is the review of the manual annually and the records of reading by all employees. Additionally, as needed employees are assigned pertinent procedures to ensure objectivity and consistency.

3.4.3 The policies are supported in this management system with references in the document as appropriate.

3.4.4 All employees have access to the QA Manual and the supporting procedures.

3.5 Actions to address Risks and Opportunities

ALS views risk management as a key component of its corporate governance responsibilities and an essential process in achieving and mandating a viable organization. ALS is committed to enterprise wide risk management to ensure its corporate governance responsibilities are met and its strategic goals are realized.

Refer to ALS Limited Risk Management Policy and Framework CAR-GL-GRP-POL-007 and Risk Appetite and Tolerance Statement CAR-GL-POL-011 for details.

Risk is defined at ALS as the effect of uncertainty on objectives. Objectives for the organization have different attributes and aspects, such as financial, service, quality, health & safety, environmental stewardship, and are considered at different levels, such as enterprise-wide, operational, and project levels. ALS interprets risk as anything that could impact meeting its corporate strategic objectives, and believes risks can provide positive opportunities as well as having negative impacts.

Tools and reporting mechanisms vary from immediate action and immediate notification of the ALS CEO in extreme cases, to management through routine procedures such as Corrective Action Reports, nonconforming events, SOP review, internal audits, and routine reporting mechanisms for lower risk situations.

Regardless of the mechanism used, the policies and tools provide a framework for categorizing, assessing, analyzing, and addressing risk, as well as monitoring and

reviewing actions taken. Roles and responsibilities are defined in the relevant procedures.

3.6 Technical Elements of the Quality Assurance Program

The laboratory's technical procedures are based upon procedures published by various agencies or organizations (See Section 23). The Quality Assurance Program provides laboratory organization, procedures, and policies by which the laboratory operates. The necessary certifications and approvals administered by external agencies are maintained by the QA department. This includes method approvals and audit administration. In addition, internal audits are performed to assess compliance with policies and procedures. SOPs are maintained for technical and administrative functions. A document control system is used for SOPs, as well as laboratory notebooks, and this QA Manual. A list of QA Program documents is provided in Appendix I and SOPs in Appendix G.

Acceptable calibration procedures are defined in the SOP for each test procedure. Calibration procedures for other laboratory equipment (balances, thermometers, etc.) are also defined. Quality Control (QC) procedures are used to monitor the testing performed. Each analytical procedure has associated QC requirements to be achieved in order to demonstrate data quality. The use of method detection limit studies, control charting, technical training and preventive maintenance procedures further ensure the quality of data produced. Proficiency Testing (PT) samples are used as an external means of monitoring the quality and proficiency of the laboratory. PT samples are obtained from qualified vendors and are performed on a regular basis. In addition to method proficiency, documentation of analyst training is performed to ensure proficiency and competency of laboratory analysts and technicians. Sample handling and custody procedures are defined in SOPs. Procedures are also in place to monitor the sample storage areas. The technical elements of the QA program are discussed in further detail in later sections of this QA manual.

3.7 Professional Conduct

One of the most important aspects of the success of ALS Environmental is the emphasis placed on the integrity of the data provided and the services rendered. This success is reliant on both the professional conduct of all employees within ALS Environmental as well as established laboratory practices.

To promote quality, ALS Environmental requires certain standards of conduct and ethical performance among employees. The following examples of documented ALS Environmental policy are representative of these standards, and are not intended to be limiting or all-inclusive:

- Under no circumstances is the willful act of fraudulent manipulation of analytical data condoned. Such acts are to be reported immediately to senior management for appropriate corrective action.
- Unless specifically required in writing by a client, alteration, deviation or omission of written contractual requirements is not permitted. Such changes must be in writing and approved by senior management.
- Falsification of data in any form will not be tolerated. While much analytical data is subject to professional judgment and interpretation, outright falsification, whenever observed or discovered, will be documented, and appropriate remedies and punitive measures will be taken toward those individuals responsible.
- It is the responsibility of all ALS Environmental employees to safeguard sensitive company information, client data, records, and information; and matters of national security concern should they arise. The nature of our business and the well-being of

our company and of our clients is dependent upon protecting and maintaining proprietary company/client information. All information, data, and reports (except that in the public domain) collected or assembled on behalf of a client is treated as confidential. Information may not be given to third parties without the consent of the client. Unauthorized release of confidential information about the company or its clients is taken seriously and is subject to formal disciplinary action. All employees sign a confidentiality agreement upon hire to protect the company and client's confidentiality and proprietary rights.

3.8 Prevention and Detection of Improper, Unethical or Illegal Actions

It is the intention of ALS Environmental to proactively prevent and/or detect any improper, unethical or illegal action conducted within the laboratory.

This is performed by the implementation of a program designed for not only the detection but also prevention. Prevention consists of educating all laboratory personnel of their roles and duties as employees, company policies, inappropriate practices, and their corresponding implications as described here.

In addition to education, appropriate and inappropriate practices are included in SOPs such as manual integration, data review and specific method procedures. Electronic and hardcopy data audits are performed regularly, including periodic audits of chromatographic electronic data. Requirements are described in the *SOP for Internal Audits* and details are listed in laboratory administrative SOPs. All aspects of this program are documented and retained on file according to the company policy on record retention.

The *SOP for Laboratory Ethics and Data Integrity* also contains information on the ALS Environmental ethics and data integrity program, including mechanisms for reporting and seeking advice on ethical decisions.

3.9 Laboratory Data Integrity and Ethics Training

New employees complete a QA and Ethics orientation as part of the induction process. On an ongoing basis, all employees receive annual ethics refresher training. Topics covered are documented in writing and all training is documented. It is the responsibility of the QA Manager to ensure that the training is conducted as described.

Key topics covered are the organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting, how and when to report data integrity issues and record keeping. Training includes discussion regarding all data integrity procedures, data integrity training documentation, in-depth data monitoring and data integrity procedure documentation.

Data integrity training provides assurance that a highly ethical approach to testing is a key component of all laboratory planning, method implementation, and training. There are four elements to the laboratory's procedures for data integrity. These include:

1) Data integrity training (conducted initially and at least annually);
2) Signed data integrity documentation for all employees;
3) In-depth periodic monitoring of data integrity;
4) Data integrity procedure documentation (*SOP for Laboratory Ethics and Data Integrity*).

There is specific emphasis on the importance of proper written narration on the part of the analyst with respect to those cases where analytical data may be useful, but are in

one sense or another partially deficient. A signature attestation sheet of data integrity training including their understanding of their obligations related to data integrity and as specified in the training is generated for attendees and maintained on file for review. Trainees are required to understand that any infractions of the laboratory data integrity procedures will result in a detailed investigation that could lead to very serious consequences including immediate termination, or civil/criminal prosecution.

The training session includes many concepts and topics, numerous examples of improper actions (defined by DoD as deviations from contract-specified or method-specified analytical practices and may be intentional or unintentional), legal and liability implications (company and personal), causes, prevention, awareness, and reporting mechanisms.

3.10 Management and Employee Commitment

ALS Environmental makes every attempt to ensure that employees are free from any commercial, financial, or other undue pressures that might affect their quality of work. Related policies are described in the *SOP for Laboratory Ethics and Data Integrity*. This includes:

- ALS Environmental Open Door Policy – Employees are encouraged to bring any work related problems or concerns to the attention of local management or their Human Resources representative. However, depending on the extent or sensitivity of the concern, employees are encouraged to directly contact any member of upper management.
- An anonymous and confidential reporting system available to all employees that is used to communicate misconduct and other concerns. The program shall help minimize negative morale, promote a positive work place, and encourage reporting suspected misconduct without retribution. Associated upper management is notified and the investigations are documented.
- Use of flexible work hours. Within reason and as approved by supervisors, employees are allowed flexible work hours in order to help ease schedule pressures which could impact decision-making and work quality.
- Operational and project scheduling assessments are continually made to ensure that project planning is performed and that adequate resources are available during anticipated periods of increased workloads. Procedures for subcontracting work are established, and within the ALS Environmental laboratory network additional capacity is typically available for subcontracting, if necessary.
- Gifts and Favors (Code of Conduct Agreement) – To avoid possible conflict of interest implications, employees do not receive unusual gifts or favors to, nor accept such gifts or favors from, persons outside the Company who are, or may be, in any way concerned with the projects on which the Company is professionally engaged.

All employees are required to sign and adhere to the requirements set forth in the *Code of Conduct Agreement, Confidentiality Agreement,* and *Ethics and Data Integrity Agreement*.

3.11 The ALS Environmental-Simi Valley staff, consisting of approximately 30 employees, includes chemists, technicians and support personnel. They represent diverse educational backgrounds, experience, and provide the comprehensive skills that the laboratory requires. As seasonal workload increases, temporary employees may be hired to perform specific tasks.

ALS Environmental is committed to providing an environment that encourages excellence. All employees share the responsibility for maintaining and improving the

quality of our analytical services. The responsibilities of key personnel within the laboratory are described below. Table 3-1 lists the ALS Environmental-Simi Valley personnel assigned to these key positions. Managerial staff members are provided the authority and resources needed to perform their duties. An organizational chart of the laboratory, as well as the resumes of key local level personnel, can be found in Appendix B.

- The role of the **Laboratory Director** is to provide technical, operational, and administrative leadership through planning, allocation and management of personnel and equipment resources. The Laboratory Director provides leadership and support for the QA program including ensuring compliance with ISO/IEC 17025:2005 and is responsible for overall laboratory efficiency and the financial performance of the Simi Valley facility.

  The Laboratory Director has the authority to stop work in response to quality problems. The Laboratory Director also provides resources for implementation of the QA program, reviews and approves this QA Manual, reviews and approves standard operating procedures (SOPs), and provides support for business development by identifying and developing new markets through continuing support of the management of existing client activities.

- The **Quality Assurance Manager** (QA Manager) has the authority and responsibility for implementing, maintaining, and improving the quality system. This includes coordination of QA activities within the laboratory, ensuring that all personnel understand their contributions to the quality system, ensuring communication takes place at all levels within the laboratory regarding the effectiveness of the quality system, evaluating the effectiveness of training; and monitor trends and continually improve the quality system. Audit and surveillance results, control charts, proficiency testing results, data analysis, corrective and preventive actions, customer feedback, and management reviews can all be used to support quality system implementation. The QA Manager is responsible for ensuring compliance with all applicable regulatory compliance quality standards (i.e. NELAP/TNI, ISO/IEC 17025:2005 & ISO/IEC 17025:2017, NAVSEA-LAP, DoD QSM, etc.). The QA Manager works with laboratory staff to establish effective quality control and assessment plans and has the authority to stop work in response to quality problems. The QA Manager is responsible for maintaining the QA Manual and performing an annual review of it; reviewing and approving SOPs and ensuring the annual review of technical SOPs; maintaining QA records such as metrological records, archived logbooks, PT results, etc.; document control; conducting PT sample studies; approving nonconformity and corrective action reports; maintaining the laboratory's certifications and approvals; and performing internal QA audits.

  The QA Manager reports directly to the Laboratory Director and also reports indirectly to the Manager of Quality Assurance, USA. It is important to note that when evaluating data, the QA Manager does so in an objective manner and free of outside, or managerial, influence.

- The Manager of Quality Assurance, USA is responsible for the overall QA program at all the ALS Environmental Group laboratories. The Manager of Quality Assurance, USA is responsible for oversight of QA Managers regulatory compliance efforts (NELAP/TNI, ISO/IEC 17025:2005 & ISO/IEC 17025:2017, NAVSEA-LAP, DoD QSM, etc) and may perform internal audits to evaluate compliance. The Manager of Quality

Assurance, USA provides assistance to the laboratory QA staff and laboratory managers as necessary.

- In the case of absence of the Laboratory Director or QA Manager, deputies are assigned to act in that role. Default deputies for these positions are a Project Manager or Volatiles (GC/MS) Technical Manager (for the Laboratory Director) and the Laboratory Director (for the QA Manager).

  The following deputies are assigned in the case of absence of a Technical Manager. The Volatiles (GC/MS) Technical Manager will serve as the deputy for the Volatiles (GC)/Semi-Volatiles Technical Manager. The Volatile (GC)/Semi-Volatiles Technical Manger will serve as the deputy for the Volatile (GC/MS) Technical Manager.

- In the event that work is stopped in response to quality problems, only the Laboratory Director or QA Manager have the authority to resume work. Projects falling under the Naval Sea Systems Command Laboratory Accreditation Program (NAVSEA-LAP) require that the resumption of work after a work stoppage be approved in writing by the QA Manager.

- **Environmental Health and Safety Coordinators** (EH&S) are responsible for the administration of the laboratory health and safety policies.

  This includes the formulation and implementation of safety policies, the supervision of new-employee safety training, the review of accidents, incidents and prevention plans, the monitoring of hazardous waste disposal and the conducting of departmental safety inspections. The EH&S Coordinators are also designated as the Chemical Hygiene Officers. The EH&S Coordinators have a dotted-line reporting responsibility to ALS North America EH&S Manager.

- The **Data Validation Coordinator/Reporting Supervisor** is responsible for data review, data package preparation, review and coordination, and preparation of case narratives (based on the information provided by the laboratory).

- The **Client Services Manager** is responsible for the Client Services Department defined for the laboratory (i.e. Project Managers, data reporting, etc.) and the sample management office/bottle preparation sections. The Client Services Department provides a complete interface with clients from initial project specifications to final deliverables. Sample management handles all activities associated with receiving, storage, and disposal of samples. The Client Services Manager has the authority to stop subcontractor work in response to quality problems.

- The **Project Manager** is a scientist assigned to each client to act as a technical liaison between the client and the laboratory. The Project Manager is responsible for ensuring that the analyses performed by the laboratory meet all project, contract, and regulatory-specific requirements. This entails coordinating with the ALS Environmental laboratory and administrative staff to ensure that client-specific needs are understood and that the services ALS Environmental provides are properly executed and satisfy the requirements of the client.

- The Analytical Laboratory is divided into operational units based upon specific disciplines. Each department is responsible for establishing, maintaining and documenting a QC program meeting department needs. Each **Department Manager and Supervisor** has the responsibility to ensure compliance with ISO/IEC 17025:2005 & ISO/IEC 17025:2017, ensure that QC functions are carried out as

planned, and to guarantee the production of high quality data. Department managers and bench-level supervisors have the responsibility to monitor the day-to-day operations to ensure that productivity and data quality objectives are met. Each department manager has the authority to stop work in response to quality problems in their area. Analysts have the responsibility to carry out testing according to prescribed methods, SOPs, and quality control guidelines particular to the laboratory in which he/she is working.

- The **Sample Management Office and Media Preparation Department** play key roles in the laboratory QA program by performing and/or assisting in the proper preparation and shipment of sampling media. In addition, personnel are responsible for the verification of sample receipt information, performing sample acceptance and log-in and distribution of documentation per laboratory defined procedures and the initial storage of samples in the proper environment and location and performing proper sample disposal. Responsibilities also include monitoring and recording of critical thermal preservation equipment temperatures and calibration of associated thermometers against NIST traceable thermometers.
- **Information Technology** (IT) staff is responsible for the administration of the Laboratory Information Management System (LIMS) and other necessary support services. Other functions of the IT staff include laboratory network maintenance, IT systems development and implementation, education of analytical staff in the use of scientific software, Electronic Data Deliverable (EDD) generation, and data back-up, archival and integrity operations.
- The **LIMS Manager** is responsible for LIMS development including all areas of software development such as design, coding, testing and distribution.
- The **Procurement Manager** is responsible for directing and coordinating activities of personnel engaged in buying materials and supplies.

Table 3-1
Summary of Technical Experience and Qualifications

Simi Valley Personnel	Years of Experience	Project Role
Kate Kaneko, B.A.	29	Laboratory Director / Client Services Manager / Project Manager
Chaney Arend, B.S.	14	Quality Assurance Manager
Robin Gill	38	Data Validation Coordinator / Reporting Supervisor
Robert De La O	28	Systems Analyst / Information Technology
Sue Anderson, B.S.	28	Project Manager
Wade Henton, B.S.	32	Volatiles (GC)/Semi-Volatiles Technical Manager
Chris Parnell, B.S.	32	Volatiles (GC/MS) Technical Manager
Wida Ang, B.S., M.S.	33	Volatiles (GC/MS) Team Leader
Michael Conejo, B.A.	7	Project Manager / Environmental Health and Safety Coordinator

Corporate Level Personnel	Project Role
Bob Di Rienzo	Corporate Quality Assurance Manager, USA
Hirenkumar Prajapati, B.S.	IT Manager USA
Albert Valle, A.A.S.	LIMS Manager USA
Steven Manak, B.S.	Procurement Group Leader

4) Document Control

4.1 Procedures for control and maintenance of documents are described in the *SOP for Document Control.* The requirements of the SOP apply to all laboratory logbooks (standards, maintenance, run logbooks, etc), certificates of analysis, SOPs, QAMs, quality assurance project plans (QAPPs), Environmental Health & Safety (EHS) manuals, and other controlled ALS Environmental documents. Management system documents generated by

the laboratory shall include page numbering and include the total number of pages or a mark to signify the end of the document.

4.2 The contents of this manual are reviewed, revised (as needed) and approved for use at least annually by authorized personnel (QA Manager, Laboratory Director, and Technical Managers) where the scope of the review ensures that it continuously reflects current policies and practices and incorporates all applicable requirements. Additionally, the date the review was completed is indicated by the date of the last approval signature on the title page.

4.3 Each controlled copy of a controlled document will be released only after a document control number is assigned and the recipient is recorded on a document distribution list. Filing and distribution is performed by the QA Manager, or designee, and ensures that only the most current version of the document is distributed and in use. A document control number is assigned to logbooks. Completed logbooks that are no longer in use are archived in a master logbook file. Logbook entries are standardized following the *SOP for Making Entries onto Analytical Records*. The entries made into laboratory logbooks are reviewed and approved at a regular interval (quarterly).

4.4 A records system is used which ensures all laboratory records (including raw data, reports, and supporting records) are retained and available. The archiving system is described in the *SOP for Data and Record Archiving.*

4.5 External documents relative to the management system are managed by the QA Manager. To prevent the use of invalid and/or outdated external documents, the laboratory maintains a master list of current documents and their availability. The list is reviewed before making the documents available. External documents are not issued to personnel.

4.6 Electronic Signatures It is a policy of ALS Environmental to allow the use of electronic signatures. For data reporting an electronic signature may be applied to the report by an approved report signatory and is binding to the same extent as a handwritten wet signature.

To authenticate the electronic signature the identity of the signatory is verified before their electronic signature can be created. Each electronic signature shall be unique to a single individual and shall not be used by any other individual. These signatures are established using only defined procedures within the software and are verified using the two distinct components of *username* and *password*. The report may not be changed once the signature has been applied.

Additionally, as a form of 'signature' used for LIMS, email, and certain internal documentation processes (e.g. acknowledgements, attestations, audit trails, etc.), and other electronic tools the user's system login credentials are used to verify and authenticate the identity of the user. Following login, these credentials are used to identify and document the user.

5) Review of Requests, Tenders and Contracts

5.1 Procedure for the Review of Work Requests

5.1.1 Requests for new work are reviewed prior to signing any contracts or otherwise agreeing to perform the work. The specific methods to be used are agreed upon between the laboratory and the client. A capability review is performed to determine if the laboratory has or needs to obtain certification to perform the work, to determine if the laboratory has the resources (personnel, equipment,

materials, capacity, skills, expertise) to perform the work, and if the laboratory is able to meet the client's required reporting and QC limits. The results of this review are communicated to the client and any potential conflict, deficiency, lack of appropriate accreditation status, or concerns of the ability to complete the client's work are resolved.

5.1.2 Any differences between the request or tender and the contract shall be resolved before any work commences. The client should be notified at this time if work is expected to be subcontracted. Each contract shall be acceptable both to the laboratory and the client. Records are maintained of pertinent discussions with a client relating to the client's requirements or the results of the work.

5.1.3 If a contract needs to be amended after work has commenced, the contract review process is repeated and any amendments are communicated to all affected personnel. Changes in accreditation status affecting ongoing projects must be reported to the client.

5.2 Allowed Deviations from Standard Operating Procedures

5.2.1 When a client requests a modification to an SOP the Project Manager must discuss the proposed deviation with the laboratory supervisor and obtain approval to accept the project. The Laboratory Director and QA Manager may also be involved. The Project Manager is responsible for documenting the approved or allowed deviation from the SOP.

5.2.2 When a client request necessitates a deviation or departure from company policies or procedure involving any non-technical function, the allowed deviation must be approved by the laboratory or the Laboratory Director. Frequent departure from policy is not encouraged. However, if frequent departure from any policy is noted, the Laboratory Director will address the possible need for a change in policy.

6) Subcontracting of Tests

Analytical services are subcontracted when the laboratory needs to balance workload or when the requested analyses are not performed by the laboratory. Subcontracting, to capable qualified laboratories is only done with the knowledge and approval of the client. Subcontracting to another ALS Environmental laboratory is preferred over external-laboratory subcontracting. Established procedures are used to qualify external subcontract laboratories. These procedures are described in the *SOP for Qualification of Subcontract Laboratories.* The QA Manager is responsible for maintaining a list of qualified subcontract laboratories.

7) Purchasing Services and Supplies

The quality level of reagents and materials (grade, traceability, etc.) required is specified in the analytical SOPs. Department supervisors ensure that the proper materials are purchased. Inspection and verification of material ordered is performed at the time of receipt by receiving personnel. The receiving staff labels the material with the date received. Expiration dates are assigned as appropriate for the material. Storage conditions and expiration dates are specified in the analytical SOP. The *SOP for Handling Consumable Materials* provides default expiration requirements. Supplies and services that are critical in maintaining the quality of laboratory testing are procured from pre-approved vendors. The policy and procedure for purchasing and procurement are described in the *SOP for Procurement and Control of Laboratory Services and Supplies.* Also, refer to section 13.5 for a discussion of reference materials.

Receipt procedures include technical review of the purchase order/request to verify that what was received is identical to the item ordered. The laboratory checks new lots of reagents for unacceptable levels of contamination prior to use in sample preservation, sample preparation, and sample analysis by following the *SOP for Quality of Reagents and Standards*.

8) Service to the Client

The laboratory uses a number of systems to assess its daily operations. In addition to the routine quality control (QC) measurements, the senior laboratory management examines a number of other indicators to assess the overall ability of the laboratory to successfully perform analyses for its clients including; on-time performance, customer complaints, training reports and non-conformity reports. A frequent, routine assessment must also be made of the laboratory's facilities and resources in anticipation of accepting an additional or increased workload.

ALS Environmental utilizes a number of different methods to ensure that adequate resources are available for service demands. Senior staff meetings, tracking of outstanding proposals and an accurate, current synopsis of incoming work all assist the senior staff in properly allocating sufficient resources. All Requests for Proposal (RFP) documents are reviewed by Project Managers, Business Development and appropriate managerial staff to identify any project specific requirements that differ from the standard practices of the laboratory. Any requirements that cannot be met are noted and communicated to the client, as well as requesting the client to provide any project specific Quality Assurance Project Plans (QAPPs) if available. Status/production meetings are also conducted regularly with the laboratory and project managers to inform the staff of the status of incoming work, future projects, or project requirements.

When a customer requests a modification to an SOP, policy, or standard specification the Project Manager will discuss the proposed deviation with the Laboratory Director and department manager to obtain approval for the deviation. The QA Manager may also be involved. All project-specific requirements must be on-file and with the service request upon logging in the samples. The modification or deviation must be documented. A Project-Specific Communication Form, LIMS comments, or similar, may be used to document such deviations.

The laboratory shall afford clients cooperation to clarify the client's request and to monitor the laboratory's performance in relation to the work performed, provided that the laboratory ensures confidentiality to other clients. The laboratory maintains and documents timely communication with the client for the purposes of seeking feedback and clarifying customer requests. Feedback is used and analyzed to improve the quality of services. The *SOP for Handling Customer Feedback* is in place for these events.

9) Complaints

The laboratory maintains a system for dealing with customer complaints. The person who initially receives the feedback (typically the Project Manager) is responsible for documenting the complaint. If the Project Manager is unable to satisfy the customer, the complaint is brought to the attention of the Client Services Manager, Laboratory Director, or QA Manager for final resolution. The complaint and resolution are documented. The procedure is described in the *SOP for Handling Customer Feedback*.

10) Facilities and Equipment

ALS Environmental-Simi Valley maintains approximately 20,000 square feet of laboratory and administrative workspace. The laboratory has been designed and constructed to provide safeguards against cross-contamination of samples and is arranged according to work function,

which enhances the efficiency of analytical operations. The ventilation system is designed to meet any needs of analyses performed in the separate work areas. ALS Environmental-Simi Valley minimizes laboratory contamination sources by employing janitorial staff to ensure good housekeeping. In addition, the segregated laboratory areas are designed for safe and efficient handling of a variety of sample types. These specialized areas (and access restrictions) include:

- Sample Management Office; Shipping and Receiving
- Records Archival
- Volatile Organics Laboratory (GC and GC/MS)
- Semi-Volatiles Laboratory (GC, GC/MS and HPLC)
- Ultra-Low Level Volatile Organics GC/MS
- General/Wet Chemistry Laboratory
- R&D Laboratory
- Canister Conditioning and Maintenance
- Flow Controller and Critical Orifice Calibration Station
- Sample Storage Walk-in Refrigerator
- Sample, Standards, and Media Storage
- Waste Disposal
- Laboratory Deionized Water System
- Laboratory Management, Client Service, Report Generation and Administration
- Information Technology (IT)

The designated areas for sample receiving, refrigerated sample storage, dedicated sample container preparation and shipping provide for the efficient and safe handling of a variety of sample types. Refer to Appendix D for facility floor plan. The laboratory is equipped with state-of-the-art analytical and administrative support equipment. The equipment and instrumentation are appropriate for the procedures in use. Appendix E lists the major equipment, illustrating the laboratory's overall capabilities and depth.

10.1 Preventive Maintenance

Preventive maintenance is a crucial element of the Quality Assurance program. Instruments at ALS Environmental (e.g., GC/MS systems, gas and liquid chromatographs, analytical balances, gas and liquid chromatographs, etc.) are maintained under commercial service contracts or by qualified, in-house personnel. All instruments are operated and maintained according to the instrument operating manuals. All routine and special maintenance activities pertaining to the instruments are recorded in instrument maintenance logbooks. The maintenance logbooks used at ALS Environmental contain extensive information about the instruments used at the laboratory.

An initial demonstration of analytical control is required on every instrument used at ALS Environmental before it may be used for sample analysis. Each instrument must be recalibrated following any instrument maintenance which may change or effect the sensitivity or linearity of the instrument or if the continuing calibration verification acceptance criteria have not been met as specified in the standard operating procedure. If an instrument is modified or repaired, a return to analytical control is required before subsequent sample analyses can occur. When an instrument is acquired at the laboratory, the following information is noted in a bound maintenance notebook specifically associated with the new equipment:

- The equipment's serial number;
- Date the equipment was received;
- Date the equipment was placed into service;
- Condition of equipment when received (new, used, reconditioned, etc.); and
- Prior history of damage, malfunction, modification or repair (if known).

Preventive maintenance procedures, frequencies, etc. are available for each instrument used at ALS Environmental. They may be found in the various SOPs for routine methods performed on an instrument and may also be found in the operating or maintenance manuals provided with the equipment at the time of purchase.

Responsibility for ensuring that routine maintenance is performed lies with the department supervisor or laboratory director. The supervisor may perform the maintenance or assign the maintenance task to a qualified bench level analyst who routinely operates the equipment. In the case of non-routine repair of capital equipment, the department supervisor is responsible for providing the repair, either by performing the repair themselves with manufacturer guidance or by acquiring on-site manufacturer repair. The laboratory maintains an adequate supply of expendable maintenance items (expected lifetime of part of less than 1 year.) These parts include items needed to perform the preventive maintenance procedures listed in Table 16-1.

When performing maintenance on an instrument (whether preventive or corrective), additional information about the problem, attempted repairs, etc. is also recorded in the notebook. Typical logbook entries include the following information:

- Details and symptoms of the problem;
- Repairs and/or maintenance performed;
- Description and/or part number of replaced parts;
- Source(s) of the replaced parts;
- Analyst's signature and date; and
- Demonstration of return to analytical control.

See the Table 16-1 for a list of preventive maintenance activities and frequency for each instrument.

For further information regarding Instrumentation see the *SOP for Analytical Instrument Acquisition, Reassignment, Maintenance and Documentation*.

10.2 Temperature Control

Temperatures are monitored and recorded for all critical measurement temperature-regulating devices including freezers, refrigerators and ovens. Each piece of equipment is labeled with a unique identifier, the required temperature or range of use according to the needs of the analysis or application. Temperature record logs are kept which contain equipment identifier, daily-recorded temperatures (if in use, business days), acceptance criteria and the initials of the laboratory staff member who performed the checks for all temperature-regulating devices in daily use.

10.3 Water Purification Systems

Purified water is utilized for a number of laboratory functions including instrument and method blanks, trip blanks, washes and sample dilutions. The water purification system utilizes three mixed-ion beds, four filters, and resistively lights with constant water recirculation. It is designed to produce deionized water of ASTM Type II quality, with 16-18 megohm-cm resistance at 25°C and is checked and recorded daily (prior to and if in use). Maintenance and repair on the system is conducted by an approved service supplier and all records including purification checks/verifications are maintained on file for review. For procedures on additional purification (i.e., boiling and/or purging) and purification checks/verifications, refer to the applicable method standard operating procedures.

11) Sample Management

Standard operating procedures have been established for all aspects of sample management within the laboratory including sample receiving, handling, acceptance, log-in, protection, storage, retention, transportation, and disposal. The procedures include provisions necessary to protect the integrity of the sample (as received) and to protect the interests of the laboratory as well as the client. These procedures ensure that samples are handled properly and that all associated documentation is complete and consistent. The sample handling factors that must be taken into account to ensure accurate, defensible analytical results include but are not limited to:

- Amount of sample taken (sampling)
- Type of container used
- Existence and type of sample preservation
- Holding Time
- Proper custodial documentation
- Sample storage, tracking and/or transfer
- Retention
- Disposal

A record of all procedures to which a sample is subjected while in the possession of the laboratory including acceptance, rejection, login, identification, preservation checks, storage, tracking, and disposal are documented and maintained. In addition, all indirect procedures which support each record of a sample and protects the integrity of a sample is documented and maintained (i.e., refrigerator and freezer temperature checks, thermometer calibrations, etc.).

11.1 Sampling

The quality of analytical results is highly dependent upon the quality of the procedures used to collect, preserve and store samples.

ALS Environmental-Simi Valley does not provide sampling services. The laboratory only provides materials needed for sample collection; therefore, ALS Environmental-Simi Valley recommends that clients follow sampling guidelines described in the specific reference methods including 40 CFR 136 and/or USEPA SW-846, NIOSH, OSHA, ASTM, CARB and SCAQMD as appropriate.

When transporting samples to the laboratory, the most expedient but lawful route of transport should be utilized. Also, the hazardous potential of the samples needs to be considered when shipping samples via air freight or passenger airlines.

11.2 Preservation

ALS Environmental-Simi Valley uses sample preservation, container, and holding time recommendations published in a number of referenced documents including, but not limited to USEPA SW 846, USEPA 600/4-79-020, USEPA 600/R-93-100 (inorganic substances), EPA/625/R-96/010b (air samples), and EPA 40CFR part 136 and associated Method Update Rules. The complete citation for each of these and other references can be found in Section 23 of this document. The appropriate container, preservation and holding time information are summarized in Appendix F. Additional information on this is addressed in each corresponding method SOP.

11.3 Shipping of Containers and Samples

ALS Environmental-Simi Valley provides sample containers to clients via media requests for all matrices (soil, water, air) with the appropriate preservatives (as applicable). These containers include Tedlar bags, Summa canisters, silica-gel tubes, etc. ALS Environmental-Simi Valley keeps client-specific shipping requirements on file and

utilizes all major transportation carriers to guarantee that sample shipping requirements (same-day, overnight, etc.) are met. ALS Environmental-Simi Valley also provides its own courier service that makes scheduled courier runs in the greater Los Angeles metropolitan area. The procedures for all requirements directed toward media requests follow the requirements detailed in the *SOP for Media Request Fulfillment*.

11.4 Sample Receiving and Acceptance

It is the policy of ALS Environmental-Simi Valley to check and record the condition of each sample (i.e. pressure, temperature, etc.) delivered to the Sample Management Office (SMO) and received by the Sample Management Custodian or alternates against certain acceptance criteria as documented in the *SOP for Sample Receiving, Acceptance, and Log-In*. This policy is available to all sample management personnel for reference. Any samples, which deviate from these outlined areas, will be clearly flagged with the nature and substance of the deviation. Assessment and condition checks utilized by ALS Environmental-Simi Valley for the acceptance or rejection of samples are based on the criteria found in Appendix F, applicable Quality Assurance Project Plan (QAPP), permit, program or rule where appropriate. This verification of sample integrity is conducted by the Sample Custodian and may be dependent on the matrix (i.e., temperature, preservation, and headspace) being submitted.

Any abnormalities or departures from specified condition requirements (as described herein) as observed during the initial assessment are recorded. When there is any doubt as to the suitability of a sample for testing, including signs of damage, when a sample does not conform to the description provided, or when the test method required is not specified in sufficient detail the appropriate Project Manager (PM) is notified.

The Project Manager is to consult with the client, whenever possible, regarding specific integrity issues documented during sample receipt for further instructions before proceeding and retain a written record of discussion. There may be instances where the client is unavailable, in which case the PM shall document all attempts at contacting the client.

There may be a need to inform the client that a sample(s) is rejected and cannot be accepted for analysis into the laboratory. This situation includes, but is not limited to loss of sample or insufficient amount (subsampling may be performed if it would not cause loss of sample integrity, but the procedure must be indicated with the test results). Subsampling as in the case of air samples is not appropriate.

The procedures for sample documentation, handling acceptance requirements and deviations from the sample acceptance policy are discussed in detail in the *SOP for Sample Receiving, Acceptance and Log-In*. This procedure is also in place to ensure samples are received and properly logged into the laboratory, and that all associated sample documentation, including Chain-of-Custody (COC) records are complete and consistent with the samples received. All associated documentation, including chain of custody forms, memos, transmittal forms, and phone logs, are kept with each project file.

11.5 Sample Log-in

Each sample is logged into the laboratory in such a way as to ensure traceability and cross-reference with regards to the unique laboratory job number, sample identifications and client sample identifications. The laboratory identification is retained throughout the life of the sample in the laboratory. The identification system is designed and operated to ensure that samples cannot be confused physically or in laboratory

documentation. Additional information is provided in the *SOP for Sample Receiving, Acceptance, and Log-In*.

11.6 Sample Custody

A sample is in someone's "custody" if:

1. It is in one's actual physical possession;
2. It is in one's view, after being in one's physical possession;
3. It is in one's physical possession and then locked up so that no one can tamper with it;
4. It is kept in a secured area, restricted to authorized personnel only.

Chain-of-Custody (COC) records are used to establish the legal custody of samples, showing the continuous possession of samples from sample collection and transportation to final destination at the laboratory. Custody of each sample is maintained from receipt through disposal (internally utilizing LIMS). When environmental samples are shipped to other laboratories for analysis, the sample management office follows formalized procedures for maintaining the chain of custody, which is written in SOPs for *Sample Receiving, Acceptance and Login* and *Laboratory Storage, Analysis, and Tracking*.

Laboratory security and access is important in maintaining the integrity of samples received at ALS Environmental-Simi Valley. Access to the building is limited to the reception area and sample receiving doors, which are manned during business hours and locked at all other times. In addition, the sample storage area within the laboratory is a controlled access area. The laboratory is equipped with an alarm system which is monitored by a private security firm who provides nighttime and weekend security.

11.7 Sample Storage, Analysis and Tracking

The procedures and requirements for documenting the storage, analysis and tracking as well as maintaining integrity of samples are detailed in the *SOP for Laboratory Storage, Analysis, and Tracking*.

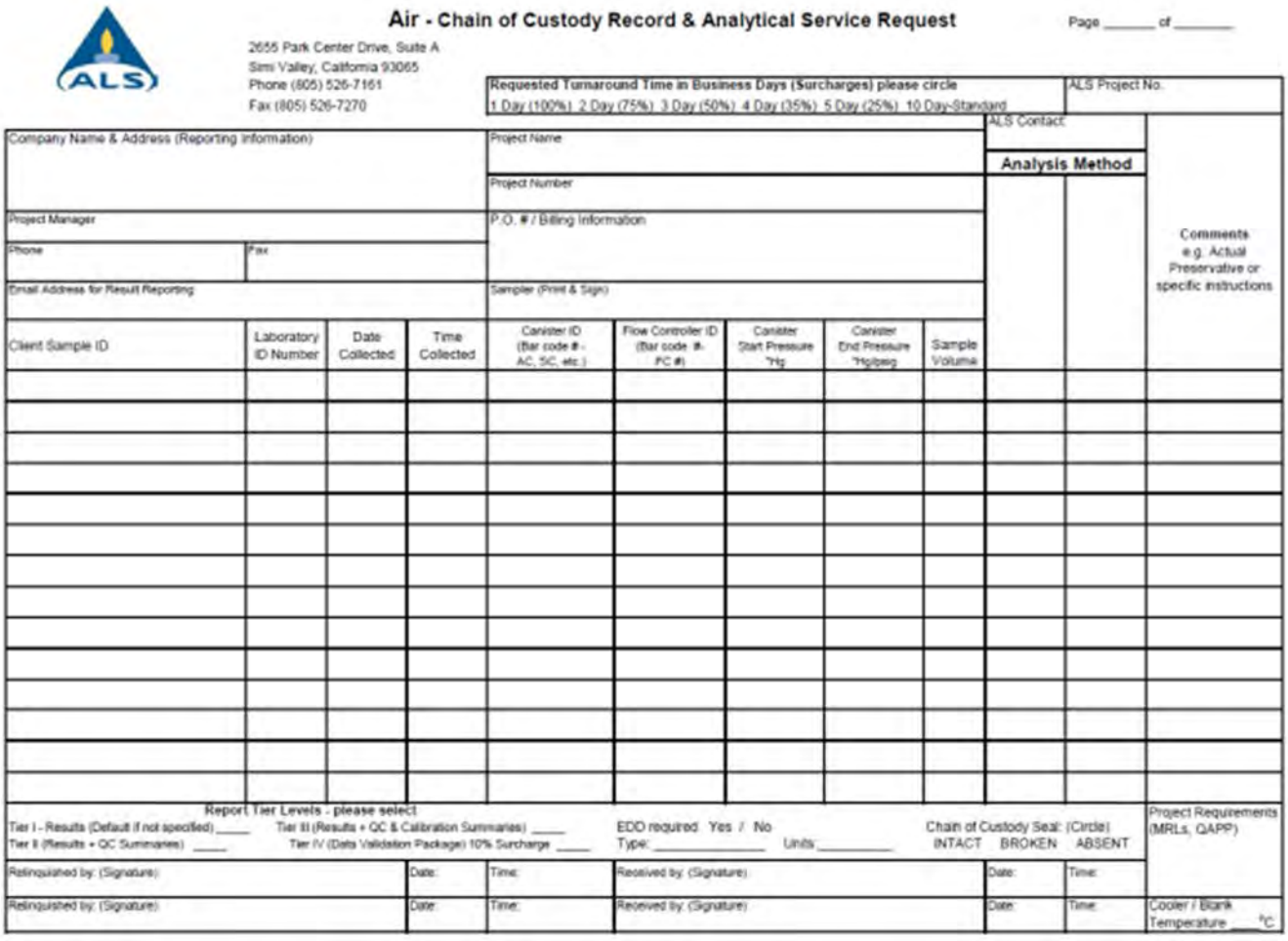
11.8 Sample Retention and Waste Disposal

Upon completion of all analyses, the laboratory samples are retained in accordance with the requirements specified in the method SOPs and the *Simi Valley Lab Waste Management Plan*. The samples are disposed according to approved disposal practices or returned to the client (if applicable). All samples are characterized according to hazardous/non-hazardous waste criteria and are segregated accordingly. This evaluation is generally based on results from analyses performed on the sample by ALS Environmental-Simi Valley or an approved subcontract laboratory. It should be noted that all wastes produced at the laboratory, including the laboratory's own various hazardous waste streams, are treated in accordance with all applicable local, State and Federal laws. Complete documentation is maintained for samples from initial receipt through final disposal. This ensures an accurate record of the samples from "cradle to grave."

11.9 Intra-laboratory / Inter-laboratory Transfer of Samples

When environmental samples are shipped to another laboratory for analysis, samples are properly packed for shipment and preserved if necessary. Sample bottles are wrapped in protective material and placed in a plastic bag (preferably Ziploc®) to avoid any possible cross-contamination of samples during the transportation process. Blue or wet ice is used for temperature preservation, where necessary.

Figure 11-1
Air Chain of Custody Form



Air - Chain of Custody Record & Analytical Service Request

Page _____ of _____

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

ALS Project No.

ALS Contact:

Company Name & Address (Reporting Information)

Project Name

Project Number

Project Manager

P.O. # / Billing Information

Phone | Fax

Email Address for Result Reporting

Sampler (Print & Sign)

Analysis Method

Comments
e.g. Actual Preservative or specific instructions

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code #- FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume			

Report Tier Levels - please select
Tier I - Results (Default if not specified) ____ Tier III (Results + QC & Calibration Summaries) ____
Tier II (Results + QC Summaries) ____ Tier IV (Data Validation Package) 10% Surcharge ____

EDD required Yes / No
Type: _____ Units: _____

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	Cooler / Blank Temperature ____ °C

Figure 11-2
Soil / Water Chain of Custody Form

Soil / Water - Chain of Custody Record & Analytical Service Request Page _____ of _____

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

ALS Project No.

ALS Contact:

Company Name & Address (Reporting Information)

Project Name

Project Number

Project Manager

P.O. # / Credit Card / Billing Information

Phone | Fax

Email Address for Result Reporting

Analysis

Comments

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Water	Soil	Solid	Other				

Report Tier Levels - please select
Tier I - Results (Default if not specified) ____ Tier III (Results + QC & Calibration Summaries) ____ EDD required Yes / No
Tier II (Results + QC Summaries) ____ Tier IV (Data Validation Package) 10% Surcharge ____ Type: _____ Units: _____

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT

Project Requirements (MRLs)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:

Cooler / Blank / Ice / No Ice
Temperature _____ °C

Figure 11-3

ALS Environmental
Sample Acceptance Check Form

Client: _____ Work order: _____
Project: _____
Sample(s) received on: _____ Date opened: _____ by: _____

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☐	☐	☐
2	Did **sample containers** arrive in good condition?	☐	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☐	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☐	☐	☐
5	Was **sample volume** received adequate for analysis?	☐	☐	☐
6	Are samples within specified holding times?	☐	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☐
8	Were **custody seals** on outside of cooler/Box/Container?	☐	☐	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☐
	Were signature and date included?	☐	☐	☐
	Were seals intact?	☐	☐	☐
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☐
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☐
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☐
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☐
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☐
	Are dual bed badges separated and individually capped and intact?	☐	☐	☐

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH<4)

12) Analytical Procedures

ALS Environmental employs methods and analytical procedures from a variety of external sources. Reference documents include but are not limited to: ASTM, CARB, NCASI, NIOSH, OSHA, SCAQMD, USEPA SW-846, USEPA 600/4-79-020, 600/R-93/100 (inorganic substances), 600/625/R-96/010b (air samples), EPA 40 CFR part 136 and associated Method Update Rules and Supplements, and *Standard Methods for the Examination of Water and Wastewater* for water and wastewater samples. Complete citations for these references can be found in Section 23. Other published procedures, such as state-specific methods, program-specific methods, or in-house methods may be used. Several factors are involved with the selection of analytical methods to be used in the laboratory. These include the method detection limit, the concentration of the analyte being measured, method selectivity, accuracy and precision of the method, the type of sample being analyzed, and the regulatory compliance objectives. The implementation of methods by ALS Environmental is described in SOPs specific to each method. A list of accredited methods is given in Appendix J. Further details are described below.

12.1 Standard Operating Procedures (SOPs) and Laboratory Notebooks

ALS Environmental maintains SOPs for use in both technical and administrative functions (Refer to Appendix G). SOPs are written following standardized format and content requirements as described in the *SOP for Establishing Standard Operating Procedures*. Each SOP is reviewed and approved by a minimum of two managers (the Laboratory Director and/or Department Manager and the QA Manager). All SOPs undergo a documented review according to the schedule outlined in the *SOP for Establishing Standard Operating Procedures* to make sure current practices are described. The QA Manager maintains a comprehensive list of current SOPs. The document control process ensures that only the most currently prepared version of an SOP is being used. The QA Manual, QAPPs, SOPs, standards preparation logbooks, maintenance logbooks, et al., are controlled documents, unless otherwise noted. The procedures for document control are described in the *SOP for Document Control*. In addition to SOPs, each laboratory department maintains a current file, accessible to all laboratory staff, of the current methodology used to perform analyses. Laboratory notebook entries are standardized following the guidelines in the *SOP for Making Entries onto Analytical Records*. Entries made into laboratory notebooks are reviewed and approved by the appropriate supervisor at a regular interval.

12.2 Modified Procedures

ALS Environmental strives to perform published methods as described in the referenced documents. If there is a material deviation from the published method, the method is cited as a "Modified" method in the analytical report. Modifications to the published methods are listed in the standard operating procedure. Standard operating procedures are available to analysts and are also available to our clients for review, especially those for "Modified" methods. Client approval is obtained for the use of "Modified" methods prior to the performance of the analysis.

12.3 Analytical Batch

The basic unit for analytical quality control is the analytical batch. The definition that ALS Environmental-Simi Valley has adopted for the analytical batch is listed below. The overriding principle for describing an analytical batch is that all the samples in a batch, both field samples and quality control samples are to be handled exactly the same way, and all of the data from each analysis is to be manipulated in exactly the same manner. The minimum requirements of an analytical batch are:

1) The number of (field) samples in a batch is not to exceed 20.
2) All (field) samples in a batch are of the same matrix.
3) The QC samples to be processed with the (field) samples include:
   a) Method Blank (a.k.a. Laboratory Reagent Blank)

      Function: Determination of laboratory contamination

   b) Laboratory Control Sample

      Function: Assessment of method performance

   c) Matrix Spiked (field) Sample (a.k.a. Laboratory Fortified Sample Matrix)*

      Function: Assessment of matrix bias

   d) Duplicate Matrix Spiked (field) Sample or Duplicate (field) Sample (a.k.a. Laboratory Duplicate)*

      Function: Assessment of batch precision

   * A sample identified as a field blank, an equipment blank, or a trip blank is not to be matrix spiked or duplicated.
4) A single lot of reagents is used to process the batch of samples.
5) Each operation within the analysis is performed by a single analyst, technician, chemist, or by a team of analysts/technicians/chemists.
6) Samples are analyzed in a continuous manner over a timeframe not to exceed 24-hours between the start of processing of the first and last sample of the batch.
7) (Field) samples are assigned to batches commencing at the time that sample processing begins. For example: for analysis of metals, sample processing begins when the samples are digested. For analysis of organic constituents, it begins when the samples are extracted.
8) The QC samples are to be analyzed in conjunction with the associated field samples prepared with them. However, for tests which have a separate sample preparation step that defines a batch (extraction, etc.), the QC samples in the batch do not require analysis each time a field sample within the preparation batch is analyzed (multiple instrument sequences to analyze all field samples in the batch need not include re-analyses of the QC samples).
9) The batch is to be assigned a unique identification number that can be used to correlate the QC samples with the field samples.
10) Batch QC refers to the QC samples that are analyzed in a batch of (field) samples.
11) Project-specific requirements may be exceptions. If project, program, or method requirements are more stringent than these laboratory minimum requirements, then the project, program, or method requirements will take precedence. However, if the project, program, or method requirements are less stringent than these laboratory minimum requirements, these laboratory minimum requirements will take precedence.

Note: Matrix spiked samples are often not feasible for air matrices. Therefore, the MS shall be used as required by the test method and as specified by the corresponding method SOP.

12.4 Specialized Procedures

ALS Environmental not only strives to provide results that are scientifically sound, legally defensible, and of known and documented quality; but also strives to provide the best solution to analytical challenges. Procedures using specialized instrumentation and methodology have been developed to improve sensitivity (provide lower detection limits), selectivity (minimize interferences while maintaining sensitivity), and overall data quality for low concentration applications. Examples are specialized GC/MS analyses and low level organics analyses.

12.5 Demonstration of Capability

A demonstration of capability (DOC) is made prior to using any new test method or when a technician is new to the method. This demonstration is made following regulatory, accreditation, or method specified procedures. In general, this demonstration does not test the performance of the method in real world samples, but in the applicable clean matrix free of target analytes and interferences.

A quality control sample material may be obtained from an outside source or may be prepared in the laboratory. The analyte(s) is (are) diluted in a volume of clean matrix (for analytes which do not lend themselves to spiking the demonstration of capability may be performed using quality control samples). Where specified, the method-required concentration levels are used. Four aliquots are prepared and analyzed according to the test procedure. The mean recovery and standard deviations are calculated and compared to the corresponding acceptance criteria for precision and accuracy in the test method or laboratory-generated acceptance criteria (if there are not established mandatory criteria). All parameters must meet the acceptance criteria. Where spike levels are not specified, actual Laboratory Control Sample results may be used to meet this requirement, provided acceptance criteria are met.

12.6 Method Detection Limits and Method Reporting Limits & Limits of Detection/ Quantitation

Method Detection Limits (MDL) for methods performed at ALS Environmental-Simi Valley are determined during initial method set up and if any significant changes are made. The MDLs are determined by following the *SOP for Performing Method Detection Limits Studies and Establishing Limits of Detection and Quantitation,* which is based on the procedure in 40 CFR Part 136, Appendix B. The US EPA published a Method Update Rule (MUR) on August 28, 2017 which updated the MDL procedure in 40 CFR Part 136. As required by NELAP and DoD protocols, the validity of MDLs is verified using LOD verification samples.

The Method Reporting Limit (MRL) is the lowest amount of an analyte in a sample that can be quantitatively determined with stated, acceptable precision and accuracy under stated analytical conditions (i.e. limit of quantitation - LOQ). LOQ are analyzed on an annual basis and cannot be lower than the lowest calibration standard. Current MDLs and MRLs are available from the laboratory.

13) Measurement Traceability and Calibration

All equipment and instruments used at ALS Environmental are operated, maintained and calibrated according to the manufacturer's guidelines and recommendations, as well as to criteria set forth in the applicable analytical methodology. Operation and calibration are performed by personnel who have been properly trained in these procedures. Documentation of calibration information is maintained in appropriate reference files. Brief descriptions of the calibration procedures for major laboratory equipment and instruments are described below. Calibration verification is performed according to the applicable analytical methodology. Calibration verification procedures and criteria are listed in laboratory Standard Operating Procedures. Documentation of calibration verification is maintained in appropriate reference files. Records are maintained to provide traceability of reference materials.

Traceability is defined as the property of a measurement result or value of a standard which can be related to stated references through an unbroken chain, each with stated uncertainties and is documented for all material used to perform calibrations. The documentation, a certificate of analysis containing, at a minimum, the manufacturer, address, accreditation number (where applicable), how traceability was achieved, the traceable values, their associated uncertainty, and the unique serial or laboratory identification number of the equipment or standard reference material (SRM) shall serve as initial point in the chain of traceability. The unique serial number or laboratory identification number is used throughout the laboratory to trace equipment and materials back to the original certificate of analysis.

Laboratory support equipment (thermometers, balances, and weights) are verified on an annual basis by a vendor accredited to ISO/IEC 17025:2005 or ISO/IEC 17025:2017 International Standards. All analytical measurements generated at ALS Environmental are performed using materials and/or processes that are traceable to a reference material. Metrology equipment (analytical balances, thermometers, etc.) is calibrated using reference materials traceable to the National Institute of Standards and Technology (NIST). These primary reference materials are themselves recertified on an annual basis. Vendors used for metrology support are required to verify compliance to International Standards by supplying the laboratory with a copy of their scope of accreditation.

Equipment subjected to overloading or mishandling, or has been shown by verification to be defective, is taken out of service and labeled until repaired. That piece of equipment is placed back in service only after verifying, by calibration, that it performs satisfactorily.

13.1 Temperature Measuring Devices

All thermometers are identified by a unique identifying number (i.e., serial number), and the calibration of these thermometers is checked annually (quarterly if digital) against a National Institute of Standards and Technology (NIST) certified thermometer. All corresponding correction factors are noted on the device as well as in the thermometer calibration logbook. The NIST calibrated thermometer is recertified by an approved vendor accredited ISO/IEC 17025:2005 or ISO/IEC 17025:2017 International Standard on an annual basis and certificates are retained on file for review. All temperature monitoring is conducted in accordance with the *SOP for Sample Receipt, Acceptance and Log-In* and thermometer calibration requirements are performed in accordance with the *SOP for Calibration and Use of the Laboratory Support Equipment*.

Specific thermometers include a temperature range per certain project requirements (complies with Department of Defense Quality Systems Manual for Environmental Laboratories); this range is recorded to document consistent compliance with required temperatures for refrigerators and freezers, where applicable.

13.2 Volumetric Dispensing Devices

The accuracy of pipettes used to make critical-volume measurements is verified on a quarterly basis. The indicated volume or range (where applicable) of the pipette is checked and an accuracy and precision verification performed. The calibrations are evaluated against the intended use (volume or range) of the pipette and if the calibration is not approved for the specified volume(s) it is tagged accordingly (i.e. "Do Not Use Below 5uL"). The results for all calibration verifications are recorded and maintained.

Note: Glass microliter syringes including gas-tight syringes are considered in the same manner as Class A glassware and are not held to the calibration/verification requirements as are other volumetric dispensing devices.

13.3 Analytical Balances and Weights

Analytical balances and weights are calibrated/recertified and certificates issued annually by an approved vendor accredited to ISO/IEC 17025:2005 or ISO/IEC 17025:2017 International Standard. The calibration of each balance is checked once each day (prior to use) in the expected range, utilizing the calibrated weights. Bound record books are kept which contain the identification of balance (serial number), recorded measurements and the initials of the analyst who performed the check. All certificates for the balances and weights are available for review.

13.4 Pressure/Vacuum Gauges

ALS Environmental-Simi Valley digital pressure/vacuum gauges are used in a number of critical measurements within the laboratory. The following is a list of the uses for this gauge type.

- Canister cleaning and conditioning.
- Measure the vacuum on canisters before they are sent to the client for sampling.
- Measure the initial/final vacuum/pressure of canisters prior to analysis.
- Measure pressure during the preparation of selected standards.

Digital pressure/vacuum gauges are calibrated and certificates issued once per year by an approved metrology organization. All calibrations are performed against standards traceable to the National Institute of Standards and Technology (NIST) or other recognized national metrology institutes. In addition, ALS Environmental-Simi Valley performs a calibration check for each gauge six months following the calibration date. The laboratory retains all corresponding calibration and verification documentation for review.

13.5 Source and Preparation of Standards and Reference Materials

Consumable reference materials routinely purchased by the laboratories (e.g., analytical standards) are purchased from nationally recognized, reputable vendors. All vendors where possible have fulfilled the requirements for ISO 9001 certification and/or are ISO/IEC 17025:2005 or ISO/IEC 17025:2017 accredited. ALS Environmental-Simi Valley relies on a primary vendor for the majority of its analytical supplies. Consumable primary stock standards are obtained from certified commercial sources or from sources referenced in a specific method. AccuStandard, Chem Services, Inc., Millipore Sigma, etc. are examples of the vendors used. Reference material information is recorded in the appropriate logbook(s) and materials are stored under conditions that provide maximum protection against deterioration and contamination.

The logbook entry includes such information as an assigned logbook identification code, the source of the material (i.e. vendor identification), solvent (if applicable) and

concentration of analyte(s), reference to the certificate of analysis and an assigned expiration date. The date that the standard is received in the laboratory is marked on the container. When the reference material is used for the first time, the date of usage and the initials of the analyst are also recorded on the container.

Stock solutions and calibration standard solutions are prepared fresh as often as necessary according to their stability. All standard solutions are properly labeled as to analyte concentration, solvent, date, preparer, and expiration date; these entries are also recorded in the appropriate notebook(s) following the *SOP for Making Entries onto Analytical Record*s. Prior to sample analysis, all calibration reference materials are verified with a second, independent source of the material.

13.6 Instrument Calibration

The laboratory specifies the procedures and documentation for initial instrument calibration and continuing calibration verification in the applicable method standard operating procedures to ensure that data is of known quality and is appropriate for a specific regulation and/or client requirement. The procedural steps for calibration including, frequency, number of points, integration, calculations, acceptance criteria (appropriate to the calibration technique employed), corrective action, associated statistics, and data qualifications are included in applicable methods, method standard operating procedures and/or client project plans. The essential elements that define the procedures and required documentation for initial instrument calibrations are specified below.

- Sufficient raw data records are retained to permit reconstruction of all calibrations.
- If a reference or mandated method does not specify the number of calibration standards, the initial calibration range shall consist of a minimum of 5 contiguous calibration points for organics and a minimum of 3 contiguous calibration points for inorganics. The actual numbers of points utilized is specified in the corresponding method SOP.
- The concentrations should bracket the expected concentration range of samples.
- Initial instrument calibration procedures referenced in test methods (either directly or indirectly) are readily available to the analysts.
- All sample results are quantitated from the initial instrument calibration and are not quantitated from any continuing instrument calibration verification unless otherwise specified by regulation, method or program.
- The initial instrument calibration is verified with a standard obtained from a second manufacturer or lot and traceability to a national standard is maintained, where available.
- The acceptance criteria utilized is appropriate for the calibration technique employed.
- The lowest calibration standard in the initial calibration is at or below the lowest concentration for which quantitative data are to be reported and is referred to at this laboratory as the method reporting limit (MRL). Some programs and/or agencies refer to this limit as the practical quantitation limit (PQL) or Limit of Quantitation (LOQ).
- Any data reported below the MRL or above the highest calibration standard is considered to have an increased quantitative uncertainty and is appropriately qualified in the report.
- The lowest calibration standard is above the limit of detection or method detection limit (MDL).

13.7 Internal and External Calibrations

Internal standard calibration involves the comparison of instrument responses from the target compounds in the sample to the responses of specific standards added to the sample or sample extract prior to injection. The ratio of the peak area of the target compound in the sample or sample extract to the peak area of the internal standard in the sample or sample extract is compared to a similar ratio derived for each calibration standard. The ratio is termed the response factor (RF) or relative response factor (RRF) in some methods.

External standard calibration involves comparison of instrument responses from the sample to the responses from the target compounds in the calibration standards. Sample peak areas are compared to peak areas of the standards. The ratio of the detector responses to the amount (mass) of analyte in the calibration standard is defined as the calibration factor or in some cases it may be referred to as response factor.

13.8 Continuing Calibration Verification

The essential elements that define the procedures and required documentation for continuing instrument calibration verification are specified below.

- When an initial calibration is not performed on the day of analysis, continuing instrument calibration verification is analyzed with each batch.
- Calibration is verified for each reported compound, element or parameter; however, for analyses such as total petroleum hydrocarbons a representative chemical related substance or mixture may be used. The allowance for this exception is dependent on applicable regulatory, method, or client project plans.
- Generally, the instrument calibration verification is performed at the beginning, end, and every ten samples of each analytical batch (except, if an internal standard is used, only one verification needs to be performed at the beginning of the analytical batch); whenever it is suspected that the analytical system may be out of calibration; if the time period for calibration or most previous calibration verification has expired; or for analytical systems that contain a specific calibration verification requirement. Specific requirements for the frequency of continuing calibration verification, for a particular method, is specified in the corresponding method standard operating procedure.

14) Assuring the Quality of Results

A primary focus of ALS Environmental's QA Program is to ensure the accuracy, precision and comparability of all analytical results. Prior to using a procedure for the analysis on field samples, acceptable method performance is established by performing demonstration of capability analyses. Performance characteristics are established by performing method detection limit studies and assessing accuracy and precision according to the reference method. ALS Environmental has established Quality Control (QC) objectives for precision and accuracy that are used to determine the acceptability of the data that is generated. These QC limits are either specified in the test methodology or are statistically derived based on the laboratory's historical data. Quality Control objectives are defined below.

14.1 Quality Control Objectives

14.1.1 Accuracy - Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the mean value of results from ongoing analyses of laboratory-fortified blanks, standard reference materials, and standard solutions.

In addition, laboratory-fortified (i.e. matrix-spiked) samples are also measured; this indicates the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery (%REC.) of the measured value, relative to the true or expected value. If a measurement process produces results whose mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination).

ALS Environmental utilizes several quality control measures to eliminate analytical bias, including systematic analysis of method blanks, laboratory control samples and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement.

14.1.2 Precision - Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling and in laboratory analysis. The American Society of Testing and Materials (ASTM) recognizes two levels of precision: repeatability - the random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions, and reproducibility - the random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material.

"Within-batch" precision is measured using replicate sample or QC analyses and is expressed as the relative percent difference (RPD) between the measurements. The "batch-to-batch" precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples from multiple analytical batches.

14.1.3 Control Limits - The control limits for accuracy and precision originate from two different sources. For analyses having enough QC data, control limits are calculated at the 99% confidence limits. For analyses not having enough QC data, or where the method is prescriptive, control limits are taken from the method on which the procedure is based. If the method does not have stated control limits, then control limits are assigned method-default or reasonable values. Control limits are updated periodically when new statistical limits are generated for the appropriate surrogate, laboratory control sample, and matrix spike compounds (typically once a year) or when method prescribed limits change. The updated limits are reviewed by the QA Manager. The new control limits replace the previous limits and data is assessed using the new values. Current acceptance limits for accuracy and precision are available from the laboratory. For inorganics, the precision limit values listed are for laboratory duplicates. For organics, the precision limit values listed are for duplicate laboratory control samples or duplicate matrix spike analyses.

14.1.4 Representativeness - Representativeness is the degree to which the field sample, being properly preserved, free of contamination, and analyzed within holding time, represents the overall sample site or material. This can be extended to the sample itself, in that representativeness is the degree to which the subsample that is analyzed represents the entire field sample submitted for analysis. ALS Environmental has sample handling procedures to ensure that the sample used

for analysis is representative of the entire sample. Further, analytical SOPs specify appropriate sample handling and sample sizes to further ensure the sample aliquot that is analyzed is representative of entire sample. Air samples received by the laboratory in canisters and bags are considered to be homogenous and therefore, no special sample preparation procedures are necessary.

14.1.5 Comparability – Comparability expresses the confidence with which one data set can be compared to another and is directly affected by data quality (accuracy and precision) and sample handling (sampling, preservation, etc). Only data of known quality can be compared. The objective is to generate data of known quality with the highest level of comparability, completeness, and usability. This is achieved by employing the quality controls listed below and standard operating procedures for the handling and analysis of all samples. Data is reported in units specified by the client and using ALS Environmental or project-specified data qualifiers.

14.2 Quality Control Procedures

The specific types, frequencies, and processes for quality control sample analysis are described in detail in method-specific standard operating procedures and listed below. These sample types and frequencies have been adopted for each method and a definition of each type of QC sample is provided below.

14.2.1 Method Blank (a.k.a. Laboratory Reagent Blank)

The method blank is an analyte-free matrix (air, water, soil, etc.) subjected to the entire analytical process. When analyte-free soil is not available, anhydrous sodium sulfate, organic-free sand, or an acceptable substitute is used. The method blank is analyzed to demonstrate that the analytical system itself does not introduce contamination. The method blank results should be below the Method Reporting Limit (MRL) or, if required for DoD projects, < ½ MRL for the analyte(s) being tested. Otherwise, corrective action must be taken. A method blank is included with the analysis of every sample preparation batch, every 20 samples, or as stated in the method, whichever is more frequent.

14.2.2 Calibration Blanks

For some methods, calibration blanks are prepared along with calibration standards in order to create a calibration curve. Calibration blanks are free of the analyte of interest and, where applicable, provide the zero point of the calibration curve. Additional project-specific requirements may also apply to calibration blanks.

14.2.3 Continuing Calibration Blanks

Continuing calibration blanks (CCBs) are solutions of analyte-free water, reagent, or solvent that are analyzed in order to verify the system is contamination-free when CCV standards are analyzed.

The frequency of CCB analysis is once every ten samples or as indicated in the method, whichever is greater. Additional project-specific requirements may also apply to continuing calibration blanks.

14.2.4 Calibration Standards

Calibration standards are vapors, liquids or solutions of known concentration prepared from primary standard or stock standard materials. Calibration standards are used to calibrate the instrument response with respect to analyte concentration.

Standards are analyzed in accordance with the requirements stated in the particular method being used.

14.2.5 Initial (or Independent) Calibration Verification Standards

Initial (or independent) calibration verification standards (ICVs) are standards that are analyzed *after* calibration but *prior to* sample analysis, in order to verify the validity and accuracy of the standards used for calibration. Once it is determined that there is no defect or error in the calibration standard(s), standards are considered valid and may be used for subsequent calibrations and quantitative determinations (as expiration dates and methods allow). The ICV standards are prepared from materials obtained from a source independent of that used for preparing the calibration standards ("second-source"). ICVs are also analyzed in accordance with method-specific requirements.

14.2.6 Continuing Calibration Verification Standards

Continuing calibration verification standards (CCVs) are midrange standards that are analyzed in order to verify that the calibration of the analytical system is still acceptable. The frequency of CCV analysis is either once every ten samples, or as indicated in the method.

14.2.7 Internal Standards

Internal standards are known amounts of specific compounds that are added to each sample prior to instrument analysis. Internal standards are generally used for GC/MS procedures to correct sample results that have been affected by changes in instrument conditions or changes caused by matrix effects. The requirements for evaluation of internal standards are specified in each method and SOP.

14.2.8 Surrogates

Surrogates are organic compounds which are similar in chemical composition and chromatographic behavior to the analytes of interest, but which are not normally found in environmental samples. Depending on the analytical method, one or more of these compounds is added to method blanks, calibration and check standards, and samples (including duplicates, matrix spike samples, duplicate matrix spike samples and laboratory control samples) prior to extraction and analysis in order to monitor the method performance on each sample. The percent recovery is calculated for each surrogate, and the recovery is a measurement of the overall method performance.

Recovery (%) = (M/T) x 100

Where: M = The measured concentration of analyte,
T = The theoretical concentration of analyte added.

14.2.9 Laboratory Control Samples

The laboratory control sample (LCS) is an aliquot of analyte-free liquid, solid or air matrix to which known amounts of the method analyte(s) is (are) added. A reference material of known matrix type, containing certified amounts of target analytes, may also be used as an LCS. An LCS is prepared and analyzed at a minimum frequency of one LCS per 20 samples, with every analytical batch or as stated in the method, whichever is more frequent. The LCS sample is prepared and analyzed in exactly the same manner as the field samples.

The percent recovery of the target analytes in the LCS is compared to established control limits and assists in determining whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements at the required reporting limit. Comparison of batch-to-batch LCS analyses enables the laboratory to evaluate batch-to-batch precision and accuracy.

Recovery (%) = (M/T) x 100

Where: M = The measured concentration of analyte,
T = The theoretical concentration of analyte added.

14.2.10 Laboratory Fortified Blanks - LFB

A laboratory blank fortified at the MRL used to verify the minimum reporting limit. The LFB is carried through the entire extraction and analytical procedure.

14.2.11 Matrix Spikes (a.k.a. Laboratory Fortified Sample Matrix)

Matrix spiked samples are aliquots of samples to which a known amount of the target analyte (or analytes) is (are) added. The samples are then prepared and analyzed in the same analytical batch, and in exactly the same manner as are routine samples. For the appropriate methods, matrix spiked samples are prepared and analyzed and at a minimum frequency of one spiked sample (and one duplicate spiked sample, if appropriate) per twenty samples. The spike recovery measures the effects of interferences caused by the sample matrix and reflects the accuracy of the method for the particular matrix in question. Spike recoveries are calculated as follows:

Recovery (%) = (S - A) x 100 ÷ T

Where: S = The observed concentration of analyte in the spiked sample,
A = The analyte concentration in the original sample, and
T = The theoretical concentration of analyte added to the spiked sample.

Note: Matrix spiked samples are often not feasible for air matrices. Therefore, the MS shall be used as required by the test method and as specified by the corresponding method SOP.

14.2.12 Laboratory Duplicates and Duplicate Matrix Spikes

Duplicates are additional replicates of samples that are subjected to the same preparation and analytical scheme as the original sample. Depending on the method of analysis, either a duplicate analysis (and/or a matrix spiked sample) or a matrix spiked sample and duplicate matrix spiked sample (MS/DMS) are analyzed. The relative percent difference between duplicate analyses or between an MS and DMS is a measure of the precision for a given method and analytical batch. The relative percent difference (RPD) for these analyses is calculated as follows:

Relative Percent Difference (RPD) = (S1 - S2) x 100 ÷ S_{ave}

Where S1 and S2 = The observed concentrations of analyte in the sample and its duplicate, or in the matrix spike and its duplicate matrix spike, and

S_{ave} = The average of observed analyte concentrations in the sample and its duplicate, or in the matrix spike and its duplicate matrix spike.

Depending on the method of analysis, either duplicates (and/or matrix spikes) or MS/DMS analyses are performed at a minimum frequency of one set per 20 samples. If an insufficient quantity of sample is available to perform a laboratory duplicate or duplicate matrix spikes, duplicate LCSs will be prepared and analyzed.

14.2.13 Control Charting

The generation of control charts is routinely performed at ALS Environmental. Surrogate, Matrix Spike and LCS recoveries are all monitored and charted. In addition, the laboratory also monitors the Relative Percent Difference (RPD) measurement of precision. Control charts are available to each department to monitor the data generated and identify trends in the analytical results. If trends in the data are perceived, various means of corrective action may then be employed in order to prevent future problems with the analytical system(s). Finally, data quality reports using control charts are generated for specific clients and projects pursuant to contract requirements. The control charting procedure is described in the SOP for *Control Limits*.

14.2.14 Glassware Washing

Glassware washing and maintenance play a crucial role in the daily operation of a laboratory. The glassware used at ALS Environmental undergoes a rigorous cleansing procedure prior to every usage. The *SOP for Glassware Cleaning* outlines the various procedures used at ALS Environmental-Simi Valley; each procedure is specific to the end-use of the equipment as well as to the overall analytical requirements of the project. In addition, other equipment that may be routinely used at the laboratory is also cleaned following instructions in the appropriate SOP.

14.2.15 Collection Efficiency

In the case of sampling trains (consisting of one or more multi-section sorbent tubes), which are received intact by the laboratory, the “front” and “back” sections shall be separated if required by the client. Each section shall be processed and analyzed separately and the analytical results reported accordingly.

14.2.16 Desorption Efficiency and Method Reporting Limits (Industrial Hygiene)

Desorption efficiency (DE) is the ability of an analytical method to recover the analyte from the collection media. Desorption efficiencies are determined initially and for each analyte to be reported. In addition, a DE study is performed each time there is a change in the test method, or with each new lot of media. Desorption efficiency shall be determined using sorbent media from the same lot number used for the field samples, if possible, and of the identical size and type. The DE values are used to correct the sample results (for all samples except passive samplers) before reporting.

Minimum reporting limits for each reportable analyte are determined initially by the analysis of spiked media, prepared at the desired reporting limit and carried through the entire analytical process. The reporting limit is verified or re-established annually (or if there is a change in methodology or instrumentation)

and instrument performance is checked with each analytical batch through the analysis of an analytical standard prepared at the reporting limit.

14.2.17 Field and Trip Blanks

Field and trip blanks are analyzed when they are submitted to the laboratory for analysis. The actual field samples are flagged (when analytes are found in the blank) if and only if the laboratory is able to analyze the samples in the same analytical sequence as the corresponding field or trip blank. If this is not possible due to client submission restrictions then the results for the samples and blanks shall be reported independently with no flag. However, an explanation of this is included in the final report. This laboratory does not feel that Summa canisters are suitable for use as trip blanks. It is for this reason that the results for these types of containers are reported as separate samples and flagging is not considered appropriate.

14.3 Uncertainty

When requested by the client or relevant to the validity of reported results, the estimation of measurement uncertainty will be provided to a client or regulatory agency. How the uncertainty will be reported may be dictated by the client's reporting specifications. Procedures for determining and reporting uncertainty are given in the *SOP for Estimation of Uncertainty of Analytical Measurements*.

15) Control of Non-Conforming Environmental Testing Work

If a quality control measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s) (See Appendix H). Failure to meet established analytical controls, such as the quality control objectives, prompts corrective action. Corrective action may take several forms and may involve a review of the calculations, a check of the instrument maintenance and operation, a review of analytical technique and methodology, and reanalysis of quality control and field samples. If a potential problem develops that cannot be solved directly by the responsible analyst, the supervisor, team leader, department manager, and/or the QA Manager may examine and pursue alternative solutions. In addition, the appropriate Project Manager is notified in order to ascertain if the client needs to be notified.

16) Corrective Action, Preventive Action, and Improvement

When work does not conform to established quality control procedures, responsible management will evaluate the significance of the nonconforming work and when required take corrective action to address the nonconformance. Actions (including halting or repeating of work and withholding of reports, as necessary) are based upon the risk levels established by the laboratory. The laboratory takes all appropriate steps necessary to ensure all sample results are reported with acceptable quality control results.

Nonconforming events such as errors, deficiencies, deviations from SOP, proficiency (PT) failure or results that fall outside of established QC limits are documented using a *Nonconformity and Corrective Action Report* form. The procedure and responsibilities for addressing nonconforming work is defined in the *SOP for Nonconformance and Corrective Action.* Nonconformances are reported to the client using various means (voice, email, narrative, etc). When a nonconformance occurs that casts doubt on the validity of the test results or additional client instructions are needed, the Project Manager notifies the client the same business day that the nonconformance is confirmed and reported. The QA Manager reviews each problem, ensuring that appropriate

corrective action has been taken by the appropriate personnel. The Nonconformity and Corrective Action Report (NCAR) is filed in the associated service request file and a copy is kept by the QA Manager. The QA Manager periodically reviews all NCARs looking for chronic, systematic problems that need more in-depth investigation and alternative corrective action consideration. In addition, the appropriate Project Manager is promptly notified of any problems in order to inform the client and proceed with any action the client may want to initiate.

Part of the corrective action process involves determining the root cause. Identifying the root cause of a nonconformance can be difficult, but important for implementing effective corrective action. Root cause principles are used to determine assignable causes, which leads to corrective action taken to prevent recurrence.

16.1 Preventive Action and Improvement

Various preventive action and improvement processes are used for eliminating potential problems or averting problems before they occur. This is explained in the *SOP for Preventive Action*.

Table 16-1

Equipment Maintenance Procedures

Instrument	Applicable Activity	Frequency	Performed
Gas Chromatographs	Replace septum	As required	In-House and Outside Vendor
	Check system for gas leaks, loose/fray wires and insulation	With cylinder change/Open system	
	Replace injection port liner	As required	
	ECD wipe test	Every 6 months	
	Thermally Clean ECD	As needed	
	Clean FID	As required	
	Change TCD assembly	As required	
	SCD – Change reaction tube	As required	
	Catalyst check	As required	
Gas Chromatography / Mass Spectrometers	Tune MSD	As needed	In-House and Outside Vendor
	Change Semi-VOA capillary column	As needed	
	Change Semi-VOA injection port septum	As required	
	Change Semi-VOA injection port liner	As required	
	Replace trap (VOA)	As required	
	Clean ion source	As required	
	Change filament	As required	
	Change electron multiplier	As required	
	Vacuum System: • Mechanical pumps: change oil, change trap pellets (HP only) • Diffusion pump: check oil, check cooling fan, change oil • Turbo pump	• Check every 6 months, check level monthly, change at least annually or sooner is necessary • As required • Replace as required	In-House
	Air Preconcentrators / Autosampler: • Change traps • Inspect Rotors • Calibrate Mass Flow Controllers	• As required • As required • Every 6 months	In-House

Instrument	Applicable Activity	Frequency	Performed
HPLC	Replace/clean check valve filter	As required	In-House
	Replace lamp UV/vis detector	As required	
	Replace flow cell	As required	
	Check flow	Quarterly	
Analytical Balances	Clean pan and compartment	Prior to and after use	In-House and Outside Vendor
	Check with NIST traceable weights	Prior to use	
	Field service	Annually	
Refrigerators and Freezers	Monitor Temperature	Daily	In-House
	Adjust Temperature	As required	
	Clean, Defrost	As required	
Ovens	Clean	As needed or if temperature is outside limit	In-House
pH probes	Condition probe	When fluctuations occur	In-House
	Change Filling Solution	Weekly	
Ammonia ISE	Store in storage solution	Between uses	In-House
UV-visible Spectrophotometer	Wavelength check	Annually	In-House
Restek Thermal Gas Purifier	Check getter tube	Monthly, change as required	In-House

17) Control of Records

17.1 Documentation

ALS Environmental maintains a records system which ensures that all laboratory records of analysis data are retained and available. Analysis data is retained for 5 years from the report date unless contractual terms or regulations specify a longer retention time. Archival procedures are described in the *SOP for Data and Record Archiving*.

17.1.1 Documentation and Archiving of Sample Analysis Data

The archiving system includes, but is not limited to, the following items (where applicable) for each set of analyses performed:

- Benchsheets describing sample preparation (if appropriate) and analysis;
- Instrument parameters (or reference to the data acquisition method);
- Sample analysis sequence;
- Instrument printouts, including chromatograms and peak integration reports for all samples, standards, blanks, spikes, duplicates and reruns;
- Applicable standard identification numbers;
- Chain of custody, service request and sample acceptance check forms;
- Initial calibration and data review checklist(s);
- Copies of report sheets submitted to the work request file; and
- Copies of Nonconformity and Corrective Action Reports, if necessary.

Individual sets of analyses are identified by analysis date and service request number. Since many analyses are performed with computer-based data systems, the final sample concentrations can be automatically calculated. If additional calculations are needed, they are written on the integration report or securely stapled to the chromatogram, if done on a separate sheet.

For organics analysis, data applicable to all analyses within the batch, such as GCMS tunes, CCVs, batch QC, and analysis sequences; are kept using a separate documentation system. This system is used to archive data on a batch-specific basis and is segregated according to the date of analysis. This system also includes results for the most recent calibration curves, as well as method validation results.

17.2 Information Technology

The generation, compilation, reporting, and archiving of electronic data is a critical component of laboratory operations. In order to generate data of known and acceptable quality, the quality assurance systems and quality control practices for electronic data systems must be complete and comprehensive and in keeping with the overall quality assurance objectives of the organization. ALS Environmental management provides the tools and resources to implement electronic data systems and establishes information technology standards and policies.

17.2.1 Software Quality Assurance

Practices are defined for assuring the quality of the computer software used throughout all laboratory operations to generate, compile, report, and store electronic data. These practices are described in the *SOP for Software and Data Quality Assurance*.

The purpose of the SOP is to describe the policies and practices for the procurement, configuration management, development, validation and verification, data security, maintenance, and use of computer software. The policies and practices described in the plan apply to purchased computer software as well as to internally developed computer software. Key components of this plan are policies for software validation and control.

17.2.2 IT Support

The local ALS Environmental Information Technology (IT) department is established to provide technical support for all computing systems. The IT department staff continually monitors the performance and output of operating systems. The IT department oversees routine system maintenance and data backups to ensure the integrity of all electronic data described in the *SOP for Electronic Data Backup, Archiving, and Restoration*. A software inventory is maintained. Additional IT responsibilities are described in the *SOP for Software and Data Quality Assurance*.

In addition to the local IT department, ALS Environmental corporate IT provides support for network-wide systems. ALS Environmental also has personnel assigned to information management duties such as development and implementation of reporting systems; data acquisition, and Electronic Data Deliverable (EDD) generation.

17.2.3 Information Management Systems

ALS Environmental has various systems in place to address specific data management needs. The Laboratory Information Management System (LIMS) is used to manage sample information and invoicing. Access is controlled by password. This system defines sample identification, analysis specifications, and provides a means of sample tracking. This system is used during sample login to generate the internal service request.

Included on the service request is a summary of client information, sample identification, required analyses, work instructions, and deliverable requirements. The LIMS is used to track the status of a sample and is important in maintaining internal chain of custody.

Where possible, instrument data acquired locally is immediately moved to a server (Microsoft Windows Server 2008 R2). This provides a reliable, easily maintained, high-volume acquisition and storage system for electronic data files. With password entry, users may access the system from many available computer stations, improving efficiency and flexibility. The server is also used for data reporting, EDD generation, and administrative functions. Access to these systems is controlled by password. A standardized EDI (electronic data interchange) format is used as a reporting platform, providing functionality and flexibility for end users. With a common standardized communication platform, the EDI provides data reporting in a variety of hardcopy and electronic deliverable formats.

17.2.4 Backup and Security

Laboratory data is either acquired directly to the centralized acquisition server or acquired locally and then transferred to the server. All data is eventually moved to the centralized data acquisition server for reporting and archiving.

Full backups onto a hard drive are performed on all file server information once per day. In addition, the laboratory's data warehouse located in Canada performs an offsite full backup nightly.

Access to sample information and data is on a need-to-know basis. Access is restricted to the person's areas of responsibility. Passwords are required on all systems. No direct external, non-ALS Environmental access is allowed to any of our network systems.

The external e-mail system and Internet access is established via a single gateway to discourage unauthorized entry. ALS Environmental uses a closed system for company e-mail. Files, such as electronic deliverables, are sent through the external e-mail system only via a trusted agent or comparable service. The external messaging system operates through a single secure gateway. E-mail attachments sent in and out of the gateway are subject to a virus scan. Because the Internet is not regulated, we use a limited access approach to provide a firewall for added security. Virus screening is performed continuously on all network systems with Internet access.

18) Audits

Quality audits are an essential part of ALS Environmental-Simi Valley's quality assurance program. There are two types of audits used at the facility: System Audits are conducted to qualitatively evaluate the operational details of the QA program, while Performance Audits are conducted by analyzing proficiency testing samples in order to quantitatively evaluate the outputs of the various measurement systems.

18.1 System Audits

The system audit examines the presence and appropriateness of laboratory systems. External system audits of ALS Environmental-Simi Valley are conducted regularly by various regulatory agencies and clients. Appendix J lists the certification and accreditation programs in which ALS Environmental-Simi Valley participates. Programs and certifications are added as required. Additionally, internal system audits of ALS Environmental-Simi Valley are conducted regularly under the direction of the QA Manager. The internal audit procedures are described in the *SOP for Internal Audits*. The internal audits are performed as follows:

- Comprehensive lab-wide system audit – performed annually. This audit is conducted such that all elements of the ALS Quality System are assessed.
- Technical/method audits
- Hardcopy report audits

All audit findings, and corrective actions are documented. The results of each audit are reported to the Laboratory Director and Department Managers for review. Any deficiencies identified are summarized in the audit report. Managers must respond with corrective actions correcting the deficiency within a defined timeframe. Should problems impacting data quality be found during an internal audit, any client whose data is adversely impacted will be given written notification within the corrective action period (if not already provided).

Electronic data audits may be performed in conjunction with hardcopy data audits. The electronic audits focus on organic chromatographic data and include an examination of audit trails, peak integrations, calibration practices, GCMS tuning data, peak response data, use of appropriate files, and other components of the analysis. The audit also verifies that the electronic data supports the hardcopy reported data.

Additional internal audits or data evaluations may be performed as needed to address any potential data integrity issues that may arise.

18.2 Performance Audits

ALS Environmental-Simi Valley also participates in the analysis of interlaboratory proficiency testing (PT) samples. Participation in PT studies is performed on a regular basis and is designed to evaluate all analytical areas of the laboratory. General procedures for these analyses are described in the *SOP for Proficiency Sample Testing Analysis*. ALS Environmental-Simi Valley routinely participates in the following studies:

- Air and Emissions PT studies, 2 per year
- Other studies as required for specific certifications, accreditations, or validations.

PT samples are processed by entering them into the LIMS system as samples (assigned Service Request, due date, testing requirements, etc.) and are processed the same as field samples. The laboratory sections handle samples the same as field samples, performing the analyses following method requirements and performing data review. The laboratory sections submit results to the QA Manager for subsequent reporting to the appropriate agencies or study provider. Results of the performance evaluation samples and audits are

reviewed by the QA Manager, Laboratory Director, and the laboratory staff. For any results outside acceptance criteria, the analysis data is reviewed to identify a root cause for the deficiency, and corrective action is taken and documented through nonconformance (NCAR) procedures.

19) Management Review

Quality assurance requires an active, ongoing commitment by ALS Environmental personnel at all levels of the organization. Communication and feedback mechanisms are designed so that analysts, supervisors and managers are aware of QA issues in the laboratory. Analysts performing routine testing are responsible for generating a data quality narrative or data review document with every analytical batch processed. This report also allows the analyst to provide appropriate notes and/or a narrative if problems were encountered with the analyses. A Non-Conformity and Corrective Action Report (NCAR) may also be initiated. Supervisors or qualified analysts review all of the completed analytical batches to ensure that all QC criteria have been examined and any deficiencies noted and addressed.

It is the responsibility of each laboratory unit to provide the reporting department with reviewed data accompanied by signature approval. The data validation coordinators provide the Project Manager with a final report of the data. Footnotes and/or narrative notes must accompany any data package if problems were encountered that require further explanation to the client. Each data package is submitted to the appropriate Project Manager, who in turn reviews the entire collection of analytical data for completeness and to ensure that any and all client-specified objectives were successfully achieved. A case narrative is written (or approved) by the Project Manager to explain any unusual problems with a specific analysis or sample, etc.

The QA Manager provides overview support to the Project Managers as required (e.g., contractually specified, etc.). The QA Manager is also responsible for the oversight of all internal and external audits, for all proficiency testing sample and analysis programs, and for all laboratory certification/accreditation responsibilities. The QA Manager regularly communicates with the Laboratory Director to review the various QA/QC activities, priorities, and status of program implementation; including such topics as the following:

- Status, schedule, and results of internal and external audits;
- Status, schedule, and results of internal and external proficiency testing studies;
- Status of certifications, accreditations, and approvals;
- Status of QA Manual and SOP review and revision;
- Status of MDLs studies;
- Discussion of QC problems in the laboratory;
- Discussion of corrective action program issues;
- Status of staff training and qualification; and
- Other topics as appropriate.

An annual management review of the quality and testing systems is performed as described in the *SOP for Laboratory Management Review*. This is done to identify any necessary changes or improvements to the quality system or quality assurance policies. This review is documented in a Managerial Review of the Laboratory's Quality Systems and Testing Activities and sent to senior management.

20) Personnel

Technical position descriptions are available for all employees, regardless of position or level of seniority. These documents are maintained by the Human Resources personnel and are available for review. In order to assess the technical capabilities and qualifications of a potential

employee, all candidates for employment at ALS Environmental are evaluated, in part, against the appropriate technical description.

Training begins the first day of employment at ALS Environmental when the company policies are presented and discussed. Safety and QA/QC requirements are integral parts of all technical SOPs and, consequently, are integral parts of all training processes at ALS Environmental. Safety training begins with reading the *Environmental Health and Safety Manual* and other safety related documents as applicable. Employees are also required to participate in periodic safety training performed by the Environmental, Health and Safety Coordinators.

Employees are responsible for complying with the requirements of the QA Manual and QA/QC requirements associated with their function(s). Quality Systems training begins with Quality Assurance orientation for new employees and reading the Quality Assurance Manual. New employees receive Ethics training and learn about ALS Environmental quality systems as part of the induction process. Each employee participates in annual Ethics Refresher training.

ALS Environmental also encourages its personnel to continue to learn and develop new skills that will enhance their performance and value to the Company. Ongoing training occurs for all employees through a variety of mechanisms. The corporate, company-wide training and development program, external and internal technical seminars and training courses, and laboratory-specific training exercises are all used to provide employees with professional growth opportunities.

All technical training is documented and records are maintained by the QA department. Training requirements and its documentation are described in the *SOP for Training Policy*. A training plan is developed whenever an employee starts a new procedure or new position. The training plan includes a description of the step-by-step process for training an employee and for initial demonstration of capability.

20.1 Initial Demonstration of Capability (IDOC)

Training in analytical procedures typically begins with the reading of the Standard Operating Procedure (SOP) for the method. Hands-on training begins with the observation of an experienced analyst performing the method, followed by the trainee performing the method under close supervision, and culminating with independent performance of the method on quality control samples. Successful completion of the applicable Demonstration of Capability analysis qualifies the analyst to perform the method independently. Demonstration of Capability is performed by one of the following:

- Successful completion of an Initial Precision and Recovery (IPR) study (required where mandated by the method).
- Analysis of 4 consecutive Laboratory Control Samples, with acceptable accuracy and precision.
- Where spiking is not possible but QC standards are used (“non-spiked” Laboratory Control Samples), analysis of 4 consecutive Laboratory Control Samples with acceptable accuracy and precision.
- Where one of the three above is not possible training is performed and supervisor approval is documented.

A flowchart identifying the Demonstration of Proficiency requirements is given in Figure 20-1. The flowchart identifies allowed approaches to assessing Demonstration of Capability when a 4-replicate study is not mandated by the method, when spiking is not an option, or when QC samples are not readily available.

20.2 Continuing Demonstration of Proficiency

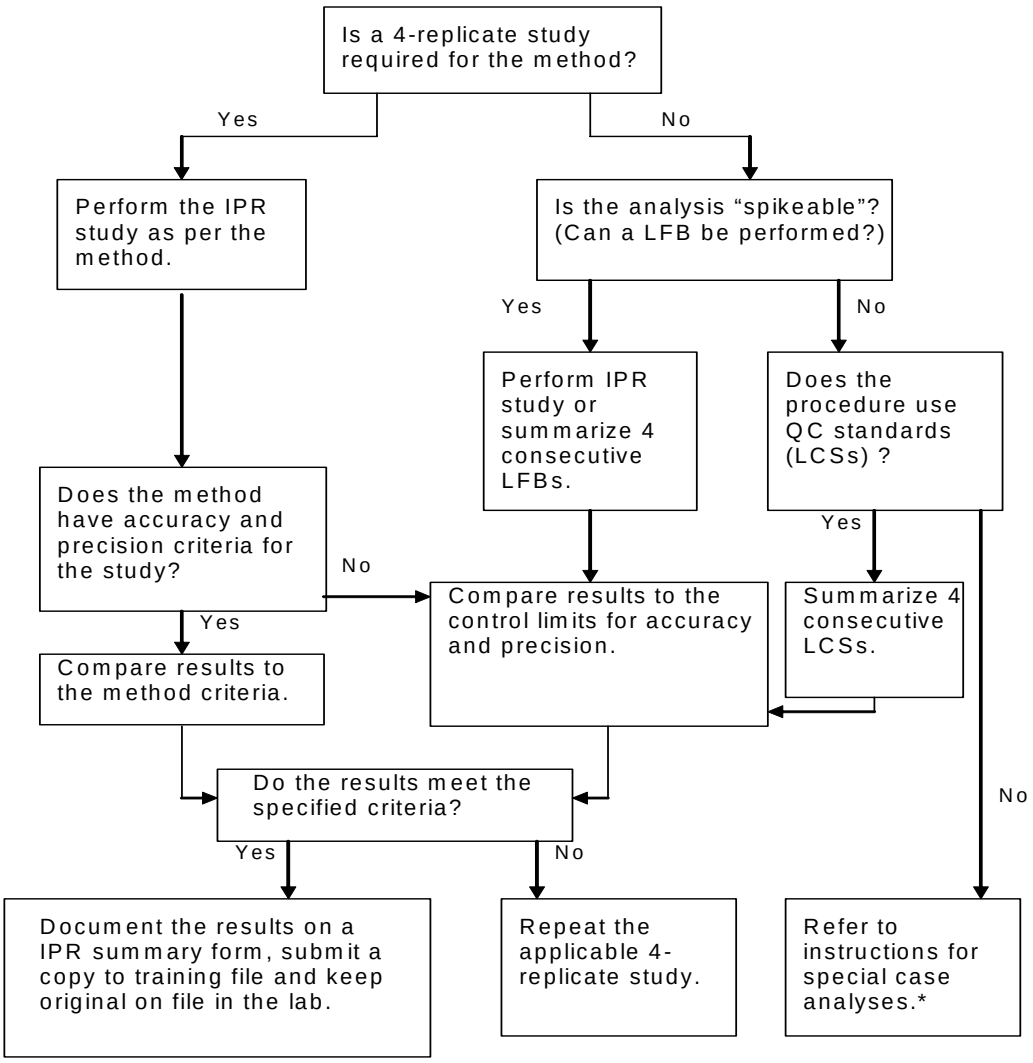
A periodic demonstration of proficiency is required to maintain continuing qualification. Continuing Demonstration of Proficiency is required each year, and may be performed one of the following ways:

- Successful performance on external (independent) single-blind sample analyses using the test method, or a similar test method using the same technology. I.e. PT sample or QC sample blind to the analyst.
- Performing Initial Demonstration of Capability as described above, with acceptable levels of precision and accuracy.
- Analysis of at least 4 consecutive LCSs with acceptable levels of accuracy and precision from in-control analytical batches.
- If the above cannot be performed, analysis of authentic samples with results statistically indistinguishable from those obtained by another trained analyst.
- For methods for which PT samples are not available and a spiked analysis (LFB, MDL, etc.) is not possible, analysis of field samples that have been analyzed by another analyst with statistically indistinguishable results.

20.3 Documentation of Training

Records are maintained to indicate the employee has the necessary training, education, and experience to perform their functions. Information of previously acquired skills and abilities for a new employee is maintained in Human Resources personnel files and ALS Environmental resumes. QA maintains a database to record the various technical skills and training acquired while employed by ALS Environmental. Information includes the employee's name, a description of the skill including the appropriate method and SOP reference, the mechanism used to document proficiency, and the date the training was completed. General procedures for documenting technical training are described in the *SOP for Training Policy*.

Figure 20-1
Initial Demonstration of Capability Requirements[a]



[a] For IDOC IPR or LFB studies, "second-source" reference materials are used, as per TNI/NELAP requirements
* Refer to the SOP for Training Policy for details. References for Quality Systems, External Documents, Manuals, Standards, and Analytical Procedures

21) Reporting of Results

ALS Environmental reports the analytical data produced in its laboratories to the client via the certified analytical report. This report includes a transmittal letter, a case narrative, client project information, specific test results, quality control data, chain of custody information, and any other project-specific support documentation. The following procedures describe our data reduction, validation and reporting procedures.

21.1 Data Reduction and Review

Results are generated by the analyst who performs the analysis and works up the data. All data is initially reviewed and processed by analysts using appropriate methods (e.g., chromatographic software, instrument printouts, hand calculation, etc.). Equations used for calculation of results are found in the applicable analytical SOPs. The resulting data set is either manually entered into an electronic report form or is electronically transferred into the report from the software used to process the original data set (e.g., chromatographic software). The data is then reviewed by the analyst for accuracy. Once the primary analyst has checked the data for accuracy and acceptability, the supervisor or second qualified analyst reviews the data for errors. Where calculations are not performed using a validated software system, the reviewer rechecks a minimum of 10% of the calculations. When the entire data set has been found to be acceptable it is turned into the reporting department where final reports are generated and then validated by a Data Validation Coordinator. The hardcopy or electronic final report is physically or electronically signed by the project manager and the final report may be stored electronically or in hardcopy format. Test analysis data shall be kept in the appropriate service request folder. Data review and reporting procedures are described in the *SOP for Data Review and Reporting.*

Policies and procedures for manual editing of data are established. The analyst making the change must initial and date the edited data entry, without obliteration of the original entry. The policies and procedures are described in the *SOP for Making Entries onto Analytical Records*.

Policies and procedures for electronic manual integration of chromatographic data are established. The analyst performing the integration must document the integration change by printing both the "before" and "after" integrations and including them in the raw data records. The policies and procedures are described in the *SOP for Manual Integration Policy*.

21.2 Confirmation Analysis

21.2.1 Gas Chromatographic and Liquid Chromatographic Analyses

For gas chromatographic (GC) and liquid chromatographic (LC) analyses, all positive results are confirmed as required by the method, typically by a second column, a second detector, a second wavelength (HPLC/UV), or by GC/MS analysis, unless exempted by one of the following situations:

- The analyte of interest produces a chromatogram containing multiple peaks exhibiting a characteristic pattern, which matches appropriate standards. This is limited to petroleum hydrocarbon analyses (e.g., gasoline and diesel).
- The sample meets all of the following requirements:
    1. All samples (liquid or solid) come from the same source (e.g., groundwater samples from the same well) for continuous monitoring. Samples of the same matrix from the same site, but from different sources (e.g., different sampling locations) are not exempt.

2. All analytes have been previously analyzed in sample(s) from the same source, identified and confirmed by a second column or by GC/MS. The chromatogram is largely unchanged from the one for which confirmation was carried out. The documents indicating previous confirmation must be available for review.

21.2.2 Confirmation Data

Confirmation data will be provided as specified in the method. Identification criteria for GC, LC or GC/MS methods are summarized below:

- GC and LC Methods
  1. The analyte must fall within plus or minus three times the standard deviation (established for the analyte/column) of the retention time of the daily midpoint standard in order to be qualitatively identified. The retention-time windows will be established and documented, as specified in the appropriate Standard Operating Procedure (SOP).
  2. When sample results are confirmed by two dissimilar columns or detectors, the agreement between quantitative results must be evaluated. The relative percent difference between the two results is calculated and evaluated against SOP and/or method criteria.
- GC/MS Methods - Two criteria are used to verify identification:
  1. Elution of the analyte in the sample will occur at the same relative retention time (RRT) as that of the analyte in the standard.
  2. The mass spectrum of the analyte in the sample must, in the opinion of a qualified analyst or the department manager, correspond to the spectrum of the analyte in the standard or the current GC/MS reference library.

21.3 Data Review and Validation of Results

The integrity of the data generated is assessed through the evaluation of the sample results, calibrations, and QC samples (method blanks, laboratory control samples, sample duplicates, matrix spikes, trip blanks, etc.). A brief description of the evaluation of these analyses is described below, with details listed in applicable SOPs. The criteria for evaluation of QC samples are listed within each method-specific SOP. Other data evaluation measures may include (as necessary) a check of the accuracy check of the QC standards and a check of the system sensitivity. Data transcriptions and calculations are also reviewed.

Note: Within the scope of this document, all possible data assessment requirements for various project protocols cannot be included in the listing below. This listing gives a general description of data evaluation practices used in the laboratory in compliance with NELAP Quality Systems requirements. Additional requirements exist for certain programs, such as projects under the DoD QSM protocols, and project-specific QAPPs.

- Method Calibration – Following the analysis of calibration blanks and standards according to the applicable SOP the calibration correlation coefficient, average response factor, etc. is calculated and compared to specified criteria. If the calibration meets criteria analysis may continue. If the calibration fails, any problems are isolated and corrected and the calibration standards reanalyzed. Following calibration and analysis of the independent calibration verification standard(s) the percent difference for the ICV is calculated. If the percent difference

is within the specified limits the calibration is complete. If not, the problem associated with the calibration and/or ICV are isolated and corrected and verification and/or calibration is repeated.

- Continuing Calibration Verification (CCV) – Following the analysis of the CCV standard the percent difference is calculated and compared to specified criteria. If the CCV meets the criteria analysis may continue. If the CCV fails, routine corrective action is performed and documented and a 2nd CCV is analyzed. If this CCV meets criteria, analysis may continue, including any reanalysis of samples that were associated with a failing CCV. If the routine corrective action failed to produce an immediate CCV within criteria, then either acceptable performance is demonstrated (after additional corrective action) with two consecutive calibration verifications or a new initial calibration is performed.
- Method Blank – Results for the method blank are calculated as performed for samples. If results are less than the MRL (<½ MRL for DoD projects), the blank may be reported. If not, associated sample results are evaluated to determine the impact of the blank result. If possible, the source of the contamination is determined. If the contamination has affected sample results the blank and samples are reanalyzed. If positive blank results are reported, the blank (and sample) results are flagged with an appropriate flag, qualifier, or footnote.
- Sample Results (Inorganic) – Following sample analysis and calculations (including any dilutions made due to the sample matrix) the result is verified to fall within the calibration range. If not, the sample is diluted and analyzed to bring the result into calibration range. When sample and sample duplicates are analyzed for precision, the calculated RPD is compared to the specified limits.

  The sample and duplicate are reanalyzed if the criteria are exceeded. The samples may require re-preparation and reanalysis. Results are reported when within the calibration range, or as estimates when outside the calibration range. When dilutions are performed the MRL is elevated accordingly.
- Sample Results (Organic) – For GC/MS analyses, it is verified that the analysis was within the prescribed tune window. If not, the sample is reanalyzed. Following sample analysis and calculations (including any dilutions made due to the sample matrix) peak integrations, retention times, and spectra are evaluated to confirm qualitative identification. Internal standard responses and surrogate recoveries are evaluated against specified criteria. If internal standard response does not meet criteria, the sample is diluted and reanalyzed. Results outside of the calibration range are diluted to within the calibration range. When dilutions are performed the MRL is elevated accordingly.
- Surrogate Results (Organic) – The percent recovery of each surrogate is compared to specified control limits. If recoveries are acceptable, the results are reported. If recoveries do not fall within control limits, the sample matrix is evaluated. When matrix interferences are present or documented, the results are reported with a qualifier that matrix interferences are present.

  If no matrix interferences are present and there is no cause for the outlier, the sample is reanalyzed. However, if the recovery is above the upper control limit with non-detected target analytes, the sample may be reported. All surrogate recovery outliers are appropriately qualified on the report.
- Duplicate Sample and/or Duplicate Matrix Spike Results – The RPD is calculated and compared to the specified control limits. If the RPD is within the control limits the

result is reported. If not, an evaluation of the sample is made to verify that a homogenous sample was used and the results are compared to the MRL. The samples and duplicates are reanalyzed and if re-analysis also produces out-of-control results, the results are reported with an appropriate qualifier.

- Laboratory Control Sample Results – Following analysis of the LCS the percent recovery is calculated and compared to specified control limits. If the recovery is within control limits, the analysis is in control and results may be reported. If not, this indicates that the analysis is not in control. Samples associated with the 'out of control' LCS, shall be considered suspect and the samples reanalyzed or the data reported with the appropriate qualifiers.
- Matrix Spike Results – Following analysis of the MS the percent recovery is calculated and compared to specified control limits. If the recovery is within control limits the results may be reported. If not, and the LCS is within control limits, this indicates that the matrix potentially biases analyte recovery. It is verified that the spike level is at least five times the background level. If not, the results are reported with a qualifier that the background level is too high for accurate recovery determination. If matrix interferences are present or results indicate a potential problem with sample preparation, steps may be taken to improve results; such as dilution and reanalysis, or re-preparation and reanalysis. Results that do not meet acceptance limits are reported with an appropriate qualifier.

21.4 Data Reporting

When an analyst determines that a data package has met the data quality objectives (and/or any client-specific data quality objectives) of the method and has qualified any anomalies in a clear, acceptable fashion, the data package will undergo a peer review by a trained chemist. Prior to release of the report to the client, the Project Manager reviews and approves the entire report for completeness and to ensure that any and all client-specified objectives were successfully achieved. The original raw test data, along with a copy of the final report, is retained by service request number for archival purposes. ALS Environmental maintains control of analytical results by adhering to standard operating procedures and by observing sample custody requirements. All data is calculated and reported in units consistent with project specifications, to enable easy comparison of data from report to report.

To the extent possible, samples shall be reported only if all QC measures are acceptable. If a QC measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s). The *SOP for Data Review and Reporting* addresses the flagging and qualification of data. The ALS Environmental-defined data qualifiers, state-specific data qualifiers, or project-defined data qualifiers are used depending on project requirements. A case narrative may be written by the analyst or project manager to explain problems with a specific analysis or sample, etc.

For subcontracted analyses, the Project Manager verifies that the report received from the subcontractor is complete. This includes checking that the correct analyses were performed, the analyses were performed for each sample as requested, a report is provided for each analysis, and the report is signed. The Project Manager accepts the report if all verification items are complete. Acceptance is demonstrated by forwarding the report to the ALS Environmental client.

21.5 Deliverables

In order to meet individual project needs, ALS Environmental provides several levels of analytical reports. Standard specifications for each level of deliverable are described in Table 21-1. Variations may be provided based on client or project specifications.

When requested, ALS Environmental provides Electronic Data Deliverables (EDDs) in the format specified by client need or project specification. ALS Environmental is capable of generating EDDs with many different formats and specifications. The EDD is prepared by report production staff using the electronic version of the laboratory report to minimize transcription errors. User guides and EDD specification outlines are used in preparing the EDD. The EDD is reviewed and compared to the final report for accuracy.

Table 21-1
Descriptions of ALS Environmental Standard Data Deliverables

Tier I. Routine Certified Analytical Report includes the following:

1. Transmittal letter
2. Chain of custody documents and sample/cooler receipt documentation
3. Sample analytical results
4. Method blank results
5. Surrogate recovery results and acceptance criteria for applicable organic methods
6. Dates of sample preparation and analysis for all tests
7. Case narrative - optional

Tier II. In addition to the Tier I Deliverables, this includes the following:

1. Matrix spike result(s) with calculated recovery and including associated acceptance criteria
2. Duplicate or duplicate matrix spike result(s) (as appropriate to method), with calculated relative percent difference
3. Laboratory Control Sample result(s) with calculated recovery and including associated acceptance criteria
4. Case narrative - optional

Tier III. Data Validation Package. In addition to the Tier II Deliverables, this includes the following:

1. Case narrative - required
2. Summary forms for all associated QC and Calibration parameters, with associated control criteria/acceptance limits

Note: Other summary forms specified in QAPPs or project/program protocols, or those related to specialized analyses will be included.

Tier IV. Full Data Validation Package:

1. All raw data associated with the sample analysis, including but not limited to:
   a. Preparation and analysis bench sheets and instrument printouts,
   b. For organics analyses, all applicable chromatograms, spectral, confirmation, and manual integration raw data. For GC/MS this includes tuning results, mass spectra of all positive hits, and the results and spectra of TIC compounds when requested.
   c. QC data,
   d. Calibration data (initial, verification, continuing, etc),
   e. Calibration blanks or instrument blanks (as appropriate to method).
2. If a project QAPP or program protocol applies, the report will be presented as required by the QAPP.

22) Summary of Changes and Document History

Revision Number	Effective Date	Document Editor	Description of Changes
33	11/03/18	C. Arend	Cover page – removed obsolete fax number
			Document control page – updated approval names
			Removed references to SOP IDs throughout document
			Section 1 – last paragraph – included 2016 TNI Standard and ISO/IEC 17025:2017
			Section 3.1 – second paragraph – included 2016 TNI Standard and ISO/IEC 17025:2017
			Section 3.2 – included ISO/IEC 17025:2017
			Section 3.3 - new
			Section 3.4 - new
			Section 3.5 – new; renumbered following sections
			Section 3.10 – last sentence of section removed
			Section 3.11 – changed "resumes of key personnel" to "resumes of key local level personnel"; removed second bullet; included ISO/IEC 17025:2017 under applicable sections; under deputies section – minor revision to align with positions held in laboratory; under Environmental Health and Safety Coordinators – minor wording revision; added "Media Preparation Department" under "Samples Management"
			Table 3-1 - updated
			Section 11.8 – removed reference to obsolete SOP and included "Simi Valley Lab Waste Management Plan"
			Section 12.3 – removed "digestion" from #8
			Section 12.6 – updated and included MUR
			Section 13 – added ISO/IEC 17025:2017
			Section 13.1 – included "quarterly if digital" to thermometer verifications; added ISO/IEC 17025:2017
			Section 13.3 – added ISO/IEC 17025:2017
			Section 13.5 – added ISO/IEC 17025:2017; updated example vendors
			Section 16 – first paragraph – added second sentence
			Section 18.2 – updated last paragraph to align with current procedure
			Section 20 – second paragraph – added "other safety related documents as applicable"; last paragraph – removed last sentence
			Section 23 – updated references
			Appendix B – updated organization charts; updated resumes
			Appendix E – updated equipment list

Appendix F – removed method no longer performed (Hydrogen Sulfide in Air)
Appendix G – updated SOP lists
Appendix I – updated controlled documents table; updated approved signatories
Appendix J – updated laboratory accreditations and certifications

23) References for Quality System Standards, External Documents, Manuals, and Test Procedures

The analytical methods used at ALS Environmental generally depend upon the end-use of the data. Since most of our work involves the analysis of environmental samples for regulatory purposes, specified federal and/or state testing methodologies are used and followed closely. Typical methods used at ALS Environmental are taken from the references listed below. Additional QA program documents are listed in Appendix I.

- 2009 and 2016 TNI Standards.
- American National Standard *General requirements for the competence of testing and calibration laboratories,* ISO/IEC 17025:2005(E) & ISO/IEC 17025:2017(E).
- *DoD Quality Systems Manual for Environmental Laboratories,* Version 5.1, 2017; and Version 5.1.1, 2018.
- Naval Sea Systems Command Laboratory Accreditation Program (LAP): S0005-AC-TED-010, Revision 3, July 31, 2013.
- 3M Organic Vapor Monitor Sampling and Analysis Guide, *Organic Vapor Monitors 3500/3510 and Organic Vapor Monitors 3520/3530*, Technical Bulletin 1028, January 1, 2004.
- 40 CFR Part 60, Test Methods for Standards of Performance for New Stationary Sources, Appendix A.
- 40 CFR Part 63, Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, Appendix A.
- 40 CFR Part 63, National Emission Standards for Hazardous Air Pollutants for Source Categories, Subchapter C.
- 40 CFR Part 136, Appendix B, Definition and Procedure for the Determination of the Method Detection Limit, Revision 2.
- American Society for Testing and Materials (ASTM), Gaseous Fuel, Coal and Coke, Volume 05.06, September 2006.
- American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Philadelphia, PA.
- Arizona Administrative Code, *Department of Health Services – Laboratories*, Title 9, Ch. 14, Article 6. *Licensing of Environmental Laboratories*, R9-14-601 through R9-14-621, October 1, 2016.
- California Environmental Protection Agency Air Resources Board, *Methods for Determining Emissions of Toxic Air Contaminants from Stationary Sources*, Volume 3, July 28, 1997.

- California Code of Regulations (CCR), Title 22, Chapter 11 *Identification and Listing of Hazardous Waste*, 7/20/05.
- Minnesota Administrative Rules, *Department of Health*, Chapter 4740, Laboratories; Accreditation Requirements.
- *Good Automated Laboratory Practices, Principles and Guidance to Regulations For Ensuring Data Integrity In Automated Laboratory Operations*, EPA 2185 (August 1995).
- Environmental Protection Agency, Methods Update Rule (MUR), Guidelines for Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Analysis and Sampling Procedures; 40 CFR Parts 122, 136, 143, 430, 455 & 465; Final Rule 3/12/07, Effective April 11, 2007.
- Environmental Protection Agency, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, Third Edition, 1986 and Updates I (7/92), II (9/94), III (12/96), IIIA (4/98), IIIB (11/04), IVA & IVB. See Chapters 1, 2, 3, 4, 5, 6, and 8.
- Environmental Protection Agency, *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, 1983.
- Environmental Protection Agency, *Methods for the Determination of Inorganic Substances in Environmental Samples,* EPA 600/R-93-100, August 1993.
- Environmental Protection Agency, *EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Edition, EPA/625/R-96-010b, January 1999.
- Environmental Protection Agency, *EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Edition Addendum, October 4, 2000.
- National Institute for Occupational Safety and Health (NIOSH) *Manual of Analytical Methods*, Third Edition (August 1987); Fourth Edition (August 1994); 1st Supplement Publication 96-135, 2nd Supplement Publication 98-119, 3rd Supplement 2003-154
- National Council for Air and Stream Improvement, Inc. (NCASI). 2007. *Appendix E - Technical Bulletin Cross Reference Guide for NCASI Methods.* Methods Manual (05).
- *SKC 575 Series Passive Sampler Rate/Selection Guide,* Form #37021, Rev 0012.
- *Standard Methods for the Examination of Water and Wastewater*, 20th Edition (1998).
- South Coast Air Quality Management District, *Laboratory Methods of Analysis for Enforcement Samples.*
- U.S. Department of Labor, Occupational Safety and Health Administration *OSHA Analytical Methods Manual.*

APPENDIX A – Glossary

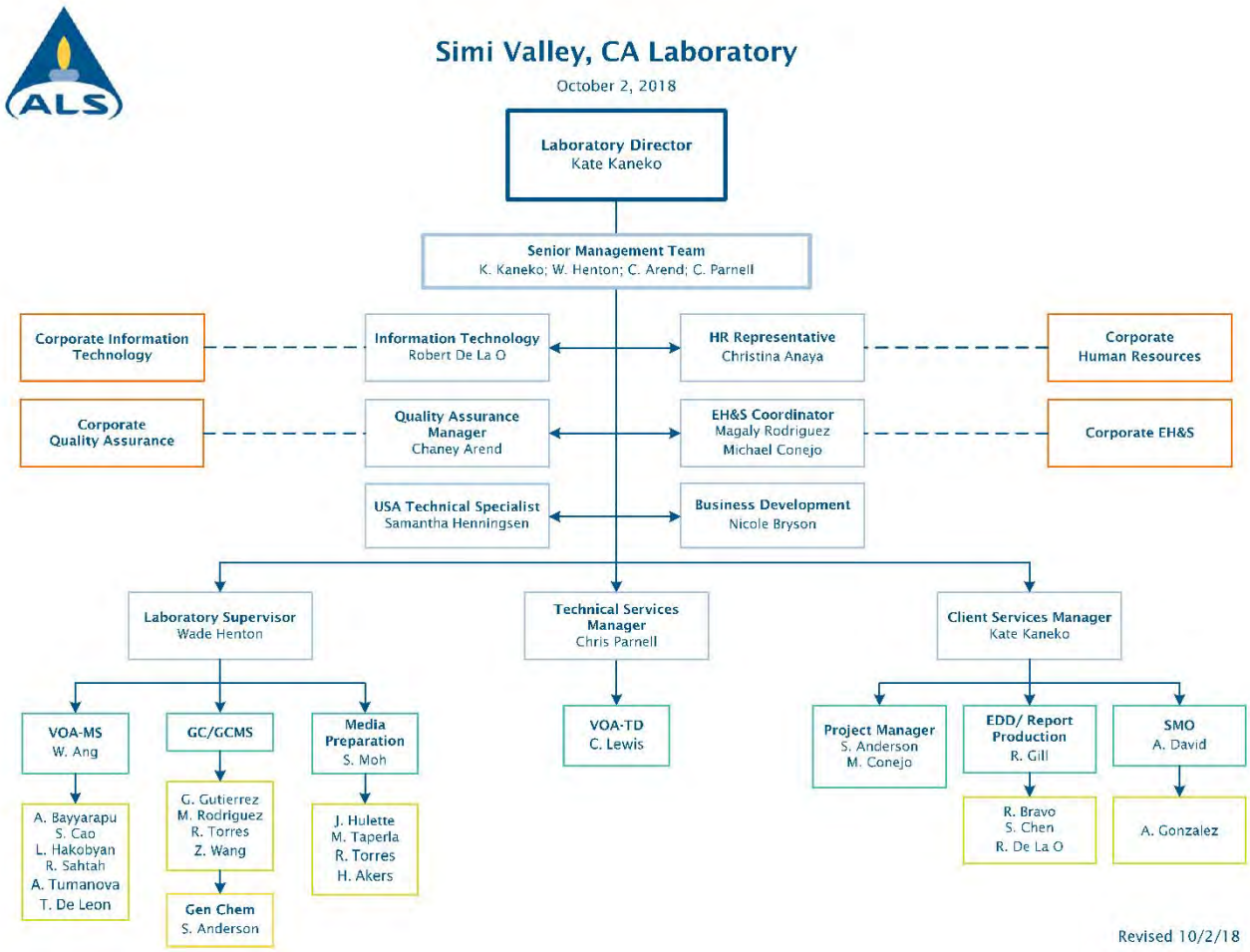
Acronym	Definition
AB	Accrediting Body
ACS	American Chemical Society
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
BFB	4-Bromofluorobenzene
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service Registry Number
CCB	Continuing Calibration Blank sample
CCC	Continuing Calibration Check sample
CCV	Continuing Calibration Verification sample
CDC	Ongoing Demonstration of Capability
CLP	Contract Laboratory Program (through USEPA)
COC	Chain-of-Custody
DCM	Dichloromethane (aka Methylene Chloride)
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOC	Demonstration of Capability
DOE	Department of Ecology (state or federal)
DOH	Department of Health
EPA	U.S. Environmental Protection Agency (aka USEPA)
EPCRA	Emergency Planning & Community Right-to-Know Act
ERA	Environmental Resource Associates
ELAP	Environmental Laboratory Accreditation Program
FID	Flame Ionization Detector
FIFRA	Federal Insecticide, Fungicide & Rodenticide Act
FR	Federal Register
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
HP	Hewlett-Packard (mfg. GC instruments)

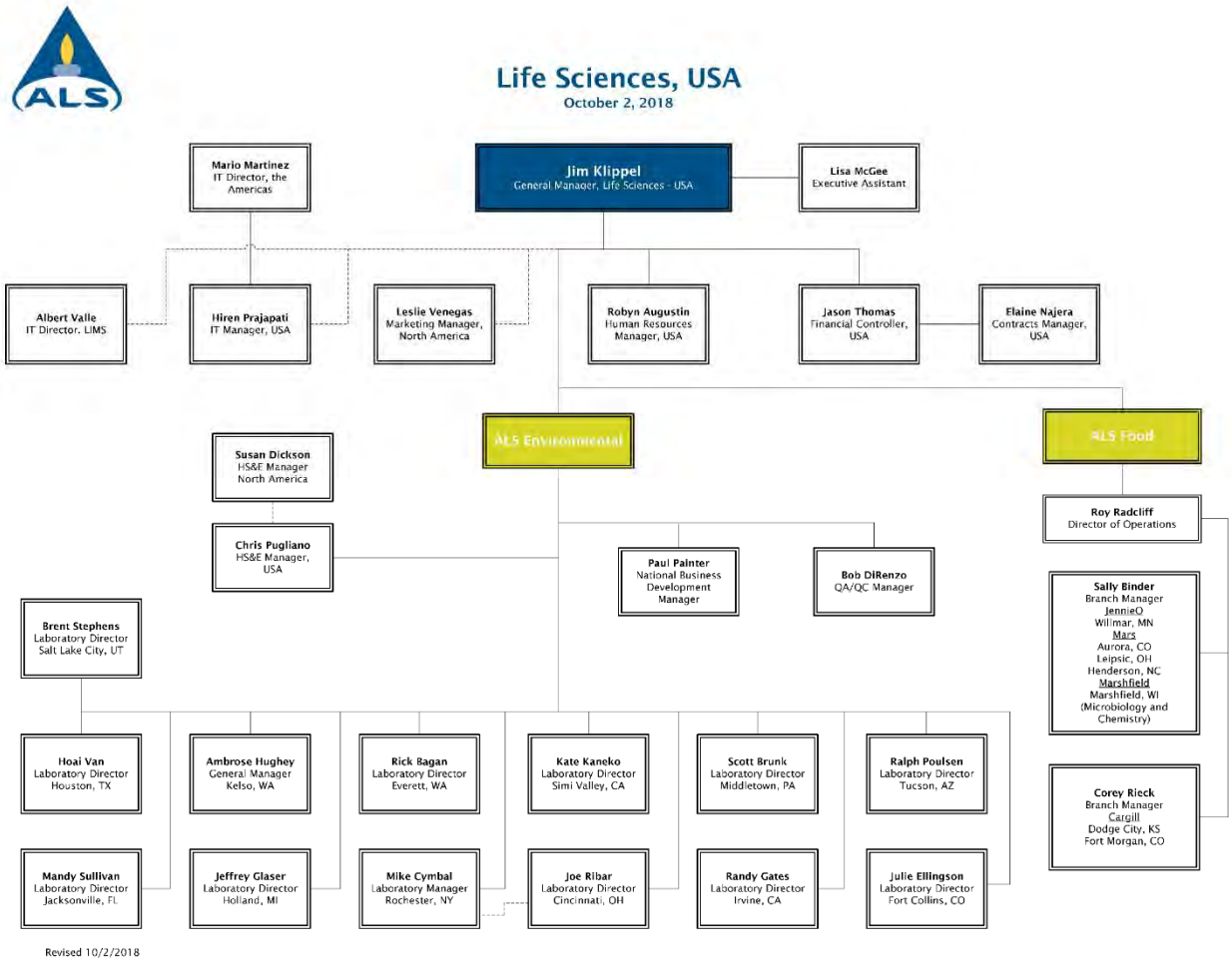
HPLC	High Performance Liquid Chromatography
IC	Ion Chromatography
ICAL	Initial Calibration
ICB	Initial Calibration Blank sample
IDC	Initial Demonstration of Capability
ICV	Initial Calibration Verification sample
IFB	Invitation for Bid
ISO/IEC	International Organization for Standardization/International Electrochemical Commission
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System
LUFT	Leaking Underground Fuel Tank
MB	Method Blank
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
NAS	National Academy of Sciences
NELAP	National Environmental Laboratory Accreditation Program
NCASI	National Council for Air and Stream Improvement (for the Paper Industry)
NCI	National Cancer Institute
ND	Not Detected
NIH	National Institute of Health
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NPD	Nitrogen Phosphorus Detector
NPDES	National Pollutant Discharge Elimination System
NSF	National Science Foundation
NTIS	National Technical Information System
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated Biphenyls
PE	Performance Evaluation sample
PID	Photoionization Detector

PQL	Practical Quantitation Limit
PT	Proficiency Test
QA	Quality Assurance
QAM	Quality Assurance Manual
QC	Quality Control
RAS	Routine Analytical Services (Contracts through USEPA)
RCRA	Resource Conservation and Recovery Act
RFP	Requests for Proposal
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SAS	Special Analytical Services (contracts through USEPA)
SIE	Selective Ion Electrode
SIM	Selected Ion Monitoring
SMO	Sample Management Office (aka Sample Receiving)
SOC	Semi-Volatile Organic Compounds
SOP	Standard Operating Procedure
SOQ	Statement of Qualifications
SOW	Statement of Work
SVOAs	Semi-Volatile Organic Analytes
SVOCs	Semi-Volatile Organic Compounds
SW-846	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
TNI	The NELAC Institute
TPH	Total Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
UST	Underground Storage Tank
UV	Ultraviolet Spectrophotometer
VOA	Volatile Organic Analyte
VOC	Volatile Organic Compounds
WP	Water Pollution
WS	Water Supply

Units	Definition
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
mg/m3	Milligrams per Cubic Meter
ng/L	Nanograms per Liter
ppb	Parts Per Billion
ppbV	Parts Per Billion Volume
ppm	Parts Per Million
ppmV	Parts Per Million Volume
ug/L	Micrograms per Liter
ug/m3	Micrograms per Cubic Meter

APPENDIX B – Organization Charts and Key Personnel Qualifications





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SUSAN 'SUE' ANDERSON

Project Manager, 2011 – Present
Simi Valley Laboratory

Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the clients' needs.

PREVIOUS EXPERIENCE

Project Manager/General Chemistry Technical Manager
2006 – 2011
Columbia Analytical Services, Inc., Simi Valley, CA

Technical Manager responsibilities include training of general chemistry staff, maintenance of MDL studies and standard operating procedures, data evaluation and reporting. Project Manager responsibilities same as listed above.

Project Manager/General Chemistry Technical Manager
2002 – 2006
Project Manager II, 2000 – 2002
Columbia Analytical Services, Inc., Canoga Park, CA

In addition to the Project Manager duties listed above, also responsible for the management of General Chemistry laboratory operations, including the financial aspects. This includes supervision and coordination of work load and training personnel as necessary as well as supervision of method development and certification, maintenance of MDL studies and SOPs, data evaluation and report responsibility. Other duties include participation in the formulation of project strategy and meetings involving major technical issues, working with regional senior management in short and long-range planning, and other duties as assigned.

Scientist I-III, 1992 – 2000
Columbia Analytical Services, Inc., Canoga Park, CA

Responsible for performing inorganic analyses such as: alkalinity, ammonia, BOD, COD, cyanide, sulfide, reactivity, fluoride, pH, hardness, hexavalent chromium, phenols, surfactants, total-dissolved-suspended solid, conductivity, turbidity, nitrate, chloride by titration, turbidimetric sulfate, color, odor, organic lead, residual chlorine, settleable solids, specific gravity, carbon dioxide, TCLP/STLC metals and semi-volatile extraction. Also perform analyses for TRPH and oil and grease and occasionally perform metals digestion. Also ran the Graphite furnace for all furnace metals and was responsible for standard prep and maintenance.

Wet Chemistry, 1990 – 1991
National Environmental Testing, Bartlett, IL

Responsible for the analyses for wastewater parameters and some inorganic analytes.

EDUCATION

University of Illinois – Urbana-Champaign, IL
BS, Biochemistry
1989

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WIDAYATI 'WIDA' ANG

Volatiles GC/MS Team Leader, 2011 – Present
Simi Valley Laboratory

Team leader for the Volatile Gas Chromatography Mass Spectrometry Air group responsibilities include but are not limited to training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review and streamlining of methods. Duties also require performance reviews and development of direct reports.

PREVIOUS EXPERIENCE

Volatile GC/MS Team Leader, 2008 – 2011
Columbia Analytical Services, Inc., Simi Valley, CA

Responsibilities same as listed above.

GC/MS Chemist, 2007 – 2008
Columbia Analytical Services, Inc., Simi Valley, CA

Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements.

Technical Manager, Organic Chemistry, 1999 – 2007
Columbia Analytical Services, Inc., Canoga Park, CA

Responsible for managing the organics department with regards to State and Federal regulatory requirements. Supervises and coordinates work load and trained personnel. Supervised method development and certification, as well as method troubleshooting and instrument maintenance. Responsible for mobile laboratory operations.

Data validator, 1998 – 1999
Laboratory Data Consultants, Inc., Carlsbad, CA

Responsible for retrieving analytical data from closed down laboratory operations, review and validation of data packages. Supervised other employees for data package assembly.

Assistant QC Manager and Data Package Specialist, 1996 – 1998
VOC Laboratories, Inc., Glendale, CA

Managed production of data packages to meet various State and Federal analytical programs as well as customized client formats. Oversaw enforcement of the laboratory for implementation of corrective action measures. Interacted with chemists and project managers to ensure accuracy and completeness of data deliverables.

Technical Director/Department Manager, 1992 – 1996
Department Supervisor and Chemist, 1988 – 1992
Thermo Analytical, Monrovia, CA

Responsible for daily operations of the organic chemistry department. Developed SOPs for various methods. Reviewed data generated for completeness and contractual requirements according to Contract Laboratory Program (CLP) and SW-846 methods. Responsible for upgrading and purchasing new instrumentation. Provided technical support and assisted with proposal preparation and audits. Trained chemists and technicians on analytical methods. Responsible for sample analysis of water, soil, and air for volatile organics by GC and GC/MS. Assisted chemists with analysis and interpretation of pesticides and PCBs.

Analytical Chemist, 1986 – 1988
Shankman Laboratories, Los Angeles, CA

Prepared and analyzed soil and water samples using GC, GC/MS, HPLC, IR, IC and UV spectrophotometric techniques.

EDUCATION

Technical University of West Berlin – West Berlin, Germany
MS, Chemistry
1984

Technical University of West Berlin – West Berlin, Germany
BS, Chemistry
1982

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MICHAEL 'MIKE' CONEJO

Project Manager and Environmental Health and Safety Coordinator
2018 - Present
Simi Valley Laboratory

Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the clients' needs. As Environmental Health and Safety Coordinator, is responsible for the implementation of the Environmental Health and Safety program of ALS North America to this facility. Duties include accident investigation and incident review, maintenance of all safety-related equipment and documents, and performing safety audits and reporting results to management.

PREVIOUS EXPERIENCE

Volatile (GC) Team Leader and Environmental Health and Safety Coordinator, 2016 – 2018
ALS Group USA, Corp.
Simi Valley, CA

Volatiles (GC) Team Leader responsibilities included but not limited to training and mentoring of junior analysts, standard operating procedure review, and streamlining of methods. Additional responsibilities listed under GC Chemist below. Environmental Health and Safety Coordinator responsibilities listed above.

GC Chemist, 2011 – 2016
ALS Group USA, Corp.
Simi Valley, CA

Analysis of vapor phase and liquid samples for various volatile compounds, performed maintenance on instruments when required, real time data reduction, participation in peer review process, maintained working knowledge of all GC methods performed in department, and good practice of all QA/QC requirements.

Technician, 2011
Columbia Analytical Services, Inc.
Simi Valley, CA

Responsibilities included canister conditioning and preparation, fulfillment of media requests and shipping samples. Additional responsibilities included training within the department of flow controller and critical orifice calibration and checks.

EDUCATION

University of California – Santa Barbara, CA
BA, Sociology
2010

College of the Canyons – Santa Clarita, CA
Coursework, Chemistry
2012

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ROBERT DE LA O

Systems Analyst / Information Technology, 2011 – Present
Simi Valley Laboratory

Responsible for generating reports, automating routine work and maintaining databases, electronic data archiving, e-mail functions. Also responsible for client spreadsheets and disk deliverables and computer maintenance/upgrades, generation and submission of client electronic data deliverables. Additional responsibilities where necessary include maintaining local laboratory network systems. Performing necessary systems maintenance, upgrades, and replacements to provide reliable network operations for the acquisition and reporting of analytical data. Assist local lab personnel with IT needs and troubleshoot hardware and software problems when they occur. Manage electronic data archiving/restoration operations. Assist Corporate IT with integration of WAN projects and applications into local operations.

PREVIOUS EXPERIENCE

Systems Analyst / Information Technology, 1995 – 2011
Columbia Analytical Services, Inc.
Simi Valley, CA

Responsibilities same as listed above.

Administrator III, 1994 – 1995
Columbia Analytical Services, Inc. (dba Performance Analytical, Inc.)
Los Angeles, CA

Responsible for logging samples in, generating reports, and invoicing. Shipping and Receiving.

Administrator III, 1990 – 1994
Performance Analytical, Inc.
Canoga Park, CA

Responsibilities same as listed above.

Assistant Manager, 1990
May Company
North Hollywood, CA

Responsibilities included employee scheduling, inventory control and making sure items were well stocked and clearly priced.

Assistant Manager, 1985 – 1990
Sears Roebuck and Company
North Hollywood, CA

Supervised 10 departments (approximately 50 employees). Responsibilities included employee scheduling, hiring, customer service/complaints, and assisting with opening and closing the store daily.

EDUCATION

Moorpark College –
Moorpark, CA
Coursework, Computer Science
1999 – 2003

Los Angeles Valley College –
Van Nuys, CA
Coursework, Business and Computer Science
1990 – 1998

California State University –
Northridge, CA
Coursework, Business and Computer Science
1987 – 1990

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ROBIN GILL

Data Validation Coordinator and Team Leader, 2011 – Present
Simi Valley Laboratory

Team leader responsibilities are evaluation and approval of work shifts, vacation requests, training and mentoring new data validation team members, in addition to yearly performance reviews to evaluate job achievements. Data validation responsibilities are for data review and validation as well as data package compilation, job tracking, archiving and the production of laboratory reports. Interacts with project managers and Quality Assurance Manager to ensure that all reports fulfill client requirements as well as QA/QC needs. Also serves as a backup for case narrative generation and manages the turnaround times so that reports are distributed to the clients in a timely manner.

PREVIOUS EXPERIENCE

Data Validation Coordinator and Team Leader, 2002 – 2011
Columbia Analytical Services, Inc.
Simi Valley, CA

Responsibilities same as listed above.

Project Manager III, Quality Control Coordinator, 1994 – 2002
Columbia Analytical Services, Inc. (dba Performance Analytical, Inc.)
Los Angeles, CA

Responsibilities same as listed above.

Project Manager III, 1991 – 1994
Performance Analytical Services, Inc.
Canoga Park, CA

Primarily responsible for data review and validation as well as data package compilation. Also responsible for job tracking, archiving, and the production of laboratory reports.

Data Group Supervisor, 1980 – 1991
ABB Environmental
Camarillo, CA

Supervised five employees in the Data Group Department. Responsible for data review and validation, document control, data package compilation, job tracking and archiving, and the organization and prioritization of workload.

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WADE HENTON

Laboratory Supervisor/Volatiles (GC) and Semi-Volatiles Technical Manager, 2016 - Present
Simi Valley Laboratory

Laboratory Supervisor responsibilities include planning, directing, and coordinating the operations of the laboratory departments. Duties and responsibilities include formulating policies, managing daily operations, and planning the use of materials and human resources. Reviews performance data to measure productivity and goal achievement and to determine areas needing cost reduction and program improvement to increase efficiency.

Volatiles (GC) and Semi-Volatiles Technical Manager responsibilities include oversight of training of analysts, peer review of analytical data, mentoring of junior analysts, standard operating procedure review, and streamlining methods. Duties also require performance

PREVIOUS EXPERIENCE

Media Preparation Team Leader, 2015 – 2016
Volatiles (GC) Team Leader, 2011 - 2016
ALS Group USA, Corp., Simi Valley, CA

Media Preparation Team Leader responsibilities include waste disposal, canister conditioning and preparation, fulfillment of media requests, shipping, flow controller and critical orifice calibration and calibration checks. Additional responsibilities include coordination of canister maintenance and release and cleaning of canisters for field sampling, training within the department, and sample media inventory. Responsibilities for Volatiles (GC) Team Leader same as Volatiles (GC) Technical Manager responsibilities listed above.

Volatiles (GC) Team Leader, 2000 – 2011
Columbia Analytical Services, Inc., Simi Valley, CA

Responsibilities same as Volatiles (GC) Technical Manager responsibilities listed above.

Scientist V, 1995 – 2000; Scientist IV, 1994 – 1995
Columbia Analytical Services, Inc. (dba Performance Analytical, Inc.)
Los Angeles, CA

Responsibilities include analyzing indoor and ambient air, source emission, and industrial hygiene samples by GC and GC/MS methods.

Analytical Chemist, 1992 – 1994
Coast-to-Coast Analytical Services, Camarillo, CA

Responsibilities included analyzing samples using EPA methods 625, 525 and 1625 as well as developing new methods for GC/MS testing.

Analytical Chemist, 1991 – 1992
Coast-to-Coast Analytical Services, Goleta, CA

Responsibilities included analyzing samples using EPA methods 624 and 524.2 by GC/MS. Used GC/MS methods to perform fuel fingerprinting.

Analytical Chemist, 1986 – 1991
Combustion Engineering Environmental, Camarillo, CA

Responsibilities included method development for GC and HPLC. Analysis of samples using EPA methods 608, 615, 631, 632 and SW846. Other methods used include 8080, 8010, 8020, 8150 and 8030. Oversaw data integrity for the GC Laboratory instrument data network. Data review.

Chemist, 1986
Fortin Industries, Sylmar, CA

R&D and QA/QC on polymer products and metal coatings using differential scanning calorimeters, scanning electron microscope, AA, GC, and HPLC.

EDUCATION

University of California Santa Barbara – Santa Barbara, CA
BS, Chemistry
1985

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CHANEY K. AREND

Quality Assurance Manager, 2011 – Present
Simi Valley Laboratory

Responsibilities include facilitate ethics and QA training, maintain all training documentation, perform QA orientation for new employees, review data (both hardcopy and electronic), perform internal QA audits and prepare written reports, review, approve, and control Standard Operating Procedures, maintain QA Manual, maintain QA records (including archived logbooks, archived certificates of analysis, nonconformity and corrective action reports, MDL studies results, SOP revision and distribution, statistical control limits, PE sample results), serve as document control officer and PC for all PE sample analyses, prepare corrective action report for any unacceptable PE sample results, maintain laboratory's certifications and approvals, facilitator for external QA audits and prepare written response to deficiencies, prepare activity report to management.

PREVIOUS EXPERIENCE

Quality Assurance Manager, 2009 – 2011
Columbia Analytical Services, Inc.
Simi Valley, CA

Responsibilities same as listed above.

Data Validation Coordinator, 2007 – 2009
Columbia Analytical Services, Inc.
Simi Valley, CA

Responsibilities included validation of analytical results produced by the laboratory. Verification of client analytical requests, sample information, and reporting formats. Interacted with project managers and Quality Assurance Manager to ensure that all reports fulfilled client requirements as well as QA/QC needs. Compiled quality control summary and calibration data upon client request for data packages.

GC/MS Chemist, 2005 -2007
Columbia Analytical Services, Inc.
Simi Valley, CA

Analyzed indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, performed maintenance on instruments when required, real time data reduction, participated in peer review process, and good practice of all QA/QC requirements.

Analyst, 2004 -2005
Columbia Analytical Services, Inc.
Kelso, WA

Performed a variety of analytical tests within the General Chemistry laboratory according to EPA Methodologies including Ion Chromatography, total sulfur, and solids. Saturday crew member responsible for performance of all short hold time methods including microbiology methodologies.

EDUCATION

Oregon State University – Corvallis, OR
BS, Biology
2004

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KATHLEEN 'KATE' KANEKO

Laboratory Director, 2018 – Present
Client Services Manager/Project Manager, 2011 – Present
Simi Valley Laboratory

Primary responsibilities include management of all laboratory departments, scheduling, productivity, reporting and evaluation of analytical methodologies, project planning, budgeting, and Quality Assurance/Quality Control protocol oversight. Other responsibilities include conducting facility compliance reviews; providing departmental support for equipment purchases; resolving personnel issues; determining resource allocation; and providing supervision, training, and leadership to key laboratory staff. Client Services Manager/Project Manager responsibilities same as below.

PREVIOUS EXPERIENCE

Project Manager, 1997 – 2011
Columbia Analytical Services, Inc.
Simi Valley, CA

Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the client's needs.

GC/MS Analytical Chemist, 1994 – 1997
Columbia Analytical Services, Inc. (dba Performance Analytical, Inc.)
Los Angeles, CA

Analysis of air samples using EPA compendium methods TO-1, TO-2 and TO-14 using cryogenic concentration and thermal desorption techniques on whole air samples collected in summa canisters, Tedlar bags, and solid sorbent air samples. Proficient in the interpretation of mass spectra. Responsible for the preparation and quality control verification of solid sorbent sampling media for EPA Compendium methods IO-1 and IO-2.

GC/MS Analytical Chemist, 1992 – 1994
Performance Analytical, Inc.
Canoga Park, CA

Responsibilities same as listed above.

GC Analytical Chemist, 1989 – 1992
Performance Analytical, Inc.
Canoga Park, CA

Performed analyses of air samples for reduced sulfur compounds, hydrocarbon distribution and speciation, fixed atmospheric gases and total gaseous non-Methane organics. Performed analyses of soil and water samples for TPHg (mod. 8015) and BTEX. Performed extractions and analyses of CARB, NIOSH, OSHA and EPA 8000 series methods. Also performed metals analysis using flame and graphite furnace atomic absorption spectrophotometry (AA, GFAA).

EDUCATION

California State University – Northridge, CA
BA, Chemistry
1989

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CHRISTOPHER PARNELL

Volatiles (GC/MS) Technical Manager, 2016 – Present
Simi Valley Laboratory

Technical Manager for the Volatiles Gas Chromatography Mass Spectrometry department. Has the responsibility of oversight of training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review and streamlining of methods. Duties also require performance reviews and development of direct reports.

PREVIOUS EXPERIENCE

Operations Manager, 2012 – 2016 / Technical Advisor (VOA/GCMS) 2011 – 2016
ALS Group USA, Corp., Simi Valley, CA

Responsibilities: Technical Advisor for the Volatile Gas Chromatography Mass Spectrometry department. Has the responsibility of oversight of training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review and streamlining of methods. Duties also require performance reviews and development of direct reports.

Operations Managers responsibilities include planning, directing, and coordinating the operations of the laboratory departments. Duties and responsibilities include formulating policies, managing daily operations, and planning the use of materials and human resources. Reviews performance data to measure productivity and goal achievement and to determine areas needing cost reduction and program improvement to increase efficiency.

Technical Advisor (VOA GC/MS), 2008 – 2011
Columbia Analytical Services, Inc., Simi Valley, CA

Technical Advisor responsibilities listed above.

GC/MS Team Leader, 2000 – 2008
Columbia Analytical Services, Inc., Simi Valley, CA

Team leader for the Volatile Gas Chromatography Mass Spectrometry group. Responsibilities include training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review, and streamlining of methods. Duties also require performance reviews and development of direct reports.

Scientist VI, 1994 – 2000
Columbia Analytical Services, Inc. (dba Performance Analytical, Inc.), Los Angeles, CA

Responsibilities include analyzing indoor air, ambient air and source emission samples by GC/MS methods, standards preparation, perform maintenance on instruments when required, real time data reduction, participation in peer review process, and good practice of all QA/QC requirements.

Scientist VI, 1991 – 1994
Performance Analytical, Inc., Canoga Park, CA

Responsibilities listed above.

Air Toxics Laboratory Supervisor, 1990 – 1991
ABB Environmental, Camarillo, CA

Responsibilities included scheduling client analyses and developing methods for non-routine analyses, and operating the Air Toxics laboratory.

Analytical Chemist, 1987 – 1990
C-E Environmental Inc., EMSI, Camarillo, CA

Responsibilities included overseeing the Pesticide/PCB analysis of samples under the EPA CLP, and interfacing with the EPA and regional offices, and performing GC analyses and extractions.

Chemist, 1986 – 1987
Damon Reference Laboratory, Newbury Park, CA

Responsibilities included performing Enzyme-linked immunosorbent assays, Western-Blot assays, and Protein Electrophoresis.

EDUCATION

University of California Santa Barbara – Santa Barbara, CA
BS, Chemistry
1986

APPENDIX C – Ethics and Data Integrity Policy

ETHICS AND DATA INTEGRITY AGREEMENT

I state that I understand the high standards of integrity required of me with regard to the duties I perform and the data I report in connection with my employment at ALS.

I agree that in the performance of my duties at ALS:

1. I shall not intentionally report data values that are not the actual values obtained;
2. I shall not intentionally report the dates, times and method citations of data analyses that are not the actual dates, times and method citations of analyses;
3. I shall not intentionally represent another individual's work as my own;
4. I shall not intentionally report data values that do not meet established quality control criteria as set forth in the Method and/or Standard Operating Procedures, or as defined by company policy.
5. I agree to inform ALS of any accidental or intentional reporting of non-authentic data by other employees.
6. I have read this ethics and data integrity agreement and understand that failure to comply with the conditions stated above will result in disciplinary action, up to and including termination.
7. I agree to adhere to the following protocols and principals of ethical conduct in my work at ALS. All work assigned to me will be performed using ALS approved methods and procedures and in compliance with the quality assurance protocols defined in the ALS Quality System.
8. I will not intentionally falsify nor improperly manipulate any sample or QC data in any manner. Furthermore, I will not modify data values unless the modification can be technically justified through a measurable analytical process or method acceptable to ALS. All such modifications and their justification will be clearly and thoroughly documented in the raw data and appropriate laboratory record, and will include my initials or signature and the date.
9. I will not make false statements to, or seek to otherwise deceive ALS staff, managers or clients. I will not knowingly, through acts of commission, omission, erasure or destruction, improperly report any test results or conclusions, be they for client samples, QC samples, or standards.
10. I will not condone any accidental or intentional reporting of unauthentic data by other ALS staff and will immediately report such occurrences to my Supervisor, Lab Director, Quality Assurance Manager, or Human Resources. I understand that failure to report such occurrences may subject me to immediate discipline, including termination.
11. If a supervisor, manager, director or other member of the ALS leadership group requests me to engage in or perform an activity that I feel is compromising data validity or defensibility, I have the right to not comply with the request. I also have the right to appeal this action through an ALS local Quality Staff, Corporate Quality Assurance or Human Resources.
12. I understand that if my job includes supervisory responsibilities, I will not instruct, request or direct any subordinate to perform any unethical or non-defensible laboratory practice. Nor will I discourage, intimidate or inhibit a staff member who may choose to appropriately appeal my supervisory instruction, request or directive that may be perceived to be improper, nor retaliate against those who do so.
13. I understand that employees who report violations of this policy will be kept free from intimidation and recrimination arising from such reporting.

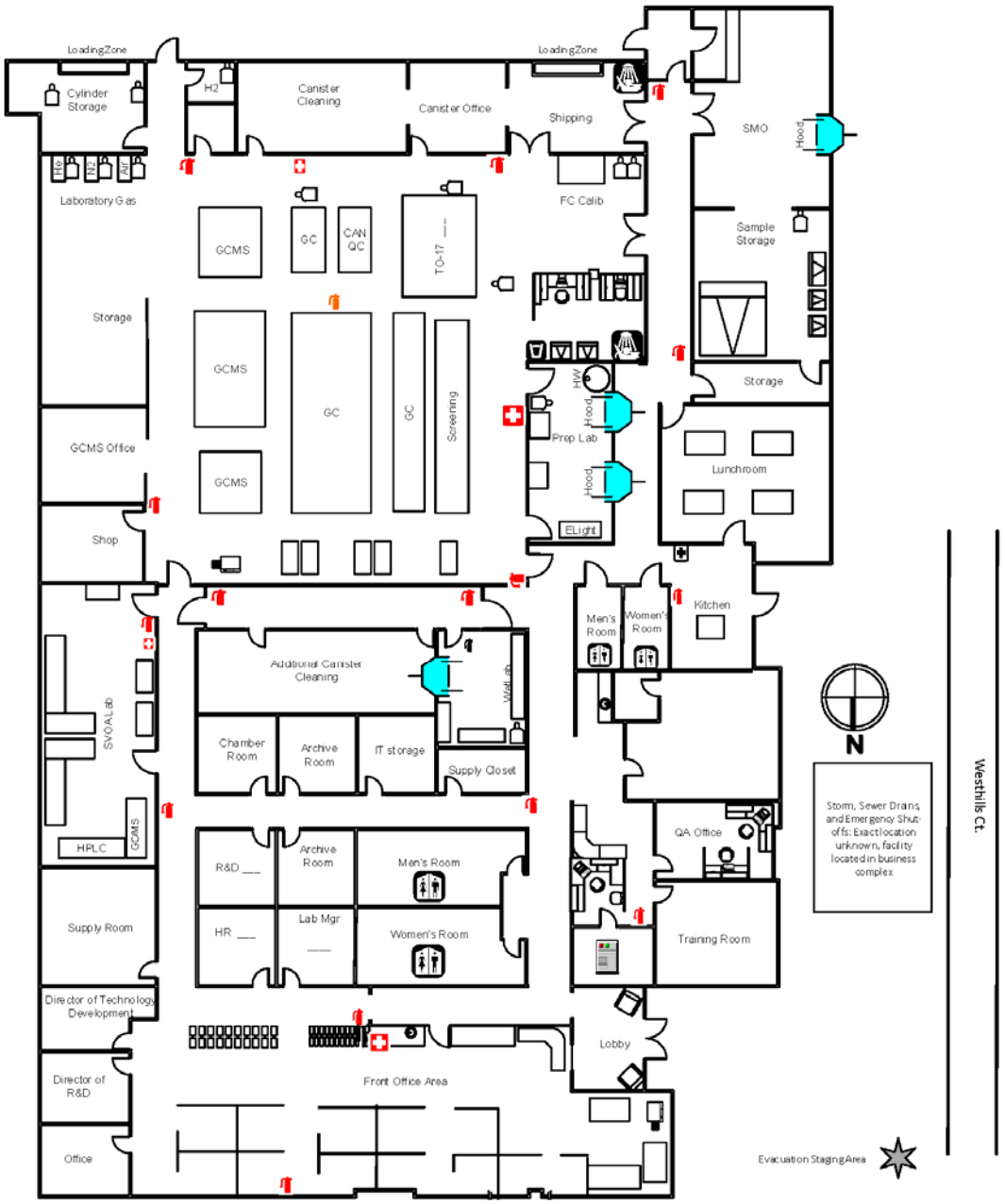
I have read, and understand the above policy and realize that failure to adhere to it may result in disciplinary action, up to and including termination. Compliance with this policy will be strictly enforced with all personnel employed by the company.

Employee Name _____ Signature _____

ALS Location_____ Date _____

APPENDIX D – Laboratory Floor Plan

ALS Environmental-Simi Valley Laboratory Floor Plan



APPENDIX E – Analytical Equipment

Equipment Description - Gas Chromatography	Purchased / Acquired	Location
Screen 02: Hewlett-Packard 5890 with FID Detector	-	VOA GC/MS Screen
Screen 03: Hewlett-Packard 5890 with FID Detector	-	VOA GC/MS Screen
GC01: Hewlett-Packard 5890 with FID/TCD Detectors *Fixed Gas Analyzer/Total Combustion Analyzer (TCA)*	1995	VOA GC
GC06: Hewlett-Packard 6890 with ECD/ECD Detectors *Hewlett-Packard 6890 Injector*	1995	SVOA
GC08: Hewlett-Packard 5890 Series II with TCD/FID Detectors	1998	VOA GC
GC09: Hewlett-Packard 5890 Series II with FID Detector	1999	VOA GC/MS Screen
GC10: Hewlett-Packard 5890A with FID/TCD Detectors	1999	VOA GC
GC12: Hewlett-Packard 5890 Series II+ with FID Detector *Hewlett-Packard 6890 Injector* (combined with MS02)	2004	SVOA
GC13: Agilent 6890A combined with Sievers 355 (SCD 1)	2001	VOA GC
GC14: Agilent 6890N with NPD/FID Detectors *Agilent 7683 Injector*	2005	SVOA
GC15: Agilent 6890N with NPD/FID Detectors *Agilent 7683 Injector*	2005	SVOA
GC16: Agilent 6890N with PFPD Detector and *OI Detector Controller* *Agilent 7683 Injector*	2005	SVOA
GC20: Agilent 7890A with FID/TCD Detectors	2008	VOA GC
GC21: Hewlett-Packard 5890 Series II with FID Detector	2009	VOA GC
GC22: Agilent 7890A combined with Agilent 355 (SCD 3)	2009	VOA GC
GC23: Hewlett-Packard 6890+ with ECD Detector (combined with MS14)	2007	SVOA
GC30: Agilent 7890B combined with Agilent 355 (SCD 2)	2016	VOA GC
GC31: Hewlett-Packard 6890A with ECD Detector	1999	SVOA

Equipment Description - GC/MS Systems	Purchased / Acquired	Location
MS02: HP 5890 Series II+ with FID Detector (GC12) & HP 5972 MSD *Hewlett-Packard 6890 Injector*	1994	SVOA
MS05: Agilent 6890/5973N MSD *Hewlett-Packard 7673 Injector*	1999	SVOA
MS07: HP 6890A/ Agilent 5973N MSD *Agilent 6890 Injector*	2001	SVOA
MS08: Agilent 6890N/5973inert MSD Tekmar AUTOCAN Autosampler	2004	VOA GC/MS
MS09: Agilent 6890N/5973inert MSD Tekmar AUTOCAN Autosampler	2005	VOA GC/MS
MS10: HP 6890A/5973 MSD	2006	SVOA
MS13: Agilent 6890N/5975B inert MSD Entech 7200 CTS Preconcentrator	2006	VOA GC/MS
MS14: HP 6890+ with ECD Detector (GC23) & HP 5973 MSD HP 7673 Injector	2007	SVOA
MS16: Agilent 6890N/5975C inert MSD Tekmar AUTOCAN Autosampler	2007	VOA GC/MS
MS18: Agilent 7890A /5975C inert XL MSD Markes Series 2 Unity Thermal Desorber Markes Series 2 Ultra TD Autosampler	2010	VOA GC/MS
MS19: Agilent 7890A (GC26)/5975C inert XL MSD Tekmar AUTOCAN Autosampler	2011	VOA GC/MS
MS20: Agilent 7890A (GC27)/5975C inert XL MSD Markes Series 2 Unity Thermal Desorber Markes Series 2 Ultra TD Autosampler	2011	VOA GC/MS
MS21: Agilent 7890A (GC28)/5975C inert XL MSD Tekmar AUTOCAN Autosampler	2012	VOA GC/MS
MS22: Agilent 7890B (GC29)/5977A MSD Markes CIA Advantage Autosampler	2015	VOA GC/MS
MS23: Agilent 7890B (GC32)/5977B MSD Markes TD 100-xr Autosampler	2017	VOA GC/MS
MS24: Agilent 7890A (GC33)/5975C Inert XL EI/CI MSD Markes TD 100-xr Autosampler	2018	VOA GC/MS
Tube Conditioner 02: PerkinElmer TurboMatrix TC 220	2015	VOA GC/MS
Tube Conditioner 03: PerkinElmer TurboMatrix TC 220	2018	VOA GC/MS

Liquid Chromatography	Purchased / Acquired	Location
LC03: Agilent Infinity LC 1220	2011	SVOA
Spectrophotometer	**Purchased / Acquired**	**Location**
SPM01: Spectronic Instrument 20+ from SC	2001	GENCHEM
pH and Specific Ion Meters	**Purchased / Acquired**	**Location**
pH01: Thermo Orion 920 Selective Ion Meter	2001	GENCHEM
Miscellaneous Equipment	**Purchased / Acquired**	**Location**
US Filter Water Purification System	2006	Main Lab

Note: Purchase/Acquired year may represent when instrument was first maintained by ALS Environmental-Simi Valley or other in-network ALS Laboratory and does not reflect age of instrument.

Air sampling containers / Flow Controllers / Critical Orifices

Six-liter Summa passivated stainless steel canisters

- 1282 Ambient
- 1279 Source
- 202 Standard

Six-liter Silonite passivated stainless steel canisters

- 1260 Ambient
- 465 Source

Three-liter Silco passivated stainless steel canisters (67)

One-liter Summa passivated stainless steel canisters (1124)

One-liter Silonite passivated stainless steel canisters (1017)

Low volume flow controllers for time integrated sampling

- 1062 Ambient
- 108 Source

Low-flow flow controllers for multi-day sampling (48)

Critical orifices (550)

Critical orifices – Sulfur (50)

Automated Summa Canister Conditioning Units

- Twenty-four position, microprocessor controlled conditioners with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (2)
- Fourteen position, microprocessor controlled conditioners with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (1)
- Sixteen position, microprocessor controlled conditioner with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (1)
- Six position, microprocessor controlled conditioner with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (1)
- Twelve position, microprocessor controlled conditioner with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (2)
- Twenty-four position (Bottle Vac Cleaning Manifold), microprocessor controlled conditioners with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (2)

APPENDIX F – Containers, Preservation and Holding Times

Sample Preservation and Holding Times for Performed Methods

Determination (Method)	Matrix	Container	Preservation	Maximum Holding Time	Sample Vol.[c]
Amines (In-House Method)	Air	Treated Alumina Tubes	Sample Receipt-NA; Storage 4˚C±2˚C	30 days	100L
Ammonia (OSHA ID-188/ID-164)	Air	H_2SO_4 Treated Carbon Bead Tubes	Sample Receipt-NA; Storage 4˚C±2˚C	28 days	TWA: 24L STEL: 7.5L
BTU by ASTM D 3588 (SULFUR, ASTM D 5504; C1-C6+, EPA TO-3M; FIXED GASES, 3C)	Gaseous Fuels	Tedlar Bag Mylar Bag Summa Canister Bottle Vac	N/A	<u>Sulfur</u> Bag – 24 hours Canister – 7 days[b] Bottle Vac[a] – 7 days[b] <u>C1-C6+</u> Bag – 72 hours Canister[a] – 30 days[b] Bottle Vac[a] – 30 days[b] <u>3C</u> Bag – 72 hours Canister[a] – 30 days[b] Bottle Vac[a] – 30 days[b]	Bags 500mL Canisters and Bottle Vacs ≥1.0L
Carboxylic Acids (In-House Method)	Air	Treated Silica Gel Tubes	Sample Receipt-NA Storage 4˚C±2˚C	30 days until extraction; 14 days for analysis	100L
Total Gaseous Non-methane Organics (TGNMO) (EPA 25C)	Air	Tedlar Bag Mylar Bag Summa Canister Bottle Vac	N/A	Bag – 72 hours Canister[a] – 30 days[b] Bottle Vac[a] – 30 days[b]	Bags 500mL Canisters and Bottle Vacs ≥1.0L
Fixed Gases (EPA 3C & ASTM D 1946)	Air	Tedlar Bag Mylar Bag Summa Canister Bottle Vac	N/A	Bag – 72 hours Canister[a] – 30 days[b] Bottle Vac[a] – 30 days[b]	Bags 500mL Canisters and Bottle Vacs ≥1.0L
Helium & Hydrogen (EPA 3C Modified)	Air	Summa Canister Bottle Vac	N/A	Canister[a] – 30 days[b] Bottle Vac[a] – 30 days[b]	Bags 500mL Canisters and Bottle Vacs ≥1.0L
Methane, Ethane, Ethene, Propane, Propene (RSK 175)	Aqueous	Glass w/Teflon-Lined Lid	No Headspace HCl to pH<2 4˚C±2˚C	14 days when preserved	(3) 40mL Vials

Sample Preservation and Holding Times for Performed Methods

Determination (Method)	Matrix	Container	Preservation	Maximum Holding Time	Sample Vol.[c]
Carbon Dioxide (RSK 175)	Aqueous	Glass w/Teflon Lined Lid	No Headspace neutral pH (5-8) 4˚C±2˚C	N/A[d]	(3) 40mL Vials
Sulfur Compounds (In-House Method)	Aqueous	Glass w/Teflon Lined Lid	No Headspace; pH>4; 4˚C±2˚C	Following pH adjustment – 24 hours	(2) 40mL Vials
Sulfur Compounds (ASTM D 5504; SCAQMD 307-91; Modified SCAQMD 307-91)	Air	Tedlar Bag Fused Silica Lined Stainless Steel Canister Bottle Vac	No direct sunlight	Bag – 24 hours Canister – 7 days[b] Bottle Vac[a] – 7 days[b]	Bags 500mL Canisters and Bottle Vacs ≥1.0L
C_1-C_6+ (EPA TO-3 Modified)	Air	Tedlar Bag Mylar Bag Summa Canister Bottle Vac	N/A	Bag – 72 hours Canister[a] – 30 days[b] Bottle Vac[a] – 30 days[b]	Bags 500mL Canisters and Bottle Vacs ≥1.0L
Methanol, Ethanol, Isopropyl alcohol, Freon, and Methylene Chloride (EPA TO-3 Modified)	Air	Tedlar Bag Mylar Bag Summa Canister Bottle Vac	N/A	Bag – 72 hours Canister[a] – 30 days[b] Bottle Vac[a] – 30 days[b]	Bags 500mL Canisters and Bottle Vacs ≥1.0L
Total Petroleum Hydrocarbons (TPHG) (EPA TO-3 Modified)	Air	Tedlar Bag Mylar Bag Summa Canister Bottle Vac	N/A	Bag – 72 hours Canister[a] – 30 days[b] Bottle Vac[a] – 30 days[b]	Bags 500mL Canisters and Bottle Vacs ≥1.0L
Formaldehyde & Other Carbonyl Compounds (EPA TO-11A)	Air	DNPH-Coated Silica Gel Cartridge w/ Polypropylene Cap; SKC UME[x] and Bacharach GMD 570 Passive Monitors (formaldehyde only)	Sample Receipt, 4˚C±2˚C; Laboratory Preservation, 4˚C±2	14 days until extraction; 30 days for analysis	100 – 150L
Volatile Organic Compounds (EPA TO-14A & TO-15)	Air	Tedlar Bag, Summa Canister (1L, 6L) Bottle Vac	N/A	Bag – 72 hours Canister – 30 days Bottle Vac[a] – 30 days[b]	Bags 500mL Canisters 1.0L/6.0 Bottle Vacs 1.0L

Sample Preservation and Holding Times for Performed Methods

Determination (Method)	Matrix	Container	Preservation	Maximum Holding Time	Sample Vol.[c]
Volatile Organic Compounds (EPA TO-17)	Air	Sorbent Tubes w/Swagelock Caps & PTFE Ferrules	<4˚C; organic solvent free environment; Laboratory Storage, 4˚C±2˚C	30 days	1-4L
Volatile Organic Compounds (EPA 325B)	Air	Sorbent Tubes w/Swagelock Caps & PTFE Ferrules	Laboratory Storage <23˚C	30 days	1-4L
Air-Phase Petroleum Hydrocarbons (MADEP APH)	Air	Summa Canister Bottle Vac	N/A	28 days Bottle Vac[a] – 30days[b]	Canisters 1.0L/6.0 Bottle Vacs 1.0L
Halogenated Volatile Organic Compounds (CARB 422)	Air	Tedlar Bag Summa Canister (1L, 6L) Bottle Vac	N/A	Bag – 72 hours Canister[a] – 30 days[b] Bottle Vac[a] – 30 days[b]	Bags 500mL Canisters 1.0L/6.0L Bottle Vacs 1.0L
Butyl Cellosolve (2-butoxyethanol) (NIOSH 1403)	Air	Charcoal Tube	Sample Receipt-NA; Store sample and extract ≤4˚C	14 days until desorption; 30 days for analysis	Project Specific
Orthorhombic Cyclooctasulfur (ASTM C471M-14)	Solid Wallboard	Ziploc Bag	Sample Receipt-NA; Storage 4˚C±2˚C; Extract -10˚C to -20˚C	Extracts – 40 days for analysis	2”x2”
Siloxanes (In-House Method)	Air	SPE Cartidges Tedlar Bags	N/A	14 days until extraction; Tedlar Bags – transfer onto sorbent tube within 72 hours. 30 days for analysis	30L Cartridges Bags 500ml
Reduced Sulfur Compounds (NCASI Method RSC-02.02)	Aqueous	40ml amber, borosilicate glass vials with Teflon faced silicone backed caps.	MeSH, DMS, and DMTS (RSCs non-H2S) addition of ascorbic acid and pH adjustment to <2.5 with 1:2 phosphoric acid solution upon collection. Laboratory Preservation, 4˚C±2	14 days	(2) 40ml VOA Vials

Sample Preservation and Holding Times for Performed Methods

Determination (Method)	Matrix	Container	Preservation	Holding Time	Sample Vol.[c]
Total Sulfide (NCASI Method RSC-02.02)	Aqueous	40ml amber, borosilicate glass vials with Teflon faced silicone backed caps.	Addition of Zinc acetate solution and pH adjustment to >10 with 1 N NaOH solution upon collection. Laboratory Preservation, 4˚C±2	14 days	(2) 40ml VOA Vials

Footnotes:

a.	Some methods do not specify the utilization of canisters; therefore, there is no required hold time and this will be noted in the case narrative.
b.	Laboratory recommended hold time; therefore, samples analyzed outside this hold time will be noted in the case narrative accordingly.
c.	Sample volumes are the minimum, which should be received by the laboratory; however, canister volumes should match the canister size utilized.
d.	There is no holding time requirement available and laboratory studies are not available indicating the validity of data prior to or following a specified length of time. Therefore, no holding time notation or qualifier will be adhered to results.

APPENDIX G – Standard Operating Procedures

Corporate SOP Titles	SOP ID
Laboratory Ethics and Data Integrity	CE-GEN001
Records Management Policy	CE-GEN003
Procurement and Control of Laboratory Services and Supplies	CE-GEN007
Handling Customer Feedback	CE-GEN010
Internal Audits	CE-QA001
Manual Integration Policy	CE-QA002
Training Policy	CE-QA003
Qualification of Subcontract Laboratories and Inter-Company Subcontracting Protocol	CE-QA004
Laboratory Management Review	CE-QA005
Control Limits	CE-QA009
Estimation of Uncertainty of Analytical Measurements	CE-QA010
Quality of Reagents and Standards	CE-QA012

Local Administrative SOP Titles	SOP Code
Data and Record Archiving	ADM-ARC
Batches and Sequences	ADM-BATCH_SEQ
Handling Consumable Materials	ADM-CONSUM
Electronic Data Backup, Archiving, and Restoration	ADM-DATA_BU
Making Entries Onto Analytical Records	ADM-DATA_ENTRY
Data Recall	ADM-DATA_RECALL
Data Review and Reporting	ADM-DATA_REV
Document Control	ADM-DOC_CNTRL
Glassware Cleaning	ADM-GLASS
Analytical Instrument Acquisition, Reassignment, Maintenance and Documentation	ADM-INSTRUM
Laboratory Storage, Analysis, and Tracking	ADM-LABSAT
Policy for the use of Accreditation Organization Names, Symbols, and Logos	ADM-LOGOS
Management of Change	ADM-MGMT_CHG
Media Request Fulfillment	ADM-MEDIA_REQ
Method Development	ADM-METH_DEV
Performing Method Detection Limit Studies and Establishing Limits of Detection and Quantitation	ADM-MDL_LOD_LOQ
Nonconformance and Corrective Action	ADM-NCAR
Preventive Action	ADM-PREV_ACT
Proficiency Testing	ADM-PT
Project Management	ADM-PMGMT
Software and Data Quality Assurance	ADM-SFTWREQA
Significant Figures	ADM-SIG_FIG
Establishing Standard Operating Procedures	ADM-SOP
Calibration and Use of Laboratory Support Equipment	ADM-SUPEQ
Cleaning and Certification of Summa Canisters and Other Specially Prepared Canisters	SMO-CAN_CERT
Evaluation and Pressurization of Specially Prepared Stainless Steel Canisters	SMO-CAN_PRESS
Flow Controllers and Critical Orifices	SMO-FLOW_CNTRL
Sample Receiving, Acceptance and Log-In	SMO-SMPL_REC

Volatile SOP Titles	SOP Code
Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels in Accordance with ASTM D 3588	VOA-BTU
Samples Preparation in Glass Chambers	VOA-CHAMBER
Dissolved Gas Analysis in Aqueous Samples Using a GC Headspace Equilibration Technique	VOA-DISGAS
Sample Preparation of Drywall for Sulfur Analysis and the Determination of Copper Corrosion	VOA-DRYWALL
Determination of Total Gaseous Nonmethane Organic (TGNMO) Emissions as Carbon in Landfill Gases in Accordance with EPA Method 25C	VOA-EPA25C
Determination of Methane, Carbon Monoxide, Carbon Dioxide, and Total Gaseous Nonmethane Organic (TGNMO) Emissions as Carbon in Landfill Gases According to Modified EPA Method 25C	VOA-EPA25CM
Determination of Hydrogen, Carbon Monoxide, Carbon Dioxide, Nitrogen, Methane, and Oxygen using Gas Chromatography with Thermal Conductivity Detection (TCD) in Accordance with EPA 3C or ASTM D 1946	VOA-EPA3C
Determination of Volatile Organic Compounds from Fugitive and Area Sources	VOA-EPA325B
Analysis of Hydrogen and Helium using Gas Chromatography with Thermal Conductivity Detection (TCD)	VOA-HHe
Analysis of Sulfur Compounds in a Gaseous Matrix by Gas Chromatography with Sulfur Chemiluminescence Detection per ASTM D 5504 and Modified SCAQMD Method 307	VOA-S307M_SCD
Analysis of Sulfur Compounds in Liquid Samples by Gas Chromatography with Sulfur Chemiluminescence Detection	VOA-SH_2O_SCD
Analysis of C1-C6+ using Gas Chromatography with Flame Ionization Detection (FID) in Accordance with a Modification of EPA Compendium Method TO-3	VOA-TO3C1C6
Analysis of Various Compounds using Gas Chromatography with Flame Ionization Detection (FID) in Accordance with a Modification of EPA Compendium Method TO-3	VOA-TO3MeOH
Analysis of Total Petroleum Hydrocarbons as Gasoline in Air by Gas Chromatography with Flame Ionization Detection	VOA-TPHG_TO3
Determination of Air-Phase Petroleum Hydrocarbons by Gas Chromatography/Mass Spectrometry (GC/MS)	VOA-MAPH
Determination of Volatile Organic Compounds in Air Samples Collected in Specially Prepared Canisters and Gas Collection Bags and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)	VOA-TO15
Determination of Volatile Organic Compounds in Ambient Air Using Active or Passive Sampling Onto Sorbent Tubes	VOA-TO17

Semi-Volatile SOP Titles	SOP Code
Determination of Formaldehyde and Other Carbonyl Compounds in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC) EPA Compendium Method T0-11A	SVO-11A
Determination of Volatile Amines in Ambient Air Using Gas Chromatography Equipped with a Nitrogen Phosphorus Detector (NPD)	SVO-AMINES
Determination of Carboxylic Acids in Ambient Air Using Gas Chromatography/Mass Spectrometry (GC/MS)	SVO-CACIDS
Analysis of Halogenated Volatile Organic Compounds in Emissions from Stationary Sources using GC/ECD in Accordance with a Modification of CARB Method 422	SVO-CARB422
NCASI Method RSC-02.02 Reduced Sulfur Compounds by Direct Injection GC/PFPD	SVO-NCASI_RSC
Preparation and Analysis of 2-Butoxyethanol on Coconut Shell Charcoal Tubes and Analyzed using GC/FID	SVO-NIOSH1403
Determination of P-9290 Target Compounds from a Chamber and Specific P-9290 Quality Control Parameters	SVO-P9290
Preparation and Analysis of Orthorhombic Cyclooctasulfur by Gas Chromatography/Electron Capture Detector (GC/ECD)	SVO-S8_ECD
Determination of Siloxanes in Biogas using Gas Chromatography/Mass Spectrometry (GC/MS)	SVO-SILOXANES

General Chemistry (WET) SOP Titles	SOP Code
Ammonia in Air by Ion Selective Electrode	WET-NH_3Air

APPENDIX H – Data Qualifiers

CODE	CATEGORY	DESCRIPTION
BC	RESULT	Reported results are not blank corrected.
BH	RESULT	Results indicate breakthrough; back section of tube greater than front section.
BT	RESULT	Results indicated possible breakthrough; back section ≥10% front section.
DE	RESULT	Reported results are corrected for desorption efficiency.
RA	RESULT	Result not available.
G	GENERAL	Improper container.
G1	GENERAL	Unpreserved or improperly preserved sample.
X	GENERAL	See case narrative.
H1	HOLD TIME	Sample analysis performed past holding time. See case narrative.
H2	HOLD TIME	Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
H3	HOLD TIME	Sample was received and analyzed past holding time.
H4	HOLD TIME	Sample was extracted past required extraction holding time, but analyzed within analysis holding time. See case narrative.
i	MATRIX	The MDL/MRL has been elevated due to matrix interference.
M	MATRIX	Matrix interference; results may be biased (high/low).
M1	MATRIX	Matrix interference due to coelution with a non-target compound. (TO-15 only)
Q	PETROLEUM	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter/heavier molecular weight constituents than the calibration standard.
Y	PETROLEUM	The chromatogram resembles a petroleum product but does not match the calibration standard.
Z	PETROLEUM	The chromatogram does not resemble a petroleum product.
#	QC	The control limit criterion is not applicable. See case narrative.
*	QC	The result is an outlier. See case narrative.
B	QC	Analyte detected in both the sample and associated method blank.
I	QC	Internal standard not within the specified limits. See case narrative.
L	QC	Laboratory control sample recovery outside the specified limits; results may be biased (high/low).
N	QC	The matrix spike sample recovery is not within control limits. See case narrative.
R	QC	Duplicate precision not met.

CODE	CATEGORY	DESCRIPTION
R1	QC	Duplicate precision not within the specified limits; however, the results are below the MRL and considered estimated.
S	QC	Surrogate recovery not within specified limits.
V	QC	The continuing calibration verification standard was outside (biased high/low) the specified limits for this compound.
C	RESULT	Result identification confirmed.
CE	RESULT	Co-elution.
D	RESULT	The reported result is from a dilution.
E	RESULT	Estimated; concentration exceeded calibration range.
J	RESULT	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
J1	RESULT	The analyte was positively identified below the method reporting limit prior to utilizing the dilution factor; the associated numerical value is considered estimated.
K	RESULT	Analyte was detected above the method reporting limit prior to normalization.
ND	RESULT	Compound was analyzed for, but not detected above the laboratory reporting/detection limit.
P	RESULT	The confirmation criterion was exceeded. The relative percent difference was greater than 40/25% between the two analytical results.
U	RESULT	Compound was analyzed for, but not detected (ND) at or above the MRL/MDL.
W	RESULT	Result quantified, but the corresponding peak was detected outside the generated retention time window.
UJ	RESULT	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
Ui	RESULT	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL; however, the MRL/MDL has been elevated due to matrix interference.
T	TIC	Analyte is a tentatively identified compound, result is estimated.

APPENDIX I – Master List of Controlled Documents

Controlled Documents*	Document Code
Health and Safety Manual	ALS-SIMI VALLEY
Lab Waste Management Plan	SV-HSE-001
Emergency Response Plan	SV-HSE-002
Disaster Management Plan	SV-HSE-003
Quality Assurance Manual	ALSMV-QAM

*Refer to Appendix G for a list of the laboratory's controlled standard operating procedures.

QA Program Files	
Item	**Location / Name**
Approved Signatories List	QA Manual Appendix I
Approved Subcontract Laboratories	Q:\Approved Sub-Contract Labs\Subcontract Lab List
Control Limit\Chart Status	Q:\Control Charts\CntrlChrt(status1).xls
Job Descriptions	HR Department
Master List of Controlled Documents (Logbooks, SOPs, etc.)	Q:\Master List of Controlled Documents\Master List of Controlled Documents.xls
MDL,LOD,LOQ Status	Q:\MDL Status\MDL Status Table (EACH DEPT).xls
Personnel Resumes, Transcripts	HR and QA Departments
Simi Valley Certification Status	Q:\Certifications\Cert Status.xls
Simi Valley Data Quality Objectives	Q:\MDL_MRL\DQO Spreadsheet.xls
Technical Training Status	Q:\Training\TRAINING STATUS.xls

Approved Signatories	
Name	**Title**
Kate Kaneko, B.A.	Laboratory Director / Client Services Manager / Project Manager
Chaney Arend, B.S.	Quality Assurance Manager
Wade Henton, B.S.	Volatiles (GC)/Semi-Volatiles Technical Manager
Chris Parnell, B.S.	Technical Manager (Volatiles GC/MS)
Wida Ang, B.S., M.S.	Team Leader (Volatiles GC/MS)
Sue Anderson, B.S.	Project Manager
Michael Conejo, B.A.	Project Manager / Environmental Health and Safety Coordinator

APPENDIX J – Laboratory Accreditations

State of Alaska Department of Environmental Conservation's Contaminated Sites Laboratory Approval Program (CS-LAP)

Approval No. 17-019
Approved Method(s):

- EPA TO-15
- EPA TO-17

State of Arizona, Department of Health Services

License No. AZ0694
Approved Method(s):

- EPA TO-15
- EPA 3C

Department of Defense, Environmental Laboratory Accreditation Program (DoD-ELAP)

Perry Johnson Laboratory Accreditation, Inc. Accreditation No. 65818
Approved Method(s):

- EPA TO-15
- EPA TO-17
- RSK 175
- EPA 3C
- ASTM D 1946-90
- SOP VOA-EPA3C (EPA 3C Modified)
- SOP VOA-TPHG_TO3 (TPHG by Modified EPA TO-3)
- SOP VOA-TO3C1C6 (Hydrocarbons and ranges by Modified EPA TO-3)
- SOP VOA-TO15 (EPA TO-15 Modified)
- SOP VOA-TO17 (EPA TO-17 Modified)

State of Florida, Department of Health (NELAP-Secondary)

Laboratory ID No.: E871020
Approved Method(s):

- EPA TO-15
- EPA TO-17

State of Louisiana, Department of Environmental Quality (NELAP-Secondary)

Certificate No.: 05071
Approved Method(s):

- EPA TO-15
- EPA 325B

State of Maine, Department of Health and Human Services
Certificate No.: 2016036
Approved Methods
- EPA TO-15
- MADEP APH

State of Minnesota, Department of Health, Environmental Laboratory Certification Program (NELAP-Secondary)
Laboratory ID: 006-999-456
Approved Method(s):
- EPA TO-15

Off-gas testing and gas sampling and analysis in support of U.S. Navy Deep Submergence Systems
SOPs:
- SMO-Can_Cert
- SMO-Can_Press
- SMO-Flow_Cntrl
- SMO-Smpl_Rec
- SVO-11A
- SVO-NIOSH1403
- SVO-P9290
- VOA-EPA25CM
- VOA-TO15

State of New Jersey, Department of Environmental Protection (NELAP-Secondary)
Laboratory ID: CA009
Approved Method(s):
- EPA TO-15

State of New York, Department of Health (NELAP –Secondary)
Laboratory ID No. 11221
Approved Method(s):
- EPA TO-15
- EPA TO-17

State of Oregon, Environmental Laboratory Accreditation Program (NELAP-Primary)
Laboratory ID: 4068
Approved Method(s):

- ASTM C471M-14
- ASTM D5504-12
- EPA 325B 2013
- EPA RSK-175
- EPA TO-15
- EPA TO-17
- MADEP APH

Commonwealth of Pennsylvania, Department of Environmental Protection Bureau of Laboratories
Registration Number: 68-03307

State of Texas, Texas Commission on Environmental Quality (NELAP-Secondary)
Certificate # T104704413-18-9
Approved Method(s):

- EPA TO-15

State of Utah, Department of Health, Environmental Laboratory Certification Program (NELAP-Secondary)
Certificate # CA016272018-9
Approved Method(s):

- EPA TO-15

State of Washington, Department of Ecology
Laboratory ID: C946
Approved Method(s):

- EPA TO-15
- EPA RSK-175
- EPA 25CM

Note 1: This Quality Assurance Manual is revised annually with DoD-ELAP and NELAP-Primary Certificates, and the Scope of Accreditations/Parameters are revised annually (where necessary). During this interim period Certificates may expire and the Scope of Accreditations/Parameters may change; therefore, these may not be updated until the next revision.

Note 2: Current Certificates and Scope of Accreditations/Parameters are on file and displayed in the front hallway. Updated or Specific Certificates and Scope of Accreditations/Parameters are available upon request.

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

ALS Environmental
2655 Park Center Drive, Suite A, Simi Valley, CA 93065

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the DoD Quality Systems Manual for Environmental Laboratories Version 5.1 January 2017 and is accredited is accordance with the:

United States Department of Defense
Environmental Laboratory Accreditation Program
(DoD-ELAP)

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system
(as outlined by the joint ISO-ILAC-IAF Communiqué dated January 2009):

This accreditation demonstrates technical competence for the defined scope:
Environmental Testing
(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen
President/Operations Manager

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

Initial Accreditation Date:	*Issue Date:*	*Expiration Date:*
January 11, 2010	January 31, 2018	March 31, 2020

Accreditation No:	*Certificate No:*
65818	L18-63

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

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Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Contact Name: Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	ASTM D 1946-90	GC/TCD	Carbon Dioxide
Air	ASTM D 1946-90	GC/TCD	Carbon Monoxide
Air	ASTM D 1946-90	GC/TCD	Hydrogen
Air	ASTM D 1946-90	GC/TCD	Methane
Air	ASTM D 1946-90	GC/TCD	Nitrogen
Air	ASTM D 1946-90	GC/TCD	Oxygen
Air	EPA 3C	GC/TCD	Carbon Dioxide
Air	EPA 3C	GC/TCD	Methane
Air	EPA 3C	GC/TCD	Nitrogen
Air	EPA 3C	GC/TCD	Oxygen
Air	EPA TO-15	GC/MS	1,1,1-Trichloroethane
Air	EPA TO-15	GC/MS	1,1,2,2-Tetrachloroethane
Air	EPA TO-15	GC/MS	1,1,2-Trichloroethane
Air	EPA TO-15	GC/MS	1,1-Dichloroethane
Air	EPA TO-15	GC/MS	1,1-Dichloroethene
Air	EPA TO-15	GC/MS	1,2,3-Trimethylbenzene
Air	EPA TO-15	GC/MS	1,2,4-Trichlorobenzene
Air	EPA TO-15	GC/MS	1,2,4-Trimethylbenzene
Air	EPA TO-15	GC/MS	1,2,Dibromo-3-Chloropropane
Air	EPA TO-15	GC/MS	1,2-Dibromoethane
Air	EPA TO-15	GC/MS	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)
Air	EPA TO-15	GC/MS	1,2-Dichlorobenzene
Air	EPA TO-15	GC/MS	1,2-Dichloroethane
Air	EPA TO-15	GC/MS	1,2-Dichloropropane
Air	EPA TO-15	GC/MS	1,3,5-Trimethylbenzene
Air	EPA TO-15	GC/MS	1,3-Butadiene
Air	EPA TO-15	GC/MS	1,3-Dichlorobenzene
Air	EPA TO-15	GC/MS	1,4-Dichlorobenzene
Air	EPA TO-15	GC/MS	1,4-Dioxane
Air	EPA TO-15	GC/MS	1-Butanol
Air	EPA TO-15	GC/MS	2-Butanone (MEK)
Air	EPA TO-15	GC/MS	2-Hexanone
Air	EPA TO-15	GC/MS	3-Ethyltoluene
Air	EPA TO-15	GC/MS	4-Ethyltoluene
Air	EPA TO-15	GC/MS	4-Methyl-2-Pentanone
Air	EPA TO-15	GC/MS	Acetone

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Contact Name: Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	EPA TO-15	GC/MS	Acetonitrile
Air	EPA TO-15	GC/MS	Acrolein
Air	EPA TO-15	GC/MS	Acrylonitrile
Air	EPA TO-15	GC/MS	Allyl Chloride
Air	EPA TO-15	GC/MS	alpha-Methylstyrene
Air	EPA TO-15	GC/MS	alpha-Pinene
Air	EPA TO-15	GC/MS	Benzene
Air	EPA TO-15	GC/MS	Benzyl Chloride
Air	EPA TO-15	GC/MS	Bromodichloromethane
Air	EPA TO-15	GC/MS	Bromoform
Air	EPA TO-15	GC/MS	Bromomethane
Air	EPA TO-15	GC/MS	Carbon Disulfide
Air	EPA TO-15	GC/MS	Carbon Tetrachloride
Air	EPA TO-15	GC/MS	Chlorobenzene
Air	EPA TO-15	GC/MS	Chloroethane
Air	EPA TO-15	GC/MS	Chloroform
Air	EPA TO-15	GC/MS	Chloromethane
Air	EPA TO-15	GC/MS	cis-1,2-Dichloroethene
Air	EPA TO-15	GC/MS	cis-1,3-Dichloropropene
Air	EPA TO-15	GC/MS	Cumene
Air	EPA TO-15	GC/MS	Cyclohexane
Air	EPA TO-15	GC/MS	Cyclohexanone
Air	EPA TO-15	GC/MS	Dibromochloromethane
Air	EPA TO-15	GC/MS	Dichlorodifluoromethane (CFC 12)
Air	EPA TO-15	GC/MS	Diisopropyl Ether
Air	EPA TO-15	GC/MS	d-Limonene
Air	EPA TO-15	GC/MS	Ethanol
Air	EPA TO-15	GC/MS	Ethyl Acetate
Air	EPA TO-15	GC/MS	Ethyl tert-Butyl Ether
Air	EPA TO-15	GC/MS	Ethylbenzene
Air	EPA TO-15	GC/MS	Hexachlorobutadiene
Air	EPA TO-15	GC/MS	Isooctane
Air	EPA TO-15	GC/MS	Isopropyl acetate
Air	EPA TO-15	GC/MS	Isopropyl Alcohol
Air	EPA TO-15	GC/MS	m-&, p-Xylenes
Air	EPA TO-15	GC/MS	Methyl Methacrylate

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Contact Name: Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	EPA TO-15	GC/MS	Methyl tert-Butyl Ether
Air	EPA TO-15	GC/MS	Methylene Chloride
Air	EPA TO-15	GC/MS	Naphthalene
Air	EPA TO-15	GC/MS	n-Butyl Acetate
Air	EPA TO-15	GC/MS	n-Butylbenzene
Air	EPA TO-15	GC/MS	n-Decane
Air	EPA TO-15	GC/MS	n-Dodecane
Air	EPA TO-15	GC/MS	n-Heptane
Air	EPA TO-15	GC/MS	n-Hexane
Air	EPA TO-15	GC/MS	n-Nonane
Air	EPA TO-15	GC/MS	o-Xylene
Air	EPA TO-15	GC/MS	sec-Butylbenzene
Air	EPA TO-15	GC/MS	tert-Amyl Methyl Ether
Air	EPA TO-15	GC/MS	tert-Butanol
Air	EPA TO-15	GC/MS	Tetrachloroethene
Air	EPA TO-15	GC/MS	trans-1,3-Dichloropropene
Air	EPA TO-15	GC/MS	Trichlorotrifluoroethane
Air	EPA TO-15	GC/MS	Vinyl Chloride
Air	EPA TO-15	GC/MS	2-Ethyltoluene
Air	EPA TO-15	GC/MS	n-Octane
Air	EPA TO-15	GC/MS	n-Propylbenzene
Air	EPA TO-15	GC/MS	n-Undecane
Air	EPA TO-15	GC/MS	p-Isopropyltoluene
Air	EPA TO-15	GC/MS	Propene
Air	EPA TO-15	GC/MS	Styrene
Air	EPA TO-15	GC/MS	tert-Butylbenzene
Air	EPA TO-15	GC/MS	Tetrahydrofuran
Air	EPA TO-15	GC/MS	Toluene
Air	EPA TO-15	GC/MS	trans-1,2-Dichloroethene
Air	EPA TO-15	GC/MS	Trichloroethene
Air	EPA TO-15	GC/MS	Trichlorofluoromethane
Air	EPA TO-15	GC/MS	Vinyl Acetate
Air	Simi Valley SOP VOA-EPA3C	GC/TCD	Carbon Dioxide
Air	Simi Valley SOP VOA-EPA 3C	GC/TCD	Carbon Monoxide
Air	Simi Valley SOP VOA-EPA 3C	GC/TCD	Hydrogen
Air	Simi Valley SOP VOA-EPA 3C	GC/TCD	Methane

Issue: 01/2018 *This supplement is in conjunction with certificate #L18-63* *Page 4 of 9*

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ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental
2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Contact Name: Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	Simi Valley SOP VOA-EPA 3C	GC/TCD	Nitrogen
Air	Simi Valley SOP VOA-EPA 3C	GC/TCD	Oxygen
Air	Simi Valley SOP VOA TO-15	GC/MS	1,1,1-Trichloroethane
Air	Simi Valley SOP VOA TO-15	GC/MS	1,1,2,2-Tetrachloroethane
Air	Simi Valley SOP VOA TO-15	GC/MS	1,1,2-Trichloroethane
Air	Simi Valley SOP VOA TO-15	GC/MS	1,1-Dichloroethane
Air	Simi Valley SOP VOA TO-15	GC/MS	1,1-Dichloroethene
Air	Simi Valley SOP VOA TO-15	GC/MS	1,2,3-Trimethylbenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	1,2,4-Trichlorobenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	1,2,4-Trimethylbenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	1,2-Dibromo-3-Chloropropane
Air	Simi Valley SOP VOA TO-15	GC/MS	1,2-Dibromoethane
Air	Simi Valley SOP VOA TO-15	GC/MS	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)
Air	Simi Valley SOP VOA TO-15	GC/MS	1,2-Dichlorobenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	1,2-Dichloroethane
Air	Simi Valley SOP VOA TO-15	GC/MS	1,2-Dichloropropane
Air	Simi Valley SOP VOA TO-15	GC/MS	1,3,5-Trimethylbenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	1,3-Butadiene
Air	Simi Valley SOP VOA TO-15	GC/MS	1,3-Dichlorobenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	1,4-Dichlorobenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	1,4-Dioxane
Air	Simi Valley SOP VOA TO-15	GC/MS	1-Butanol
Air	Simi Valley SOP VOA TO-15	GC/MS	2-Butanone (MEK)
Air	Simi Valley SOP VOA TO-15	GC/MS	2-Ethyltoluene
Air	Simi Valley SOP VOA TO-15	GC/MS	2-Hexanone
Air	Simi Valley SOP VOA TO-15	GC/MS	3-Ethyltoluene
Air	Simi Valley SOP VOA TO-15	GC/MS	4-Ethyltoluene
Air	Simi Valley SOP VOA TO-15	GC/MS	4-Methyl-2-Pentanone
Air	Simi Valley SOP VOA TO-15	GC/MS	Acetone
Air	Simi Valley SOP VOA TO-15	GC/MS	Acetonitrile
Air	Simi Valley SOP VOA TO-15	GC/MS	Acrolein
Air	Simi Valley SOP VOA TO-15	GC/MS	Acrylonitrile
Air	Simi Valley SOP VOA TO-15	GC/MS	Allyl Chloride
Air	Simi Valley SOP VOA TO-15	GC/MS	alpha-Methylstyrene
Air	Simi Valley SOP VOA TO-15	GC/MS	alpha-Pinene

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Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Contact Name: Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	Simi Valley SOP VOA TO-15	GC/MS	Benzene
Air	Simi Valley SOP VOA TO-15	GC/MS	Benzyl Chloride
Air	Simi Valley SOP VOA TO-15	GC/MS	Bromodichloromethane
Air	Simi Valley SOP VOA TO-15	GC/MS	Bromoform
Air	Simi Valley SOP VOA TO-15	GC/MS	Bromomethane
Air	Simi Valley SOP VOA TO-15	GC/MS	Carbon Disulfide
Air	Simi Valley SOP VOA TO-15	GC/MS	Carbon Tetrachloride
Air	Simi Valley SOP VOA TO-15	GC/MS	Chlorobenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	Chloroethane
Air	Simi Valley SOP VOA TO-15	GC/MS	Chloroform
Air	Simi Valley SOP VOA TO-15	GC/MS	Chloromethane
Air	Simi Valley SOP VOA TO-15	GC/MS	cis-1,2-Dichloroethene
Air	Simi Valley SOP VOA TO-15	GC/MS	cis-1,3-Dichloropropene
Air	Simi Valley SOP VOA TO-15	GC/MS	Cumene
Air	Simi Valley SOP VOA TO-15	GC/MS	Cyclohexane
Air	Simi Valley SOP VOA TO-15	GC/MS	Cyclohexanone
Air	Simi Valley SOP VOA TO-15	GC/MS	Dibromochloromethane
Air	Simi Valley SOP VOA TO-15	GC/MS	Dichlorodifluoromethane (CFC 12)
Air	Simi Valley SOP VOA TO-15	GC/MS	Diisopropyl Ether
Air	Simi Valley SOP VOA TO-15	GC/MS	d-Limonene
Air	Simi Valley SOP VOA TO-15	GC/MS	Ethanol
Air	Simi Valley SOP VOA TO-15	GC/MS	Ethyl Acetate
Air	Simi Valley SOP VOA TO-15	GC/MS	Ethyl tert-Butyl Ether
Air	Simi Valley SOP VOA TO-15	GC/MS	Ethylbenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	Hexachlorobutadiene
Air	Simi Valley SOP VOA TO-15	GC/MS	Isooctane
Air	Simi Valley SOP VOA TO-15	GC/MS	Isopropyl acetate
Air	Simi Valley SOP VOA TO-15	GC/MS	Isopropyl Alcohol
Air	Simi Valley SOP VOA TO-15	GC/MS	m-&,p-Xylenes
Air	Simi Valley SOP VOA TO-15	GC/MS	Methyl Methacrylate
Air	Simi Valley SOP VOA TO-15	GC/MS	Methyl tert-Butyl Ether
Air	Simi Valley SOP VOA TO-15	GC/MS	Methylene Chloride
Air	Simi Valley SOP VOA TO-15	GC/MS	Naphthalene
Air	Simi Valley SOP VOA TO-15	GC/MS	n-Butyl Acetate
Air	Simi Valley SOP VOA TO-15	GC/MS	n-Butylbenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	n-Decane

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Contact Name: Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	Simi Valley SOP VOA TO-15	GC/MS	n-Dodecane
Air	Simi Valley SOP VOA TO-15	GC/MS	n-Heptane
Air	Simi Valley SOP VOA TO-15	GC/MS	n-Hexane
Air	Simi Valley SOP VOA TO-15	GC/MS	n-Nonane
Air	Simi Valley SOP VOA TO-15	GC/MS	n-Octane
Air	Simi Valley SOP VOA TO-15	GC/MS	n-Propylbenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	n-Undecane
Air	Simi Valley SOP VOA TO-15	GC/MS	o-Xylene
Air	Simi Valley SOP VOA TO-15	GC/MS	p-Isopropyltoluene
Air	Simi Valley SOP VOA TO-15	GC/MS	Propene
Air	Simi Valley SOP VOA TO-15	GC/MS	sec-Butylbenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	Styrene
Air	Simi Valley SOP VOA TO-15	GC/MS	t-Butanol
Air	Simi Valley SOP VOA TO-15	GC/MS	tert-Amyl Methyl Ether
Air	Simi Valley SOP VOA TO-15	GC/MS	tert-Butylbenzene
Air	Simi Valley SOP VOA TO-15	GC/MS	Tetrachloroethene
Air	Simi Valley SOP VOA TO-15	GC/MS	Tetrahydrofuran
Air	Simi Valley SOP VOA TO-15	GC/MS	Toluene
Air	Simi Valley SOP VOA TO-15	GC/MS	trans-1,2-Dichloroethene
Air	Simi Valley SOP VOA TO-15	GC/MS	trans-1,3-Dichloropropene
Air	Simi Valley SOP VOA TO-15	GC/MS	Trichloroethene
Air	Simi Valley SOP VOA TO-15	GC/MS	Trichlorofluoromethane
Air	Simi Valley SOP VOA TO-15	GC/MS	Trichlorotrifluoroethane
Air	Simi Valley SOP VOA TO-15	GC/MS	Vinyl Acetate
Air	Simi Valley SOP VOA TO-15	GC/MS	Vinyl Chloride
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,1,1-Trichloroethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,1,2,2-Tetrachloroethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,1,2-Trichloroethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,1-Dichloroethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,1-Dichloroethene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,2,4-Trichlorobenzene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,2,4-Trimethylbenzene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,2-Dibromo-3-chloropropane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,2-Dibromoethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,2-Dichlorobenzene

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Certificate of Accreditation: Supplement

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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,2-Dichloroethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,2-Dichloropropane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,3,5-Trimethylbenzene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,3-Butadiene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,3-Dichlorobenzene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,4-Dichlorobenzene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	1,4-Dioxane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	2,2,4-Trimethylpentane (Isooctane)
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	2-Butanone (MEK)
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	2-Hexanone
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	2-Propanol (Isopropyl Alcohol)
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	4-Methyl-2-pentanone
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Acetone
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Acetonitrile
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Benzene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Bromodichloromethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Bromoform
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Carbon Disulfide
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Carbon Tetrachloride
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Chlorobenzene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Chloroethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Chloroform
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Chloromethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	cis-1,2-Dichloroethene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	cis-1,3-Dichloropropene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Cumene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Cyclohexane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Dibromochloromethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Dichlorodifluoromethane (CFC 12)
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Ethanol
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Ethylbenzene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Hexachlorobutadiene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	m,p-Xylenes
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Methyl tert-Butyl Ether
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Methylene Chloride
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Naphthalene

Issue: 01/2018 *This supplement is in conjunction with certificate #L18-63* *Page 8 of 9*

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

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Contact Name: Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	n-Heptane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	n-Hexane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	n-Octane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	o-Xylene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Styrene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Tetrachloroethene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Tetrahydrofuran (THF)
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Toluene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	trans-1,2-Dichloroethene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	trans-1,3-Dichloropropene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Trichloroethene
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Trichlorofluoromethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Trichlorotrifluoroethane
Air	Simi Valley SOP VOA TO-17/EPA TO-17	GC/MS	Vinyl Chloride
Air	Simi Valley SOP VOA-TO3C1C6	GC/FID	C1 - C6+
Air	Simi Valley SOP VOA-TO3C1C6	GC/FID	Ethane
Air	Simi Valley SOP VOA-TO3C1C6	GC/FID	Methane
Air	Simi Valley SOP VOA-TO3C1C6	GC/FID	n-Butane
Air	Simi Valley SOP VOA-TO3C1C6	GC/FID	n-Hexane
Air	Simi Valley SOP VOA-TO3C1C6	GC/FID	n-Pentane
Air	Simi Valley SOP VOA-TO3C1C6	GC/FID	Propane
Air	Simi Valley SOP VOA-TO3C1C6	GC/FID	Total Volatile Petroleum Hydrocarbons (TVPH) as Hexane
Air	Simi Valley SOP VOA-TPHG_TO3	GC/FID	Total Petroleum Hydrocarbons Gasoline (TPHG)
Aqueous	RSK 175	GC/TCD	Carbon Dioxide
Aqueous	RSK 175	GC/FID	Ethane
Aqueous	RSK 175	GC/FID	Ethene
Aqueous	RSK 175	GC/FID	Methane

OREGON

Environmental Laboratory Accreditation Program

NELAP Recognized

ALS Environmental - Simi Valley

4068

2655 Park Center Drive, Suite A

Simi Valley, CA 93065

IS GRANTED APPROVAL BY ORELAP UNDER THE 2009 TNI STANDARDS, TO PERFORM ANALYSES ON ENVIRONMENTAL SAMPLES IN MATRICES AS LISTED BELOW :

Air	*Drinking Water*	*Non Potable Water*	*Solids and Chem. Waste*	*Tissue*
Chemistry		Chemistry		

AND AS RECORDED IN THE LIST OF APPROVED ANALYTES, METHODS, ANALYTICAL TECHNIQUES, AND FIELDS OF TESTING ISSUED CONCURRENTLY WITH THIS CERTIFICATE AND REVISED AS NECESSARY.

ACCREDITED STATUS DEPENDS ON SUCCESSFUL ONGOING PARTICIPATION IN THE PROGRAM AND CONTINUED COMPLIANCE WITH THE STANDARDS.

CUSTOMERS ARE URGED TO VERIFY THE LABORATORY'S CURRENT ACCREDITATION STATUS IN OREGON.

Christopher L. Redman

Christopher L. Redman, BA
Oregon State Public Health Laboratory
ORELAP Program Manager
7202 NE Evergreen Parkway, Suite 100
Hillsboro, OR 97124

EFFECTIVE DATE : 02/16/2018

EXPIRATION DATE : 02/15/2019

Certificate No : 4068 - 005

OREGON

Environmental Laboratory Accreditation Program

ORELAP Fields of Accreditation

ORELAP ID: 4068

ALS Environmental - Simi Valley

EPA CODE: CA01627

2655 Park Center Drive, Suite A

Certificate: 4068 - 005

Simi Valley, CA 93065 Issue Date: 2/16/2018 Expiration Date: 2/15/2019

As of 2/16/2018 this list supersedes all previous lists for this certificate number.

MATRIX	Reference	Code	Analyte	Code	Description
Air					
	ASTM C471M-14 2014			30002256	Gypsum and Gypsum Products
		3964	Orthorhombic Cyclooctasulfur		
	ASTM D5504-12 2012			30032270	Sulfur Compounds in Natural Gas and Gaseous Fuels by GC and Chemiluminescence
		4842	1-Propanethiol		
		6113	2,5-Dimethylthiophene		
		4544	2-Ethylthiophene		
		4843	2-Propanethiol		
		5783	3-Methylthiophene		
		4450	Carbon disulfide		
		7215	Carbonyl sulfide		
		6078	Diethyl Disulfide		
		6081	Diethyl Sulfide		
		4729	Dimethyl disulfide		
		6116	Dimethyl Sulfide		
		7506	Ethanethiol		
		3840	Hydrogen sulfide		
		3725	i-Butanethiol		
		7507	Methanethiol		
		7509	Methyl ethyl sulfide		
		9508	n-Butanethiol		
		9556	t-Butanethiol		
		9574	Tetrahydrothiophene		
		9578	Thiophene		
	EPA 325B 2013			10277437	Sorbent Tubes Coupled with Thermal Desorption and GC/MS
		4375	Benzene		
		4765	Ethylbenzene		
		5240	m+p-xylene		
		5250	o-Xylene		
		5140	Toluene		
	EPA TO-15			10248803	VOCs collected in Canisters by GC/MS
		5160	1,1,1-Trichloroethane		
		5110	1,1,2,2-Tetrachloroethane		
		5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)		
		5165	1,1,2-Trichloroethane		
		4630	1,1-Dichloroethane		
		4640	1,1-Dichloroethylene		

Department of Agriculture, Laboratory Division
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OREGON

Environmental Laboratory Accreditation Program

ORELAP Fields of Accreditation

ORELAP ID: 4068

ALS Environmental - Simi Valley

EPA CODE: CA01627

2655 Park Center Drive, Suite A

Certificate: 4068 - 005

Simi Valley, CA 93065

Issue Date: 2/16/2018 Expiration Date: 2/15/2019

As of 2/16/2018 this list supersedes all previous lists for this certificate number.

Air	EPA TO-15	5182	1,2,3-Trimethylbenzene
		5155	1,2,4-Trichlorobenzene
		5210	1,2,4-Trimethylbenzene
		4570	1,2-Dibromo-3-chloropropane (DBCP)
		4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
		4695	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon-114)
		4610	1,2-Dichlorobenzene
		4635	1,2-Dichloroethane (Ethylene dichloride)
		4655	1,2-Dichloropropane
		5215	1,3,5-Trimethylbenzene
		9318	1,3-Butadiene
		4615	1,3-Dichlorobenzene
		4620	1,4-Dichlorobenzene
		4735	1,4-Dioxane (1,4- Diethyleneoxide)
		4836	1-Propene (Propylene)
		5220	2,2,4-Trimethylpentane
		4410	2-Butanone (Methyl ethyl ketone, MEK)
		4538	2-Ethyltoluene
		4860	2-Hexanone (MBK)
		4531	3-Ethyltoluene (1-Methyl-3-ethylbenzene)
		4542	4-Ethyltoluene
		4910	4-Isopropyltoluene (p-Cymene)
		4995	4-Methyl-2-pentanone (MIBK)
		4315	Acetone
		4320	Acetonitrile
		4325	Acrolein (Propenal)
		4340	Acrylonitrile
		4355	Allyl chloride (3-Chloropropene)
		4357	alpha-Methylstyrene
		6698	alpha-Pinene
		4375	Benzene
		5635	Benzyl chloride
		4385	Bromobenzene
		4395	Bromodichloromethane
		4400	Bromoform
		4403	Butyl acetate
		4450	Carbon disulfide
		4455	Carbon tetrachloride
		4475	Chlorobenzene
		4575	Chlorodibromomethane
		4485	Chloroethane (Ethyl chloride)

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Air	EPA TO-15	4505	Chloroform
		4645	cis-1,2-Dichloroethylene
		4680	cis-1,3-Dichloropropene
		4555	Cyclohexane
		4560	Cyclohexanone
		4625	Dichlorodifluoromethane (Freon-12)
		9375	Di-isopropylether (DIPE)
		6208	d-Limonene
		4750	Ethanol
		4755	Ethyl acetate
		4765	Ethylbenzene
		4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
		4835	Hexachlorobutadiene
		4890	Isopropyl acetate
		4895	Isopropyl alcohol (2-Propanol, Isopropanol)
		4900	Isopropylbenzene (Cumene)
		5240	m+p-xylene
		4950	Methyl bromide (Bromomethane)
		4960	Methyl chloride (Chloromethane)
		4990	Methyl methacrylate
		5000	Methyl tert-butyl ether (MTBE)
		4975	Methylene chloride (Dichloromethane)
		5005	Naphthalene
		4425	n-Butyl alcohol (1-Butanol, n-Butanol)
		4435	n-Butylbenzene
		5875	n-Decane
		6235	n-Dodecane
		4825	n-Heptane
		4855	n-Hexane
		5026	n-Nonane
		5027	n-Octane
		5090	n-Propylbenzene
		6747	n-Undecane
		5250	o-Xylene
		4440	sec-Butylbenzene
		5100	Styrene
		4370	T-amylmethylether (TAME)
		4420	tert-Butyl alcohol
		4445	tert-Butylbenzene
		5115	Tetrachloroethylene (Perchloroethylene)
		5120	Tetrahydrofuran (THF)
		5140	Toluene

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Air	EPA TO-15	4700	trans-1,2-Dichloroethylene		
		4685	trans-1,3-Dichloropropylene		
		5170	Trichloroethene (Trichloroethylene)		
		5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)		
		5225	Vinyl acetate		
		5235	Vinyl chloride		
		5260	Xylene (total)		
	EPA TO-17			10312206	Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling Onto Sorbent Tubes
		5160	1,1,1-Trichloroethane		
		5110	1,1,2,2-Tetrachloroethane		
		5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)		
		5165	1,1,2-Trichloroethane		
		4630	1,1-Dichloroethane		
		4640	1,1-Dichloroethylene		
		5155	1,2,4-Trichlorobenzene		
		5210	1,2,4-Trimethylbenzene		
		4570	1,2-Dibromo-3-chloropropane (DBCP)		
		4585	1,2-Dibromoethane (EDB, Ethylene dibromide)		
		4695	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon-114)		
		4610	1,2-Dichlorobenzene		
		4635	1,2-Dichloroethane (Ethylene dichloride)		
		4655	1,2-Dichloropropane		
		5215	1,3,5-Trimethylbenzene		
		9318	1,3-Butadiene		
		4615	1,3-Dichlorobenzene		
		4620	1,4-Dichlorobenzene		
		4735	1,4-Dioxane (1,4- Diethyleneoxide)		
		5220	2,2,4-Trimethylpentane		
		4410	2-Butanone (Methyl ethyl ketone, MEK)		
		4860	2-Hexanone (MBK)		
		4995	4-Methyl-2-pentanone (MIBK)		
		4315	Acetone		
		4320	Acetonitrile		
		4375	Benzene		
		4395	Bromodichloromethane		
		4400	Bromoform		
		4450	Carbon disulfide		
		4455	Carbon tetrachloride		
		4475	Chlorobenzene		

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Simi Valley, CA 93065

Issue Date: 2/16/2018 Expiration Date: 2/15/2019

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Air	EPA TO-17	4575	Chlorodibromomethane		
		4485	Chloroethane (Ethyl chloride)		
		4505	Chloroform		
		4645	cis-1,2-Dichloroethylene		
		4680	cis-1,3-Dichloropropene		
		4555	Cyclohexane		
		4625	Dichlorodifluoromethane (Freon-12)		
		4750	Ethanol		
		4765	Ethylbenzene		
		4835	Hexachlorobutadiene		
		4895	Isopropyl alcohol (2-Propanol, Isopropanol)		
		4900	Isopropylbenzene (Cumene)		
		5240	m+p-xylene		
		4960	Methyl chloride (Chloromethane)		
		5000	Methyl tert-butyl ether (MTBE)		
		4975	Methylene chloride (Dichloromethane)		
		5005	Naphthalene		
		4825	n-Heptane		
		4855	n-Hexane		
		5027	n-Octane		
		5250	o-Xylene		
		5100	Styrene		
		5115	Tetrachloroethylene (Perchloroethylene)		
		5120	Tetrahydrofuran (THF)		
		5140	Toluene		
		4700	trans-1,2-Dichloroethylene		
		4685	trans-1,3-Dichloropropylene		
		5170	Trichloroethene (Trichloroethylene)		
		5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)		
		5235	Vinyl chloride		
		5260	Xylene (total)		
	MADEP APH			90017188	Air-Phase Petroleum Hydrocarbons
		9318	1,3-Butadiene		
		3792	APH Aliphatics C5-C8		
		3793	APH Aliphatics C9-C12		
		3794	APH Aromatics C9-C10		
		4375	Benzene		
		4765	Ethylbenzene		
		5240	m+p-xylene		
		5000	Methyl tert-butyl ether (MTBE)		
		5005	Naphthalene		
		5250	o-Xylene		

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Department of Environmental Quality, Laboratory Division
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Air	MADEP APH	5140	Toluene		
Non-Potable Water	EPA RSK-175 (GC-FID)			10212905	Methane, Ethane, and Ethene in water by Headspace GC/FID
		4747	Ethane		
		4752	Ethene		
		4926	Methane		
	EPA RSK-175 (GC-TCD)			10212858	Fixed Gases in water by Headspace GC/TCD
		3755	Carbon dioxide		

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Environmental Laboratory Accreditation Program

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2655 Park Center Drive, Suite A

Simi Valley, CA 93065

NELAP Recognized

IS GRANTED APPROVAL BY ORELAP UNDER THE 2009 TNI STANDARDS, TO PERFORM ANALYSES ON ENVIRONMENTAL SAMPLES IN MATRICES AS LISTED BELOW :

Air	*Drinking Water*	*Non Potable Water*	*Solids and Chem. Waste*	*Tissue*
Chemistry		Chemistry		

AND AS RECORDED IN THE LIST OF APPROVED ANALYTES, METHODS, ANALYTICAL TECHNIQUES, AND FIELDS OF TESTING ISSUED CONCURRENTLY WITH THIS CERTIFICATE AND REVISED AS NECESSARY.

ACCREDITED STATUS DEPENDS ON SUCCESSFUL ONGOING PARTICIPATION IN THE PROGRAM AND CONTINUED COMPLIANCE WITH THE STANDARDS.

CUSTOMERS ARE URGED TO VERIFY THE LABORATORY'S CURRENT ACCREDITATION STATUS IN OREGON.

Alia D. Servin, Ph.D.
Oregon State Public Health Laboratory
ORELAP Program Manager
7202 NE Evergreen Parkway, Suite 100
Hillsboro, OR 97124

EFFECTIVE DATE : 02/16/2019

EXPIRATION DATE : 02/15/2020

Certificate No : 4068 - 006

OREGON

Environmental Laboratory Accreditation Program

ORELAP Fields of Accreditation

ORELAP ID: 4068

ALS Environmental - Simi Valley

EPA CODE: CA01627

2655 Park Center Drive, Suite A

Certificate: 4068 - 006

Simi Valley, CA 93065 Issue Date: 2/16/2019 Expiration Date: 2/15/2020

As of 2/16/2019 this list supersedes all previous lists for this certificate number.

MATRIX	Reference	Code	Analyte	Code	Description
Air					
	ASTM C471M-14 (GC/MS or GC/ECD) ASTM C471M-14 (GC/MS or GC/ECD)	3964	Orthorhombic Cyclooctasulfur	30002256	Gypsum and Gypsum Products
	ASTM D5504-12 2012			30032270	Sulfur Compounds in Natural Gas and Gaseous Fuels by GC and Chemiluminescence
		4842	1-Propanethiol		
		6113	2,5-Dimethylthiophene		
		4544	2-Ethylthiophene		
		4843	2-Propanethiol		
		5783	3-Methylthiophene		
		4450	Carbon disulfide		
		7215	Carbonyl sulfide		
		6078	Diethyl Disulfide		
		6081	Diethyl Sulfide		
		4729	Dimethyl disulfide		
		6116	Dimethyl Sulfide		
		7506	Ethanethiol		
		3840	Hydrogen sulfide		
		3725	i-Butanethiol		
		7507	Methanethiol		
		7509	Methyl ethyl sulfide		
		9508	n-Butanethiol		
		9556	t-Butanethiol		
		9574	Tetrahydrothiophene		
		9578	Thiophene		
	EPA 325B 2013			10277437	Sorbent Tubes Coupled with Thermal Desorption and GC/MS
		4375	Benzene		
		4765	Ethylbenzene		
		5240	m+p-xylene		
		5250	o-Xylene		
		5140	Toluene		
	EPA TO-15			10248803	VOCs collected in Canisters by GC/MS
		5160	1,1,1-Trichloroethane		
		5110	1,1,2,2-Tetrachloroethane		
		5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)		
		5165	1,1,2-Trichloroethane		

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Air	EPA TO-15	4630	1,1-Dichloroethane
		4640	1,1-Dichloroethylene
		5182	1,2,3-Trimethylbenzene
		5155	1,2,4-Trichlorobenzene
		5210	1,2,4-Trimethylbenzene
		4570	1,2-Dibromo-3-chloropropane (DBCP)
		4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
		4695	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon-114)
		4610	1,2-Dichlorobenzene
		4635	1,2-Dichloroethane (Ethylene dichloride)
		4655	1,2-Dichloropropane
		5215	1,3,5-Trimethylbenzene
		9318	1,3-Butadiene
		4615	1,3-Dichlorobenzene
		4620	1,4-Dichlorobenzene
		4735	1,4-Dioxane (1,4- Diethyleneoxide)
		4836	1-Propene (Propylene)
		5220	2,2,4-Trimethylpentane
		4410	2-Butanone (Methyl ethyl ketone, MEK)
		4538	2-Ethyltoluene
		4860	2-Hexanone (MBK)
		4531	3-Ethyltoluene (1-Methyl-3-ethylbenzene)
		4542	4-Ethyltoluene
		4910	4-Isopropyltoluene (p-Cymene)
		4995	4-Methyl-2-pentanone (MIBK)
		4315	Acetone
		4320	Acetonitrile
		4325	Acrolein (Propenal)
		4340	Acrylonitrile
		4355	Allyl chloride (3-Chloropropene)
		4357	alpha-Methylstyrene
		6698	alpha-Pinene
		4375	Benzene
		5635	Benzyl chloride
		4385	Bromobenzene
		4395	Bromodichloromethane
		4400	Bromoform
		4403	Butyl acetate
		4450	Carbon disulfide
		4455	Carbon tetrachloride
		4475	Chlorobenzene

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Air	EPA TO-15	4575	Chlorodibromomethane
		4485	Chloroethane (Ethyl chloride)
		4505	Chloroform
		4645	cis-1,2-Dichloroethylene
		4680	cis-1,3-Dichloropropene
		4555	Cyclohexane
		4560	Cyclohexanone
		4625	Dichlorodifluoromethane (Freon-12)
		9375	Di-isopropylether (DIPE)
		6208	d-Limonene
		4750	Ethanol
		4755	Ethyl acetate
		4765	Ethylbenzene
		4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
		4835	Hexachlorobutadiene
		4890	Isopropyl acetate
		4895	Isopropyl alcohol (2-Propanol, Isopropanol)
		4900	Isopropylbenzene (Cumene)
		5240	m+p-xylene
		4950	Methyl bromide (Bromomethane)
		4960	Methyl chloride (Chloromethane)
		4990	Methyl methacrylate
		5000	Methyl tert-butyl ether (MTBE)
		4975	Methylene chloride (Dichloromethane)
		5005	Naphthalene
		4425	n-Butyl alcohol (1-Butanol, n-Butanol)
		4435	n-Butylbenzene
		5875	n-Decane
		6235	n-Dodecane
		4825	n-Heptane
		4855	n-Hexane
		5026	n-Nonane
		5027	n-Octane
		5090	n-Propylbenzene
		6747	n-Undecane
		5250	o-Xylene
		4440	sec-Butylbenzene
		5100	Styrene
		4370	T-amylmethylether (TAME)
		4420	tert-Butyl alcohol
		4445	tert-Butylbenzene
		5115	Tetrachloroethylene (Perchloroethylene)

Air	EPA TO-15	5120	Tetrahydrofuran (THF)	
		5140	Toluene	
		4700	trans-1,2-Dichloroethylene	
		4685	trans-1,3-Dichloropropylene	
		5170	Trichloroethene (Trichloroethylene)	
		5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	
		5225	Vinyl acetate	
		5235	Vinyl chloride	
		5260	Xylene (total)	
	EPA TO-17			10312206 Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling Onto Sorbent Tubes
		5160	1,1,1-Trichloroethane	
		5110	1,1,2,2-Tetrachloroethane	
		5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	
		5165	1,1,2-Trichloroethane	
		4630	1,1-Dichloroethane	
		4640	1,1-Dichloroethylene	
		5155	1,2,4-Trichlorobenzene	
		5210	1,2,4-Trimethylbenzene	
		4570	1,2-Dibromo-3-chloropropane (DBCP)	
		4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	
		4695	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon-114)	
		4610	1,2-Dichlorobenzene	
		4635	1,2-Dichloroethane (Ethylene dichloride)	
		4655	1,2-Dichloropropane	
		5215	1,3,5-Trimethylbenzene	
		9318	1,3-Butadiene	
		4615	1,3-Dichlorobenzene	
		4620	1,4-Dichlorobenzene	
		4735	1,4-Dioxane (1,4- Diethyleneoxide)	
		5220	2,2,4-Trimethylpentane	
		4410	2-Butanone (Methyl ethyl ketone, MEK)	
		4860	2-Hexanone (MBK)	
		4995	4-Methyl-2-pentanone (MIBK)	
		4315	Acetone	
		4320	Acetonitrile	
		4375	Benzene	
		4395	Bromodichloromethane	
		4400	Bromoform	
		4450	Carbon disulfide	

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ORELAP Fields of Accreditation

ORELAP ID: 4068

ALS Environmental - Simi Valley

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Simi Valley, CA 93065 Issue Date: 2/16/2019 Expiration Date: 2/15/2020

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Air	EPA TO-17	4455	Carbon tetrachloride		
		4475	Chlorobenzene		
		4575	Chlorodibromomethane		
		4485	Chloroethane (Ethyl chloride)		
		4505	Chloroform		
		4645	cis-1,2-Dichloroethylene		
		4680	cis-1,3-Dichloropropene		
		4555	Cyclohexane		
		4625	Dichlorodifluoromethane (Freon-12)		
		4750	Ethanol		
		4765	Ethylbenzene		
		4835	Hexachlorobutadiene		
		4895	Isopropyl alcohol (2-Propanol, Isopropanol)		
		4900	Isopropylbenzene (Cumene)		
		5240	m+p-xylene		
		4960	Methyl chloride (Chloromethane)		
		5000	Methyl tert-butyl ether (MTBE)		
		4975	Methylene chloride (Dichloromethane)		
		5005	Naphthalene		
		4825	n-Heptane		
		4855	n-Hexane		
		5027	n-Octane		
		5250	o-Xylene		
		5100	Styrene		
		5115	Tetrachloroethylene (Perchloroethylene)		
		5120	Tetrahydrofuran (THF)		
		5140	Toluene		
		4700	trans-1,2-Dichloroethylene		
		4685	trans-1,3-Dichloropropylene		
		5170	Trichloroethene (Trichloroethylene)		
		5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)		
		5235	Vinyl chloride		
		5260	Xylene (total)		
	MADEP APH			90017188	Air-Phase Petroleum Hydrocarbons
		9318	1,3-Butadiene		
		3792	APH Aliphatics C5-C8		
		3793	APH Aliphatics C9-C12		
		3794	APH Aromatics C9-C10		
		4375	Benzene		
		4765	Ethylbenzene		
		5240	m+p-xylene		
		5000	Methyl tert-butyl ether (MTBE)		

OREGON

Environmental Laboratory Accreditation Program

ORELAP Fields of Accreditation

ORELAP ID: 4068

ALS Environmental - Simi Valley

EPA CODE: CA01627

2655 Park Center Drive, Suite A

Certificate: 4068 - 006

Simi Valley, CA 93065

Issue Date: 2/16/2019 Expiration Date: 2/15/2020

As of 2/16/2019 this list supersedes all previous lists for this certificate number.

Air	MADEP APH	5005	Naphthalene		
		5250	o-Xylene		
		5140	Toluene		
Non-Potable Water	EPA RSK-175 (GC-FID)			10212905	Methane, Ethane, and Ethene in water by Headspace GC/FID
		4747	Ethane		
		4752	Ethene		
		4926	Methane		
	EPA RSK-175 (GC-TCD)			10212858	Fixed Gases in water by Headspace GC/TCD
		3755	Carbon dioxide		

APPENDIX A-9

ALS ENVIRONMENTAL WINNIPEG, CANADA

NA-QM-0002 v02 QUALITY MANUAL POLICY SUMMARY

The following is a brief summary of policies that govern our work in ALS Canada Environmental locations. The complete policies and resulting procedures describing specific work are located in the Quality System documentation referenced below.

Organization and Responsibilities – Section 4.1
ALS management accepts the responsibility to carry out its testing activities in such a way as to meet the requirements of clients, regulatory authorities, ISO/IEC 17025:2005, ISO/IEC 17025:2017, and organizations providing accreditation and recognition relevant to each location, including the program requirements of CALA, PJLA, PALA, TNI, and the US DOD, and to communicate the on-going effectiveness of the management system to all staff. The ALS Quality System does not differentiate between accredited and non-accredited tests.

Management System Policy Statement – Section 4.2
ALS management is committed to good professional practice, and to providing a superior level of service and quality in its testing activities that exceeds the industry norm. Our management system is designed to comply with the requirements of ISO/IEC 17025:2005, ISO/IEC 17025:2017, the program requirements of all applicable accrediting bodies, ALS corporate goals, and to satisfy the needs of clients, regulatory authorities, and organizations providing recognition. All staff are required to be familiar with ALS Quality System documentation and to implement its policies and procedures in their work. ALS management is committed to complying with these policies and to continually improve the effectiveness of the management system.

Document Control – Section 4.3 & NA-SP-0425
ALS controls all procedures that form part of its quality management system, including those of internal and external origins, so that work instructions are up-to-date all of the time and so that archived versions will not be inadvertently used.

Review of Agreements, Quotations and Contracts – Section 4.4 & NA-SP-0650 & NA-SP-0651
Appropriate personnel are involved with the provision of quotations and contracts to the degree necessary to understand and fulfill our clients' needs.

Subcontracting Tests – Section 4.5 & NA-SP-0052
Testing is subcontracted to another ALS location or external organization when it cannot be carried out at the receiving location. An evaluation process ensures that the requirements of clients, ALS and accreditation bodies are fulfilled, and risks to ALS are minimized.

Purchasing and Handling Supplies and Services – Section 4.6 & NA-SP-0050
ALS controls the procurement of supplies and services where there is a potential impact to the quality of test results. Documented procedures exist for the purchasing, reception, and storage of materials relevant to the tests performed at each location.

Service to the Customer – Section 4.7
ALS cooperates closely with its customers to ensure their testing needs are understood, and allows them reasonable access to relevant areas of the laboratories. ALS prepares and distributes surveys to its customers that are evaluated by national and regional management teams and are used to define initiatives for improvements.

Complaints – Section 4.8 & NA-SP-0125
ALS is committed to providing a superior level of service to its customers. As a result, every complaint received from customers or other parties, whether received by direct communication or during survey activities, is important and receives follow-up.

Control of Nonconformances – Section 4.9 & NA-SP-0125
When any work conducted by ALS does not conform to a requirement, including noncompliance with ALS policies and procedures or the requirements of our customers, the nonconformance is recorded and reviewed by an appropriate authority.

Improvement – Section 4.10
Management's commitment to continuously improving the effectiveness of the management system is demonstrated by the use of various management system tools to identify areas of needed improvement, including internal and external audits, corrective and preventive action reports, management reviews, various management reports, meetings, client feedback, proficiency test results, reviews of test method performance, data quality objectives, client surveys, and input from personnel.

Corrective Action – Section 4.11 & NA-SP-0125
Appropriate corrective actions are evaluated whenever investigation of a nonconformance indicates prevention of recurrence is needed.

Preventive Action – Section 4.12 & NA-SP-0125
When improvement opportunities are identified or when preventive actions are needed, action plans are developed, implemented and monitored to reduce the likelihood of a nonconformance.

Control of Records – Section 4.13 & NA-SP-0175 & NA-SP-0252 & NA-SP-0850
ALS controls quality and technical records. Quality and technical records are maintained in a readily retrievable manner for a minimum of five years.

Internal Audits – Section 4.14 & NA-SP-0400
Internal audits are performed at each facility following pre-determined schedules and defined procedures to ensure operations comply with the requirements of the management system, the program requirements of all applicable accrediting and recognition bodies, and ISO/IEC 17025:2005 and 2017.

Management Reviews – Section 4.15 & NA-SP-0401
At least annually, Management conducts a review to ensure the management system is effective, continues to be suitable for its operations, and to identify necessary changes or improvements.

Actions to Address Risks and Opportunities – 4.16
ALS policies and tools provide a framework for categorizing, assessing, analyzing, and addressing risk, as well as monitoring and reviewing actions taken. Roles and responsibilities are defined in the relevant procedures.

Computer Systems – Section 5.1 & NA-SP-0150 & NA-SP-0850
Access, maintenance, and protection of the secure ALS computer network is managed nationally by the ALS IT Group. Records are maintained that document the technical specifications and validation of LIMS products codes and calculations.

Personnel - Section 5.2
New employees receive an orientation to ALS and job-specific training. The effectiveness of training actions is evaluated using direct observation and quality system tools. ALS requires all employees to review and sign the Code of Conduct and the Data Integrity agreements that communicate the employee responsibilities and expectations, including those for confidentiality, independence and impartiality.

Accommodations and Environmental Conditions – Section 5.3
ALS facilities and their environmental conditions are appropriate for the correct performance of tests conducted at each location. Incompatible activities are separated and steps are taken to prevent cross-contamination. ALS has an extensive safety program managed by the Compliance Department.

Test Methods and Method Validation – Section 5.4 & NA-SP-0100 & NA-SP-0101 & NA-SP-0102
Where possible, ALS uses the latest versions of published standard methods. Deviations from authorized test methods occur only if the deviation has been documented, technically justified, authorized, and accepted by the customer where applicable.
Initial method validation confirms a location can properly operate the test method before introducing the test into the laboratory. Initial method validation is as extensive as necessary to meet the needs of the given application, and includes an initial estimation of measurement uncertainty. Revalidation is performed periodically to demonstrate continued compliance to requirements.

Equipment – Section 5.5 & NA-SP-0051 & NA-SP-0078
Appropriate equipment and instrumentation is obtained and maintained to ensure test method performance meets client needs and performance specifications.

Measurement Traceability – Section 5.6
ALS measurement and testing equipment that can have a significant effect on the accuracy or validity of test results is calibrated using established procedures that ensure traceability through an unbroken chain of calibrations or by comparison to national measurement standards, where applicable.

Sampling – Section 5.7
ALS laboratories do not field sample. Subsampling from submitted sample containers is conducted in a manner to obtain representative sub-samples. The error associated with subsampling is statistically monitored by collecting duplicate sub-samples for test procedures where subsampling occurs. Sub-sampling instructions are included or referenced in test methods where applicable.

Handling of Samples – Section 5.8 & NA-SP-0325
ALS procedures for sample handling include transportation conditions, receipt, handling, protection, storage, retention, and disposal. The sample handing practices are designed to ensure the consistency and reliability of ALS services, to minimize preventable errors, and to ensure compliance with regulatory and client-specific requirements. Samples are given a unique identification upon receipt which is retained by the sample throughout its life. Abnormalities or other departures from specified sampling or transportation procedures are documented. Where there is doubt concerning the integrity of the sample, its identification or suitability for testing, or the requested tests, the customer is consulted before proceeding. ALS has appropriate facilities needed to securely maintain sample integrity, both before testing and where archiving for future testing is required. Where important to protecting sample integrity, storage conditions are monitored and recorded. Samples are retained for an appropriate amount of time before disposal. Each test is evaluated for specific disposal requirements.

Assuring the Quality of Test Results – Section 5.9 & NA-SP-0104 & NA-SP-0109 & NA-SP-0175
Extensive Quality Control (QC) practices monitor the validity of test results for every batch of samples analyzed. ALS laboratories also participate in an extensive range of proficiency testing (PT) programs that provide an external evaluation of the performance of test methods. Test results proceed through several reviews prior to the release of final reports. Our data validation process includes test result validation, inter-parameter validation, and report validation.

Reporting Test Results – Section 5.10
The LIMS standard test report includes all information necessary for the interpretation of test results. When report re customized, information not reported is retained in the database. The confidentiality of test reports is protected by ensuring only the correct individual receives results and by identifying transmissions as confidential. It is ALS practice to never disclose information about a client's test results to a third party without the prior consent of the client, or unless compelled to by law. If ALS is obligated by law to disclose such information, the client will be informed prior to doing so.

CALA
Canadian Association for Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 1442
Laboratory Name: ALS Environmental (Winnipeg)
Parent Institution: ALS Canada Ltd.
Address: 1329 Niakwa Road East Unit 12 Winnipeg MB R2J 3T4
Contact: Mr. David Gurdibaniuk
Phone: (204) 255-9745
Fax: (204) 255-9721
Email: ALSWP.Quality@alsglobal.com; linda.neimor@ALSGlobal.com

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served: All Interested Parties
Revised On: July 4, 2019
Valid To: September 30, 2021

Scope of Accreditation

Air (Inorganic)
Asbestos - Air (175)
WP-TM-1702; NIOSH 7400
PCM FIBRE COUNTING
Asbestos

Air (Inorganic)
Radon - Air (142)
WP-TM-1801; modified from EPA 402-R-92-004
ELECTRET RADON MONITOR
Radon

Air (Mycology)
Mould - Air (055)
WP-TM-1703; modified from INTRODUCTION TO FOOD-BOURNE FUNGI
CULTURABLE - MICROSCOPY
Biocontaminant Identification
Biocontaminant Quantitation

Air (Mycology)
Mould - Air (163)
WP-TM-1704; modified from ASTM D7391
DIRECT MICROSCOPIC EXAMINATION
Biocontaminant Identification
Biocontaminant Quantification

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Food (Inorganic)
pH - Food (188)
WP-TM-1223; MFHPB-03
pH METER
pH

Food (Microbiology)
Coliforms - Food [Butter, Cheese, Dairy, Dairy Products (Except Unpasturized Milk for Payment Purposes), Edible Meat Offal, Egg, Milk Powder] (153)
WP-TM-1210; MFHPB-19
MOST PROBABLE NUMBER
Escherichia coli (E. coli)
Fecal (Thermotolerant) Coliforms
Total Coliforms

Food (Microbiology)
Coliforms - Food [Butter, Cheese, Dairy, Dairy Products (Except Unpasturized Milk for Payment Purposes), Edible Meat Offal, Egg, Milk Powder] (157)
WP-TM-1209; MFHPB-31
POUR PLATE
Total Coliforms

Food (Microbiology)
Coliforms - Food [Environmental Surface, Food Product] (200)
WP-TM-1228; MFHPB-34
PETRIFILM METHOD
Escherichia coli (E. coli)
Total Coliform

Food (Microbiology)
Gluten - Food (192)
WP-TM-1226; AOAC 2014.03 and ROMER GLUTEN G12 ASSAY PRODUCT INSERT
ELISA
Gluten

Food (Microbiology)
Heterotrophic Plate Count (HPC) - Food [Butter, Cheese, Dairy, Dairy Products (Except Unpasturized Milk for Payment Purposes), Edible Meat Offal, Egg, Milk Powder] (152)
WP-TM-1208; MFHPB-18
POUR PLATE
Heterotrophic Plate Count (HPC)

Food (Microbiology)
Listeria - Food [Bread, Cacao, Environmental Surface, Meat] (189)
WP-TM-1224; MFLP-28
PCR
Listeria

Food (Microbiology)
Listeria - Food [Butter, Cheese, Dairy, Dairy Products (Except Unpasturized Milk for Payment Purposes), Edible Meat Offal, Egg, Milk Powder] (151)
WP-TM-1202; AOAC 997.03
VISUAL IMMUNOPRECIPITATE ASSAY
Listeria monocytogenes

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Food (Microbiology)
Listeria - Food [Butter, Cheese, Dairy, Dairy Products (Except Unpasturized Milk for Payment Purposes), Edible Meat Offal, Egg, Environmental Surface, Milk Powder] (156)
WP-TM-1201; MFHPB-30
PRESENCE/ABSENCE
Listeria monocytogenes

Food (Microbiology)
Listeria - Food [Butter, Cheese, Dairy, Dairy Products (Except Unpasturized Milk for Payment Purposes), Edible Meat Offal, Egg, Milk Powder] (158)
WP-TM-1203; MFLP-34
VISUAL IMMUNOPRECIPITATE ASSAY
Listeria monocytogenes

Food (Microbiology)
Salmonella - Food [Butter, Cheese, Dairy, Dairy Products (Except Unpasturized Milk for Payment Purposes), Edible Meat Offal, Egg, Environmental Surface, Milk Powder] (154)
WP-TM-1204; MFHPB-20
SPREAD PLATE
Salmonella

Food (Microbiology)
Salmonella - Food [Chocolate, Dairy, Environmental Surface, Poultry] (179)
WP-TM-1222; MFLP-29
PCR
Salmonella

Food (Microbiology)
Salmonella - Food [Egg, Egg Product, Meat, Poultry] (160)
WP-TM-1206; USDA MLG 4
SPREAD PLATE
Salmonella

Food (Microbiology)
Staphylococcus aureus - Food [Butter, Cheese, Dairy, Dairy Products (Except Unpasturized Milk for Payment Purposes), Edible Meat Offal, Egg, Milk Powder] (155)
WP-TM-1207; MFHPB-21
SPREAD PLATE
Staphylococcus aureus

Food (Microbiology)
Yeast and Mould - Food (168)
WP-TM-1211; MFHPB-22
POUR PLATE
Mould
Yeast

Soil (Inorganic)
Total Mercury - Soil (195)
NA-TM-1005, NA-TP-2004, NA-TP-2012; modified from EPA 1631E and EPA 200.2
COLD VAPOUR AA - DIGESTION
Mercury

Solids (Biology)
Benthic Organisms - Solids [Sediment] (075)
WP-TM-1301; modified from SM 10500
MICROSCOPE EXAMINATION
Benthos Enumeration
Benthos Identification

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Solids (Inorganic)
Asbestos - Solids [Bulk] (176)
WP-TM-1701; NIOSH 9002
POLARIZED LIGHT MICROSCOPY (PLM)
Bulk Asbestos

Solids (Inorganic)
Cations - Solids [Soil] (184)
NA-TM-1002, WP-TM-1034; modified from EPA 6020B and SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 15
ICP/MS - SATURATED PASTE EXTRACTION
Calcium
Magnesium
Potassium
Sodium
Sulfur

Solids (Inorganic)
Chloride - Solids [Soil] (183)
WP-TM-1033; modified from SM 4500-CL- E
COLORIMETRIC - DISCRETE ANALYZER
Chloride

Solids (Inorganic)
Conductivity - Solids [Soil] (185)
WP-TM-1034; SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 15
CONDUCTIVITY METER
Conductivity

Solids (Inorganic)
Metals - Solids (149)
NA-TM-1002, NA-TM-1700, NA-TP-2007; modified from EPA 1311 (PREPARATION) and EPA 6020B (ANALYSIS)
ICP/MS - TCLP
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Molybdenum
Nickel
Potassium
Selenium
Silver
Strontium
Thallium
Tin
Uranium

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Vanadium
Zinc
Zirconium

Solids (Inorganic)
Moisture - Solids [Soil] (170)
WP-TM-1108; CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD
GRAVIMETRIC
Percent Moisture

Solids (Inorganic)
Particle Size Analysis (PSA) - Solids [Soil] (201)
WP-TM-1036; modified from ASTM D422-63
HYDROMETER
Clay (<0.005mm)
Gravel (4.75mm-75mm)
Sand (0.075mm-4.75mm)
Silt (0.005mm-0.075mm)

Solids (Inorganic)
Particle Size Analysis (PSA) - Solids [Soil] (202)
WP-TM-1035; modified from ASTM D422-63
GRAVIMETRIC
Sand (>75um)

Solids (Inorganic)
Percent Saturation - Solids [Saturated Paste] (186)
WP-TM-1034; SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 15
SATURATED PASTE
Saturation Percentage

Solids (Inorganic)
pH - Solids [Soil] (182)
WP-TM-1032; SOIL SAMPLING & METHODS OF ANALYSIS 2ND ED, 2008
pH METER
pH

Solids (Inorganic)
Total Metals - Solids (131)
NA-TM-1002, NA-TP-2004, NA-TP-2007; modified from EPA 200.2 and EPA 6020B
ICP/MS - DIGESTION
Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Molybdenum

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Nickel
Phosphorus
Potassium
Selenium
Silver
Sodium
Strontium
Sulfur
Thallium
Thorium
Tin
Titanium
Uranium
Vanadium
Zinc

Solids (Mycology)
Mould - Solids [Bulk, Swab] (178)
WP-TM-1703; INTRODUCTION TO FOOD-BOURNE FUNGI, 5TH ED
CULTURABLE - MICROSCOPY
Mould

Solids (Organic)
Glycols - Solids [Soil] (145)
WP-TM-1102; modified from ASTM D3695-82
GC/FID
Diethylene glycol
Ethylene glycol
Propylene glycol
Tetraethylene glycol
Triethylene glycol

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Solids [Soil] (148)
NA-TM-1100, NA-TP-2100; modified from CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD
GC/FID
F2: C10-C16
F3: C16-C34
F4: C34-C50

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Solids [Soil] (150)
NA-TM-1100, NA-TP-2100; modified from CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD
GRAVIMETRIC - TUMBLER
F4: Gravimetric

Solids (Organic)
Polycyclic Aromatic Hydrocarbons (PAH) - Solids [Soil] (051)
NA-TM-1105, NA-TP-2103; modified from EPA 8270D
GC/MS - SHAKE EXTRACTION
1-Methylnaphthalene
2-Methylnaphthalene
Acenaphthene
Acenaphthylene
Acridine
Anthracene

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Benzo (a) anthracene
Benzo (a) pyrene
Benzo(b,j)fluoranthene
Benzo (g,h,i) perylene
Benzo (k) fluoranthene
Chrysene
Dibenzo (a,h) anthracene
Fluoranthene
Fluorene
Indeno (1,2,3 - cd) pyrene
Naphthalene
Phenanthrene
Pyrene
Quinoline

Solids (Organic)
Volatile Fatty Acids - Solids [Soil] (129)
WP-TM-1105; modified from ASTM D2908-91
GC/MS - WATER EXTRACTION
Acetic acid
Butyric acid
Caproic acid
Formic acid
Isobutyric acid
Isovaleric acid
Propionic acid
Valeric acid

Solids (Organic)
Volatile Organic Compounds (VOC) - Solids [Soil] (141)
NA-TM-1102, NA-TP-2102; modified from EPA 5021A and EPA 8260C
GC/MS - METHANOL EXTRACTION/HEADSPACE
1,1-Dichloroethane
1,1-Dichloroethylene
1,1-Dichloropropene
1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromo-3-chloropropane (DBCP)
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,3,5-Trimethylbenzene
1,4-Dichlorobenzene
2-Chlorotoluene
2,2-Dichloropropane
4-Chlorotoluene
4-Isopropyltoluene

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Acetone (2-Propanone)
Benzene
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
Carbon disulfide
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Ethylbenzene
Ethylene Dibromide
Hexachlorobutadiene
Hexane
Isopropylbenzene
m/p-xylene
Methyl ethyl ketone
Methyl isobutyl ketone
Methyl n-butyl ketone
Methyl t-butyl ether
n-Butylbenzene
o-xylene
sec-Butylbenzene
Styrene
tert-Butylbenzene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane
Vinyl chloride

Solids (Organic)
Volatile Petroleum Hydrocarbons (VPH) - Solids [Soil] (140)
NA-TM-1102, NA-TP-2102; CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD (PERFORMANCE BASED MODIFICATION)
GC/FID - METHANOL EXTRACTION/HEADSPACE
F1: C6-C10

Tissue (Inorganic)
Total Mercury - Tissue (198)
NA-TM-1005, NA-TP-2006, NA-TP-2012; modified from EPA 1631E and EPA 200.3
COLD VAPOUR AA
Mercury

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Tissue (Inorganic)
Total Metals - Tissue (070)
NA-TM-1002, NA-TP-2006, NA-TP-2007; BCMOE LABORATORY MANUAL and EPA 6020B
ICP/MS - DIGESTION
Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Cesium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Molybdenum
Nickel
Phosphorus
Potassium
Rubidium
Selenium
Silver
Sodium
Strontium
Tellurium
Thallium
Tin
Titanium
Uranium
Vanadium
Zinc

Tissue (Organic)
Chlorophyll - Tissue (171)
WP-TM-1022; modified from EPA 445.0
ACETONE EXTRACTION/FLUORESCENCE
Chlorophyll a

Waste (Inorganic)
Total Mercury - Waste (197)
NA-TM-1005, NA-TM-1700, NA-TP-2012; modified from EPA 1311 and EPA 1631E
COLD VAPOUR AA - DIGESTION - TCLP
Mercury

Water (Biology)
Phytoplankton and Zooplankton - Water (076)
WP-TM-0102; modified from SM 10200
MICROSCOPE EXAMINATION
Phytoplankton Enumeration
Phytoplankton identification

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Zooplankton Enumeration
Zooplankton Identification

Water (Inorganic)
Alkalinity - Water (001)
WP-TM-1028; modified from SM 2320 B
TITRIMETRIC
Alkalinity (pH 4.5)

Water (Inorganic)
Ammonia - Water (135)
WP-TM-1011, WP-WI-3005; modified from SM 4500-NH3 F
COLORIMETRIC - DISCRETE ANALYZER
Ammonia

Water (Inorganic)
Anions - Water (134)
NA-TM-1001; modified from EPA 300.1
ION CHROMATOGRAPHY
Bromide
Chloride
Fluoride
Nitrate
Nitrite
Sulfate

Water (Inorganic)
Biochemical Oxygen Demand (BOD) - Water (015)
WP-TM-1015; modified from SM 5210 B
D.O. METER
BOD (5 day)
CBOD (5 day)

Water (Inorganic)
Carbon - Water (038)
WP-TM-1029; modified from SM 5310 B
AUTO IR ANALYZER
Inorganic Carbon
Organic Carbon
Total Carbon (Calculation)

Water (Inorganic)
Chemical Oxygen Demand (COD) - Water (060)
WP-TM-1017; modified from HACH and SM 5220 D
COLOR - DIGESTION
COD

Water (Inorganic)
Chlorine - Water (147)
WP-TM-1013; modified from SM 4500-CL G
COLORIMETRIC
Free Chlorine
Total Chlorine

Water (Inorganic)
Colour - Water (136)
WP-TM-1010, WP-WI-3005; modified from SM 2120 C
COLORIMETRIC - DISCRETE ANALYZER
True Colour

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Water (Inorganic)
Conductivity - Water (003)
WP-TM-1028; modified from SM 2510 B
CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic)
Dissolved and Extractable Metals - Water (056)
NA-TM-1002, NA-TP-2002, NA-TP-2007; modified from EPA 200.2 and EPA 6020B
ICP/MS
Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Cesium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum
Nickel
Phosphorus
Potassium
Rubidium
Selenium
Silicon
Silver
Sodium
Strontium
Sulfur
Tellurium
Thallium
Thorium
Tin
Titanium
Tungsten
Uranium
Vanadium
Zinc
Zirconium

Water (Inorganic)
Dissolved Oxygen - Water (088)
WP-TM-1018; modified from SM 4500-O C
IODOMETRIC - AZIDE MODIFICATION
Dissolved Oxygen

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Water (Inorganic)
Mercury - Water (196)
NA-TM-1005, NA-TP-2002, NA-TP-2012; modified from EPA 1631E and EPA 200.2 and SM 3030 B
COLD VAPOUR AA - DIGESTION
Mercury

Water (Inorganic)
Oil and Grease - Water (169)
WP-TM-1109; modified from EPA 1664
GRAVIMETRIC - EXTRACTION
Mineral Oil and Grease
Total Oil and Grease

Water (Inorganic)
pH - Water (019)
WP-TM-1028; modified from SM 4500-H+
pH METER
pH

Water (Inorganic)
Phosphorus - Water (164)
WP-TM-1016; modified from SM 4500-P A and SM 4500-P B and SM 4500-P E
COLORIMETRIC - DISCRETE ANALYZER
Dissolved Phosphate
Phosphate

Water (Inorganic)
Phosphorus - Water (165)
WP-TM-1016; modified from SM 4500-P A and SM 4500-P B and SM 4500-P E
COLORIMETRIC - DISCRETE ANALYZER - DIGESTION
Total Dissolved Phosphorus
Total Inorganic Phosphorus
Total Phosphorus

Water (Inorganic)
Silica - Water (137)
WP-TM-1012, WP-WI-3005; modified from SM 4500-SIO2
COLORIMETRIC - DISCRETE ANALYZER
Reactive Silica

Water (Inorganic)
Solids - Water (014)
NA-TM-1004, WP-TM-1014; modified from SM 2540 B and SM 2540 C and SM 2540 D
GRAVIMETRIC
Total Dissolved Solids
Total Solids
Total Suspended Solids
Volatile Suspended Solids

Water (Inorganic)
Total Kjeldahl Nitrogen (TKN) - Water (173)
WP-TM-1030, WP-TP-2000, WP-WI-3005; modified from SM 4500-NORG D
COLORIMETRIC - DISCRETE ANALYZER
Total Kjeldahl Nitrogen

Water (Inorganic)
Total Metals - Water (180)
NA-TM-1002, NA-TP-2001, NA-TP-2007; EPA 200.2 and EPA 6020B
ICP/MS - DIGESTION
Aluminum

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Antimony
Antimony
Arsenic
Arsenic
Barium
Beryllium
Beryllium
Bismuth
Boron
Cadmium
Cadmium
Calcium
Cesium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum
Nickel
Phosphorus
Potassium
Rubidium
Selenium
Selenium
Silicon
Silver
Silver
Sodium
Strontium
Sulfur
Tellurium
Thallium
Thorium
Tin
Tin
Titanium
Tungsten
Uranium
Uranium
Vanadium
Zinc
Zirconium

Water (Inorganic)

Turbidity - Water (068)
WP-TM-1009; modified from SM 2130 B
TURBIDIMETRIC
Turbidity

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Water (Inorganic)
UV Absorbance and Transmittance - Water (166)
WP-TM-1027; modified from SM 5910 B
SPECTROPHOTOMETRIC
UV Absorbance
UV Transmittance

Water (Microbiology)
Coliforms - Water (039)
NA-TM-1300; modified from IDEXX and SM 9223 B
MOST PROBABLE NUMBER (QUANTI-TRAY)
Escherichia coli
Total Coliforms

Water (Microbiology)
Coliforms - Water (172)
WP-TM-1221; modified from ON MOECC E3407
MEMBRANE FILTRATION (DC-AGAR)
Escherichia coli
Total Coliforms

Water (Microbiology)
Cryptosporidium and Giardia - Water (053)
WP-TM-1212; modified from EPA 1623
IMS/FA - FILTRATION
Cryptosporidium Enumeration
Giardia Enumeration

Water (Microbiology)
Fecal (Thermotolerant) Coliforms - Water (025)
WP-TM-1218; modified from SM 9222 D
MEMBRANE FILTRATION (mFC)
Fecal (Thermotolerant) Coliforms

Water (Microbiology)
Fecal (Thermotolerant) Coliforms - Water (167)
NA-TM-1300; modified from SM 9223 B
MOST PROBABLE NUMBER (QUANTI-TRAY)
Fecal (Thermotolerant) Coliforms

Water (Microbiology)
Fecal Streptococci - Water (199)
WP-TM-1231; modified from SM 9230 C
MEMBRANE FILTRATION
Fecal streptococcus

Water (Microbiology)
Heterotrophic Plate Count (HPC) - Water (041)
NA-TM-1301; modified from SM 9215 B
POUR PLATE
Heterotrophic Plate Count (HPC)

Water (Microbiology)
Legionella - Water (118)
WP-TM-1213; modified from ISO 11731 and SM 9260 J
MEMBRANE FILTRATION
Legionella-enumeration

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Water (Microbiology)
Microcystins - Water (090)
WP-TM-1104; ENVIROLOGIX MANUAL and TOXICON MANUAL
ELISA
Microcystins

Water (Microbiology)
Pseudomonas aeruginosa - Water (093)
WP-TM-1215; modified from SM 9213 E
MEMBRANE FILTRATION (mPAC)
Pseudomonas aeruginosa

Water (Microbiology)
Total Coliforms - Water (078)
WP-TM-1218; modified from SM 9222 B
MEMBRANE FILTRATION (mENDO)
Total Coliforms

Water (Organic)
Alcohols and Glycols - Water (146)
WP-TM-1102; modified from ASTM D2908-91
GC/FID
Diethylene glycol
Ethanol
Ethylene glycol
Isobutanol
Isopropanol
Methanol
n-Butanol
n-Pentanol
Propylene glycol
sec-Butanol
Tetraethylene glycol
Triethylene glycol

Water (Organic)
Chlorophyll A - Water (144)
WP-TM-1022; EPA 445.0
FLUORESCENCE
Chlorophyll

Water (Organic)
Haloacetic Acids (HAA) - Water (124)
WP-TM-1103; modified from EPA 552.2
GC/ECD - LIQUID/LIQUID PARTITION
Bromochloroacetic acid
Dibromoacetic acid
Dichloroacetic acid
Monobromoacetic acid
Monochloroacetic acid
Trichloroacetic acid

Water (Organic)
Petroleum Hydrocarbons (PHC) - Water (132)
NA-TM-1112, NA-TP-2100; modified from CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD and EPA 3511
GC/FID - EXTRACTION
F2: C10-C16

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F3: C16-C34
F4: C34-C50

Water (Organic)
Polycyclic Aromatic Hydrocarbons (PAH) - Water (193)
NA-TM-1112, NA-TP-2103; modified from EPA 3511 and EPA 8270D
GC/MS - EXTRACTION
1-Methylnaphthalene
2-Methylnaphthalene
Acenaphthene
Acenaphthylene
Acridine
Anthracene
Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b,j) fluoranthene
Benzo (g,h,i) perylene
Benzo (k) fluoranthene
Chrysene
Dibenzo (a,h) anthracene
Fluoranthene
Fluorene
Indeno (1,2,3 - cd) pyrene
Naphthalene
Phenanthrene
Pyrene
Quinoline

Water (Organic)
Volatile Fatty Acids - Water (130)
WP-TM-1105; modified from ASTM D2908-91
GC/MS
Acetic acid
Butyric acid
Caproic acid
Formic acid
Isobutyric acid
Isovaleric acid
Propionic acid
Valeric acid

Water (Organic)
Volatile Organic Compounds (VOC) - Water (139)
NA-TM-1102; modified from EPA 5021A and EPA 8260C
GC/MS - HEADSPACE
1,1-Dichloroethane
1,1-Dichloroethylene
1,1-Dichloropropene
1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromo-3-chloropropane (DBCP)
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane

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1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,3,5-Trimethylbenzene
1,4-Dichlorobenzene
2-Chlorotoluene
2,2-Dichloropropane
4-Chlorotoluene
4-Isopropyltoluene
Acetone (2-Propanone)
Benzene
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromodichloromethane - Formation Potential
Bromoform
Bromoform - Formation Potential
Bromomethane
Carbon disulfide
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chlorodibromomethane - Formation Potential
Chloroethane
Chloroform
Chloroform - Formation Potential
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Ethylbenzene
Ethylene Dibromide
Hexachlorobutadiene
Hexane
Isopropylbenzene
m/p-xylene
Methyl ethyl ketone
Methyl isobutyl ketone
Methyl n-butyl ketone
Methyl t-butyl ether
n-Butylbenzene
o-xylene
sec-Butylbenzene
Styrene
tert-Butylbenzene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene

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trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

Water (Organic)
Volatile Petroleum Hydrocarbons (VPH) - Water (138)
NA-TM-1102; modified from EPA 5021A and EPA 8015D
GC/FID - HEADSPACE
F1: C6-C10

Water (Toxicology)
Daphnia magna - Water [Wastewater] (017)
WP-TM-1401; EPS 1/RM/11 and EPS 1/RM/14
ACUTE LETHALITY (SURVIVAL)
Daphnia LC50 (48 h)
Single Concentration (48h)

Water (Toxicology)
Microtox - Water [Wastewater] (050)
WP-TM-1403; EPS 1/RM/24
BIOLUMINESCENCE
Microtox (30min.)
Microtox (5min.)
Microtox IC50 (15 min)

Water (Toxicology)
Rainbow Trout - Water [Wastewater] (049)
WP-TM-1402; EPS 1/RM/13 and EPS 1/RM/9
ACUTE LETHALITY (SURVIVAL)
Single Concentration (96h)
Trout LC50 (96 h)

Water (Toxicology)
Rainbow Trout [pH Stabilization] - Water [Wastewater] (161)
WP-TM-1402; EPS 1/RM/13 and EPS 1/RM/50
ACUTE LETHALITY (SURVIVAL)
Single Concentration (96h) - pH Stabilization
Trout LC50 (96h) - pH Stabilization

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APPENDIX B

DATA VALIDATION VARIANCE DOCUMENTATION

Appendix B. Data Validation Variance Documentation

Most data are evaluated in accordance with the United States Environmental Protection Agency (USEPA) National Functional Guidelines (NFGs) documentation USEPA Methods, and Chapter 8 of the EPA Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP), document number EPA 402-B-04-001A (EPA 2004) and the American Nuclear Society Standard 41.5-2012 (ANS 2012) for radiological analyses; however, professional judgment, outside the guidance documents and methods, is often necessary when making decisions regarding data quality. The tables below are intended to specifically document how Trihydro Corporation's Chemical Data Evaluation Service's (CDES) group interprets the areas where professional judgment is recommended referenced guidance documents or where Trihydro may validate differently from the specific guidance documents. The tables are grouped by compound type (i.e., organic, inorganic, or radiological analyses). Radiochemical analyses will be validated as described in Appendix B, and in accordance with guidelines from Chapter 8 of the EPA MARLAP, document number EPA 402-B-04-001A (EPA 2004) and the American Nuclear Society Standard 41.5-2012 (ANS 2012). Changes to data validation procedures for radiological analyses may be made at the discretion of the data validator and will be documented in the data validation reports. Where guidance tables are not included for specific analyses, then professional judgement is not required and the referenced guidelines will be followed.

- Data for organic analyses were evaluated in general accordance with validation criteria set forth in the USEPA Contract Laboratory Program (CLP) NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017 with additional reference to the USEPA CLP NFGs for Organic Data Review, document number EPA 540/R-99/008, October 1999. When additional reference is necessary for interpretation of the analytical data, the analytical method may be used as an additional resource although analytical methods do not provide guidance for qualification of data.
- Data for inorganic analyses were evaluated in general accordance with the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017 with additional reference to the USEPA CLP NFGs for Inorganic Data Review, document number EPA-540-R-04-004, October 2004. When additional reference is necessary for interpretation of the analytical data, the analytical method may be used as an additional resource although analytical methods do not provide guidance for qualification of data.
- Data for radiological analyses were evaluated in general accordance with the EPA MARLAP
- Data for radiological analyses were evaluated in general accordance with the American Nuclear Society Verification and Validation of Radiological Data for use in Waste Management and Environmental Remediation (ANSI/ANSI-41.5-2012) (ANSI 2012) (Revised 2018)
- Review of field duplicates was conducted in accordance with the USEPA New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement1, June 2018.

Appendix B. Data Validation Variance Documentation

The following table contains the flags used during the data validation process and the associated flag definitions.

Flag Code	Flag Definition
J	Estimated concentration or result
J+	The result is an estimated concentration, but may be biased high (This code is not applicable to the data validation of radiological analyses.)
J-	The result is an estimated concentration, but may be biased low (This code is not applicable to the data validation of radiological analyses.)
UJ	Estimated reporting limit (This code is not applicable to the data validation of radiological analyses.)
U	Evaluated to be undetected at the reporting limit or for radiological analyses the analyte result is less than the critical value
JB	Estimated concentration due to blank contamination (This code is not applicable to the data validation of radiological analyses.)
R	Rejected, data not usable
NJ	Tentative identification and estimated concentration
Q	A reported combined standard uncertainty, which exceeds the project's required method uncertainty. This qualifier will only be used for radiological analyses data validation.

Updated: October 2019

Appendix B. Data Validation Variance Documentation

Organic Analyses

The organic guidelines used to determine the quality of the data are in accordance with the NFGs and USEPA Methods for the analysis of volatile organic compounds, semivolatile organic compounds, pesticide compounds, and Aroclor compounds.

Preservation Criteria

Review Items:

a) pH

b) Sample Temperature

c) Holding Time

d) Other Sample Conditions (e.g., headspace)

Criteria:
The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.

Trihydro action variances from standard U.S. EPA criteria:
The data validation variances listed below are based on validator professional judgment and may slightly vary from the USEPA CLP National Functional Guidelines but are found to be more conservative. Validator professional judgment may vary due to specific project data quality objectives. The variances listed below are applicable to the preservation review items. Items noted in bold type indicate variances due to professional judgment.

Out of control review items noted above will result from the use of technical holding times. Sample holding times defined in days will be evaluated in days (independent of hours and minutes elapsed), sample holding times published in hours will be measured to the hour, etc.

TABLE 1. HOLDING TIME ACTIONS FOR TRACE VOLATILE ANALYSES

Matrix	Preserved	Criteria	Action	
			Detected Associated Compounds	Non-Detected Associated Compounds
Aqueous	Yes	Greater than 14 days	**J-**	**R**
Aqueous *	Yes, but the VOA contains headspace greater than a dime size.	Greater than 7 days**	**J -**	**R**
Aqueous	No, pH > 2 at the time of analysis.	Greater than 7 days	**J -**	**R**

Preservation Criteria

*** Qualification regarding sample headspace is subject to professional judgment. Hence, if sample condition does not allow zero headspace other action may be taken.**
**** Qualification regarding sample headspace is subject to professional judgment. Sample holding time may not be considered.**

NFG Section E Items 1a), b), c), and d): Gross holding time exceedances (doubling the technical hold and/or extraction time) will result in the rejection (R) of all data for the sample.

TABLE 2. HOLDING TIME ACTIONS FOR LOW/MEDIUM VOLATILE ANALYSES

Matrix	Preserved	Criteria	Action	
			Detected Associated Compounds	Non-Detected Associated Compounds
Aqueous	Yes	Greater than 14 days	**J-**	**R**
Aqueous*	Yes, but the VOA contains headspace greater than a dime size.	Greater than 7 days**	**J-**	**R**
Aqueous	No, pH > 2 at the time of analysis.	Greater than 7 days	**J-**	**R**

*** Qualification regarding sample headspace is subject to professional judgment. Hence, if sample condition does not allow zero headspace other action may be taken.**
**** Qualification regarding sample headspace is subject to professional judgment. Sample holding time may not be considered.**

NFG Section E Items 1a), b), c), and d): Gross holding time exceedances (doubling the technical hold and/or extraction time) will result in the rejection (R) of all data for the sample.

TABLE 3. HOLDING TIME ACTIONS FOR SEMIVOLATILES/PESTICIDE ORGANIC ANALYSES

Matrix	Preserved	Criteria	Action	
			Detected Associated Compounds	Non-Detected Associated Compounds
Aqueous	Yes / No	Greater than 7 days (for extraction) and/or Greater than 40 days (for analysis)	**J**	**UJ**

Preservation Criteria				
Non-Aqueous	Yes / No	Greater than 14 days (for extraction) and/or Greater than 40 days (for analysis)	**J**	**UJ**
Aqueous	Yes / No	Grossly Exceeded (more than two times the holding time)	**J**	**R**
Non-Aqueous	Yes / No	Grossly Exceeded (more than two times the holding time)	**J**	**R**

Some analytical extraction and holding times are defined only in units of days, such as the 14-day holding time for preserved volatiles samples. In determining if samples were extracted/analyzed within acceptable holding times, a holding time of 14 days is interpreted to be equal to 14 days after the date of sampling, independent of sampling time. Data validation actions based on differences between laboratory acceptable holding times and the method holding times, as defined above, are described in Table 4, below.

Apply bias indicators (J+, J-) only if behavior of analyte(s) is known and documented.

NFG Section E Items 1a), b), c), and d): Gross holding time exceedances (doubling the technical hold and/or extraction time) will result in the rejection (R) of all data for the sample.

Aroclor holding times are now one year for properly preserved samples.

TABLE 4. HOLDING TIME ACTIONS FOR DISCREPANCIES BETWEEN LABORATORY HOLDING TIMES AND METHOD HOLDING TIMES

Analysis Within Laboratory Hold/Extraction Time?	Analysis Within Method Hold/Extraction Time?	Action	
		Detected Associated Compounds	Non-Detected Associated Compounds
Yes	Yes	None	None
Yes	No	**J**	**UJ**
No	No	**J**	**UJ or R**

TABLE 5. TEMPERATURE ACTIONS FOR ORGANIC ANALYSES

	< 0°C Frozen	0-2° Not Frozen	2-6°C	6-10°C	10-20°C	>20°C
Volatiles	**Reject**	**no qual**	**no qual**	**J- / UJ***	**J- / UJ / REJECT***	**Reject**
SVOCs	**Reject**	**no qual**	**no qual**	**J / UJ***	**J / UJ***	**Reject**
Metals	**no qual**	**no qual**	**no qual**	**no qual**	**no qual**	**no qual**

Preservation Criteria						
Inorganics	**Analyte dependent**	**no qual**	**no qual**	**Analyte dependent**	**Analyte dependent**	**Analyte dependent**

***Temperatures >6˚C but ≤10˚C may be accepted based on the professional judgment of the validator. Application and selection of qualifiers for volatile and semivolatile is based on validator's professional judgment.**

Validator may elect to not qualify samples if they were hand delivered to the laboratory and did not have sufficient time to cool (less than 24 hours from last collection time). Qualification is at the discretion of the validator.

TABLE 6. SOIL GAS VAPOR INTRUSION HELIUM CONCENTRATION ACTIONS

Matrix	Criteria	Action	
		Detected Associated Compounds	Non-Detected Associated Compounds
Soil Gas	Sample had helium concentration greater than 10% of the concentration in the shroud *	**R if analyzed**	**R if analyzed**
Soil Gas	Sample had helium concentration greater than 5%, but less than or equal to 10% of the concentration in the shroud *	**J**	**UJ**
Soil Gas	Sample had concentration of helium less than 5% of the concentration in the shroud *	No qualification	No qualification

*** Unless other limits are specified by project requirements.**

Appendix B. Data Validation Variance Documentation

Gas Chromatograph/Mass Spectrometer (GC/MS) and GC Electron Capture Detector (ECD) Instrument Performance Check
Review Items: a) Bromofluorobenzene (BFB) mass spectra and mass listing. b) Semi-Volatiles, decafluorotriphenylphosphine (DFTPP) mass spectra, and mass listing. c) Chromatograms and data system printouts.
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.
Trihydro action variances from standard U.S. EPA criteria: Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section.

Appendix B. Data Validation Variance Documentation

Initial Calibration

Review Items:

a) Initial Calibration Verification Result Recoveries (if applicable)

b) Time of Analyses for Initial Calibration

c) Mean Relative Response Factor (RRF) Results

d) Relative Standard Deviation (%RSD) Results

e) Chromatograms and Quantitation Reports

Criteria:
The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.

Trihydro action variances from standard U.S. EPA criteria:
Data validation criteria are in general accordance with the criteria noted in the NFG listed in the criteria section.

TABLE 7. INITIAL CALIBRATION ACTION FOR PESTICIDE ANALYSES

Criteria	Action**	
	Detected Associated Compounds	Non-Detected Associated Compounds
Initial Calibration was not performed in the proper sequence	**R**	**R**
%RSD exceeds allowable limits*	**J**	**UJ**

* %RSD $\leq$ 20.0% for single component target compounds except alpha-BHC and delta-BHC.
* %RSD $\leq$ 25.0% for alpha-BHC and delta-BHC. %RSD $\leq$ 30.0% for Toxaphene peaks.
* %RSD $\leq$ 30.0% for surrogates (tetrachloro-m-xylene and decachlorobiphenyl).

** - If the confirmation column is not used for either identification or quantification, no qualification will be necessary.

TABLE 8. INITIAL CALIBRATION ACTION FOR AROCLOR ANALYSES

Criteria	Action**	
	Detected Associated Compounds	Non-Detected Associated Compounds
Initial Calibration was not performed in the proper sequence	**R**	**R**
%RSD exceeds allowable limits*	**J**	**UJ**

Appendix B. Data Validation Variance Documentation

Initial Calibration
* %RSD $\leq$ 20.0% for Aroclors. * %RSD $\leq$ 20.0% for surrogates (tetrachloro-m-xylene and decachlorobiphenyl). ** - If the confirmation column is not used for either identification or quantification, no qualification will be necessary.

Initial Calibration Verification
Review Items: a) Initial Calibration Verification Result Recoveries (if applicable) b) Mean Relative Response Factor (RRF) Results c) Percent Difference (%D) Results d) Chromatograms and Quantitation Reports (if necessary)
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.
Trihydro action variances from standard U.S. EPA criteria: Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section. If the confirmation column is not used for either identification or quantification, no qualification will be necessary.

Continuing Calibration Verification
Review Items: a) Continuing Calibration Verification Result Recoveries (if applicable) b) Time of Analyses for Continuing Calibration Verification Results c) Mean Relative Response Factor (RRF) Results d) Percent Difference (%D) Results e) Chromatograms and Quantitation Reports (if necessary)
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.
Trihydro action variances from standard U.S. EPA criteria:

Appendix B. Data Validation Variance Documentation

Continuing Calibration Verification
Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section. If the confirmation column is not used for either identification or quantification, no qualification will be necessary. **For Method 8260 and Method 8270 analytes not included in the tables in the NFGs, the limit for %D should be 25%.**

Appendix B. Data Validation Variance Documentation

Blanks

Review Items:

a) Method, Trip, Equipment, and Field Blank Concentrations

b) Comparable Sample Results

Criteria:
The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.

Trihydro action variances from standard U.S. EPA criteria:
The below mentioned data validation variances are based on validator professional judgment and may slightly vary from the USEPA CLP National Functional Guidelines but are found to be more conservative. Validator professional judgment may vary due to specific project data quality objectives. Items noted in bold type indicate variances due to professional judgment.

Please note that if a project requires that the samples be reported to the method detection limit as the reporting limit, the U flag will not be used and the JB will be utilized instead.

TABLE 9. BLANK ACTIONS FOR TRACE VOLATILES, LOW-LEVEL VOLATILES SEMIVOLATILES, PESTICIDES, AND AROCLOR ANALYTES

Blank Type	Blank Result	Sample Result	Action for Samples
Method, Field, Equipment, Trip	Detect below the laboratory reporting limit	Detect below the laboratory reporting limit and/or below the blank concentration	**Report result with a U qualifier at the laboratory reporting limit**
Method, Field, Equipment, Trip	Detect below the laboratory reporting limit	Non-detect	No Qualification
Method, Field, Equipment, Trip	Detect below the laboratory reporting limit	Detect above or equal to the laboratory reporting limit but below or equal to 10 times the blank concentration	**Report result with a JB qualifier**
Method, Field, Equipment, Trip	Detect above or equal to the laboratory reporting limit	Detect below the laboratory reporting limit	**Report result with a U qualifier at the laboratory reporting limit**

Appendix B. Data Validation Variance Documentation

Blanks

Method, Field, Equipment, Trip	Detect above or equal to the laboratory reporting limit	Non-detect	No Qualification
Method, Field, Equipment, Trip	Detect above or equal to the laboratory reporting limit	Detect above or equal to the laboratory reporting limit but below or equal to 10 times the blank concentration	**Report result with a JB qualifier**
Method, Field, Equipment, Trip	Detect above or equal to the laboratory reporting limit	Detect below or equal to the blank concentration	**Report result with a U qualifier at the detection amount**

Deuterated Monitoring Compounds (DMC) and Surrogate Spike Compounds

Review Items:

a) Surrogate or Deuterated Monitoring Compound Recovery Results
b) Surrogate or Deuterated Monitoring Compound Results
c) Chromatograms and Quantitation Reports

Criteria:

The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.

Trihydro action variances from standard U.S. EPA criteria:

The data validation variances listed below are based on validator professional judgment and may slightly vary from the USEPA CLP National Functional Guidelines but are found to be more conservative. Validator professional judgment may vary due to specific project data quality objectives. Items noted in bold type indicate variances due to professional judgment.

TABLE 10. DMC RECOVERY ACTIONS FOR VOLATILE ANALYSES

Criteria*	Action*	
	Detected Associated Compounds	Non-Detected Associated Compounds
%R Less than Lower Acceptance Limit	**J -**	**UJ**
%R Less than 20%	**J -**	**R**

Deuterated Monitoring Compounds (DMC) and Surrogate Spike Compounds

***If a list of associated analytes is not available from the laboratory, flag all analytes for the analytical method if one or more surrogate(s) is outside the laboratory quality control limits.**

TABLE 11. DMC RECOVERY ACTIONS FOR SEMIVOLATILE ANALYSES

Criteria	Action*	
	Detected Associated Compounds	Non-Detected Associated Compounds
%R Less than Lower Acceptance Limit	**J -**	**UJ**
%R Less than 10%	**J -**	**R**

***If a list of associated analytes is not available from the laboratory, flag analytes according to the type of surrogate exceeding the laboratory quality control limits. Flag data only if two of the three base/neutral surrogates are outside of the laboratory quality control limits. In this case, flag all associated base/neutral analytes. If two of the three acid surrogates are outside of the laboratory quality control limits, qualify all associated acid analytes.**

*** If available, determine if diluted surrogate concentration is below the calibration range. If the surrogate is below the calibration range in the diluted sample, do not qualify for surrogate recovery.**

TABLE 12. SURROGATE ACTIONS FOR PESTICIDE ANALYSES

Criteria	Action*	
	Detected Associated Compounds	Non-Detected Associated Compounds
%R Greater than 200%	**J +**	No qualification
%R Less than 10% (when sample dilution is not a factor*)	**J -**	**R**

***If a list of associated analytes is not available from the laboratory, flag all analytes for the analytical method.**

*** If available, determine if diluted surrogate concentration is below the calibration range. If the surrogate is below the calibration range in the diluted sample, do not qualify for surrogate recovery.**

Deuterated Monitoring Compounds (DMC) and Surrogate Spike Compounds

TABLE 13. SURROGATE ACTIONS FOR AROCLOR ANALYSES

Criteria	Action*	
	Detected Associated Compounds	Non-Detected Associated Compounds
%R Greater than 200%	**J +**	No qualification
%R Less than 10% (when sample dilution is not a factor)	**J -**	**R**

***If a list of associated analytes is not available from the laboratory, flag all analytes for the analytical method.**

*** If available, determine if diluted surrogate concentration is below the calibration range. If the surrogate is below the calibration range in the diluted sample, do not qualify for surrogate recovery.**

Appendix B. Data Validation Variance Documentation

Matrix Spike/Matrix Spike Duplicates (MS/MSDs)

Review Items:

a) MS/MSD Recoveries

b) MS/MSD Relative Percent Difference (RPD) Values

c) MS/MSD Preparation Samples

d) MS/MSD Raw Results

e) Chromatograms and Quantitation Reports

Criteria:
The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.
The NFGs provide control limits for only a small number of the organic target analytes; therefore, laboratory-generated control limits should be used to evaluate performance of MS/MSD analyses.

Trihydro action variances from standard U.S. EPA criteria:
The data validation variances listed below are based on validator professional judgment and may slightly vary from the USEPA CLP National Functional Guidelines but are found to be more conservative. Validator professional judgment may vary due to specific project data quality objectives. Items noted in bold type indicate variances due to professional judgment.

TABLE 14. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ACTIONS FOR TRACE VOLATILES
LOW-LEVEL VOLATILES, SEMIVOLATILES, PESTICIDES, AND AROCLOR ANALYTES

Criteria	Action	
	Detected Spiked Compounds	Non-detected Spiked Compounds
%R above the Upper Acceptance Limit**	**J +**	No Qualification
%R value below the Lower Acceptance Limit**	**J -**	**UJ**
For Volatiles, %R Less than 20%**	**J -**	**UJ and R***
For Semivolatiles, %R Less than 10%**	**J -**	**UJ and R***
MS/MSD RPD value above the Upper Acceptance Limit**	**J**	**UJ**

***Flag non-detect results for the MS/MSD parent sample with an R flag. Flag other associated non-detect results as UJ.**

**** Qualify ALL samples in the <u>preparation</u> batch.**

Appendix B. Data Validation Variance Documentation

Laboratory Control Samples/Laboratory Control Sample Duplicates (LCS/LCSD)

Review Items:

a) LCS/LCSD Recoveries

b) LCS/LCSD Relative Percent Difference (RPD) Values (If applicable)

c) LCS/LCSD Raw Results

d) Chromatograms and Quantitation Reports

Criteria:
The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017 (pesticides and PCBs) and in USEPA CLP NFGs for Organic Data Review; document number EPA 540/R-99/008, October 1999 (volatiles and semivolatiles).
The NFGs provide control limits for only a small number of the organic target analytes; therefore, laboratory-generated control limits should be used to evaluate performance of LCS/LCSD analyses.

Trihydro action variances from standard U.S. EPA criteria:
The data validation variances listed below are based on validator professional judgment and may slightly vary from the USEPA CLP National Functional Guidelines but are found to be more conservative. Validator professional judgment may vary due to specific project data quality objectives. The variances listed below are applicable to the LCS/LCSD review items. Items listed in bold type indicate variances due to professional judgment.

TABLE 15. LCS/LCSD ACTIONS FOR TRACE VOLATILES, LOW-LEVEL VOLATILES, SEMI-VOLATILES PESTICIDES, AND AROCLOR ANALYTES

Criteria	Action	
	Detected Spiked Compounds	Non-detected Spiked Compounds
%R above the Upper Acceptance Limit*	**J +**	No Qualification
RPD value above the Upper Acceptance Limit (if applicable)	**J**	**UJ**
%R below the Lower Acceptance Limit*	**J -**	**UJ**
%R Less than 30% (Volatiles)	**J -**	**R**
%R Less than 10% (Semi-Volatiles)	**J -**	**R**

*** But above 30% for volatiles and 10% for semi-volatiles.**
Associations are based on preparation batches not analytical batches.

Appendix B. Data Validation Variance Documentation

Laboratory Duplicates

Review Items:

a) Chromatogram Results
b) Quantitation Reports
c) RPD Values

Criteria:

Use laboratory limits or limits defined in project QAPP, if available.

Criteria for duplicate analyses are not defined in the USEPA CLP NFGs or the USEPA New England Environmental Data Review Supplement.

Trihydro action variances from standard U.S. EPA criteria:

The data validation variances listed below are based on validator professional judgment. Validator professional judgment may vary due to specific project data quality objectives. The variances listed below are applicable to the Laboratory Duplicate review items. Items noted in bold type indicate variances due to professional judgment.

If acceptance limits are not defined in the laboratory report or the project QAPP, use professional judgement to qualify data.

TABLE 16. LABORATORY DUPLICATE ACTIONS FOR TRACE VOLATILES, LOW-LEVEL VOLATILES SEMI-VOLATILES, PESTICIDES, AND AROCLOR ANALYTES

Criteria	Action	
	Detected Compounds	Non-Detected Compounds
RPD value is greater than laboratory limits or QAPP limits and both results are greater than five times the reporting limit **	**J**	**UJ**
RPD value is greater than laboratory limits or QAPP limits and one or both results are less than five times the reporting limit	No Qualification	
RPD value is less than laboratory limits or QAPP limits	No Qualification	

**** Qualify ALL samples in the <u>preparation</u> batch.**

Appendix B. Data Validation Variance Documentation

Field Duplicates

Review Items:

a) Chromatogram Results

b) Quantitation Reports

Criteria:

The criteria are identical to those noted in the USEPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement0, April 2013.

Trihydro action variances from standard U.S. EPA criteria:

The data validation variances listed below are based on validator professional judgment and may slightly vary from the USEPA CLP National Functional Guidelines but are found to be more conservative. Validator professional judgment may vary due to specific project data quality objectives. The variances listed below are applicable to the Field Duplicate review items. Items noted in bold type indicate variances due to professional judgment.

TABLE 17. FIELD DUPLICATE ACTIONS FOR TRACE VOLATILES, LOW-LEVEL VOLATILES SEMI-VOLATILES, PESTICIDES, AND AROCLOR ANALYTES

Matrix		
Water		
Criteria	Action	
	Detected Compounds	Non-Detected Compounds
The analyte RPD value is greater than 100%*	**J**	**UJ**
RPD value is greater than 30% and one or both results are greater than two times the reporting limit (Flag the parent and duplicate samples only)	**J**	Not Applicable
One sample is non-detect and the other is detect. The detected value is greater than two times the reporting limit (Flag the parent and duplicate samples only)	**J**	**UJ**
One sample is non-detect and the other is detect. The detected value is less than or equal to two times the reporting limit	No Qualification	

Appendix B. Data Validation Variance Documentation

Field Duplicates	
RPD value is greater than 30% and both results are less than two times the reporting limit	No Qualification
RPD value is less than 30%	No Qualification

***All samples for this day of sampling will be qualified.**

This guidance is applicable unless other regulatory or project–specific) guidance is available (e.g. TRRP or QAPP).

If multiple field duplicates are collected in a sample set, associations are based on date of collection.

Field Duplicates

TABLE 18. FIELD DUPLICATE ACTIONS FOR TRACE VOLATILES, LOW-LEVEL VOLATILES, SEMI-VOLATILES PESTICIDES, AND AROCLOR ANALYTES

Matrix		
Soil		
Criteria	Action	
	Detected Compounds	Non-Detected Compounds
The analyte RPD value is greater than 100%*	J	UJ
RPD value is greater than 50% and one or both results are greater than two times the reporting limit (Flag the parent and duplicate samples only)	J	UJ
One sample is non-detect and the other is detect. The detected value is greater than two times the reporting limit (Flag the parent and duplicate samples only)	J	UJ
One sample is non-detect and the other is detect. The detected value is less than or equal to two times the reporting limit	No Qualification	
RPD value is greater than 50% and both results are less than two times the reporting limit	No Qualification	
RPD value is less than 50%	No Qualification	

***All samples for this analyte will be qualified.**

This guidance is applicable unless other regulatory or project–specific) guidance is available (e.g. TRRP or QAPP).
If multiple field duplicates are collected in a sample set, associations are based on date of collection.

Field Duplicates

TABLE 19. FIELD DUPLICATE ACTIONS FOR TRACE VOLATILES, LOW-LEVEL VOLATILES, SEMI-VOLATILES PESTICIDES, AND AROCLOR ANALYTES

Matrix		
Air		
Criteria	Action	
	Detected Compounds	Non-Detected Compounds
The analyte RPD value is greater than 100%*	**J**	**UJ**
One sample is non-detect and the other is detect. The detected value is greater than two times the reporting limit (Flag the parent and duplicate samples only)	**J**	**UJ**
RPD value is greater than 25% and one or both results are greater than two times the reporting limit (Flag the parent and duplicate samples only)	**J**	**UJ**
RPD value is greater than 25% and both results are less than two times the reporting limit	No Qualification	
RPD value is less than 25%	No Qualification	

***All samples for this analyte will be qualified.**

This guidance is applicable unless other regulatory or project–specific) guidance is available (e.g. TRRP or QAPP).

If multiple field duplicates are collected in a sample set, associations are based on date of collection.

Appendix B. Data Validation Variance Documentation

Internal Standards
Review Items: a) Retention Time Variance b) Area Counts
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.
Trihydro action variances from standard U.S. EPA criteria: Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section.

Appendix B. Data Validation Variance Documentation

Target Compound Identification
Review Items: a) Relative Retention Times b) Mass Spectra Results c) Retention Times d) Chromatograms e) Data System Printouts
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.
Trihydro action variances from standard U.S. EPA criteria: Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section.

Appendix B. Data Validation Variance Documentation

Tentatively Identified Compounds (TICs)
Review Items: a) Chromatograms b) Library search printouts c) Spectra for the TIC candidates
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.
Trihydro action variances from standard U.S. EPA criteria: Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section.

Appendix B. Data Validation Variance Documentation

Gel Permeation Chromatography (GPC) Performance Check
Review Items: a) Two Ultraviolent (UV) Traces b) GPC Quantitation Blank Quantitation Reports c) Chromatograms
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002, January 2017.
Trihydro action variances from standard U.S. EPA criteria: Data validator criteria are in general accordance with the criteria noted in the respective NFG listed in the criteria section.

Appendix B. Data Validation Variance Documentation

Inorganic Analyses

The inorganic guidelines used to determine the quality of the data are in accordance with the NFGs and USEPA Methods for the analysis of metals, cyanide, and other inorganic analytes.

Preservation Criteria
Review Items: a) pH b) cooler temperature c) holding time d) other sample conditions
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017.
Trihydro action variances from standard U.S. EPA criteria: Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section. **a) b) c) d) Gross holding time exceedances (doubling the technical hold and/or extraction time) will result in the rejection (R) of all data for the sample. Sample holding times are evaluated based on defined limit units (e.g., a holding time of 14 days is interpreted to be equal to 14 days after the date of sampling, independent of sampling time, and a 48 hour holding time is calculated to the hour).**

TABLE 20a. TEMPERATURE ACTIONS FOR INORGANIC ANALYSES

Matrix	Preservation	Criteria	Action	
			Detected Associated Compounds	Non-Detected Associated Compounds
Aqueous and Non-Aqueous	Yes/No	Samples were received with temperatures above 6°C but below 20°C*	**J**	**UJ**
Aqueous and Non-Aqueous	Yes/No	Samples were received with temperatures below 2°C, sample bottles were not intact and the samples were frozen	**R if analyzed**	**R if analyzed**

Aqueous and Non-Aqueous	Yes/No	Samples were received with temperatures below 2˚C and were frozen but sample bottles were intact	No qualification	No qualification
Aqueous and Non-Aqueous	Yes/No	Samples were received with temperatures above 20˚C	**Reject all results****	
Aqueous	No	Samples were digested/analyzed over twice the holding time from the time of sampling	**Reject all results**	

**Temperatures > 6°C but ≤ 10°C for mercury and cyanide may be accepted based on the professional judgment of the validator.*

**Metals (except mercury) samples received above 20°C may not require rejection due to the chemical stability of the metals and may be accepted based on the professional judgment of the validator. Use professional judgement to evaluate analytes not addressed in NFGs.

Please refer to the categories below for general guidance on relative sensitivity to elevated temperatures in coolers. This list is provided for general guidance only and professional judgement should be applied when determining qualifications of sample data based on cooler temperatures.

TABLE 20b. TEMPERATURE SENSITIVITIES FOR INORGANIC ANALYSES

Very Sensitive	Moderately Sensitive	Insensitive
Acidity	Ammonia	Hardness
Alkalinity	Bromide	Metals
BOD	Chloride	TDS
COD	Fluoride	TSS
Hexavalent Chromium	Kjeldahl Nitrogen (TKN)	
Color	Nitrate+Nitrite	
Cyanide	Phenolics	
Ferrous Iron	Conductivity	
pH	Sulfate	
Nitrate	Turbidity	
Nitrite	Mercury	
DO		

Appendix B. Data Validation Variance Documentation

ICP-MS Tune Analysis
Review Items: a) Instrument Printouts b) Raw Data
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017.
Trihydro action variances from standard U.S. EPA criteria: Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section.

Appendix B. Data Validation Variance Documentation

Calibration
Review Items: a) Instrument Printouts b) Raw Data
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017 with additional reference to the USEPA CLP NFGs for Inorganic Data Review, document number EPA-540-R-04-004, October 2004.
Trihydro action variances from standard U.S. EPA criteria: Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section.

Appendix B. Data Validation Variance Documentation

Blanks

Review Items:

a) Method, Calibration, Trip, Equipment, and Field Blank Concentrations

b) Associated Sample Results

Criteria:

The criteria are identical to those noted in the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017.

Trihydro action variances from standard U.S. EPA criteria:

The data validation variances listed below are based on validator professional judgment and may slightly vary from the USEPA CLP National Functional Guidelines but are found to be more conservative. Validator professional judgment may vary due to specific project data quality objectives. Items noted in bold type indicate variances due to professional judgment. **Please note that if a project requires that the samples be reported to the method detection limit as the reporting limit, the U flag will not be used and the JB will be utilized instead.**

TABLE 21. BLANK ACTIONS FOR INORGANIC ANALYTES

Blank Type	Blank Result	Sample Result	Action for Samples
Method, Field, Equipment, Trip, Calibration	Detect below the laboratory reporting limit	Detect below the laboratory reporting limit and/or below the blank concentration	**Report result with a U qualifier at the laboratory reporting limit**
Method, Field, Equipment, Trip, Calibration	Detect below the laboratory reporting limit	Non-detect	No Qualification
Method, Field, Equipment, Trip, Calibration	Detect below the laboratory reporting limit	Detect above or equal to the laboratory reporting limit but below or equal to 10 times the blank concentration	**Report result with a JB qualifier**
Method, Field, Equipment, Trip, Calibration	Detect above or equal to the laboratory reporting limit	Detect below the laboratory reporting limit	**Report result with a U qualifier at the laboratory reporting limit**
Method, Field, Equipment, Trip, Calibration	Detect above or equal to the laboratory reporting limit	Non-detect	No Qualification

Method, Field, Equipment, Trip, Calibration	Detect above or equal to the laboratory reporting limit	Detect above or equal to the laboratory reporting limit but below or equal to 10 times the blank concentration	**Report result with a JB qualifier**
Method, Field, Equipment, Trip, Calibration	Detect above or equal to the laboratory reporting limit	Detect below or equal to the blank concentration	**Report result with a U qualifier at the sample amount**
Calibration	Negative result with absolute value > reporting limit	Detect less than 10x the laboratory reporting limit	**J -**
Calibration	Negative result with absolute value > reporting limit	Non-detect	**UJ**

Inductively Coupled Plasma – Interference Check Sample (ICP-ICS)

Review Items:

a) Instrument Printouts

b) Raw Data

Criteria:

The criteria are identical to those noted in the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017.

Trihydro action variances from standard U.S. EPA criteria:

Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section.

Appendix B. Data Validation Variance Documentation

Laboratory Control Samples/Laboratory Control Sample Duplicates (LCS/LCSD)
Review Items: a) LCS/LCSD Recoveries b) LCS/LCSD Relative Percent Difference (RPD) Values (If applicable) c) LCS/LCSD Raw Results
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017. NOTE: Specific LCS/LCSD percent recovery control limits are provided in the NFGs for ICP-AES metals and ICP-MS metals; however, LCS/LCSD RPD control limits are not defined. In addition, LCS/LCSD percent recovery and RPD control limits are not provided for mercury or cyanide. If specific control limits are not defined in the NFGs, then laboratory-generated control limits should be used.
Trihydro action variances from standard U.S. EPA criteria: Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section.

Appendix B. Data Validation Variance Documentation

Matrix Spike/Matrix Spike Duplicates (MS/MSDs)
Review Items: a) MS/MSD Recoveries b) MS/MSD Relative Percent Difference (RPD) Values c) MS/MSD Preparation Samples d) Post-Digestion Spike Recoveries (if any)
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017. NOTE: Specific MS/MSD percent recovery control limits (75%-125%) are provided in the NFGs for ICP-AES metals, ICP-MS metals, mercury, and cyanide; however, MS/MSD RPD control limits are not provided. Laboratory-generated control limits should be used for the evaluation of the MS/MSD RPD results.
Trihydro action variances from standard U.S. EPA criteria: Data validator criteria are in general accordance with the criteria noted in the NFG listed in the criteria section. When Post-Digestion Spike results for metals are required and available, the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017 should be used to qualify the sample results. When Post-Digestion Spike results for metals are not available and/or not required, Table 22 below should be used to qualify the sample results. If Post-Digestion Spike analyses are not required, but are still performed and reported by the laboratory, the Post-Digestion Spike results may be ignored and Table 22 should be used to qualify the sample results.

TABLE 22. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ACTIONS FOR INORGANICS

Criteria	Action	
	Detected Spiked Compounds	Non-detected Spiked Compounds
%R above the Upper Acceptance Limit**	**J+**	No Qualification
%R value below the Lower Acceptance Limit**	**J-**	**UJ**
%R Less than 30%**	**J-**	**UJ and R***

Appendix B. Data Validation Variance Documentation

Matrix Spike/Matrix Spike Duplicates (MS/MSDs)		
MS/MSD RPD value above the Upper Acceptance Limit**	**J**	**UJ**

*Flag non-detect results for the MS/MSD parent sample with an R flag. Flag other associated non-detect results with a UJ flag.

** Qualify ALL samples in the preparation batch.

Appendix B. Data Validation Variance Documentation

Laboratory Duplicates
Review Items: a) Sample Results b) Reporting Limits c) RPD Values
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017. NOTE: For analyses not included in the NFG, laboratory limits will be used for evaluation of laboratory performance.
Trihydro action variances from standard U.S. EPA criteria: The data validation variances listed below are based on validator professional judgment and may slightly vary from the USEPA CLP National Functional Guidelines but are found to be more conservative. Validator professional judgment may vary due to specific project data quality objectives. The variances listed below are applicable to the laboratory duplicate review items. Items noted in bold type indicate variances due to professional judgment.

TABLE 23. LABORATORY DUPLICATE ACTIONS FOR INORGANIC ANALYTES

Criteria	Action	
	Detected Compounds	Non-Detected Compounds
RPD value is greater than 20% and both results are greater than five times the reporting limit **	**J**	**UJ**
Original sample or duplicate sample is less than or equal to five times the reporting limit and absolute difference between sample and duplicate is greater than the reporting limit. **	**J**	**UJ**

** Qualify ALL samples in the preparation batch.

Appendix B. Data Validation Variance Documentation

ICP Serial Dilution
Review Items: a) Method Detection Limits (MDLs) b) Percent Difference (%D) Values
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017.
Trihydro action variances from standard U.S. EPA criteria: The data validation variances listed below are based on validator professional judgment and may slightly vary from the USEPA CLP National Functional Guidelines but are found to be more conservative. Validator professional judgment may vary due to specific project data quality objectives. Items noted in bold type indicate variances due to professional judgment. **If serial dilution samples are not prepared from client samples, the serial dilution results will be examined but will not be flagged since matrix similarity could not be guaranteed.**

Appendix B. Data Validation Variance Documentation

Field Duplicates

Review Items:

a) Sample Results

b) Reporting Limits

Criteria:

The criteria are identical to those noted in the USEPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement0, April 2013.

Trihydro action variances from standard U.S. EPA criteria:

The data validation variances listed below are based on validator professional judgment. Validator professional judgment may vary due to specific project data quality objectives. The variances listed below are applicable to the field duplicate review items. Items noted in bold type indicate variances due to professional judgment.

TABLE 24. FIELD DUPLICATE ACTIONS FOR INORGANIC ANALYSES

Matrix		
Water		
Criteria	**Action**	
	Detected Compounds	**Non-Detected Compounds**
The analyte RPD value is greater than 100%*	**J**	**UJ**
RPD value is greater than 30% and one or both results are greater than two times the reporting limit (Flag the parent and duplicate samples only)	**J**	**UJ**
RPD value is greater than 30% and both results are less than two times the reporting limit	No Qualification	
RPD value is less than 30%	No Qualification	

*** If the RPD is > 100%, qualify the analyte results in all associated samples.**
This guidance is applicable unless other regulatory or project–specific guidance is available (e.g. TRRP or QAPP).
If multiple field duplicates are collected in a sample set, associations are based on date of collection.

Appendix B. Data Validation Variance Documentation

Field Duplicates

TABLE 25. FIELD DUPLICATE ACTIONS FOR INORGANIC ANALYSES

Matrix		
Soil		
Criteria	Action	
	Detected Compounds	Non-Detected Compounds
The analyte RPD value is greater than 100%*	J	UJ
RPD value is greater than 50% and one or both results are greater than two times the reporting limit (Flag the parent and duplicate samples only)	J	UJ
RPD value is greater than 50% and both results are less than two times the reporting limit	No Qualification	
RPD value is less than 50%	No Qualification	

*** If the RPD is > 100%, qualify the analyte results in all associated samples.**
This guidance is applicable unless other regulatory or project–specific guidance is available (e.g. TRRP or QAPP).
If multiple field duplicates are collected in a sample set, associations are based on date of collection.

Appendix B. Data Validation Variance Documentation

ICP-MS Internal Standards
Review Items: a) Instrument printouts b) Raw data c) Relative Intensities
Criteria: The criteria are identical to those noted in the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017.
Trihydro action variances from standard U.S. EPA criteria: The data validation variances listed below are based on validator professional judgment. Validator professional judgment may vary due to specific project data quality objectives. **The National Functional Guidelines listed in the criteria section above specifies that a minimum of five of the following internal standards are required to be added to each sample: ^{6}Li, Sc, Y, Rh, In, Tb, Ho, Lu and Bi. However, the analytical methods may allow other internal standards to be used. The appropriateness of the internal standards will be evaluated based on method requirements.** **Requirements for internal standard intensity evaluation in some methods differ from the criteria National Functional Guidelines. Where method requirements are more strict than requirements in the National Functional Guidelines, method criteria will be used.**

Appendix B. Data Validation Variance Documentation

Total and Dissolved Metals

Review Items:

a) Laboratory reports
b) Electronic Data Deliverable (EDD)
c) Raw data (if available)

Criteria:

The criteria are implied in "Overall Assessment of Data" sections in the USEPA CLP NFGs for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001, January 2017.

Trihydro action variances from standard U.S. EPA criteria:

The data validation variances listed below are based on validator professional judgment. Validator professional judgment may vary due to specific project data quality objectives.

In data sets with analyses of both total and dissolved metals for submitted samples, ensure that the total metals concentrations were greater than the associated dissolved metals results

Calculate the total – dissolved metal concentrations for each analyte for each sample. If the result is greater than or equal to 0 (total concentration ≥ dissolved result), no further action is required. If the result is less than 0 (total concentration < dissolved result), actions are defined in the table below.

TABLE 26. TOTAL AND DISSOLVED ANALYSES

Criteria	Action	
	Detected Compounds	Non-Detected Compounds
Total metal concentration is less than the associated dissolved metal result.	**J**	-----
Total metal concentration is less than 5 times the applicable RL, the associated dissolved metal result is greater than 5 times the RL, and the difference between the results is greater than the value of the RL.	**J**	**UJ**
Total metal concentration is less than 5 times the applicable RL, the associated dissolved metal result is greater than 5 times the RL, and the difference between the results is less than the value of the RL.	No Qualification	
Total metal concentration is less than the associated dissolved metal result and the difference is greater than the measurement uncertainty (RPD > 30% for water samples).	**J**	-----
Total metal concentration is greater than the associated dissolved metal result.	No Qualification	

Both total metal concentration and the associated dissolved metal result are less than 5 times the applicable RLs	No Qualification
Total metal concentration is less than the associated dissolved metal result but within measurement uncertainty (RPD < 30% for water samples).	No Qualification

If the dissolved metals concentration was greater than the associated total metals result for an analyte,

1) **Contact the laboratory to identify the issue for resolution.**
2) **If the laboratory confirms the reported results, contact the project manager or responsible project personnel to notify of the potential error.**
3) **Assign appropriate qualifiers with reason code DIS-TOT (Dissolved metals concentration was greater than the associated total metals result) or LE (Laboratory Error).**

Professional judgement: If total metal concentration is less than the associated dissolved result, calculate the RPD for the two values. Measurement uncertainty can be the laboratory duplicate criteria of 20% (from NFG) or the laboratory-specific limit for lab duplicates or the MS/MSD RPD for the specific analyte or the field duplicate limit for the appropriate matrix.

References

USEPA. 2004. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004. October.

USEPA. 2017. Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-2017-001. January.

USEPA. 2017. Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-2017-002. January.

USEPA. 1999. Contract Laboratory Program National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008. October.

USEPA. 2013. USEPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement0. April.

APPENDIX C

LABORATORY REPORTING LIMITS AND MDLS

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Acetone	67-64-1	8260C	100	50	14000	NA	NA	NA
Acrolein	107-02-8	8260C	50	25	0.042[a]	NA	NA	NA
Acrylonitrile	107-13-1	8260C	100	50	0.52[a]	NA	NA	NA
Benzene	71-43-2	8260C	5.0	1	5	78-117	49-140	20
Bromobenzene	108-86-1	8260C	5.0	2.5	62	NA	NA	NA
Bromodichloromethane	75-27-4	8260C	5.0	2.5	80	NA	NA	NA
Bromoform	75-25-2	8260C	5.0	2.5	80	NA	NA	NA
Bromomethane (Methyl Bromide)	74-83-9	8260C	5.0	3.9	7.5	NA	NA	NA
Bromochloromethane	74-97-5	8260C	5.0	2.5	83	NA	NA	NA
2-Butanone (MEK)	78-93-3	8260C	25	12	5600	NA	NA	NA
n -Butylbenzene	104-51-8	8260C	5.0	2.5	1000	NA	NA	NA
sec -Butylbenzene	135-98-8	8260C	5.0	2.5	2000	NA	NA	NA
tert -Butylbenzene	98-06-6	8260C	5.0	2.5	690	NA	NA	NA
Carbon disulfide	75-15-0	8260C	10	5.0	810	NA	NA	NA
Carbon tetrachloride	56-23-5	8260C	5.0	2.5	5	NA	NA	NA
Chlorobenzene	108-90-7	8260C	5.0	2.5	100	79-113	47-135	20
Chloroethane (Ethyl Chloride)	75-00-3	8260C	5.0	2.5	21000	NA	NA	NA
Chloroform	67-66-3	8260C	5.0	2.5	80	73-118	49-136	20
Chloromethane (Methyl Chloride)	74-87-3	8260C	5.0	2.5	190	NA	NA	NA
2-Chlorotoluene	95-49-8	8260C	5.0	2.5	240	NA	NA	NA
4-Chlorotoluene	106-43-4	8260C	5.0	2.5	250	NA	NA	NA
Cyclohexane	110-82-7	8260C	100	50	13000	NA	NA	NA
Dibromochloromethane	124-48-1	8260C	5.0	2.5	80	NA	NA	NA
1,2-Dibromoethane (EDB)	106-93-4	8260C	5.0	2.5	0.05[a]	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	8260C	10	5.0	0.2	NA	NA	NA
Dibromomethane (Methylene Bromide)	74-95-3	8260C	5.0	2.7	8.3	NA	NA	NA
trans -1,4-Dichloro-2-butene	110-57-6	8260C	100	50	0.013[a]	NA	NA	NA
1,2-Dichlorobenzene	95-50-1	8260C	5.0	2.5	600	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	8260C	5.0	2.5	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	8260C	5.0	2.5	75	NA	NA	NA

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Dichlorodifluoromethane	75-71-8	8260C	5.0	5.0	200	NA	NA	NA
1,1-Dichloroethane (DCA)	75-34-3	8260C	5.0	0.6	28	NA	NA	NA
1,2-Dichloroethane (EDC)	107-06-2	8260C	5.0	0.6	5	NA	NA	NA
1,1-Dichloroethene	75-35-4	8260C	5.0	2.5	7	71-126	46-148	20
cis -1,2-Dichloroethene	156-59-2	8260C	5.0	0.65	70	NA	NA	NA
trans -1,2-Dichloroethene	156-60-5	8260C	5.0	0.86	100	NA	NA	NA
1,2-Dichloropropane	78-87-5	8260C	5.0	2.5	5	79-126	53-142	20
1,3-Dichloropropane	142-28-9	8260C	5.0	2.5	370	NA	NA	NA
2,2-Dichloropropane	594-20-7	8260C	5.0	4.2	NA	NA	NA	NA
1,1-Dichloropropene	563-58-6	8260C	5.0	2.5	NA	NA	NA	NA
cis -1,3-Dichloropropene	10061-01-5	8260C	5.0	2.5	4.7[b]	NA	NA	NA
trans -1,3-Dichloropropene	10061-02-6	8260C	5.0	2.5	4.7[b]	NA	NA	NA
1,4-Dioxane (p-Dioxane)	123-91-1	8260C	100	50	4.6[c]	NA	NA	NA
Ethylbenzene	100-41-4	8260C	5.0	1	700	80-118	44-145	20
Ethyl methacrylate	97-63-2	8260C	100	50	630	NA	NA	NA
Hexachloro-1,3-butadiene	87-68-3	8260C	5.0	2.5	1.4[b]	NA	NA	NA
n-Hexane	110-54-3	8260C	5.0	2.5	1500	NA	NA	NA
2-Hexanone	591-78-6	8260C	25	12	38	NA	NA	NA
Iodomethane	74-88-4	8260C	10	6.8	NA	NA	NA	NA
Isopropylbenzene (Cumene)	98-82-8	8260C	5.0	2.5	450	82-120	43-148	20
p-Isopropyltoluene	99-87-6	8260C	5.0	2.5	NA	NA	NA	NA
Methyl Acetate	79-20-9	8260C	50	25	20000	NA	NA	NA
Methylcyclohexane	108-87-2	8260C	50	25	NA	NA	NA	NA
Methylene Chloride (Dichloromethane)	75-09-2	8260C	5.0	5.0	5	NA	NA	NA
1-Methylnaphthalene	90-12-0	8260C	10	10	11	NA	NA	NA
2-Methylnaphthalene	91-57-6	8260C	10	10	36	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	108-10-1	8260C	25	12	6300	NA	NA	NA
Methyl-tert-butyl-Ether (MTBE)	1634-04-4	8260C	4	2.1	140	72-128	38-158	20
Naphthalene	91-20-3	8260C	1	1.4	1.7	71-121	40-137	20
n -Propylbenzene	103-65-1	8260C	5	2.5	660	NA	NA	NA
Styrene	100-42-5	8260C	5	2.5	100	NA	NA	NA

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
1,1,1,2-Tetrachloroethane	630-20-6	8260C	5.0	2.5	5.7	NA	NA	NA
1,1,2,2-Tetrachloroethane	79-34-5	8260C	5.0	2.5	0.76[a]	70-124	44-139	20
Tetrachloroethene (PCE)	127-18-4	8260C	5.0	0.93	5	73-124	41-145	20
Toluene	108-88-3	8260C	5.0	1	1000	78-116	48-139	20
1,2,3-Trichlorobenzene	87-61-6	8260C	5.0	2.5	7	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	8260C	5.0	2.5	70	NA	NA	NA
1,1,1-Trichloroethane (TCA)	71-55-6	8260C	5.0	0.89	200	72-127	48-145	20
1,1,2-Trichloroethane	79-00-5	8260C	5.0	2.5	5	NA	NA	NA
1,1,2-Trichlorotrifluoroethane*	76-13-1	8260C	5.0	2.5	10000	NA	NA	NA
Trichloroethene (TCE)	79-01-6	8260C	5.0	0.8	5	76-120	43-147	20
Trichlorofluoromethane	75-69-4	8260C	5.0	2.5	5200	NA	NA	NA
1,2,3-Trichloropropane	96-18-4	8260C	5.0	2.5	0.0075[a]	NA	NA	NA
1,2,4-Trimethylbenzene	95-63-6	8260C	5.0	2.5	56	79-117	39-140	20
1,3,5-Trimethylbenzene	108-67-8	8260C	5.0	2.5	60	NA	NA	NA
Vinyl Acetate	108-05-4	8260C	50	25	410	NA	NA	NA
Vinyl Chloride (Chloroethene)	75-01-4	8260C	2.0	0.97	2	70-136	49-153	20
Xylenes, Total	1330-20-7	8260C	10	5	190	79-119	44-145	20
4-Bromofluorobenzene (surr)	460-00-4	8260C	NA	NA	NA	85-114		
Dibromofluoromethane (surr)	1868-53-7	8260C	NA	NA	NA	80-122		
Toluene-d8 (surr)	2037-26-5	8260C	NA	NA	NA	85-114		

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.
[a]Limit not achievable
[b]Limit may be achievable based on MDL - check with laboratory
[c]Limit not achievable, must use 8270 PAH-SIM method to achieve this limit
*Synonym: 1,1,2-Trichloro-1,2,2-trifluoroethane

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Dissolved Gases in Water by GC/FID

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Methane	74-82-8	RSK-175	10	8	NA	78-135	NA	20
Ethane	74-84-0	RSK-175	10	3.4	NA	83-133	NA	20
Ethene	74-85-1	RSK-175	10	3.3	NA	67-135	NA	20

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Acenaphthene	83-32-9	8270C	10	5	530	17-120	32-118	20
Acenaphthylene	208-96-8	8270C	10	5	NA	19-118	32-117	20
Acetophenone	98-86-2	8270C	10	5	1900	NA	NA	NA
Anthracene	120-12-7	8270C	10	5	1800	41-130	43-134	20
Atrazine	1912-24-9	8270C	10	5	3[b]	NA	NA	NA
Benzaldehyde	100-52-7	8270C	50	25	190	NA	NA	NA
Benz[a]anthracene	56-55-3	8270C	10	5	0.3[c]	44-140	48-142	20
Benzo[a]pyrene	50-32-8	8270C	10	5	0.2[c]	39-129	33-146	20
Benzo[b]fluoranthene	205-99-2	8270C	10	5	2.5[c]	40-130	32-148	20
Benzo[g,h,i]perylene	191-24-2	8270C	10	5	NA	40-127	36-136	20
Benzo[k]fluoranthene	207-08-9	8270C	10	5	25	38-130	34-140	20
Benzyl alcohol	100-51-6	8270C	10	10	2000	NA	NA	NA
Biphenyl (1,1 - biphenyl or Diphenyl)	92-52-4	8270C	10	5	0.83	NA	NA	NA
bis(2-chloroethoxy) methane	111-91-1	8270C	10	5	59	NA	NA	NA
bis(2-chloroethyl) ether	111-44-4	8270C	10	5	0.14[a]	NA	NA	NA
bis(2-chloro-1-methylethyl) ether*	108-60-1	8270C	10	5	710	NA	NA	NA
bis(2-ethylhexyl) phthalate	117-81-7	8270C	10	5	6[b]	NA	NA	NA
4-Bromophenyl phenyl ether	101-55-03	8270C	10	5	NA	NA	NA	NA
Butyl benzyl phthalate	85-68-7	8270C	10	5	160	NA	NA	NA
4-Chloroaniline	106-47-8	8270C	10	10	3.7[a]	NA	NA	NA
4-Chloro-3-methylphenol (p-chloro-m-Cresol)	59-50-7	8270C	10	7	1400	18-127	15-119	20
2-Chloronaphthalene	91-58-7	8270C	10	5	750	NA	NA	NA
2-Chlorophenol	95-57-8	8270C	10	5	91	18-105	13-95	20
4-Chlorophenyl phenyl ether	7005-72-3	8270C	10	5	NA	NA	NA	NA
Caprolactam	105-60-2	8270C	10	5	9900	NA	NA	NA
Carbazole	86-74-8	8270C	10	5	NA	NA	NA	NA
Chrysene	218-01-9	8270C	10	5	250	46-133	49-135	20
Dibenz[a,h]anthracene	53-70-3	8270C	10	5	0.25[a]	42-129	31-147	20
Dibenzofuran	132-64-9	8270C	10	5	7.9[b]	NA	NA	NA
Di-*n*-butyl phthalate	84-74-2	8270C	10	5	900	NA	NA	NA
3,3'-Dichlorobenzidine	91-94-1	8270C	20	10	1.3[a]	NA	NA	NA

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
2,4-Dichlorophenol	120-83-2	8270C	10	5	46	NA	NA	NA
Diethyl phthalate	84-66-2	8270C	10	5	15000	NA	NA	NA
2,4-Dimethylphenol	105-67-9	8270C	10	5	360	NA	NA	NA
Dimethylphthalate	131-11-3	8270C	10	5	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol**	534-52-1	8270C	20	10	1.5[a]	NA	NA	NA
2,4-Dinitrophenol	51-28-5	8270C	50	25	39[b]	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	8270C	10	5	2.4[a]	10-142	10-134	20
2,6-Dinitrotoluene	606-20-2	8270C	10	5	0.49[a]	NA	NA	NA
Di-*n*-octyl phthalate	117-84-0	8270C	10	5	200	NA	NA	NA
Fluoranthene	206-44-0	8270C	10	5	800	45-138	52-142	20
Fluorene	86-73-7	8270C	10	5	290	27-129	40-129	20
Hexachlorobenzene	118-74-1	8270C	10	5	1[a]	NA	NA	NA
Hexachloro-1,3-butadiene	87-68-3	8270C	10	5	1.4[a]	NA	NA	NA
Hexachlorocyclopentadiene	77-47-4	8270C	10	5	50	NA	NA	NA
Hexachloroethane	67-72-1	8270C	10	5	3.3[b]	NA	NA	NA
Indeno[1,2,3-cd]pyrene	193-39-5	8270C	10	5	2.5[c]	41-126	37-136	20
Isophorone	78-59-1	8270C	10	5	780	NA	NA	NA
2-Methylphenol (o-Cresol)	95-48-7	8270C	10	5	930	NA	NA	NA
3 & 4-Methylphenol (m & p Cresols)	108-39-4, 106-44-5	8270C	10	10	930	NA	NA	NA
1-Methylnaphthalene	90-12-0	8270C	10	5	11	10-132	10-119	20
2-Methylnaphthalene	91-57-6	8270C	10	5	36	10-101	10-111	20
N-Nitroso-di-*n*-propylamine	621-64-7	8270C	10	5	0.11[a]	20-120	12-111	20
N-Nitrosodiphenylamine	86-30-6	8270C	10	5	120	NA	NA	NA
Naphthalene	91-20-3	8270C	10	5	1.7[c]	11-87	10-107	20
2-Nitroaniline	88-74-4	8270C	10	5	190	NA	NA	NA
3-Nitroaniline	99-09-2	8270C	10	5	NA	NA	NA	NA
4-Nitroaniline	100-01-6	8270C	10	5	38	NA	NA	NA
Nitrobenzene	98-95-3	8270C	10	5	1.4[a]	NA	NA	NA
2-Nitrophenol	88-75-5	8270C	10	5	NA	NA	NA	NA

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
4-Nitrophenol	100-02-7	8270C	50	50	NA	10-87	10-76	20
Pentachlorophenol	87-86-5	8270C	50	25	1[a]	21-141	21-132	20
Phenanthrene	85-01-8	8270C	10	5	NA	41-130	46-131	20
Phenol	108-95-2	8270C	10	5	5800	10-62	10-52	20
Pyrene	129-00-0	8270C	10	5	120	45-138	48-139	20
1,2,4,5-tetrachlorobenzene	95-94-3	8270C	10	5	1.7	NA	NA	NA
2,3,4,6-tetrachlorophenol	58-90-2	8270C	10	5	240	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	8270C	10	5	1200	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	8270C	10	5	12	NA	NA	NA
2,4,6-Tribromophenol (surr)	118-79-6	8270C	NA	NA	NA	29-134		
2-Fluorobiphenyl (surr)	321-60-8	8270C	NA	NA	NA	22-111		
2-Fluorophenol (surr)	367-12-4	8270C	NA	NA	NA	10-82		
Nitrobenzne-d5 (surr)	4165-60-0	8270C	NA	NA	NA	15-115		
Phenol-d5 (surr)	4165-62-2	8270C	NA	NA	NA	10-65		
Terphenyl-d14 (surr)	1718-51-0	8270C	NA	NA	NA	33-152		

NOTES:

Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

[a]Limit not achievable

[b]Limit may be achievable based on MDL - check with laboratory

[c]Must use 8270 PAH-SIM method to achieve this limit

*****Synonyms: bis(2-chloroisopropyl) ether and 2,2'-Oxybis(1-chloropropane)

** Synonym: 4,6-Dinitro-o-cresol

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
SVOC Compounds								
Acetophenone	98-86-2	8270C	10	5	1900	NA	NA	NA
Atrazine	1912-24-9	8270C	10	5	3[b]	NA	NA	NA
Benzaldehyde	100-52-7	8270C	50	25	190	NA	NA	NA
Benzyl alcohol	100-51-6	8270C	10	10	2000	NA	NA	NA
Biphenyl (1,1 - biphenyl or Diphenyl)	92-52-4	8270C	10	5	0.83	NA	NA	NA
bis(2-chloroethoxy) methane	111-91-1	8270C	10	5	59	NA	NA	NA
bis(2-chloroethyl) ether	111-44-4	8270C	10	5	0.14[a]	NA	NA	NA
bis(2-chloro-1-methylethyl) ether*	108-60-1	8270C	10	5	710	NA	NA	NA
bis(2-ethylhexyl) phthalate	117-81-7	8270C	10	5	6[b]	NA	NA	NA
4-Bromophenyl phenyl ether	101-55-03	8270C	10	5	NA	NA	NA	NA
Butyl benzyl phthalate	85-68-7	8270C	10	5	160	NA	NA	NA
4-Chloroaniline	106-47-8	8270C	10	10	3.7[a]	NA	NA	NA
4-Chloro-3-methylphenol (p-chloro-m-Cresol)	59-50-7	8270C	10	7	1400	18-127	15-119	20
2-Chloronaphthalene	91-58-7	8270C	10	5	750	NA	NA	NA
2-Chlorophenol	95-57-8	8270C	10	5	91	18-105	13-95	20
4-Chlorophenyl phenyl ether	7005-72-3	8270C	10	5	NA	NA	NA	NA
Caprolactam	105-60-2	8270C	10	5	9900	NA	NA	NA
Carbazole	86-74-8	8270C	10	5	NA	NA	NA	NA
Dibenzofuran	132-64-9	8270C	10	5	7.9[b]	NA	NA	NA
Di-*n* -butyl phthalate	84-74-2	8270C	10	5	900	NA	NA	NA
3,3'-Dichlorobenzidine	91-94-1	8270C	20	10	1.3[a]	NA	NA	NA
2,4-Dichlorophenol	120-83-2	8270C	10	5	46	NA	NA	NA
Diethyl phthalate	84-66-2	8270C	10	5	15000	NA	NA	NA
2,4-Dimethylphenol	105-67-9	8270C	10	5	360	NA	NA	NA
Dimethylphthalate	131-11-3	8270C	10	5	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol**	534-52-1	8270C	20	10	1.5[a]	NA	NA	NA
2,4-Dinitrophenol	51-28-5	8270C	50	25	39[b]	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	8270C	10	5	2.4[a]	10-142	10-134	20

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
2,6-Dinitrotoluene	606-20-2	8270C	10	5	0.49[a]	NA	NA	NA
Di-*n*-octyl phthalate	117-84-0	8270C	10	5	200	NA	NA	NA
Hexachlorobenzene	118-74-1	8270C	10	5	1[a]	NA	NA	NA
Hexachloro-1,3-butadiene	87-68-3	8270C	10	5	1.4[a]	NA	NA	NA
Hexachlorocyclopentadiene	77-47-4	8270C	10	5	50	NA	NA	NA
Hexachloroethane	67-72-1	8270C	10	5	3.3[b]	NA	NA	NA
Isophorone	78-59-1	8270C	10	5	780	NA	NA	NA
2-Methylphenol (o-Cresol)	95-48-7	8270C	10	5	930	NA	NA	NA
3 & 4-Methylphenol (m & p Cresols)	108-39-4, 106-44-5	8270C	10	10	930	NA	NA	NA
N-Nitroso-di-*n*-propylamine	621-64-7	8270C	10	5	0.11[a]	20-120	12-111	20
N-Nitrosodiphenylamine	86-30-6	8270C	10	5	120	NA	NA	NA
2-Nitroaniline	88-74-4	8270C	10	5	190	NA	NA	NA
3-Nitroaniline	99-09-2	8270C	10	5	NA	NA	NA	NA
4-Nitroaniline	100-01-6	8270C	10	5	38	NA	NA	NA
Nitrobenzene	98-95-3	8270C	10	5	1.4[a]	NA	NA	NA
2-Nitrophenol	88-75-5	8270C	10	5	NA	NA	NA	NA
4-Nitrophenol	100-02-7	8270C	50	50	NA	10-87	10-76	20
Pentachlorophenol	87-86-5	8270C	50	25	1[a]	21-141	21-132	20
Phenol	108-95-2	8270C	10	5	5800	10-62	10-52	20
1,2,4,5-tetrachlorobenzene	95-94-3	8270C	10	5	1.7	NA	NA	NA
2,3,4,6-tetrachlorophenol	58-90-2	8270C	10	5	240	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	8270C	10	5	1200	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	8270C	10	5	12	NA	NA	NA
2,4,6-Tribromophenol (surr)	118-79-6	8270C	NA	NA	NA	29-134		
2-Fluorophenol (surr)	367-12-4	8270C	NA	NA	NA	10-82		
Nitrobenzne-d5 (surr)	4165-60-0	8270C	NA	NA	NA	15-115		
Phenol-d5 (surr)	4165-62-2	8270C	NA	NA	NA	10-65		

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
PAHs Compounds								
1-Methylnaphthalene	90-12-0	8270C SIM	1	0.058	11	20-92	15-88	20
2-Methylnaphthalene	91-57-6	8270C SIM	1	0.062	36	18-98	19-92	20
Acenaphthene	83-32-9	8270C SIM	1	0.012	530	21-102	13-91	20
Acenaphthylene	208-96-8	8270C SIM	1	0.012	NA	23-118	10-110	20
Anthracene	120-12-7	8270C SIM	0.1	0.021	1800	29-119	18-111	20
Benzo[a]anthracene	56-55-3	8270C SIM	0.1	0.023	0.3	36-131	36-113	20
Benzo[a]pyrene	50-32-8	8270C SIM	0.1	0.013	0.2	31-121	22-92	20
Benzo[b]fluoranthene	205-99-2	8270C SIM	0.1	0.026	2.5	32-130	28-104	20
Benzo[g,h,i]perylene	191-24-2	8270C SIM	0.1	0.014	NA	23-118	10-83	20
Benzo[k]fluoranthene	207-08-9	8270C SIM	0.1	0.018	25	33-127	19-98	20
Chrysene	218-01-9	8270C SIM	0.5	0.025	250	41-118	36-100	20
Dibenz[a,h]anthracene	53-70-3	8270C SIM	0.1	0.02	0.25	25-121	12-88	20
Fluoranthene	206-44-0	8270C SIM	1	0.022	800	36-128	41-114	20
Fluorene	86-73-7	8270C SIM	1	0.022	290	26-114	21-104	20
Indeno[1,2,3-cd]pyrene	193-39-5	8270C SIM	0.1	0.015	2.5	26-119	13-88	20
Naphthalene	91-20-3	8270C SIM	1	0.098	1.7	19-97	14-92	20
Phenanthrene	85-01-8	8270C SIM	1	0.03	NA	32-115	29-105	20
Pyrene	129-00-0	8270C SIM	1	0.015	120	36-123	29-112	20
2-Fluorobiphenyl (surr)	321-60-8	8270C SIM	NA	NA	NA	10-83		
Terphenyl-d14 (surr)	1718-51-0	8270C SIM	NA	NA	NA	28-125		

NOTES:

Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

[a]Limit not achievable

[b]Limit may be achievable based on MDL - check with laboratory

[c]Must use 8270 PAH-SIM method to achieve this limit

*****Synonyms: bis(2-chloroisopropyl) ether and 2,2'-Oxybis(1-chloropropane)

** Synonym: 4,6-Dinitro-o-cresol

PAH = Polycyclic Aromatic Hydrocarbon

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for PAHs by SIM in Water

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
1-Methylnaphthalene	90-12-0	8270C SIM	1	0.058	11	15-95	10-90	20
2-Methylnaphthalene	91-57-6	8270C SIM	1	0.062	36	15-91	10-117	20
Acenaphthene	83-32-9	8270C SIM	1	0.012	530	19-106	15-82	20
Acenaphthylene	208-96-8	8270C SIM	1	0.012	NA	24-117	13-98	20
Anthracene	120-12-7	8270C SIM	0.1	0.021	1800	34-113	23-113	20
Benzo[a]anthracene	56-55-3	8270C SIM	0.1	0.023	0.3	41-141	18-145	20
Benzo[a]pyrene	50-32-8	8270C SIM	0.1	0.013	0.2	42-148	18-123	20
Benzo[b]fluoranthene	205-99-2	8270C SIM	0.1	0.026	2.5	36-157	16-129	20
Benzo[g,h,i]perylene	191-24-2	8270C SIM	0.1	0.014	NA	34-145	12-109	20
Benzo[k]fluoranthene	207-08-9	8270C SIM	0.1	0.018	25	40-151	22-118	20
Chrysene	218-01-9	8270C SIM	0.5	0.025	250	44-137	24-134	20
Dibenz[a,h]anthracene	53-70-3	8270C SIM	0.1	0.02	0.25	34-146	12-118	20
Fluoranthene	206-44-0	8270C SIM	1	0.022	800	39-146	24-149	20
Fluorene	86-73-7	8270C SIM	1	0.022	290	30-116	15-115	20
Indeno[1,2,3-cd]pyrene	193-39-5	8270C SIM	0.1	0.015	2.5	37-146	12-114	20
Naphthalene	91-20-3	8270C SIM	1	0.098	1.7	15-96	10-120	20
Phenanthrene	85-01-8	8270C SIM	1	0.03	NA	37-124	16-131	20
Pyrene	129-00-0	8270C SIM	1	0.015	120	43-131	22-133	20
2-Fluorobiphenyl (surr)	321-60-8	8270C SIM	NA	NA	NA	10-105		
Terphenyl-d14 (surr)	1718-51-0	8270C SIM	NA	NA	NA	10-142		

NOTES:
PAH = Polycyclic Aromatic Hydrocarbon
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for PAHs by SIM in Water Extracted by Method 3511

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
1-Methylnaphthalene	90-12-0	8270C SIM	1	0.014	11	57-113	49-116	20
2-Methylnaphthalene	91-57-6	8270C SIM	1	0.024	36	54-111	53-109	20
Acenaphthene	83-32-9	8270C SIM	1	0.017	530	62-109	54-111	20
Acenaphthylene	208-96-8	8270C SIM	1	0.030	NA	70-124	64-123	20
Anthracene	120-12-7	8270C SIM	0.1	0.022	1800	69-120	70-115	20
Benzo[a]anthracene	56-55-3	8270C SIM	0.1	0.063	0.3	53-138	65-126	20
Benzo[a]pyrene	50-32-8	8270C SIM	0.1	0.026	0.2	57-150	66-137	20
Benzo[b]fluoranthene	205-99-2	8270C SIM	0.1	0.044	2.5	62-138	58-138	20
Benzo[g,h,i]perylene	191-24-2	8270C SIM	0.1	0.023	NA	40-139	50-126	20
Benzo[k]fluoranthene	207-08-9	8270C SIM	0.1	0.095	25	50-151	57-142	20
Chrysene	218-01-9	8270C SIM	0.5	0.038	250	45-144	53-134	20
Dibenz[a,h]anthracene	53-70-3	8270C SIM	0.1	0.056	0.25	43-149	55-135	20
Fluoranthene	206-44-0	8270C SIM	1	0.034	800	57-148	68-140	20
Fluorene	86-73-7	8270C SIM	1	0.008	290	54-136	59-128	20
Indeno[1,2,3-cd]pyrene	193-39-5	8270C SIM	0.1	0.028	2.5	44-147	52-136	20
Naphthalene	91-20-3	8270C SIM	1	0.023	1.7	58-111	50-116	20
Phenanthrene	85-01-8	8270C SIM	1	0.052	NA	64-127	59-130	20
Pyrene	129-00-0	8270C SIM	1	0.011	120	57-131	57-127	20
2-Fluorobiphenyl (surr)	321-60-8	8270C SIM	NA	NA	NA	55-118		
Terphenyl-d14 (surr)	1718-51-0	8270C SIM	NA	NA	NA	56-128		

NOTES:
PAH = Polycyclic Aromatic Hydrocarbon
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for 1,4- Dioxane in Water by SIM

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
1,4 - Dioxane (p-Dioxane)	123-91-1	8270C SIM	3	0.58	4.6	10-44	10-65	20
1,4-Dioxane d8 (Surr)	17647-74-4	8270C SIM	NA	NA	NA	10-44		

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Metals in Water by ICP/CVAA

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Aluminum	7429-90-5	6010B	200	53.9	20000	80-120	75-125	20
Antimony	7440-36-0	6010B	6	4.33	6	80-120	75-125	20
Arsenic	7440-38-2	6010B	10	3.84	10	80-120	75-125	20
Barium	7440-39-3	6010B	10	0.53	2000	80-120	75-125	20
Beryllium	7440-41-7	6010B	4	0.3	4	80-120	75-125	20
Boron	7440-42-8	6010B	100	7.71	4000	80-120	75-125	20
Cadmium	7440-43-9	6010B	2	0.42	5	80-120	75-125	20
Calcium	7440-70-2	6010B	1000	72.93	NA	80-120	75-125	20
Chromium	7440-47-3	6010B	10	1.21	100	80-120	75-125	20
Cobalt	7440-48-4	6010B	10	0.75	6[b]	80-120	75-125	20
Copper	7440-50-8	6010B	10	2.35	1300	80-120	75-125	20
Iron	7439-89-6	6010B	100	32.4	14000	80-120	75-125	20
Lead	7439-92-1	6010B	10	3.51	15	80-120	75-125	20
Lithium	7439-93-2	6010B	20	4.73	40	80-120	75-125	20
Magnesium	7439-95-4	6010B	1000	57.5	NA	80-120	75-125	20
Manganese	7439-96-5	6010B	10	1.12	430	80-120	75-125	20
Mercury	7439-97-6	7470A	2	0.1	2	80-120	75-125	20
Molybdenum	7439-98-7	6010B	10	0.64	100	80-120	75-125	20
Nickel	7440-02-0	6010B	10	1.45	390	80-120	75-125	20
Potassium	7440-09-7	6010B	1000	84.3	NA	80-120	75-125	20
Selenium	7782-49-2	6010B	10	4.15	50	80-120	75-125	20
Silver	7440-22-4	6010B	10	1.24	94	80-120	75-125	20
Sodium	7440-23-5	6010B	1000	39.3	NA	80-120	75-125	20
Strontium	7440-24-6	6010B	10	0.38	12000	80-120	75-125	20
Thallium	7440-28-0	6010B	10	3.18	2[d]	80-120	75-125	20
Tin (Sn)	7440-31-5	6010B	10	2.28	12000	80-120	75-125	20
Titanium	7440-32-6	6010B	10	1.37	NA	80-120	75-125	20
Vanadium	7440-62-2	6010B	10	2.15	86	80-120	75-125	20
Zinc	7440-66-6	6010B	20	6.92	6000	80-120	75-125	20

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.
[b]Limit may be achievable based on MDL - check with laboratory
[d]To achieve this limit method 6020 must be used

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Metals in Water by ICP/MS

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Aluminum	7429-90-5	6020	10	1.54	20000	80-120	75-125	20
Antimony	7440-36-0	6020	1	0.18	6	80-120	75-125	20
Arsenic	7440-38-2	6020	1	0.223	10	80-120	75-125	20
Barium	7440-39-3	6020	1	0.196	2000	80-120	75-125	20
Beryllium	7440-41-7	6020	0.2	0.038	4	80-120	75-125	20
Boron	7440-42-8	6020	5	2.19	4000	80-120	75-125	20
Cadmium	7440-43-9	6020	0.2	0.03	5	80-120	75-125	20
Chromium	7440-47-3	6020	2	0.177	100	80-120	75-125	20
Cobalt	7440-48-4	6020	1	0.075	6	80-120	75-125	20
Copper	7440-50-8	6020	1	0.227	1300	80-120	75-125	20
Lead	7439-92-1	6020	1	0.107	15	80-120	75-125	20
Manganese	7439-96-5	6020	1	0.083	430	80-120	75-125	20
Molybdenum	7439-98-7	6020	1	0.131	100	80-120	75-125	20
Nickel	7440-02-0	6020	0.5	0.128	390	80-120	75-125	20
Selenium	7782-49-2	6020	1	0.311	50	80-120	75-125	20
Silver	7440-22-4	6020	0.5	0.042	94	80-120	75-125	20
Strontium	7440-24-6	6020	1	0.061	12000	80-120	75-125	20
Thallium	7440-28-0	6020	1	0.049	2	80-120	75-125	20
Tin	7440-31-5	6020	1	0.515	12000	80-120	75-125	20
Titanium	7440-32-6	6020	1	0.12	NA	80-120	75-125	20
Uranium	7440-61-1	6020	1	0.011	30	80-120	75-125	20
Vanadium	7440-62-2	6020	1	0.219	86	80-120	75-125	20
Zinc	7440-66-6	6020	3	1.48	6000	80-120	75-125	20

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for EDB/DBCP in Water by GC/ECD

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
1,2-Dibromoethane (EDB)	106-93-4	8011	0.035	0.005	0.05	60-140	60-140	20
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	8011	0.035	0.005	0.2	60-140	60-140	20
4-Bromofluorobenzene (surr)	460-00-4	8011	NA	NA	NA	50-150		

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Misc. Compounds in Water by GC/FID

Target Analyte	CAS Number	Method	RL mg/L	MDL mg/L	2009 RISC Closure Level[1] mg/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Gasoline Range Organics C5-C12	NA	8015D	0.2	0.1	14	52-142	57-152	20
4-Bromofluorobenzene (surr)	460-00-4	8015D	NA	NA	NA	48-165		

Target Analyte	CAS Number	Method	RL mg/L	MDL mg/L	2009 RISC Closure Level[1] mg/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Diesel Range Organics C8-C28	NA	8015D	0.1	0.081	2.5	41-98	36-114	20
High End Organics C8-C34	NA	8015D	0.1	0.1	2.5	41-98	36-114	20
n-Pentacosane (surr)	620-99-2	8015D	NA	NA	NA	12-126		

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Ethanol	64-17-5	8015D	5000	140	NA	74-120	71-122	20
Methanol	67-56-1	8015D	5000	240	20000	75-120	65-126	20
2-Propanol (Isopropanol)	67-63-0	8015D	5000	120	410[b]	77-135	76-134	20
n-Butanol	71-36-3	8015D	5000	110	2000[b]	80-121	65-129	20
Ethylene Glycol	107-21-1	8015D	5000	3200	40000	48-150	34-153	20
Propylene Glycol	57-55-6	8015D	5000	870	400000	42-141	35-141	20

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.
[1]TPH Closure Level - RISC Announcements July 06, 2009
[b]Limit may be achievable based on MDL - check with laboratory

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for PCBs in Water by GC/ECD

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Aroclor® 1016	12674-11-2	8082A	0.1	0.072	1.4	45-157	27-174	20
Aroclor® 1221	11104-28-2	8082A	0.1	0.087	0.047[a]	NA	NA	NA
Aroclor® 1232	11141-16-5	8082A	0.1	0.077	0.047[a]	NA	NA	NA
Aroclor® 1242	53469-21-9	8082A	0.1	0.077	0.078[b]	NA	NA	NA
Aroclor® 1248	12672-29-6	8082A	0.1	0.064	0.078[b]	NA	NA	NA
Aroclor® 1254	11097-69-1	8082A	0.1	0.081	0.078[b]	NA	NA	NA
Aroclor® 1260	11096-82-5	8082A	0.1	0.071	0.078[b]	42-155	10-157	20
Aroclor® 1262	37324-23-5	8082A	0.1	0.100	NA	NA	NA	NA
Aroclor® 1268	11100-14-4	8082A	0.1	0.097	NA	NA	NA	NA
Tetrachloro-m-xylene (surr)	877-09-8	8082A	NA	NA	NA	10-148		

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.
[a]Limit not achievable
[b]Limit may be achievable based on MDL - check with laboratory

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limitsfor Pest and Herb by GC/ECD and Pest by GC/NPD in Water

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Organochlorine Pesticides								
4,4'-DDD	72-54-8	8081B	0.1	0.0166	0.063[b]	28-187	30-177	20
4,4'-DDE	72-55-9	8081B	0.1	0.0179	0.46	37-179	32-176	20
4,4'-DDT	50-29-3	8081B	0.1	0.0194	2.3	31-192	24-178	20
Aldrin	309-00-2	8081B	0.05	0.0077	0.0092[b]	10-166	10-155	20
alpha-BHC (alpha-Hexachlorocyclohexane)	319-84-6	8081B	0.05	0.0116	0.072	33-155	45-138	20
beta-BHC (beta-Hexachlorocyclohexane)	319-85-7	8081B	0.05	0.0111	0.25	42-159	56-145	20
delta-BHC	319-86-8	8081B	0.05	0.0086	NA	33-145	44-131	20
gamma-BHC (Lindane)	58-89-9	8081B	0.05	0.0112	0.2	21-163	42-146	20
Chlordane (technical)	57-74-9	8081B	0.5	0.16	2	NA	NA	NA
alpha-Chlordane	5103-71-9	8081B	0.5	0.0095	2	38-170	23-180	20
gamma-Chlordane	5103-74-2	8081B	0.5	0.01	2	38-170	34-174	20
Dieldrin	60-57-1	8081B	0.1	0.0165	0.018[b]	39-174	22-177	20
Endosulfan I	959-98-8	8081B	0.05	0.0084	100	21-180	16-182	20
Endosulfan II	33213-65-9	8081B	0.1	0.025	100	41-177	23-184	20
Endosulfan sulfate	1031-07-8	8081B	0.1	0.0144	100	44-169	24-179	20
Endrin	72-20-8	8081B	0.1	0.0152	2	24-189	10-197	20
Endrin aldehyde	7421-93-4	8081B	0.1	0.0183	2	50-152	10-183	20
Endrin ketone	53494-70-5	8081B	0.1	0.0169	2	48-171	20-185	20
Heptachlor	76-44-8	8081B	0.05	0.0097	0.4	10-170	10-160	20
Heptachlor epoxide	1024-57-3	8081B	0.05	0.0092	0.2	41-168	10-185	20
Methoxychlor	72-43-5	8081B	0.5	0.1572	40	32-176	33-174	20
Toxaphene	8001-35-2	8081B	1	0.14	3	NA	NA	NA
DCB (Surr)	2051-24-3	8081B	NA	NA	NA	14-122		

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Organophosphorus Pesticides								
Atrazine	1912-24-9	8141B	0.5	0.1	3	45-193	22-165	20
Azinphos, methyl (Guthion)	86-50-0	8141B	0.5	0.2	56	49-167	60-161	20
Chlorpyrifos	2921-88-2	8141B	0.5	0.14	8.4	74-140	12-153	20
Diazinon	333-41-5	8141B	0.5	0.145	10	75-150	96-109	20
Dichlorvos	62-73-7	8141B	0.5	0.131	2.6	26-197	44-141	20
Dimethoate	60-51-5	8141B	0.5	0.406	44	34-154	15-199	20
Disulfoton	298-04-4	8141B	0.5	0.222	0.5	54-138	10-200	20
Famphur	52-85-7	8141B	0.5	0.172	NA	54-163	32-200	20
Malathion	121-75-5	8141B	0.5	0.172	390	72-148	74-153	20
Methyl Parathion	298-00-0	8141B	0.5	0.173	4.5	68-145	36-164	20
Naled	300-76-5	8141B	0.5	0.406	40	43-161	50-134	20
Parathion (Ethyl parathion)	56-38-2	8141B	0.5	0.172	86	70-151	15-186	20
Phorate	298-02-2	8141B	0.5	0.175	3	56-148	17-200	20
Ronnel	299-84-3	8141B	0.5	0.134	410	48-179	31-163	20
Simazine	122-34-9	8141B	0.5	0.213	4	38-200	31-168	20
Stirophos (Tetrachlorvinphos)	22248-79-9	8141B	0.5	0.186	28	59-158	64-129	20
Terbufos	13071-79-9	8141B	0.5	0.164	0.24[b]	66-140	65-181	20
Total Demeton	8065-48-3	8141B	0.5	0.226	0.42[b]	50-137	48-140	20
Total Merphos	150-50-5	8141B	0.5	0.232	0.6	34-128	21-140	20
Triphenylphosphate (Surr)	115-86-6	8141B	NA	NA	NA	47-179		

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limitsfor Pest and Herb by GC/ECD and Pest by GC/NPD in Water

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Chlorinated Acid Herbicides								
2,4,5-T	93-76-5	8151A	1	0.51	160	54-119	38-132	20
2,4,5-TP (Silvex)	93-72-1	8151A	1	0.52	50	56-119	38-136	20
2,4-D*	94-75-7	8151A	1	0.47	70	56-110	32-139	20
2,4-DB**	94-82-6	8151A	1	0.65	450	68-122	10-200	20
3,5-Dichlorobenzoic acid	51-36-5	8151A	1	0.54	NA	65-114	71-130	20
Acifluorfen		8151A	1	0.58	260	57-109	69-118	20
Bentazon	25057-89-0	8151A	1	0.59	570	66-117	67-158	20
Dalapon	75-99-0	8151A	1	0.84	200	30-119	66-94	20
DCPA (dacthal, chlorthal-dimethyl)		8151A	1	0.55	120	47-109	26-170	20
Dicamba	1918-00-9	8151A	1	0.56	570	64-116	66-162	20
Dichloroprop	120-36-5	8151A	1	0.65	NA	66-107	66-111	20
Dinoseb	88-85-7	8151A	1	0.64	7	33-114	10-155	20
MCPA	94-74-6	8151A	100	82	7.5[a]	67-133	42-143	20
MCPP	7085-19-0	8151A	100	72	16[a]	76-136	10-200	20
Pentachlorophenol	87-86-5	8151A	1	0.54	1	46-128	25-154	20
Picloram	1918-02-1	8151A	1	0.35	500	67-127	89-141	20
2,4-DCAA (Surr)	19719-28-9	8151A	NA	NA	NA	46-129		

NOTES:

Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

[a]Limit not achievable

[b]Limit may be achievable based on MDL - check with laboratory

*Synonym: 2,4-Dichlorophenoxy acetic acid

**Synonym: 4-(2,4-Dichlorophenoxy) butanoic acid

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Misc. Compounds in Water

Target Analyte	CAS Number	Method	RL ug/L	MDL ug/L	2019 RCG Ground Water Tap Limit ug/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Alkalinity, Total	NA	2320B	2000	1000	NA	90-110	90-110	20
Bromide	24959-67-9	9056A/300.0	50	14	NA	80-120/90-110	80-120	15
Chloride	16887-00-6	4500Cl-E	1000	744	NA	90-110	90-110	20
Chloride	16887-00-6	9056A/300.0	250	91	NA	80-120/90-110	80-120	15
Chlorine, Residual	7782-50-5	4500Cl-G	100	10	0.3[a]	90-110	90-110	20
Chromium, Hexavalent	18540-29-9	7196A	10	3.5	0.35[a]	90-110	85-115	20
COD	NA	410.4	10000	5000	NA	90-110	90-110	20
Cyanide, Free	57-12-5	9014	100	50	200	90-110	90-110	20
Cyanide, Free	57-12-5	OIA1677	2	1.29	200	82-132	82-130	11
Cyanide, Available	57-12-5	OIA1677	2	1.29	200	82-132	82-130	11
Cyanide, Total	57-12-5	9012A	10	5.8	200	90-110	90-110	20
Fluoride	16984-48-8	9056A/300.0	100	12	4000	80-120/90-110	80-120	15
Fluoride	16984-48-8	4500F-C	100	17	4000	90-110	90-110	20
Hardness	NA	2340B	1000	1000	NA	NA	NA	20
Nitrogen, Nitrate	14797-55-8	9056A/300.0	50	14	10000	80-120/90-110	80-120	15
Nitrogen, Nitrate	14797-55-8	353.2	100	20	10000	90-110	90-110	20
Nitrogen, Nitrite	14797-65-0	9056A/300.0	50	13	1000	80-120/90-110	80-120	15
Nitrogen, Nitrite	14797-65-0	353.2	100	5	1000	90-110	90-110	20
Nitrogen, Nitrate+Nitrite	NA	9056A/300.0	100	50	10000	80-120/90-110	80-120	15
Nitrogen, Nitrate+Nitrite	NA	353.2	100	20	10000	90-110	90-110	20
Nitrogen, Ammonia	7664-41-7	350.1/4500-NH_3 G	100	27	NA	90-110	90-110	20
pH	NA	4500H+B	0.1Std. Units	0.1Std. Units	NA	0.1Std. Units	NA	2
Phenolics, Total	NA	420.4	20	4	NA	90-110	90-110	20
Phosphorus, Ortho	7778-77-0	4500P-E	100	50	NA	90-110	90-110	20
Phosphorus, Total	7723-14-0	365.1	50	50	NA	90-110	90-110	20
Sulfate	14808-79-8	9056A/300.0	250	173	NA	80-120/90-110	80-120	15
Sulfate	14808-79-8	9038	10000	5100	NA	90-110	90-110	20
Sulfide	18496-25-8	4500S2-D	100	17	NA	90-110	90-110	20
TKN (Total Kjeldahl Nitrogen)	7727-37-9	351.2	500	257	NA	90-110	90-110	20
Total Dissolved Solids	NA	2540C	10000	10000	NA	80-120	NA	10
Total Organic Carbon	7440-44-0	5310C	1000	146	NA	90-110	80-120	20
Total Suspended Solids	NA	2540D	5000	5000	NA	80-120	NA	10
Turbidity	NA	180.1	1 NTU	0.9 NTU	NA	80-120	NA	20

NOTES:

Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

[a]Limit not achievable

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Misc. Compounds in Water

Target Analyte	CAS Number	SW-846 Method	RL mg/L	MDL mg/L	EPA TCLP Limit [1] mg/L	LCS Limits % Rec.	MS Limits % Rec.	RPD Max %
TCLP Metals								
Arsenic	7440-38-2	1311/6010B	0.01	0.005	5	80-120	75-125	20
Barium	7440-39-3	1311/6010B	0.5	0.25	100	80-120	75-125	20
Cadmium	7440-43-9	1311/6010B	0.005	0.0025	1	80-120	75-125	20
Chromium	7440-47-3	1311/6010B	0.01	0.0052	5	80-120	75-125	20
Lead	7439-92-1	1311/6010B	0.01	0.005	5	80-120	75-125	20
Mercury	7439-97-6	1311/7470A	0.002	0.001	0.2	80-120	75-125	20
Selenium	7782-49-2	1311/6010B	0.01	0.005	1	80-120	75-125	20
Silver	7440-22-4	1311/6010B	0.01	0.005	5	80-120	75-125	20
TCLP Volatiles								
Benzene	71-43-2	1311/8260C	0.05	0.01	0.5	78-117	49-140	20
Carbon Tetrachloride	56-23-5	1311/8260C	0.05	0.025	0.5	68-132	45-148	20
Chlorobenzene	108-90-7	1311/8260C	0.05	0.025	100	79-113	47-135	20
Chloroform	67-66-3	1311/8260C	0.05	0.025	6	73-118	49-136	20
1,2-Dichloroethane	107-06-2	1311/8260C	0.05	0.025	0.5	68-119	44-138	20
1,1-Dichloroethene	75-35-4	1311/8260C	0.05	0.025	0.7	71-126	46-148	20
Methyl ethyl ketone (2-Butanone; MEK)	78-93-3	1311/8260C	1	0.5	200	62-140	36-153	20
Tetrachloroethene (PCE)	127-18-4	1311/8260C	0.05	0.025	0.7	73-124	41-145	20
Trichloroethene (TCE)	79-01-6	1311/8260C	0.05	0.025	0.5	76-120	43-147	20
Vinyl Chloride	75-01-4	1311/8260C	0.02	0.01	0.2	70-136	49-153	20
4-Bromofluorobenzene (surr)	460-00-4	1311/8260C	NA	NA	NA	85-114		
Dibromofluoromethane (surr)	1868-53-7	1311/8260C	NA	NA	NA	80-122		
Toluene-d8 (surr)	2037-26-5	1311/8260C	NA	NA	NA	85-114		

TCLP Semivolatiles								
1,4-Dichlorobenzene	106-46-7	1311/8270C	0.1	0.05	7.5	10-83	13-72	20
2,4,5-Trichlorophenol	95-95-4	1311/8270C	0.5	0.25	400	39-101	36-101	20
2,4,6-Trichlorophenol	88-06-2	1311/8270C	0.1	0.05	2	39-109	30-106	20
2,4-Dinitrotoluene	121-14-2	1311/8270C	0.1	0.05	0.13	39-111	36-97	20
2-Methylphenol (o-Cresol)	95-48-7	1311/8270C	0.1	0.05	200	29-86	24-84	20
3-&4-Methylphenol (m&p-Cresol)	108-39-4, 106-44-5	1311/8270C	0.2	0.1	200	22-84	17-82	20
Hexachlorobenzene	118-74-1	1311/8270C	0.1	0.05	0.13	10-90	10-82	20
Hexachlorobutadiene	87-68-3	1311/8270C	0.1	0.05	0.5	31-117	20-99	20
Hexachloroethane	67-72-1	1311/8270C	0.1	0.05	3	10-81	10-73	20
Nitrobenzene	98-95-3	1311/8270C	0.1	0.05	2	40-96	32-92	20
Pentachlorophenol	87-86-5	1311/8270C	0.5	0.25	100	33-121	27-122	20
Pyridine	110-86-1	1311/8270C	0.1	0.05	5	10-52	10-55	20
2,4,6-Tribromophenol (surr)	118-79-6	1311/8270C	NA	NA	NA	33-108		
2-Fluorobiphenyl (surr)	321-60-8	1311/8270C	NA	NA	NA	19-93		
2-Fluorophenol (surr)	367-12-4	1311/8270C	NA	NA	NA	10-59		
Nitrobenzne-d5 (surr)	4165-60-0	1311/8270C	NA	NA	NA	27-95		
Phenol-d5 (surr)	4165-62-2	1311/8270C	NA	NA	NA	10-42		
Terphenyl-d14 (surr)	1718-51-0	1311/8270C	NA	NA	NA	11-147		
TCLP Pesticides								
gamma-BHC (Lindane)	58-89-9	1311/8081B	0.00025	0.00025	0.4	21-163	42-146	20
Chlordane (technical)	57-74-9	1311/8081B	0.0025	0.0025	0.03	NA	NA	NA
Endrin	72-20-8	1311/8081B	0.0005	0.0005	0.02	24-189	10-197	20
Heptachlor	76-44-8	1311/8081B	0.00025	0.00025	0.008	10-170	10-160	20
Heptachlor epoxide	1024-57-3	1311/8081B	0.00025	0.00025	0.008	41-168	10-185	20
Methoxychlor	72-43-5	1311/8081B	0.0025	0.0025	10	32-176	33-174	20
Toxaphene	8001-35-2	1311/8081B	0.005	0.005	0.5	NA	NA	NA
DCB (Surr)	2051-24-3	1311/8081B	NA	NA	NA	14-122		
TCLP Herbicides								
2,4,5-TP (Silvex)	93-72-1	1311/8151A	0.005	0.005	1	27-138	10-154	20
2,4-D	94-75-7	1311/8151A	0.005	0.005	10	30-123	10-138	20
2,4-DCAA (Surr)	19719-28-9	1311/8151A	NA	NA	NA	10-156		

[1] Reference: 40 CFR 261, Appendix II, 1993 ed., as amended by 58 FR 46040, August 31, 1993.

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Volatiles in Soil

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Acetone	67-64-1	8260C	0.1	0.05	85000	57	NA	NA	NA
Acrolein	107-02-8	8260C	0.1	0.05	0.2	0.00017[a]	NA	NA	NA
Acrylonitrile	107-13-1	8260C	0.1	0.05	3.5	0.0023[a]	NA	NA	NA
Benzene	71-43-2	8260C	0.005	0.001	17	0.051	74-119	38-144	20
Bromobenzene	108-86-1	8260C	0.005	0.0025	410	0.84	NA	NA	NA
Bromodichloromethane	75-27-4	8260C	0.005	0.0025	4.1	0.43	NA	NA	NA
Bromoform	75-25-2	8260C	0.005	0.0032	270	0.42	NA	NA	NA
Bromomethane (Methyl Bromide)	74-83-9	8260C	0.005	0.004	9.5	0.038	NA	NA	NA
Bromochloromethane	74-97-5	8260C	0.005	0.0025	210	0.41	NA	NA	NA
2-Butanone (MEK)	78-93-3	8260C	0.025	0.012	28000	23	NA	NA	NA
n-Butylbenzene	104-51-8	8260C	0.005	0.0025	110	64	NA	NA	NA
sec-Butylbenzene	135-98-8	8260C	0.005	0.0025	150	120	NA	NA	NA
tert-Butylbenzene	98-06-6	8260C	0.005	0.0025	180	31	NA	NA	NA
Carbon disulfide	75-15-0	8260C	0.010	0.005	740	4.8	NA	NA	NA
Carbon tetrachloride	56-23-5	8260C	0.005	0.0025	9.1	0.039	NA	NA	NA
Chlorobenzene	108-90-7	8260C	0.005	0.0025	390	1.4	76-113	30-134	20
Chloroethane (Ethyl Chloride)	75-00-3	8260C	0.005	0.0025	2100	120	NA	NA	NA
Chloroform	67-66-3	8260C	0.005	0.0025	4.5	0.44	71-117	40-139	20
Chloromethane (Methyl Chloride)	74-87-3	8260C	0.005	0.0025	150	0.98	NA	NA	NA
2-Chlorotoluene	95-49-8	8260C	0.005	0.0025	910	4.7	NA	NA	NA
4-Chlorotoluene	106-43-4	8260C	0.005	0.0025	250	4.8	NA	NA	NA
Cyclohexane	110-82-7	8260C	0.10	0.05	120	270	NA	NA	NA
Dibromochloromethane	124-48-1	8260C	0.005	0.0025	120	0.43	NA	NA	NA
1,2-Dibromoethane (EDB)	106-93-4	8260C	0.005	0.0025	0.5	0.00028[a]	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	8260C	0.005	0.0025	0.074	0.0017[b]	NA	NA	NA
Dibromomethane (Methylene Bromide)	74-95-3	8260C	0.005	0.0032	34	0.041	NA	NA	NA
trans-1,4-Dichloro-2-butene	110-57-6	8260C	0.1	0.05	0.1	0.00012[a]	NA	NA	NA
1,2-Dichlorobenzene	95-50-1	8260C	0.005	0.0025	380	12	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	8260C	0.005	0.0025	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	8260C	0.005	0.0025	36	1.4	NA	NA	NA

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Volatiles in Soil

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Dichlorodifluoromethane	75-71-8	8260C	0.005	0.005	120	6	NA	NA	NA
1,1-Dichloroethane	75-34-3	8260C	0.005	0.0025	50	0.16	NA	NA	NA
1,2-Dichloroethane (EDC)	107-06-2	8260C	0.005	0.0025	6.4	0.028	NA	NA	NA
1,1-Dichloroethene	75-35-4	8260C	0.005	0.0025	320	0.05	70-127	43-151	20
cis -1,2-Dichloroethene	156-59-2	8260C	0.005	0.0025	220	0.41	NA	NA	NA
trans -1,2-Dichloroethene	156-60-5	8260C	0.005	0.0025	1900	0.62	NA	NA	NA
1,2-Dichloropropane	78-87-5	8260C	0.005	0.0025	22	0.033	77-125	41-147	20
1,3-Dichloropropane	142-28-9	8260C	0.005	0.0025	1500	2.6	NA	NA	NA
2,2-Dichloropropane	594-20-7	8260C	0.005	0.0025	NA	NA	NA	NA	NA
1,1-Dichloropropene	563-58-6	8260C	0.005	0.0025	NA	NA	NA	NA	NA
cis -1,3-Dichloropropene	10061-01-5	8260C	0.005	0.0025	25	0.034	NA	NA	NA
trans -1,3-Dichloropropene	10061-02-6	8260C	0.005	0.0025	25	0.034	NA	NA	NA
1,4-Dioxane (p-Dioxane)	123-91-1	8260C	0.5	0.25	74	0.019[a]	NA	NA	NA
Ethylbenzene	100-41-4	8260C	0.005	0.0025	81	16	73-118	23-146	20
Ethyl methacrylate	97-63-2	8260C	0.1	0.05	1100	3	NA	NA	NA
Hexachloro-1,3-butadiene	87-68-3	8260C	0.005	0.0025	17	0.054	NA	NA	NA
n-Hexane	110-54-3	8260C	0.005	0.0025	140	210	NA	NA	NA
2-Hexanone	591-78-6	8260C	0.1	0.05	280	0.18	NA	NA	NA
Iodomethane	74-88-4	8260C	0.1	0.05	NA	NA	NA	NA	NA
Isopropylbenzene (Cumene)	98-82-8	8260C	0.005	0.0025	270	15	74-121	22-147	20
p-Isopropyltoluene	99-87-6	8260C	0.005	0.0025	NA	NA	NA	NA	NA
Methyl Acetate	79-20-9	8260C	0.005	0.0025	29000	83	NA	NA	NA
Methylcyclohexane	108-87-2	8260C	0.005	0.0025	NA	NA	NA	NA	NA
Methylene Chloride (Dichloromethane)	75-09-2	8260C	0.02	0.01	490	0.025	NA	NA	NA
1-Methylnaphthalene	90-12-0	8260C	0.01	0.01	250	1.2	NA	NA	NA
2-Methylnaphthalene	91-57-6	8260C	0.01	0.01	340	3.7	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	108-10-1	8260C	0.03	0.012	3400	28	NA	NA	NA
Methyl-tert-butyl-Ether (MTBE)	1634-04-4	8260C	0.005	0.0025	660	0.63	74-131	54-151	20
Naphthalene	91-20-3	8260C	0.005	0.0025	53	0.11	63-123	10-129	20
n -Propylbenzene	103-65-1	8260C	0.005	0.0025	260	25	NA	NA	NA
Styrene	100-42-5	8260C	0.005	0.0025	870	2.2	NA	NA	NA

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Volatiles in Soil

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
1,1,1,2-Tetrachloroethane	630-20-6	8260C	0.005	0.0025	28	0.043	NA	NA	NA
1,1,2,2-Tetrachloroethane	79-34-5	8260C	0.005	0.0025	8.4	0.0059	70-124	14-173	20
Tetrachloroethene (PCE)	127-18-4	8260C	0.005	0.0014	110	0.045	70-116	25-147	20
Toluene	108-88-3	8260C	0.005	0.0025	820	14	72-112	31-144	20
1,2,3-Trichlorobenzene	87-61-6	8260C	0.005	0.0025	88	0.42	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	8260C	0.005	0.0025	81	4.1	NA	NA	NA
1,1,1-Trichloroethane (TCA)	71-55-6	8260C	0.005	0.0025	640	1.4	72-125	48-141	20
1,1,2-Trichloroethane	79-00-5	8260C	0.005	0.0025	2.1	0.032	NA	NA	NA
1,1,2-Trichlorotrifluoroethane (1,1,2-Trichloro-1,2,2-trifluoroethane)	76-13-1	8260C	0.005	0.0025	910	490	NA	NA	NA
Trichloroethene (TCE)	79-01-6	8260C	0.005	0.001	5.7	0.036	74-120	22-167	20
Trichlorofluoromethane	75-69-4	8260C	0.005	0.0025	1200	66	NA	NA	NA
1,2,3-Trichloropropane	96-18-4	8260C	0.005	0.0025	0.071	0.000065[a]	NA	NA	NA
1,2,4-Trimethylbenzene	95-63-6	8260C	0.005	0.0025	220	1.6	69-117	10-162	20
1,3,5-Trimethylbenzene	108-67-8	8260C	0.005	0.0025	180	1.7	NA	NA	NA
Vinyl Acetate	108-05-4	8260C	0.1	0.05	1300	1.7	NA	NA	NA
Vinyl Chloride (Chloroethene)	75-01-4	8260C	0.005	0.0025	0.83	0.014	58-133	40-150	20
Xylenes, Total	1330-20-7	8260C	0.010	0.005	260	3.7	71-119	20-146	20
4-Bromofluorobenzene (surr)	460-00-4	8260C	NA	NA	NA	NA	65-119		
Dibromofluoromethane (surr)	1868-53-7	8260C	NA	NA	NA	NA	77-131		
Toluene-d8 (surr)	2037-26-5	8260C	NA	NA	NA	NA	77-127		

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.
[a]Limit not achievable
[b]Limit may be achievable based on MDL - check with laboratory

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Acenaphthene	83-32-9	8270C	0.33	0.16	5000	110	45-103	18-113	20
Acenaphthylene	208-96-8	8270C	0.33	0.16	NA	NA	46-103	17-113	20
Acetophenone	98-86-2	8270C	0.33	0.16	2500	12	NA	NA	NA
Anthracene	120-12-7	8270C	0.33	0.16	25000	1200	53-106	22-114	20
Atrazine	1912-24-9	8270C	0.33	0.16	34	0.039[a]	NA	NA	NA
Benzaldehyde	100-52-7	8270C	0.33	0.16	1200	0.84	NA	NA	NA
Benz[a]anthracene	56-55-3	8270C	0.33	0.16	15	2.1	52-107	18-115	20
Benzo[a]pyrene	50-32-8	8270C	0.33	0.16	1.5	4.7	46-108	14-109	20
Benzo[b]fluoranthene	205-99-2	8270C	0.33	0.16	15	60	48-111	10-120	20
Benzo[g,h,i]perylene	191-24-2	8270C	0.33	0.16	NA	NA	44-111	13-109	20
Benzo[k]fluoranthene	207-08-9	8270C	0.33	0.16	150	590	49-111	14-114	20
Benzyl alcohol	100-51-6	8270C	0.33	0.33	8800	9.7	NA	NA	NA
Biphenyl (1,1 - biphenyl or Diphenyl)	92-52-4	8270C	0.33	0.16	66	0.17	NA	NA	NA
bis(2-chloroethoxy) methane	111-91-1	8270C	0.33	0.16	270	0.27[b]	NA	NA	NA
bis(2-chloroethyl) ether	111-44-4	8270C	0.33	0.16	3.2	0.00074[a]	NA	NA	NA
bis(2-chloro-1-methylethyl) ether*	108-60-1	8270C	0.33	0.16	1000	5.2	NA	NA	NA
bis(2-ethylhexyl) phthalate	117-81-7	8270C	0.33	0.16	550	29	NA	NA	NA
4-Bromophenyl phenyl ether	101-55-03	8270C	0.33	0.16	NA	NA	NA	NA	NA
Butyl benzyl phthalate	85-68-7	8270C	0.33	0.16	4100	46	NA	NA	NA
4-Chloroaniline	106-47-8	8270C	0.33	0.16	38	0.031[a]	NA	NA	NA
4-Chloro-3-methylphenol	59-50-7	8270C	0.33	0.16	8800	33	46-112	14-127	20
2-Chloronaphthalene	91-58-7	8270C	0.33	0.16	6700	77	NA	NA	NA
2-Chlorophenol	95-57-8	8270C	0.33	0.16	550	1.8	47-102	14-115	20
4-Chlorophenyl phenyl ether	7005-72-3	8270C	0.33	0.16	NA	NA	NA	NA	NA
Caprolactam	105-60-2	8270C	0.33	0.33	43000	49	NA	NA	NA
Carbazole	86-74-8	8270C	0.33	0.16	NA	NA	NA	NA	NA
Chrysene	218-01-9	8270C	0.33	0.16	1500	1800	53-109	18-119	20
Dibenz[a,h]anthracene	53-70-3	8270C	0.33	0.16	1.5	19	47-110	12-114	20
Dibenzofuran	132-64-9	8270C	0.33	0.16	100	2.9	NA	NA	NA
Di-*n*-butyl phthalate	84-74-2	8270C	0.33	0.16	8800	45	NA	NA	NA
3,3'-Dichlorobenzidine	91-94-1	8270C	0.66	0.33	17	0.17[a]	NA	NA	NA

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
2,4-Dichlorophenol	120-83-2	8270C	0.33	0.16	270	0.45	NA	NA	NA
Diethyl phthalate	84-66-2	8270C	0.33	0.16	71000	120	NA	NA	NA
2,4-Dimethylphenol	105-67-9	8270C	0.33	0.16	1800	8.5	NA	NA	NA
Dimethylphthalate	131-11-3	8270C	0.33	0.16	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	534-52-1	8270C	1.6	0.8	7.1	0.051[a]	NA	NA	NA
2,4-Dinitrophenol	51-28-5	8270C	1.6	0.8	180	0.87[a]	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	8270C	0.33	0.16	24	0.065[a]	32-115	10-125	20
2,6-Dinitrotoluene	606-20-2	8270C	0.33	0.16	5	0.013[a]	NA	NA	NA
Di-*n*-octyl phthalate	117-84-0	8270C	0.33	0.16	880	1100	NA	NA	NA
Fluoranthene	206-44-0	8270C	0.33	0.16	3400	1800	50-113	20-120	20
Fluorene	86-73-7	8270C	0.33	0.16	3400	110	46-107	17-120	20
Hexachlorobenzene	118-74-1	8270C	0.33	0.16	2.9	0.25[b]	NA	NA	NA
Hexachloro-1,3-butadiene	87-68-3	8270C	0.33	0.16	17	0.054[a]	NA	NA	NA
Hexachlorocyclopentadiene	77-47-4	8270C	0.33	0.33	2.5	3.1	NA	NA	NA
Hexachloroethane	67-72-1	8270C	0.33	0.16	25	0.04[a]	NA	NA	NA
Indeno[1,2,3-cd]pyrene	193-39-5	8270C	0.33	0.16	15	200	46-111	13-109	20
Isophorone	78-59-1	8270C	0.33	0.16	8000	5.2	NA	NA	NA
2-Methylphenol (o-Cresol)	95-48-7	8270C	0.33	0.16	4500	15	NA	NA	NA
3 & 4-Methylphenol (m & p Cresols)	108-39-4, 106-44-5	8270C	0.33	0.16	4500	15	NA	NA	NA
1-Methylnaphthalene	90-12-0	8270C	0.33	0.16	250	1.2	55-108	11-142	20
2-Methylnaphthalene	91-57-6	8270C	0.33	0.16	340	3.7	49-101	19-118	20
N-Nitroso-di-*n*-propylamine	621-64-7	8270C	0.33	0.16	1.1	0.0017[a]	40-103	24-108	20
N-Nitrosodiphenylamine	86-30-6	8270C	0.33	0.16	1500	13	NA	NA	NA
Naphthalene	91-20-3	8270C	0.33	0.16	53	0.11[c]	47-97	20-112	20
2-Nitroaniline	88-74-4	8270C	1.6	0.8	880	1.6	NA	NA	NA
3-Nitroaniline	99-09-2	8270C	1.6	0.8	NA	NA	NA	NA	NA
4-Nitroaniline	100-01-6	8270C	1.6	0.8	350	0.32[a]	NA	NA	NA
Nitrobenzene	98-95-3	8270C	0.33	0.16	71	0.018[a]	NA	NA	NA
2-Nitrophenol	88-75-5	8270C	0.33	0.16	NA	NA	NA	NA	NA

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
4-Nitrophenol	100-02-7	8270C	1.6	0.8	NA	NA	28-123	10-137	20
Pentachlorophenol	87-86-5	8270C	1.6	1.6	14	0.028[a]	27-124	10-139	20
Phenanthrene	85-01-8	8270C	0.33	0.16	NA	NA	53-107	28-113	20
Phenol	108-95-2	8270C	0.33	0.16	27000	67	40-104	10-117	20
Pyrene	129-00-0	8270C	0.33	0.16	2500	260	45-119	18-130	20
1,2,4,5-tetrachlorobenzene	95-94-3	8270C	0.33	0.16	32	0.16	NA	NA	NA
2,3,4,6-tetrachlorophenol	58-90-2	8270C	0.33	0.16	2700	3.6	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	8270C	0.33	0.16	8800	81	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	8270C	0.33	0.16	88	0.23[b]	NA	NA	NA
2,4,6-Tribromophenol (surr)	118-79-6	8270C	NA	NA	NA	NA	10-114		
2-Fluorobiphenyl (surr)	321-60-8	8270C	NA	NA	NA	NA	21-96		
2-Fluorophenol (surr)	367-12-4	8270C	NA	NA	NA	NA	16-104		
Nitrobenzne-d5 (surr)	4165-60-0	8270C	NA	NA	NA	NA	18-98		
Phenol-d5 (surr)	4165-62-2	8270C	NA	NA	NA	NA	18-108		
Terphenyl-d14 (surr)	1718-51-0	8270C	NA	NA	NA	NA	29-124		

NOTES:

Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

[a]Limit not achievable

[b]Limit may be achievable based on MDL - check with laboratory

[c]Must use 8270 PAH-SIM method to achieve this limit

*****Synonyms: bis(2-chloroisopropyl) ether and 2,2'-Oxybis(1-chloropropane)

** Synonym: 4,6-Dinitro-o-cresol

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for PAHs by SIM in Soil

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
1-Methylnaphthalene	90-12-0	8270C SIM	0.005	0.00063	250	1.2	44-111	10-145	20
2-Methylnaphthalene	91-57-6	8270C SIM	0.005	0.0006	340	3.7	45-111	10-135	20
Acenaphthene	83-32-9	8270C SIM	0.005	0.0004	5000	110	48-109	10-138	20
Acenaphthylene	208-96-8	8270C SIM	0.005	0.00078	NA	NA	49-108	11-133	20
Anthracene	120-12-7	8270C SIM	0.005	0.00025	25000	1200	44-104	10-131	20
Benzo[a]anthracene	56-55-3	8270C SIM	0.005	0.00069	15	2.1	46-122	10-158	20
Benzo[a]pyrene	50-32-8	8270C SIM	0.005	0.001	1.5	4.7	31-156	10-174	20
Benzo[b]fluoranthene	205-99-2	8270C SIM	0.005	0.001	15	60	29-158	10-184	20
Benzo[g,h,i]perylene	191-24-2	8270C SIM	0.005	0.00099	NA	NA	35-145	10-170	20
Benzo[k]fluoranthene	207-08-9	8270C SIM	0.005	0.00063	150	590	33-150	10-183	20
Chrysene	218-01-9	8270C SIM	0.005	0.00078	1500	1800	47-120	10-147	20
Dibenz[a,h]anthracene	53-70-3	8270C SIM	0.005	0.0011	1.5	19	28-160	10-166	20
Fluoranthene	206-44-0	8270C SIM	0.005	0.00064	3400	1800	49-121	10-158	20
Fluorene	86-73-7	8270C SIM	0.005	0.0007	3400	110	47-116	10-142	20
Indeno[1,2,3-cd]pyrene	193-39-5	8270C SIM	0.005	0.00091	15	200	31-155	10-167	20
Naphthalene	91-20-3	8270C SIM	0.005	0.00039	53	0.11	47-103	13-128	20
Phenanthrene	85-01-8	8270C SIM	0.005	0.00059	NA	NA	50-114	10-164	20
Pyrene	129-00-0	8270C SIM	0.005	0.00069	2500	260	49-114	10-152	20
2-Fluorobiphenyl (surr)	321-60-8	8270C SIM	NA	NA	NA	NA	23-107		
Terphenyl-d14 (surr)	1718-51-0	8270C SIM	NA	NA	NA	NA	16-117		

NOTES:
PAH = Polycyclic Aromatic Hydrocarbon
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Metals in Soil by ICP/CVAA

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Aluminum	7429-90-5	6010B	50	3.68	100000	600000	80-120	75-125	20
Antimony	7440-36-0	6010B	1	0.24	43	5.4	80-120	75-125	20
Arsenic	7440-38-2	6010B	1	0.2	9.5	5.9	80-120	75-125	20
Barium	7440-39-3	6010B	1	0.06	21000	1700	80-120	75-125	20
Beryllium	7440-41-7	6010B	0.5	0.02	220	63	80-120	75-125	20
Boron	7440-42-8	6010B	5	0.48	22000	260	80-120	75-125	20
Cadmium	7440-43-9	6010B	0.5	0.02	99	7.5	80-120	75-125	20
Calcium	7440-70-2	6010B	50	9.84	NA	NA	80-120	75-125	20
Chromium	7440-47-3	6010B	1	0.29	NA	1000000	80-120	75-125	20
Cobalt	7440-48-4	6010B	1	0.03	32	5.4	80-120	75-125	20
Copper	7440-50-8	6010B	1	0.12	4300	920	80-120	75-125	20
Iron	7439-89-6	6010B	50	4.92	77000	7100	80-120	75-125	20
Lead	7439-92-1	6010B	1	0.15	400	270	80-120	75-125	20
Magnesium	7439-95-4	6010B	50	2.83	NA	NA	80-120	75-125	20
Manganese	7439-96-5	6010B	1	0.12	2500	560	80-120	75-125	20
Mercury	7439-97-6	7471A	0.2	0.1	3.1	2.1	80-120	75-125	20
Molybdenum	7439-98-7	6010B	1	0.05	550	41	80-120	75-125	20
Nickel	7440-02-0	6010B	1	0.11	2100	510	80-120	75-125	20
Phosphorus	7723-14-0	6010B	50	4.11	NA	NA	80-120	75-125	20
Potassium	7440-09-7	6010B	50	5.81	NA	NA	80-120	75-125	20
Selenium	7782-49-2	6010B	1	0.37	550	5.3	80-120	75-125	20
Silver	7440-22-4	6010B	0.5	0.28	550	16	80-120	75-125	20
Sodium	7440-23-5	6010B	50	8.19	NA	NA	80-120	75-125	20
Strontium	7440-24-6	6010B	1	0.07	66000	8500	80-120	75-125	20
Thallium	7440-28-0	6010B	1	0.24	1.1	2.9	80-120	75-125	20
Tin (Sn)	7440-31-5	6010B	5	2.02	66000	60000	80-120	75-125	20
Titanium	7440-32-6	6010B	1	0.09	NA	NA	80-120	75-125	20
Vanadium	7440-62-2	6010B	1	0.11	550	1700	80-120	75-125	20
Zinc	7440-66-6	6010B	1	0.35	32000	7500	80-120	75-125	20

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Metals in Soil by ICP/MS

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Aluminum	7429-90-5	6020	1	0.518	10000	600000	80-120	75-125	20
Antimony	7440-36-0	6020	0.1	0.034	43	5.4	80-120	75-125	20
Arsenic	7440-38-2	6020	0.1	0.04	9.5	5.9	80-120	75-125	20
Barium	7440-39-3	6020	0.1	0.02	21000	1700	80-120	75-125	20
Beryllium	7440-41-7	6020	0.05	0.029	220	63	80-120	75-125	20
Boron	7440-42-8	6020	0.5	0.369	22000	260	80-120	75-125	20
Cadmium	7440-43-9	6020	0.05	0.045	99	7.5	80-120	75-125	20
Chromium	7440-47-3	6020	0.2	0.128	NA	1000000	80-120	75-125	20
Cobalt	7440-48-4	6020	0.1	0.006	32	5.4	80-120	75-125	20
Copper	7440-50-8	6020	0.05	0.033	4300	920	80-120	75-125	20
Lead	7439-92-1	6020	0.1	0.01	400	270	80-120	75-125	20
Manganese	7439-96-5	6020	0.1	0.048	2500	560	80-120	75-125	20
Molybdenum	7439-98-7	6020	0.1	0.031	550	41	80-120	75-125	20
Nickel	7440-02-0	6020	0.05	0.036	2100	510	80-120	75-125	20
Selenium	7782-49-2	6020	0.1	0.048	550	5.3	80-120	75-125	20
Silver	7440-22-4	6020	0.05	0.022	550	16	80-120	75-125	20
Strontium	7440-24-6	6020	0.1	0.005	66000	8500	80-120	75-125	20
Thallium	7440-28-0	6020	0.1	0.006	1.1	2.9	80-120	75-125	20
Tin	7440-31-5	6020	10	1.44	66000	60000	80-120	75-125	20
Titanium	7440-32-6	6020	0.1	0.027	NA	NA	80-120	75-125	20
Uranium	7440-61-1	6020	0.1	0.001	22	270	80-120	75-125	20
Vanadium	7440-62-2	6020	0.05	0.015	550	1700	80-120	75-125	20
Zinc	7440-66-6	6020	0.5	0.335	32000	7500	80-120	75-125	20

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Misc. Compounds in Soil by GC/FID

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2009 RISC Closure Level[1] mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Gasoline Range Organics C5-C12	NA	8015D	1	0.3	4300	61-140	23-156	20
4-Bromofluorobenzene (surr)	460-00-4	8015D	NA	NA	NA	19-176		

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2009 RISC Closure Level[1] mg/L	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Diesel Range Organics C8-C28	NA	8015D	10	5	5800	45-94	10-176	20
High End Organics C8-C34	NA	8015D	10	5	5800	45-94	10-176	20
n-Pentacosane (surr)	620-99-2	8015D	NA	NA	NA	10-181		

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Ethanol	64-17-5	8015D	5	0.065	NA	NA	85-105	44-124	20
Methanol	67-56-1	8015D	5	0.082	100000	81	79-111	47-116	20
Isopropanol (2-Propanol)	67-63-0	8015D	5	0.059	7800	1.7[b]	78-114	10-142	20
n-Butanol	71-36-3	8015D	5	0.03	7600	8.3	81-110	10-135	20
Ethylene Glycol	107-21-1	8015D	5	3.1	100000	160	50-158	12-157	20
Propylene Glycol	57-55-6	8015D	5	1.9	100000	1600	56-118	31-109	20

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.
[1]TPH Closure Level - RISC Announcements July 06, 2009
[a]Limit not achievable
[b]Limit may be achievable based on MDL - check with laboratory

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for PCBs in Soil by GC/ECD

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Aroclor® 1016	12674-11-2	8082A	0.1	0.0048	5.7	2.7	59-119	10-159	20
Aroclor® 1221	11104-28-2	8082A	0.1	0.0048	2.8	0.016[b]	NA	NA	NA
Aroclor® 1232	11141-16-5	8082A	0.1	0.0029	2.4	0.016[b]	NA	NA	NA
Aroclor® 1242	53469-21-9	8082A	0.1	0.0028	3.2	0.24	NA	NA	NA
Aroclor® 1248	12672-29-6	8082A	0.1	0.0055	3.2	0.24	NA	NA	NA
Aroclor® 1254	11097-69-1	8082A	0.1	0.0031	1.7	0.41	NA	NA	NA
Aroclor® 1260	11096-82-5	8082A	0.1	0.0057	3.4	1.1	57-119	11-131	20
Aroclor® 1262	37324-23-5	8082A	0.1	0.0037	NA	NA	NA	NA	NA
Aroclor® 1268	11100-14-4	8082A	0.1	0.0033	NA	NA	NA	NA	NA
Tetrachloro-m-xylene (surr)	877-09-8	8082A	NA	NA	NA	NA	26-140		

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.
[a]Limit not achievable
[b]Limit may be achievable based on MDL - check with laboratory

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Pest and Herb by GC/ECD and Pest by GC/NPD in Soil

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Organochlorine Pesticides									
4,4'-DDD	72-54-8	8081B	0.005	0.0007	2.7	0.3	42-185	10-199	20
4,4'-DDE	72-55-9	8081B	0.005	0.0006	28	2.2	40-191	10-200	20
4,4'-DDT	50-29-3	8081B	0.005	0.0018	27	16	30-196	10-186	20
Aldrin	309-00-2	8081B	0.0025	0.0007	0.55	0.03	42-177	10-184	20
alpha-BHC (alpha-Hexachlorocyclohexane)	319-84-6	8081B	0.0025	0.0003	1.2	0.0084	30-178	15-165	20
beta-BHC (beta-Hexachlorocyclohexane)	319-85-7	8081B	0.0025	0.0005	4.2	0.029	39-176	10-180	20
delta-BHC	319-86-8	8081B	0.0025	0.0006	NA	NA	23-162	10-176	20
gamma-BHC (Lindane)	58-89-9	8081B	0.0025	0.0003	8	0.023	39-170	10-174	20
Chlordane (technical)	57-74-9	8081B	0.05	0.0074	24	5.4	NA	NA	NA
alpha-Chlordane	5103-71-9	8081B	0.0025	0.0003	24	5.4	41-177	10-182	20
gamma-Chlordane	5103-74-2	8081B	0.0025	0.0004	24	5.4	41-180	10-187	20
Dieldrin	60-57-1	8081B	0.005	0.0006	0.48	0.015	40-183	10-186	20
Endosulfan I	959-98-8	8081B	0.0025	0.0003	660	27	42-181	10-192	20
Endosulfan II	33213-65-9	8081B	0.005	0.0008	660	27	40-187	10-190	20
Endosulfan sulfate	1031-07-8	8081B	0.005	0.0006	660	27	38-181	10-191	20
Endrin	72-20-8	8081B	0.005	0.0008	27	1.6	33-200	10-183	20
Endrin aldehyde	7421-93-4	8081B	0.005	0.0011	27	1.6	39-178	10-180	20
Endrin ketone	53494-70-5	8081B	0.005	0.0010	27	1.6	33-191	10-200	20
Heptachlor	76-44-8	8081B	0.0025	0.0003	1.8	0.66	38-183	10-197	20
Heptachlor epoxide	1024-57-3	8081B	0.0025	0.0003	0.98	0.082	41-181	10-199	20
Methoxychlor	72-43-5	8081B	0.025	0.0071	450	43	20-200	10-200	20
Toxaphene	8001-35-2	8081B	0.05	0.0329	6.9	9.3	NA	NA	NA
DCB (Surr)	2051-24-3	8081B	NA	NA	NA	NA	18-136		

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Pest and Herb by GC/ECD and Pest by GC/NPD in Soil

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Organophosphorus Pesticides									
Atrazine	1912-24-9	8141B	0.025	0.007	34	0.039	34-195	22-182	20
Azinphos, methyl (Guthion)	86-50-0	8141B	0.025	0.009	270	0.34	61-137	10-192	20
Chlorpyrifos	2921-88-2	8141B	0.025	0.006	88	2.5	65-140	10-153	20
Diazinon	333-41-5	8141B	0.025	0.006	62	1.3	60-151	11-156	20
Dichlorvos	62-73-7	8141B	0.025	0.005	27	0.016[b]	23-191	10-179	20
Dimethoate	60-51-5	8141B	0.025	0.010	200	0.2	32-164	10-197	20
Disulfoton	298-04-4	8141B	0.025	0.007	3.5	0.019[b]	62-136	10-148	20
Famphur	52-85-7	8141B	0.025	0.008	NA	NA	60-139	10-176	20
Malathion	121-75-5	8141B	0.025	0.006	1800	2	60-141	10-167	20
Methyl Parathion	298-00-0	8141B	0.025	0.007	22	0.15	63-136	10-182	20
Naled	300-76-5	8141B	0.025	0.008	220	0.36	46-158	10-200	20
Parathion (Ethyl parathion)	56-38-2	8141B	0.025	0.007	530	8.7	60-146	10-171	20
Phorate	298-02-2	8141B	0.025	0.007	18	0.067	58-145	10-160	20
Ronnel	299-84-3	8141B	0.025	0.009	5500	75	61-144	10-175	20
Simazine	122-34-9	8141B	0.025	0.008	63	0.039	17-200	24-186	20
Stirophos (Tetrachlorvinphos)		8141B	0.025	0.01	320	1.7	60-140	10-189	20
Terbufos	13071-79-9	8141B	0.025	0.006	2.8	0.011[b]	61-147	10-159	20
Total Demeton	8065-48-3	8141B	0.025	0.004	3.5	NA	53-151	10-171	20
Total Merphos	150-50-5	8141B	0.025	0.025	3.2	1.2	21-138	10-112	20
Triphenylphosphate (Surr)	115-86-6	8141B	NA	NA	NA	NA	10-174		

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Pest and Herb by GC/ECD and Pest by GC/NPD in Soil

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Chlorinated Acid Herbicides									
2,4,5-T	93-76-5	8151A	0.05	0.024	880	1.3	55-127	23-158	20
2,4,5-TP (Silvex)	93-72-1	8151A	0.05	0.027	710	0.55	73-126	35-160	20
2,4-D (2,4-Dichlorophenoxy acetic acid)	94-75-7	8151A	0.05	0.027	980	0.36	59-108	23-143	20
2,4-DB (4-(2,4-Dichlorophenoxy) butanoic aci	94-82-6	8151A	0.05	0.049	2700	8.5	62-141	10-194	20
3,5-Dichlorobenzoic acid	51-36-5	8151A	0.05	0.026	NA	NA	80-110	44-143	20
Acifluorfen		8151A	0.05	0.044	1100	41	51-134	19-158	20
Bentazon	25057-89-0	8151A	0.05	0.034	2700	2.5	30-122	10-147	20
Dalapon	75-99-0	8151A	0.05	0.024	2700	0.83	38-114	44-127	20
DCPA (dacthal, chlorthal-dimethyl)		8151A	0.05	0.044	880	2.9	20-150	10-145	20
Dicamba	1918-00-9	8151A	0.05	0.033	2700	2.9	64-116	33-145	20
Dichloroprop	120-36-5	8151A	0.05	0.027	NA	NA	68-112	31-144	20
Dinoseb	88-85-7	8151A	0.05	0.028	88	1.2	10-125	10-174	20
MCPA	94-74-6	8151A	5	2.649	45	0.039[a]	68-126	33-180	20
MCPP	7085-19-0	8151A	5	2.516	88	0.095[a]	82-124	22-185	20
Pentachlorophenol	87-86-5	8151A	0.05	0.028	14	0.028	78-118	28-158	20
Picloram	1918-02-1	8151A	0.05	0.018	6200	2.8	10-90	10-94	20
2,4-DCAA (Surr)	19719-28-9	8151A	NA	NA	NA	NA	32-144		

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.

[a]Limit not achievable

[b]Limit may be achievable based on MDL - check with laboratory

Pace Analytical Services, LLC. Reporting Limits and Method Detection Limits for Misc. Compounds in Soil

Target Analyte	CAS Number	Method	RL mg/Kg	MDL mg/Kg	2019 RCG Soil Direct Contact Residential Limit mg/Kg	2019 RCG Soil MTG Residential Limit mg/Kg	LCS Limits % Rec.	MS/MSD Limits % Rec.	RPD Max %
Bromide	24959-67-9	9056A	0.5	0.5	NA	NA	80-120	80-120	15
Chromium, Hexavalent	18540-29-9	3060A/7196A	2	2	4.2	0.14[a]	80-120	75-125	20
Chloride	16887-00-6	9056A	2.5	2.5	NA	NA	80-120	80-120	15
Cyanide, Total	57-12-5	9012A	0.5	0.26	32	40	90-110	90-110	20
Fluoride	16984-48-8	9056A	1	1	4300	NA	80-120	80-120	15
Nitrate	14797-55-8	353.2	5	2.5	100000	NA	90-110	90-110	20
Nitrite	14797-65-0	353.2	5	2.5	11000	NA	90-110	90-110	20
Nitrate+Nitrite	NA	351.2	5	2.5	NA	NA	90-110	90-110	20
Percent Moisture	NA	2540G	0.1%	0.1%	NA	NA	NA	NA	5
Sulfate	14808-79-8	9056A	2.5	2.5	NA	NA	80-120	80-120	15
TKN (Total Kjeldahl Nitroger	7727-37-9	351.2	50	44	NA	NA	90-110	90-110	20
pH	NA	9045C	0.1Std. Units	0.1Std. Units	NA	NA	NA	NA	2

NOTES:
Compounds, Reporting Limits, Method Detection Limits, Control Limits, and/or Method versions are subject to change.
[a]Limit not achievable

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	MDL	MRL	DOD LOD	DOD LOQ	UNITS	Accuracy (LCS %Rec.)	Matrix Spike (%Rec.)	Precision (% RPD)	DOD QSM (LCS %Rec.)	DOD QSM (% RPD)	MDL	LOD
TO-15 SIM	1,1,1-Trichloroethane	71-55-6	Air	0.0059	0.025	0.022	0.025	ug/m^3	79-117	NA	25	68-125	-	0.0011	0.0040
TO-15 SIM	1,1,2,2-Tetrachloroethane	79-34-5	Air	0.0072	0.025	0.021	0.025	ug/m^3	72-127	NA	25	65-127	-	0.0010	0.0031
TO-15 SIM	1,1,2-Trichloroethane	79-00-5	Air	0.0079	0.10	0.022	0.10	ug/m^3	79-118	NA	25	73-119	-	0.0014	0.0040
TO-15 SIM	1,1-Dichloroethane	75-34-3	Air	0.0061	0.025	0.021	0.025	ug/m^3	74-123	NA	25	68-126	-	0.0015	0.0052
TO-15 SIM	1,1-Dichloroethene	75-35-4	Air	0.0086	0.025	0.021	0.025	ug/m^3	84-122	NA	25	61-133	-	0.0022	0.0053
TO-15 SIM	1,2,4-Trichlorobenzene	120-82-1	Air	0.013	0.050	0.043	0.050	ug/m^3	54-152	NA	25	55-142	-	0.0018	0.0058
TO-15 SIM	1,2,4-Trimethylbenzene	95-63-6	Air	0.0083	0.10	0.021	0.10	ug/m^3	61-142	NA	25	66-132	-	0.0017	0.0043
TO-15 SIM	1,2-Dibromo-3-chloropropane	96-12-8	Air	0.0095	0.10	0.021	0.10	ug/m^3	64-143	NA	25	-	-	0.00098	0.0022
TO-15 SIM	1,2-Dibromoethane	106-93-4	Air	0.0079	0.025	0.022	0.025	ug/m^3	80-118	NA	25	74-122	-	0.0010	0.0029
TO-15 SIM	1,2-Dichlorobenzene	95-50-1	Air	0.0083	0.025	0.022	0.025	ug/m^3	66-135	NA	25	63-129	-	0.0014	0.0037
TO-15 SIM	1,2-Dichloroethane	107-06-2	Air	0.0084	0.025	0.021	0.025	ug/m^3	74-123	NA	25	65-128	-	0.0021	0.0052
TO-15 SIM	1,2-Dichloropropane	78-87-5	Air	0.0073	0.025	0.021	0.025	ug/m^3	75-122	NA	25	69-123	-	0.0016	0.0045
TO-15 SIM	1,3,5-Trimethylbenzene	108-67-8	Air	0.0073	0.10	0.021	0.10	ug/m^3	64-139	NA	25	67-130	-	0.0015	0.0043
TO-15 SIM	1,3-Butadiene	106-99-0	Air	0.014	0.050	0.042	0.050	ug/m^3	55-141	NA	25	66-134	-	0.0063	0.019
TO-15 SIM	1,3-Dichlorobenzene	541-73-1	Air	0.0085	0.025	0.022	0.025	ug/m^3	65-134	NA	25	65-130	-	0.0014	0.0037
TO-15 SIM	1,4-Dichlorobenzene	106-46-7	Air	0.0081	0.025	0.022	0.025	ug/m^3	63-132	NA	25	60-131	-	0.0013	0.0037
TO-15 SIM	1,4-Dioxane	123-91-1	Air	0.0085	0.10	0.021	0.10	ug/m^3	77-121	NA	25	71-122	-	0.0024	0.0058
TO-15 SIM	Acetone	67-64-1	Air	0.056	2.5	0.11	2.5	ug/m^3	62-126	NA	25	58-128	-	0.024	0.046
TO-15 SIM	Acrolein	107-02-8	Air	0.039	0.20	0.10	0.20	ug/m3	66-128	NA	25	62-126	-	0.017	0.044
TO-15 SIM	Benzene	71-43-2	Air	0.020	0.075	0.041	0.075	ug/m^3	73-125	NA	25	69-119	-	0.0063	0.013
TO-15 SIM	Bromodichloromethane	75-27-4	Air	0.0069	0.025	0.021	0.025	ug/m^3	79-118	NA	25	72-128	-	0.0010	0.0031
TO-15 SIM	Bromomethane	74-83-9	Air	0.0093	0.025	0.020	0.025	ug/m^3	73-119	NA	25	63-134	-	0.0024	0.0052
TO-15 SIM	Carbon Tetrachloride	56-23-5	Air	0.012	0.025	0.021	0.025	ug/m^3	79-118	NA	25	68-132	-	0.0019	0.0033
TO-15 SIM	Chlorobenzene	108-90-7	Air	0.0092	0.10	0.021	0.10	ug/m^3	69-129	NA	25	70-119	-	0.0020	0.0046
TO-15 SIM	Chloroethane	75-00-3	Air	0.0085	0.025	0.020	0.025	ug/m^3	68-126	NA	25	63-127	-	0.0032	0.0076
TO-15 SIM	Chloroform	67-66-3	Air	0.018	0.10	0.043	0.10	ug/m^3	75-117	NA	25	68-123	-	0.0037	0.0088
TO-15 SIM	Chloromethane	74-87-3	Air	0.019	0.050	0.040	0.050	ug/m^3	70-125	NA	25	59-132	-	0.0092	0.019
TO-15 SIM	cis-1,2-Dichloroethene	156-59-2	Air	0.0092	0.025	0.021	0.025	ug/m^3	79-116	NA	25	70-121	-	0.0023	0.0053
TO-15 SIM	cis-1,3-Dichloropropene	10061-01-5	Air	0.0062	0.025	0.022	0.025	ug/m^3	78-120	NA	25	70-128	-	0.0014	0.0048
TO-15 SIM	Dibromochloromethane	124-48-1	Air	0.0088	0.025	0.022	0.025	ug/m3	80-116	NA	25	70-130		0.0010	0.0026
TO-15 SIM	Dichlorodifluoromethane	75-71-8	Air	0.017	0.050	0.042	0.050	ug/m^3	76-120	NA	25	59-128	-	0.0034	0.0085
TO-15 SIM	Ethylbenzene	100-41-4	Air	0.0097	0.10	0.021	0.10	ug/m^3	66-133	NA	25	70-124	-	0.0022	0.0048
TO-15 SIM	Hexachloro-1,3-butadiene	87-68-3	Air	0.0092	0.10	0.021	0.10	ug/m^3	64-134	NA	25	56-138	-	0.00086	0.0020
TO-15 SIM	m- & p-Xylene	179601-23-1	Air	0.019	0.10	0.042	0.10	ug/m^3	62-137	NA	25	61-134	-	0.0044	0.0097
TO-15 SIM	Methyl tert-Butyl Ether	1634-04-4	Air	0.0093	0.025	0.022	0.025	ug/m^3	76-119	NA	25	66-126	-	0.0026	0.0061
TO-15 SIM	Methylene Chloride	75-09-2	Air	0.013	0.10	0.043	0.10	ug/m^3	73-115	NA	25	62-115	-	0.0037	0.012
TO-15 SIM	Naphthalene	91-20-3	Air	0.016	0.10	0.041	0.10	ug/m^3	47-158	NA	25	57-138	-	0.0031	0.0078
TO-15 SIM	o-Xylene	95-47-6	Air	0.0089	0.10	0.021	0.10	ug/m^3	62-137	NA	25	67-125	-	0.0020	0.0048
TO-15 SIM	Styrene	100-42-5	Air	0.0074	0.10	0.021	0.10	ug/m^3	56-146	NA	25	73-127	-	0.0017	0.0049
TO-15 SIM	Tetrachloroethene	127-18-4	Air	0.0082	0.025	0.021	0.025	ug/m^3	77-117	NA	25	66-124	-	0.0012	0.0031
TO-15 SIM	Toluene	108-88-3	Air	0.011	0.10	0.042	0.10	ug/m^3	76-111	NA	25	66-119	-	0.0029	0.011
TO-15 SIM	trans-1,2-Dichloroethene	156-60-5	Air	0.0073	0.025	0.021	0.025	ug/m^3	80-117	NA	25	67-124	-	0.0018	0.0053

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METHOD	ANALYTE	CAS No.	MATRIX	MDL	MRL	DOD LOD	DOD LOQ	UNITS	Accuracy (LCS %Rec.)	Matrix Spike (%Rec.)	Precision (% RPD)	DOD QSM (LCS %Rec.)	DOD QSM (% RPD)	MDL	LOD
TO-15 SIM	trans-1,3-Dichloropropene	10061-02-6	Air	0.0055	0.025	0.021	0.025	ug/m^3	77-121	NA	25	75-133	-	0.0012	0.0046
TO-15 SIM	Trichloroethene	79-01-6	Air	0.0085	0.025	0.021	0.025	ug/m^3	79-116	NA	25	71-123	-	0.0016	0.0039
TO-15 SIM	Trichlorofluoromethane	75-69-4	Air	0.015	0.050	0.042	0.050	ug/m^3	78-117	NA	25	62-126	-	0.0027	0.0075
TO-15 SIM	Trichlorotrifluoroethane	76-13-1	Air	0.0089	0.025	0.021	0.025	ug/m^3	70-122	NA	25	66-126	-	0.0012	0.0027
TO-15 SIM	Vinyl Chloride	75-01-4	Air	0.0076	0.025	0.021	0.025	ug/m^3	56-138	NA	25	64-127	-	0.0030	0.0082
TO-15 SIM	1,1,1,2-Tetrachloroethane	630-20-6	Air	0.0091	0.10	-	-	ug/m^3	70-130	NA	25	-	-	0.0013	-
TO-15 SIM	1,2,3-Trichloropropane	96-18-4	Air	0.0086	0.10	-	-	ug/m^3	70-130	NA	25	-	-	0.0014	-
TO-15 SIM	Bromobenzene	108-86-1	Air	0.0042	0.10	-	-	ug/m^3	70-130	NA	25	-	-	0.00065	-
TO-15 Scan	1,1,1-Trichloroethane	71-55-6	Air	0.066	0.54	0.17	0.54	ug/m^3	64-108	NA	25	68-125	-	0.012	0.031
TO-15 Scan	1,1,2,2-Tetrachloroethane	79-34-5	Air	0.074	0.53	0.17	0.53	ug/m^3	66-119	NA	25	65-127	-	0.011	0.025
TO-15 Scan	1,1,2-Trichloroethane	79-00-5	Air	0.054	0.54	0.17	0.54	ug/m^3	68-112	NA	25	73-119	-	0.0099	0.031
TO-15 Scan	1,1-Dichloroethane	75-34-3	Air	0.078	0.52	0.31	0.52	ug/m^3	66-106	NA	25	68-126	-	0.019	0.077
TO-15 Scan	1,1-Dichloroethene	75-35-4	Air	0.074	0.54	0.17	0.54	ug/m^3	68-107	NA	25	61-133	-	0.019	0.043
TO-15 Scan	1,2,3-Trimethylbenzene	526-73-8	Air	0.073	0.52	0.17	0.52	ug/m^3	62-124	NA	25	-	-	0.015	0.035
TO-15 Scan	1,2,4-Trichlorobenzene	120-82-1	Air	0.13	0.53	0.32	0.53	ug/m^3	62-141	NA	25	55-142	-	0.018	0.043
TO-15 Scan	1,2,4-Trimethylbenzene	95-63-6	Air	0.074	0.53	0.17	0.53	ug/m^3	61-122	NA	25	66-132	-	0.015	0.035
TO-15 Scan	1,2-Dibromo-3-chloropropane	96-12-8	Air	0.10	0.52	0.31	0.52	ug/m^3	67-138	NA	25	-	-	0.010	0.032
TO-15 Scan	1,2-Dibromoethane	106-93-4	Air	0.062	0.54	0.17	0.54	ug/m^3	66-122	NA	25	74-122	-	0.0081	0.022
TO-15 Scan	1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	Air	0.084	0.51	0.31	0.51	ug/m^3	56-111	NA	25	63-121	-	0.012	0.044
TO-15 Scan	1,2-Dichlorobenzene	95-50-1	Air	0.079	0.54	0.17	0.54	ug/m^3	61-126	NA	25	63-129	-	0.013	0.028
TO-15 Scan	1,2-Dichloroethane	107-06-2	Air	0.059	0.53	0.17	0.53	ug/m^3	60-110	NA	25	65-128	-	0.015	0.042
TO-15 Scan	1,2-Dichloropropane	78-87-5	Air	0.066	0.54	0.17	0.54	ug/m^3	66-112	NA	25	69-123	-	0.014	0.037
TO-15 Scan	1,3,5-Trimethylbenzene	108-67-8	Air	0.077	0.53	0.17	0.53	ug/m^3	60-117	NA	25	67-130	-	0.016	0.035
TO-15 Scan	1,3-Butadiene	106-99-0	Air	0.088	0.52	0.31	0.52	ug/m^3	53-134	NA	25	66-134	-	0.040	0.14
TO-15 Scan	1,3-Dichlorobenzene	541-73-1	Air	0.080	0.54	0.17	0.54	ug/m^3	61-125	NA	25	65-130	-	0.013	0.028
TO-15 Scan	1,4-Dichlorobenzene	106-46-7	Air	0.082	0.54	0.32	0.54	ug/m^3	59-123	NA	25	60-131	-	0.014	0.053
TO-15 Scan	1,4-Dioxane	123-91-1	Air	0.063	0.53	0.17	0.53	ug/m^3	70-116	NA	25	71-122	-	0.017	0.047
TO-15 Scan	1-Butanol	71-36-3	Air	0.14	1.0	0.33	1.0	ug/m^3	54-143	NA	25	62-133	-	0.046	0.11
TO-15 Scan	2,2,4-Trimethylpentane (Isooctane)	540-84-1	Air	0.080	0.53	0.32	0.53	ug/m^3	64-113	NA	25	68-121	-	0.017	0.069
TO-15 Scan	2-Butanone (MEK)	78-93-3	Air	0.11	1.0	0.31	1.0	ug/m^3	71-116	NA	25	67-130	-	0.037	0.11
TO-15 Scan	2-Ethyltoluene	611-14-3	Air	0.068	0.54	0.17	0.54	ug/m^3	62-116	NA	25	-	-	0.014	0.035
TO-15 Scan	2-Hexanone	591-78-6	Air	0.066	0.54	0.17	0.54	ug/m^3	59-128	NA	25	62-128	-	0.016	0.042
TO-15 Scan	2-Methyl-2-Propanol (tert-Butyl Alcoho	75-65-0	Air	0.16	1.1	0.64	1.1	ug/m^3	64-114	NA	25	24-150	-	0.053	0.21
TO-15 Scan	2-Propanol (Isopropyl Alcohol)	67-63-0	Air	0.22	2.1	0.62	2.1	ug/m^3	60-124	NA	25	52-125	-	0.090	0.25
TO-15 Scan	3-Chloro-1-propene (Allyl Chloride)	107-05-1	Air	0.072	0.53	0.17	0.53	ug/m^3	63-127	NA	25	71-131	-	0.023	0.054
TO-15 Scan	3-Ethyltoluene	620-14-4	Air	0.072	0.53	0.17	0.53	ug/m^3	60-117	NA	25	-	-	0.015	0.035
TO-15 Scan	4-Ethyltoluene	622-96-8	Air	0.085	0.53	0.32	0.53	ug/m^3	63-124	NA	25	67-129	-	0.017	0.065
TO-15 Scan	4-Isopropyltoluene (p-Cymene)	99-87-6	Air	0.081	0.52	0.31	0.52	ug/m^3	58-122	NA	25	67-130	-	0.015	0.056
TO-15 Scan	4-Methyl-2-pentanone	108-10-1	Air	0.073	0.53	0.17	0.53	ug/m^3	65-124	NA	25	67-130	-	0.018	0.041

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TO-15 Scan	Acetone	67-64-1	Air	1.2	5.4	2.7	5.4	ug/m^3	60-113	NA	25	58-128	-	0.51	1.1
TO-15 Scan	Acetonitrile	75-05-8	Air	0.13	0.52	0.31	0.52	ug/m^3	57-126	NA	25	63-132	-	0.077	0.18
TO-15 Scan	Acrolein	107-02-8	Air	0.15	1.0	0.31	1.0	ug/m^3	62-121	NA	25	62-126	-	0.065	0.14
TO-15 Scan	Acrylonitrile	107-13-1	Air	0.11	0.52	0.31	0.52	ug/m^3	66-125	NA	25	71-137	-	0.051	0.14
TO-15 Scan	alpha-Methylstyrene	98-83-9	Air	0.085	0.53	0.32	0.53	ug/m^3	64-131	NA	25	67-128	-	0.018	0.066
TO-15 Scan	alpha-Pinene	80-56-8	Air	0.082	0.52	0.31	0.52	ug/m^3	65-120	NA	25	-	-	0.015	0.056
TO-15 Scan	Benzene	71-43-2	Air	0.077	0.52	0.17	0.52	ug/m^3	67-106	NA	25	69-119	-	0.024	0.053
TO-15 Scan	Benzyl Chloride	100-44-7	Air	0.12	1.1	0.32	1.1	ug/m^3	77-142	NA	25	50-147	-	0.023	0.062
TO-15 Scan	Bromodichloromethane	75-27-4	Air	0.077	0.53	0.17	0.53	ug/m^3	67-113	NA	25	72-128	-	0.011	0.025
TO-15 Scan	Bromoform	75-25-2	Air	0.11	0.53	0.32	0.53	ug/m^3	65-132	NA	25	66-139	-	0.011	0.031
TO-15 Scan	Bromomethane	74-83-9	Air	0.074	0.50	0.16	0.50	ug/m^3	65-110	NA	25	63-134	-	0.019	0.041
TO-15 Scan	Carbon Disulfide	75-15-0	Air	0.16	1.1	0.54	1.1	ug/m^3	67-109	NA	25	57-134	-	0.051	0.17
TO-15 Scan	Carbon Tetrachloride	56-23-5	Air	0.074	0.52	0.17	0.52	ug/m^3	64-112	NA	25	68-132	-	0.012	0.027
TO-15 Scan	Chlorobenzene	108-90-7	Air	0.071	0.53	0.17	0.53	ug/m^3	61-114	NA	25	70-119	-	0.015	0.037
TO-15 Scan	Chloroethane	75-00-3	Air	0.066	0.51	0.31	0.51	ug/m^3	64-111	NA	25	63-127	-	0.025	0.12
TO-15 Scan	Chloroform	67-66-3	Air	0.071	0.54	0.17	0.54	ug/m^3	66-105	NA	25	68-123	-	0.015	0.035
TO-15 Scan	Chloromethane	74-87-3	Air	0.086	0.50	0.30	0.50	ug/m^3	51-121	NA	25	59-132	-	0.042	0.15
TO-15 Scan	cis-1,2-Dichloroethene	156-59-2	Air	0.075	0.53	0.17	0.53	ug/m^3	67-110	NA	25	70-121	-	0.019	0.043
TO-15 Scan	cis-1,3-Dichloropropene	10061-01-5	Air	0.083	0.56	0.18	0.56	ug/m^3	75-120	NA	25	70-128	-	0.018	0.040
TO-15 Scan	Cumene	98-82-8	Air	0.077	0.53	0.17	0.53	ug/m^3	61-116	NA	25	68-124	-	0.016	0.035
TO-15 Scan	Cyclohexane	110-82-7	Air	0.15	1.0	0.33	1.0	ug/m^3	67-110	NA	25	70-117	-	0.044	0.096
TO-15 Scan	Cyclohexanone	108-94-1	Air	0.083	0.49	0.29	0.49	ug/m^3	61-127	NA	25	-	-	0.021	0.072
TO-15 Scan	Dibromochloromethane	124-48-1	Air	0.070	0.54	0.17	0.54	ug/m^3	67-123	NA	25	70-130	-	0.0082	0.020
TO-15 Scan	Dichlorodifluoromethane (CFC 12)	75-71-8	Air	0.087	0.52	0.31	0.52	ug/m^3	62-103	NA	25	59-128	-	0.018	0.063
TO-15 Scan	Diisopropyl Ether	108-20-3	Air	0.070	0.54	0.32	0.54	ug/m^3	62-109	NA	25	70-117	-	0.017	0.077
TO-15 Scan	d-Limonene	5989-27-5	Air	0.11	0.51	0.30	0.51	ug/m^3	66-124	NA	25	-	-	0.020	0.054
TO-15 Scan	Ethanol	64-17-5	Air	0.37	5.1	0.82	5.1	ug/m^3	57-124	NA	25	59-125	-	0.20	0.44
TO-15 Scan	Ethyl Acetate	141-78-6	Air	0.28	1.1	0.65	1.1	ug/m^3	64-127	NA	25	65-128	-	0.078	0.18
TO-15 Scan	Ethyl tert-Butyl Ether	637-92-3	Air	0.064	0.53	0.17	0.53	ug/m^3	69-109	NA	25	-	-	0.015	0.041
TO-15 Scan	Ethylbenzene	100-41-4	Air	0.075	0.52	0.17	0.52	ug/m^3	64-113	NA	25	70-124	-	0.017	0.039
TO-15 Scan	Hexachlorobutadiene	87-68-3	Air	0.11	0.53	0.32	0.53	ug/m^3	49-131	NA	25	56-138	-	0.010	0.030
TO-15 Scan	Isopropyl Acetate	108-21-4	Air	0.17	1.0	0.62	1.0	ug/m^3	66-119	NA	25	-	-	0.041	0.15
TO-15 Scan	m,p-Xylenes	179601-23-1	Air	0.14	1.1	0.34	1.1	ug/m^3	64-114	NA	25	61-134	-	0.032	0.078
TO-15 Scan	Methyl Methacrylate	80-62-6	Air	0.19	1.1	0.64	1.1	ug/m^3	73-118	NA	25	70-128	-	0.046	0.16
TO-15 Scan	Methyl tert-Butyl Ether	1634-04-4	Air	0.063	0.54	0.17	0.54	ug/m^3	67-109	NA	25	66-126	-	0.017	0.047
TO-15 Scan	Methylene Chloride	75-09-2	Air	0.15	0.54	0.32	0.54	ug/m^3	66-105	NA	25	62-115	-	0.043	0.092
TO-15 Scan	Naphthalene	91-20-3	Air	0.13	0.51	0.31	0.51	ug/m^3	62-145	NA	25	57-138	-	0.025	0.059
TO-15 Scan	n-Butyl Acetate	123-86-4	Air	0.073	0.54	0.17	0.54	ug/m^3	64-128	NA	25	-	-	0.015	0.036
TO-15 Scan	n-Butylbenzene	104-51-8	Air	0.077	0.53	0.17	0.53	ug/m^3	64-121	NA	25	66-130	-	0.014	0.031
TO-15 Scan	n-Decane	124-18-5	Air	0.072	0.54	0.17	0.54	ug/m^3	67-120	NA	25	70-118	-	0.012	0.029
TO-15 Scan	n-Dodecane	112-40-3	Air	0.15	0.52	0.31	0.52	ug/m^3	64-152	NA	25	62-147	-	0.022	0.045
TO-15 Scan	n-Heptane	142-82-5	Air	0.085	0.54	0.32	0.54	ug/m^3	66-110	NA	25	69-123	-	0.021	0.078

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TO-15 Scan	n-Hexane	110-54-3	Air	0.11	0.54	0.32	0.54	ug/m^3	60-115	NA	25	63-120	-	0.031	0.091
TO-15 Scan	n-Nonane	111-84-2	Air	0.089	0.54	0.32	0.54	ug/m^3	64-117	NA	25	63-128	-	0.017	0.061
TO-15 Scan	n-Octane	111-65-9	Air	0.12	0.54	0.32	0.54	ug/m^3	65-114	NA	25	69-121	-	0.026	0.069
TO-15 Scan	n-Propylbenzene	103-65-1	Air	0.077	0.54	0.17	0.54	ug/m^3	63-117	NA	25	69-123	-	0.016	0.035
TO-15 Scan	n-Undecane	1120-21-4	Air	0.14	0.53	0.32	0.53	ug/m^3	68-127	NA	25	69-123	-	0.022	0.050
TO-15 Scan	o-Xylene	95-47-6	Air	0.077	0.53	0.17	0.53	ug/m^3	65-114	NA	25	67-125	-	0.018	0.039
TO-15 Scan	Propene	115-07-1	Air	0.13	0.52	0.31	0.52	ug/m^3	53-112	NA	25	57-136	-	0.076	0.18
TO-15 Scan	sec-Butylbenzene	135-98-8	Air	0.073	0.53	0.17	0.53	ug/m^3	62-117	NA	25	68-125	-	0.013	0.031
TO-15 Scan	Styrene	100-42-5	Air	0.086	0.53	0.32	0.53	ug/m^3	67-124	NA	25	73-127	-	0.020	0.075
TO-15 Scan	tert-Amyl Methyl Ether	994-05-8	Air	0.065	0.54	0.17	0.54	ug/m^3	68-112	NA	25	-	-	0.016	0.041
TO-15 Scan	tert-Butylbenzene	98-06-6	Air	0.080	0.53	0.32	0.53	ug/m^3	58-122	NA	25	65-124	-	0.015	0.058
TO-15 Scan	Tetrachloroethene	127-18-4	Air	0.069	0.53	0.17	0.53	ug/m^3	55-120	NA	25	66-124	-	0.010	0.025
TO-15 Scan	Tetrahydrofuran (THF)	109-99-9	Air	0.067	0.53	0.17	0.53	ug/m^3	65-110	NA	25	64-123	-	0.023	0.058
TO-15 Scan	Toluene	108-88-3	Air	0.065	0.53	0.17	0.53	ug/m^3	62-111	NA	25	66-119	-	0.017	0.045
TO-15 Scan	trans-1,2-Dichloroethene	156-60-5	Air	0.074	0.53	0.17	0.53	ug/m^3	70-115	NA	25	67-124	-	0.019	0.043
TO-15 Scan	trans-1,3-Dichloropropene	10061-02-6	Air	0.11	0.53	0.32	0.53	ug/m^3	77-123	NA	25	75-133	-	0.024	0.071
TO-15 Scan	Trichloroethene	79-01-6	Air	0.072	0.53	0.17	0.53	ug/m^3	66-108	NA	25	71-123	-	0.013	0.032
TO-15 Scan	Trichlorofluoromethane	75-69-4	Air	0.081	0.53	0.32	0.53	ug/m^3	63-104	NA	25	62-126	-	0.014	0.057
TO-15 Scan	Trichlorotrifluoroethane	76-13-1	Air	0.076	0.53	0.17	0.53	ug/m^3	59-109	NA	25	66-126	-	0.0099	0.022
TO-15 Scan	Vinyl Acetate	108-05-4	Air	1.2	5.3	2.6	5.3	ug/m^3	68-136	NA	25	56-139	-	0.34	0.74
TO-15 Scan	Vinyl Chloride	75-01-4	Air	0.057	0.53	0.17	0.53	ug/m^3	57-117	NA	25	64-127	-	0.022	0.067
TO-15 Scan	1,1,1,2-Tetrachloroethane	630-20-6	Air	0.23	0.50	-	-	ug/m^3	-	NA	25	-	-	0.034	-
TO-15 Scan	1,1-Dichloropropene	563-58-6	Air	0.24	0.50	-	-	ug/m^3	-	NA	25	-	-	0.052	-
TO-15 Scan	1,1-Difluoroethane	75-37-6	Air	0.26	0.50	-	-	ug/m^3	-	NA	25	-	-	0.096	-
TO-15 Scan	1,2,3,4-Tetramethylbenzene	488-23-3	Air	0.25	0.50	-	-	ug/m^3	-	NA	25	-	-	0.046	-
TO-15 Scan	1,2,3,5-Tetramethylbenzene	527-53-7	Air	0.24	0.50	-	-	ug/m^3	-	NA	25	-	-	0.044	-
TO-15 Scan	1,2,3-Trichlorobenzene	87-61-6	Air	0.27	0.50	-	-	ug/m^3	-	NA	25	-	-	0.036	-
TO-15 Scan	1,2,3-Trichloropropane	96-18-4	Air	0.25	0.50	-	-	ug/m^3	-	NA	25	-	-	0.041	-
TO-15 Scan	1,2,4,5-Tetramethylbenzene	95-93-2	Air	0.22	0.50	-	-	ug/m^3	-	NA	25	-	-	0.040	-
TO-15 Scan	1,3-Dichloropropane	142-28-9	Air	0.26	0.50	-	-	ug/m^3	-	NA	25	-	-	0.056	-
TO-15 Scan	1-Chloro-1,1-Difluoroethane	75-68-3	Air	0.23	0.50	-	-	ug/m^3	-	NA	25	-	-	0.056	-
TO-15 Scan	1-Chlorohexane	544-10-5	Air	0.25	0.50	-	-	ug/m^3	-	NA	25	-	-	0.051	-
TO-15 Scan	2,2-Dichloro-1,1,1-trifluoroethane (CF(	306-83-2	Air	0.24	0.50	-	-	ug/m^3	-	NA	25	-	-	0.038	-
TO-15 Scan	2,2-Dichloropropane	594-20-7	Air	0.14	0.50	-	-	ug/m^3	-	NA	25	-	-	0.030	-
TO-15 Scan	2,3-Dimethylpentane	565-59-3	Air	0.24	0.50	-	-	ug/m^3	-	NA	25	-	-	0.059	-
TO-15 Scan	2-Chlorotoluene	95-49-8	Air	0.26	0.50	-	-	ug/m^3	-	NA	25	-	-	0.050	-
TO-15 Scan	2-Methylbutane	78-78-4	Air	0.26	0.50	-	-	ug/m^3	-	NA	25	-	-	0.088	-
TO-15 Scan	2-Methylpentane	107-83-5	Air	0.24	0.50	-	-	ug/m^3	-	NA	25	-	-	0.068	-
TO-15 Scan	4-Chlorotoluene	106-43-4	Air	0.26	0.50	-	-	ug/m^3	-	NA	25	-	-	0.050	-
TO-15 Scan	Bromobenzene	108-86-1	Air	0.25	0.50	-	-	ug/m^3	-	NA	25	-	-	0.039	-
TO-15 Scan	Chlorodifluoromethane (CFC 22)	75-45-6	Air	0.25	0.50	-	-	ug/m^3	-	NA	25	-	-	0.071	-

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	MDL	MRL	DOD LOD	DOD LOQ	UNITS	Accuracy (LCS %Rec.)	Matrix Spike (%Rec.)	Precision (% RPD)	DOD QSM (LCS %Rec.)	DOD QSM (% RPD)	MDL	LOD
TO-15 Scan	Chloropentafluoroethane	76-15-3	Air	0.23	0.50	-	-	ug/m^3	-	NA	25	-	-	0.036	-
TO-15 Scan	Dibromomethane	74-95-3	Air	0.20	0.50	-	-	ug/m^3	-	NA	25	-	-	0.028	-
TO-15 Scan	Fluorodichloromethane	75-43-4	Air	0.24	0.50	-	-	ug/m^3	-	NA	25	-	-	0.057	-
TO-15 Scan	Indan	496-11-7	Air	0.24	0.50	-	-	ug/m^3	-	NA	25	-	-	0.050	-
TO-15 Scan	Indene	95-13-6	Air	0.20	0.50	-	-	ug/m^3	-	NA	25	-	-	0.042	-
TO-15 Scan	Methyl Acetate	79-20-9	Air	0.24	0.50	-	-	ug/m^3	-	NA	25	-	-	0.079	-
TO-15 Scan	Methylcyclohexane	108-87-2	Air	0.26	0.50	-	-	ug/m^3	-	NA	25	-	-	0.065	-
TO-15 Scan	Norflurane (R134a)	811-97-2	Air	0.23	0.50	-	-	ug/m^3	-	NA	25	-	-	0.055	-
TO-15 Scan	Thiophene	110-02-1	Air	0.22	0.50	-	-	ug/m^3	-	NA	25	-	-	0.064	-
TO-15 Scan	Vinyl Bromide	593-60-2	Air	0.21	0.50	-	-	ug/m^3	-	NA	25	-	-	0.048	-
TO-15 Scan (Low Level)	Propene	115-07-1	Air	0.13	0.52	-	-	ug/m^3	53-112	NA	25	-	-	0.076	-
TO-15 Scan (Low Level)	Dichlorodifluoromethane (CFC 12)	75-71-8	Air	0.087	0.52	-	-	ug/m^3	62-103	NA	25	-	-	0.018	-
TO-15 Scan (Low Level)	Chloromethane	74-87-3	Air	0.086	0.20	-	-	ug/m^3	51-121	NA	25	-	-	0.042	-
TO-15 Scan (Low Level)	1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	Air	0.084	0.51	-	-	ug/m^3	56-111	NA	25	-	-	0.012	-
TO-15 Scan (Low Level)	Vinyl Chloride	75-01-4	Air	0.057	0.11	-	-	ug/m^3	57-117	NA	25	-	-	0.022	-
TO-15 Scan (Low Level)	1,3-Butadiene	106-99-0	Air	0.088	0.21	-	-	ug/m^3	53-134	NA	25	-	-	0.040	-
TO-15 Scan (Low Level)	Bromomethane	74-83-9	Air	0.074	0.20	-	-	ug/m^3	65-110	NA	25	-	-	0.019	-
TO-15 Scan (Low Level)	Chloroethane	75-00-3	Air	0.066	0.20	-	-	ug/m^3	64-111	NA	25	-	-	0.025	-
TO-15 Scan (Low Level)	Ethanol	64-17-5	Air	0.37	5.1	-	-	ug/m^3	57-124	NA	25	-	-	0.20	-
TO-15 Scan (Low Level)	Acetonitrile	75-05-8	Air	0.13	0.52	-	-	ug/m^3	57-126	NA	25	-	-	0.077	-
TO-15 Scan (Low Level)	Acrolein	107-02-8	Air	0.15	1.0	-	-	ug/m^3	62-121	NA	25	-	-	0.065	-
TO-15 Scan (Low Level)	Acetone	67-64-1	Air	1.2	5.4	-	-	ug/m^3	60-113	NA	25	-	-	0.51	-
TO-15 Scan (Low Level)	Trichlorofluoromethane	75-69-4	Air	0.081	0.53	-	-	ug/m^3	63-104	NA	25	-	-	0.014	-
TO-15 Scan (Low Level)	2-Propanol (Isopropyl Alcohol)	67-63-0	Air	0.22	2.1	-	-	ug/m^3	60-124	NA	25	-	-	0.090	-
TO-15 Scan (Low Level)	Acrylonitrile	107-13-1	Air	0.11	0.52	-	-	ug/m^3	66-125	NA	25	-	-	0.051	-
TO-15 Scan (Low Level)	1,1-Dichloroethene	75-35-4	Air	0.074	0.11	-	-	ug/m^3	68-107	NA	25	-	-	0.019	-
TO-15 Scan (Low Level)	2-Methyl-2-Propanol (tert-Butyl Alcoho	75-65-0	Air	0.16	1.1	-	-	ug/m^3	64-114	NA	25	-	-	0.053	-
TO-15 Scan (Low Level)	Methylene Chloride	75-09-2	Air	0.15	0.54	-	-	ug/m^3	66-105	NA	25	-	-	0.043	-
TO-15 Scan (Low Level)	3-Chloro-1-propene (Allyl Chloride)	107-05-1	Air	0.072	0.53	-	-	ug/m^3	63-127	NA	25	-	-	0.023	-
TO-15 Scan (Low Level)	Trichlorotrifluoroethane	76-13-1	Air	0.076	0.53	-	-	ug/m^3	59-109	NA	25	-	-	0.0099	-
TO-15 Scan (Low Level)	Carbon Disulfide	75-15-0	Air	0.16	1.1	-	-	ug/m^3	67-109	NA	25	-	-	0.051	-
TO-15 Scan (Low Level)	trans-1,2-Dichloroethene	156-60-5	Air	0.074	0.11	-	-	ug/m^3	70-115	NA	25	-	-	0.019	-
TO-15 Scan (Low Level)	1,1-Dichloroethane	75-34-3	Air	0.078	0.10	-	-	ug/m^3	66-106	NA	25	-	-	0.019	-
TO-15 Scan (Low Level)	Methyl tert-Butyl Ether	1634-04-4	Air	0.063	0.54	-	-	ug/m^3	67-109	NA	25	-	-	0.017	-
TO-15 Scan (Low Level)	Vinyl Acetate	108-05-4	Air	1.2	5.3	-	-	ug/m^3	68-136	NA	25	-	-	0.34	-
TO-15 Scan (Low Level)	2-Butanone (MEK)	78-93-3	Air	0.11	1.0	-	-	ug/m^3	71-116	NA	25	-	-	0.037	-
TO-15 Scan (Low Level)	cis-1,2-Dichloroethene	156-59-2	Air	0.075	0.11	-	-	ug/m^3	67-110	NA	25	-	-	0.019	-
TO-15 Scan (Low Level)	Diisopropyl Ether	108-20-3	Air	0.070	0.54	-	-	ug/m^3	62-109	NA	25	-	-	0.017	-
TO-15 Scan (Low Level)	Ethyl Acetate	141-78-6	Air	0.28	1.1	-	-	ug/m^3	64-127	NA	25	-	-	0.078	-
TO-15 Scan (Low Level)	n-Hexane	110-54-3	Air	0.11	0.54	-	-	ug/m^3	60-115	NA	25	-	-	0.031	-
TO-15 Scan (Low Level)	Chloroform	67-66-3	Air	0.071	0.11	-	-	ug/m^3	66-105	NA	25	-	-	0.015	-

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	MDL	MRL	DOD LOD	DOD LOQ	UNITS	Accuracy (LCS %Rec.)	Matrix Spike (%Rec.)	Precision (% RPD)	DOD QSM (LCS %Rec.)	DOD QSM (% RPD)	MDL	LOD
TO-15 Scan (Low Level)	Tetrahydrofuran (THF)	109-99-9	Air	0.067	0.53	-	-	ug/m^3	65-110	NA	25	-	-	0.023	-
TO-15 Scan (Low Level)	Ethyl tert-Butyl Ether	637-92-3	Air	0.064	0.53	-	-	ug/m^3	69-109	NA	25	-	-	0.015	-
TO-15 Scan (Low Level)	1,2-Dichloroethane	107-06-2	Air	0.059	0.11	-	-	ug/m^3	60-110	NA	25	-	-	0.015	-
TO-15 Scan (Low Level)	1,1,1-Trichloroethane	71-55-6	Air	0.066	0.11	-	-	ug/m^3	64-108	NA	25	-	-	0.012	-
TO-15 Scan (Low Level)	Isopropyl Acetate	108-21-4	Air	0.17	1.0	-	-	ug/m^3	66-119	NA	25	-	-	0.041	-
TO-15 Scan (Low Level)	1-Butanol	71-36-3	Air	0.14	1.0	-	-	ug/m^3	54-143	NA	25	-	-	0.046	-
TO-15 Scan (Low Level)	Benzene	71-43-2	Air	0.077	0.10	-	-	ug/m^3	67-106	NA	25	-	-	0.024	-
TO-15 Scan (Low Level)	Carbon Tetrachloride	56-23-5	Air	0.074	0.10	-	-	ug/m^3	64-112	NA	25	-	-	0.012	-
TO-15 Scan (Low Level)	Cyclohexane	110-82-7	Air	0.15	1.0	-	-	ug/m^3	67-110	NA	25	-	-	0.044	-
TO-15 Scan (Low Level)	tert-Amyl Methyl Ether	994-05-8	Air	0.065	0.54	-	-	ug/m^3	68-112	NA	25	-	-	0.016	-
TO-15 Scan (Low Level)	1,2-Dichloropropane	78-87-5	Air	0.066	0.11	-	-	ug/m^3	66-112	NA	25	-	-	0.014	-
TO-15 Scan (Low Level)	Bromodichloromethane	75-27-4	Air	0.077	0.11	-	-	ug/m^3	67-113	NA	25	-	-	0.011	-
TO-15 Scan (Low Level)	Trichloroethene	79-01-6	Air	0.072	0.11	-	-	ug/m^3	66-108	NA	25	-	-	0.013	-
TO-15 Scan (Low Level)	1,4-Dioxane	123-91-1	Air	0.063	0.53	-	-	ug/m^3	70-116	NA	25	-	-	0.017	-
TO-15 Scan (Low Level)	2,2,4-Trimethylpentane (Isooctane)	540-84-1	Air	0.080	0.53	-	-	ug/m^3	64-113	NA	25	-	-	0.017	-
TO-15 Scan (Low Level)	Methyl Methacrylate	80-62-6	Air	0.19	1.1	-	-	ug/m^3	73-118	NA	25	-	-	0.046	-
TO-15 Scan (Low Level)	n-Heptane	142-82-5	Air	0.085	0.54	-	-	ug/m^3	66-110	NA	25	-	-	0.021	-
TO-15 Scan (Low Level)	cis-1,3-Dichloropropene	10061-01-5	Air	0.083	0.56	-	-	ug/m^3	75-120	NA	25	-	-	0.018	-
TO-15 Scan (Low Level)	4-Methyl-2-pentanone	108-10-1	Air	0.073	0.53	-	-	ug/m^3	65-124	NA	25	-	-	0.018	-
TO-15 Scan (Low Level)	trans-1,3-Dichloropropene	10061-02-6	Air	0.11	0.53	-	-	ug/m^3	77-123	NA	25	-	-	0.024	-
TO-15 Scan (Low Level)	1,1,2-Trichloroethane	79-00-5	Air	0.054	0.11	-	-	ug/m^3	68-112	NA	25	-	-	0.0099	-
TO-15 Scan (Low Level)	Toluene	108-88-3	Air	0.065	0.53	-	-	ug/m^3	62-111	NA	25	-	-	0.017	-
TO-15 Scan (Low Level)	2-Hexanone	591-78-6	Air	0.066	0.54	-	-	ug/m^3	59-128	NA	25	-	-	0.016	-
TO-15 Scan (Low Level)	Dibromochloromethane	124-48-1	Air	0.070	0.11	-	-	ug/m^3	67-123	NA	25	-	-	0.0082	-
TO-15 Scan (Low Level)	1,2-Dibromoethane	106-93-4	Air	0.062	0.11	-	-	ug/m^3	66-122	NA	25	-	-	0.0081	-
TO-15 Scan (Low Level)	n-Butyl Acetate	123-86-4	Air	0.073	0.54	-	-	ug/m^3	64-128	NA	25	-	-	0.015	-
TO-15 Scan (Low Level)	n-Octane	111-65-9	Air	0.12	0.54	-	-	ug/m^3	65-114	NA	25	-	-	0.026	-
TO-15 Scan (Low Level)	Tetrachloroethene	127-18-4	Air	0.069	0.11	-	-	ug/m^3	55-120	NA	25	-	-	0.010	-
TO-15 Scan (Low Level)	Chlorobenzene	108-90-7	Air	0.071	0.53	-	-	ug/m^3	61-114	NA	25	-	-	0.015	-
TO-15 Scan (Low Level)	Ethylbenzene	100-41-4	Air	0.075	0.52	-	-	ug/m^3	64-113	NA	25	-	-	0.017	-
TO-15 Scan (Low Level)	m,p-Xylenes	179601-23-1	Air	0.14	1.1	-	-	ug/m^3	64-114	NA	25	-	-	0.032	-
TO-15 Scan (Low Level)	Bromoform	75-25-2	Air	0.11	0.53	-	-	ug/m^3	65-132	NA	25	-	-	0.011	-
TO-15 Scan (Low Level)	Styrene	100-42-5	Air	0.086	0.53	-	-	ug/m^3	67-124	NA	25	-	-	0.020	-
TO-15 Scan (Low Level)	o-Xylene	95-47-6	Air	0.077	0.53	-	-	ug/m^3	65-114	NA	25	-	-	0.018	-
TO-15 Scan (Low Level)	n-Nonane	111-84-2	Air	0.089	0.54	-	-	ug/m^3	64-117	NA	25	-	-	0.017	-
TO-15 Scan (Low Level)	1,1,2,2-Tetrachloroethane	79-34-5	Air	0.074	0.11	-	-	ug/m^3	66-119	NA	25	-	-	0.011	-
TO-15 Scan (Low Level)	Cumene	98-82-8	Air	0.077	0.53	-	-	ug/m^3	61-116	NA	25	-	-	0.016	-
TO-15 Scan (Low Level)	alpha-Pinene	80-56-8	Air	0.082	0.52	-	-	ug/m^3	65-120	NA	25	-	-	0.015	-
TO-15 Scan (Low Level)	n-Propylbenzene	103-65-1	Air	0.077	0.54	-	-	ug/m^3	63-117	NA	25	-	-	0.016	-
TO-15 Scan (Low Level)	3-Ethyltoluene	620-14-4	Air	0.072	0.53	-	-	ug/m^3	60-117	NA	25	-	-	0.015	-
TO-15 Scan (Low Level)	4-Ethyltoluene	622-96-8	Air	0.085	0.53	-	-	ug/m^3	63-124	NA	25	-	-	0.017	-
TO-15 Scan (Low Level)	1,3,5-Trimethylbenzene	108-67-8	Air	0.077	0.53	-	-	ug/m^3	60-117	NA	25	-	-	0.016	-

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	MDL	MRL	DOD LOD	DOD LOQ	UNITS	Accuracy (LCS %Rec.)	Matrix Spike (%Rec.)	Precision (% RPD)	DOD QSM (LCS %Rec.)	DOD QSM (% RPD)	MDL	LOD
TO-15 Scan (Low Level)	alpha-Methylstyrene	98-83-9	Air	0.085	0.53	-	-	ug/m^3	64-131	NA	25	-	-	0.018	-
TO-15 Scan (Low Level)	2-Ethyltoluene	611-14-3	Air	0.068	0.54	-	-	ug/m^3	62-116	NA	25	-	-	0.014	-
TO-15 Scan (Low Level)	1,2,4-Trimethylbenzene	95-63-6	Air	0.074	0.53	-	-	ug/m^3	61-122	NA	25	-	-	0.015	-
TO-15 Scan (Low Level)	n-Decane	124-18-5	Air	0.072	0.54	-	-	ug/m^3	67-120	NA	25	-	-	0.012	-
TO-15 Scan (Low Level)	Benzyl Chloride	100-44-7	Air	0.12	1.1	-	-	ug/m^3	77-142	NA	25	-	-	0.023	-
TO-15 Scan (Low Level)	1,3-Dichlorobenzene	541-73-1	Air	0.080	0.54	-	-	ug/m^3	61-125	NA	25	-	-	0.013	-
TO-15 Scan (Low Level)	1,4-Dichlorobenzene	106-46-7	Air	0.082	0.54	-	-	ug/m^3	59-123	NA	25	-	-	0.014	-
TO-15 Scan (Low Level)	sec-Butylbenzene	135-98-8	Air	0.073	0.53	-	-	ug/m^3	62-117	NA	25	-	-	0.013	-
TO-15 Scan (Low Level)	4-Isopropyltoluene (p-Cymene)	99-87-6	Air	0.081	0.52	-	-	ug/m^3	58-122	NA	25	-	-	0.015	-
TO-15 Scan (Low Level)	1,2,3-Trimethylbenzene	526-73-8	Air	0.073	0.52	-	-	ug/m^3	62-124	NA	25	-	-	0.015	-
TO-15 Scan (Low Level)	1,2-Dichlorobenzene	95-50-1	Air	0.079	0.54	-	-	ug/m^3	61-126	NA	25	-	-	0.013	-
TO-15 Scan (Low Level)	d-Limonene	5989-27-5	Air	0.11	0.51	-	-	ug/m^3	66-124	NA	25	-	-	0.020	-
TO-15 Scan (Low Level)	1,2-Dibromo-3-chloropropane	96-12-8	Air	0.10	0.52	-	-	ug/m^3	67-138	NA	25	-	-	0.010	-
TO-15 Scan (Low Level)	n-Undecane	1120-21-4	Air	0.14	0.53	-	-	ug/m^3	68-127	NA	25	-	-	0.022	-
TO-15 Scan (Low Level)	1,2,4-Trichlorobenzene	120-82-1	Air	0.13	0.53	-	-	ug/m^3	62-141	NA	25	-	-	0.018	-
TO-15 Scan (Low Level)	Naphthalene	91-20-3	Air	0.13	0.51	-	-	ug/m^3	62-145	NA	25	-	-	0.025	-
TO-15 Scan (Low Level)	n-Dodecane	112-40-3	Air	0.15	0.52	-	-	ug/m^3	64-152	NA	25	-	-	0.022	-
TO-15 Scan (Low Level)	Hexachlorobutadiene	87-68-3	Air	0.11	0.53	-	-	ug/m^3	49-131	NA	25	-	-	0.010	-
TO-15 Scan (Low Level)	Cyclohexanone	108-94-1	Air	0.083	0.49	-	-	ug/m^3	61-127	NA	25	-	-	0.021	-
TO-15 Scan (Low Level)	tert-Butylbenzene	98-06-6	Air	0.080	0.53	-	-	ug/m^3	58-122	NA	25	-	-	0.015	-
TO-15 Scan (Low Level)	n-Butylbenzene	104-51-8	Air	0.077	0.53	-	-	ug/m^3	64-121	NA	25	-	-	0.014	-

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METHOD	ANALYTE	CAS No.	MATRIX	MRL	UNITS	Alternate MRL	UNITS	Alternate MRL	UNITS	1L Canister MDL	1L Canister LOD	1L Canister MRL	UNITS	1L Canister MDL	1L Canister LOD
TO-15 SIM	1,1,1-Trichloroethane	71-55-6	Air	0.0046	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,1,2,2-Tetrachloroethane	79-34-5	Air	0.0036	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,1,2-Trichloroethane	79-00-5	Air	0.018	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,1-Dichloroethane	75-34-3	Air	0.0062	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,1-Dichloroethene	75-35-4	Air	0.0063	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,2,4-Trichlorobenzene	120-82-1	Air	0.0067	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,2,4-Trimethylbenzene	95-63-6	Air	0.020	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,2-Dibromo-3-chloropropane	96-12-8	Air	0.010	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,2-Dibromoethane	106-93-4	Air	0.0033	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,2-Dichlorobenzene	95-50-1	Air	0.0042	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,2-Dichloroethane	107-06-2	Air	0.0062	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,2-Dichloropropane	78-87-5	Air	0.0054	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,3,5-Trimethylbenzene	108-67-8	Air	0.020	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,3-Butadiene	106-99-0	Air	0.023	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,3-Dichlorobenzene	541-73-1	Air	0.0042	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,4-Dichlorobenzene	106-46-7	Air	0.0042	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,4-Dioxane	123-91-1	Air	0.028	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Acetone	67-64-1	Air	1.1	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Acrolein	107-02-8	Air	0.087	ppbv										
TO-15 SIM	Benzene	71-43-2	Air	0.023	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Bromodichloromethane	75-27-4	Air	0.0037	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Bromomethane	74-83-9	Air	0.0064	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Carbon Tetrachloride	56-23-5	Air	0.0040	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Chlorobenzene	108-90-7	Air	0.022	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Chloroethane	75-00-3	Air	0.0095	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Chloroform	67-66-3	Air	0.020	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Chloromethane	74-87-3	Air	0.024	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	cis-1,2-Dichloroethene	156-59-2	Air	0.0063	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	cis-1,3-Dichloropropene	10061-01-5	Air	0.0055	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Dibromochloromethane	124-48-1	Air	0.0029	ppbv										
TO-15 SIM	Dichlorodifluoromethane	75-71-8	Air	0.010	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Ethylbenzene	100-41-4	Air	0.023	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Hexachloro-1,3-butadiene	87-68-3	Air	0.0094	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	m- & p-Xylene	179601-23-1	Air	0.023	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Methyl tert-Butyl Ether	1634-04-4	Air	0.0069	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Methylene Chloride	75-09-2	Air	0.029	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Naphthalene	91-20-3	Air	0.019	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	o-Xylene	95-47-6	Air	0.023	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Styrene	100-42-5	Air	0.023	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Tetrachloroethene	127-18-4	Air	0.0037	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Toluene	108-88-3	Air	0.027	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	trans-1,2-Dichloroethene	156-60-5	Air	0.0063	ppbv	-	-	-	-	-	-	-	-	-	-

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METHOD	ANALYTE	CAS No.	MATRIX	MRL	UNITS	Alternate MRL	Alternate UNITS	Alternate MRL	Alternate UNITS	1L Canister MDL	1L Canister LOD	1L Canister MRL	1L Canister UNITS	1L Canister MDL	1L Canister LOD
TO-15 SIM	trans-1,3-Dichloropropene	10061-02-6	Air	0.0055	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Trichloroethene	79-01-6	Air	0.0047	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Trichlorofluoromethane	75-69-4	Air	0.0089	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Trichlorotrifluoroethane	76-13-1	Air	0.0033	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Vinyl Chloride	75-01-4	Air	0.0098	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,1,1,2-Tetrachloroethane	630-20-6	Air	0.015	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	1,2,3-Trichloropropane	96-18-4	Air	0.017	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 SIM	Bromobenzene	108-86-1	Air	0.016	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan	1,1,1-Trichloroethane	71-55-6	Air	0.099	ppbv	1.1	ug/m3	0.20	ppbv	0.17	0.43	1.4	ug/m3	0.030	0.08
TO-15 Scan	1,1,2,2-Tetrachloroethane	79-34-5	Air	0.077	ppbv	1.1	ug/m3	0.16	ppbv	0.19	0.43	1.3	ug/m3	0.027	0.062
TO-15 Scan	1,1,2-Trichloroethane	79-00-5	Air	0.099	ppbv	1.1	ug/m3	0.20	ppbv	0.14	0.43	1.4	ug/m3	0.025	0.078
TO-15 Scan	1,1-Dichloroethane	75-34-3	Air	0.13	ppbv	1.0	ug/m3	0.25	ppbv	0.20	0.78	1.3	ug/m3	0.048	0.19
TO-15 Scan	1,1-Dichloroethene	75-35-4	Air	0.14	ppbv	1.1	ug/m3	0.28	ppbv	0.19	0.43	1.4	ug/m3	0.047	0.11
TO-15 Scan	1,2,3-Trimethylbenzene	526-73-8	Air	0.11	ppbv	1.0	ug/m3	0.20	ppbv	0.18	0.43	1.3	ug/m3	0.037	0.086
TO-15 Scan	1,2,4-Trichlorobenzene	120-82-1	Air	0.071	ppbv	1.1	ug/m3	0.15	ppbv	0.33	0.80	1.3	ug/m3	0.044	0.11
TO-15 Scan	1,2,4-Trimethylbenzene	95-63-6	Air	0.11	ppbv	1.1	ug/m3	0.22	ppbv	0.19	0.43	1.3	ug/m3	0.038	0.086
TO-15 Scan	1,2-Dibromo-3-chloropropane	96-12-8	Air	0.054	ppbv	1.0	ug/m3	0.10	ppbv	0.25	0.78	1.3	ug/m3	0.026	0.080
TO-15 Scan	1,2-Dibromoethane	106-93-4	Air	0.070	ppbv	1.1	ug/m3	0.14	ppbv	0.16	0.43	1.4	ug/m3	0.020	0.055
TO-15 Scan	1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	Air	0.073	ppbv	1.0	ug/m3	0.14	ppbv	0.21	0.78	1.3	ug/m3	0.030	0.11
TO-15 Scan	1,2-Dichlorobenzene	95-50-1	Air	0.090	ppbv	1.1	ug/m3	0.18	ppbv	0.20	0.43	1.4	ug/m3	0.033	0.071
TO-15 Scan	1,2-Dichloroethane	107-06-2	Air	0.13	ppbv	1.1	ug/m3	0.27	ppbv	0.15	0.43	1.3	ug/m3	0.036	0.11
TO-15 Scan	1,2-Dichloropropane	78-87-5	Air	0.12	ppbv	1.1	ug/m3	0.24	ppbv	0.17	0.43	1.4	ug/m3	0.036	0.09
TO-15 Scan	1,3,5-Trimethylbenzene	108-67-8	Air	0.11	ppbv	1.1	ug/m3	0.22	ppbv	0.19	0.43	1.3	ug/m3	0.039	0.086
TO-15 Scan	1,3-Butadiene	106-99-0	Air	0.24	ppbv	1.0	ug/m3	0.45	ppbv	0.22	0.78	1.3	ug/m3	0.099	0.35
TO-15 Scan	1,3-Dichlorobenzene	541-73-1	Air	0.090	ppbv	1.1	ug/m3	0.18	ppbv	0.20	0.43	1.4	ug/m3	0.033	0.071
TO-15 Scan	1,4-Dichlorobenzene	106-46-7	Air	0.090	ppbv	1.1	ug/m3	0.18	ppbv	0.21	0.80	1.4	ug/m3	0.034	0.13
TO-15 Scan	1,4-Dioxane	123-91-1	Air	0.15	ppbv	1.1	ug/m3	0.31	ppbv	0.16	0.43	1.3	ug/m3	0.044	0.12
TO-15 Scan	1-Butanol	71-36-3	Air	0.33	ppbv	1.0	ug/m3	0.33	ppbv	0.35	0.83	2.5	ug/m3	0.12	0.27
TO-15 Scan	2,2,4-Trimethylpentane (Isooctane)	540-84-1	Air	0.11	ppbv	1.1	ug/m3	0.24	ppbv	0.20	0.80	1.3	ug/m3	0.043	0.17
TO-15 Scan	2-Butanone (MEK)	78-93-3	Air	0.34	ppbv	1.0	ug/m3	0.34	ppbv	0.28	0.78	2.5	ug/m3	0.093	0.26
TO-15 Scan	2-Ethyltoluene	611-14-3	Air	0.11	ppbv	1.1	ug/m3	0.22	ppbv	0.17	0.43	1.4	ug/m3	0.035	0.086
TO-15 Scan	2-Hexanone	591-78-6	Air	0.13	ppbv	1.1	ug/m3	0.27	ppbv	0.17	0.43	1.4	ug/m3	0.040	0.10
TO-15 Scan	2-Methyl-2-Propanol (tert-Butyl Alcohc	75-65-0	Air	0.36	ppbv	1.1	ug/m3	0.36	ppbv	0.40	1.6	2.8	ug/m3	0.13	0.53
TO-15 Scan	2-Propanol (Isopropyl Alcohol)	67-63-0	Air	0.85	ppbv	2.1	ug/m3	0.85	ppbv	0.55	1.6	5.3	ug/m3	0.22	0.63
TO-15 Scan	3-Chloro-1-propene (Allyl Chloride)	107-05-1	Air	0.17	ppbv	1.1	ug/m3	0.35	ppbv	0.18	0.43	1.3	ug/m3	0.057	0.14
TO-15 Scan	3-Ethyltoluene	620-14-4	Air	0.11	ppbv	1.1	ug/m3	0.22	ppbv	0.18	0.43	1.3	ug/m3	0.037	0.086
TO-15 Scan	4-Ethyltoluene	622-96-8	Air	0.11	ppbv	1.1	ug/m3	0.22	ppbv	0.21	0.80	1.3	ug/m3	0.043	0.16
TO-15 Scan	4-Isopropyltoluene (p-Cymene)	99-87-6	Air	0.095	ppbv	1.0	ug/m3	0.18	ppbv	0.20	0.78	1.3	ug/m3	0.037	0.14
TO-15 Scan	4-Methyl-2-pentanone	108-10-1	Air	0.13	ppbv	1.1	ug/m3	0.27	ppbv	0.18	0.43	1.3	ug/m3	0.045	0.10

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METHOD	ANALYTE	CAS No.	MATRIX	MRL	UNITS	Alternate MRL	UNITS	Alternate MRL	UNITS	1L Canister MDL	1L Canister LOD	1L Canister MRL	UNITS	1L Canister MDL	1L Canister LOD
TO-15 Scan	Acetone	67-64-1	Air	2.3	ppbv	5.4	ug/m3	2.3	ppbv	3.0	6.8	14	ug/m3	1.3	2.8
TO-15 Scan	Acetonitrile	75-05-8	Air	0.31	ppbv	1.0	ug/m3	0.60	ppbv	0.33	0.78	1.3	ug/m3	0.19	0.46
TO-15 Scan	Acrolein	107-02-8	Air	0.44	ppbv	1.0	ug/m3	0.44	ppbv	0.38	0.78	2.5	ug/m3	0.16	0.34
TO-15 Scan	Acrylonitrile	107-13-1	Air	0.24	ppbv	1.0	ug/m3	0.46	ppbv	0.28	0.78	1.3	ug/m3	0.13	0.36
TO-15 Scan	alpha-Methylstyrene	98-83-9	Air	0.11	ppbv	1.1	ug/m3	0.23	ppbv	0.21	0.80	1.3	ug/m3	0.044	0.17
TO-15 Scan	alpha-Pinene	80-56-8	Air	0.093	ppbv	1.0	ug/m3	0.18	ppbv	0.21	0.78	1.3	ug/m3	0.037	0.14
TO-15 Scan	Benzene	71-43-2	Air	0.16	ppbv	1.0	ug/m3	0.31	ppbv	0.19	0.43	1.3	ug/m3	0.060	0.13
TO-15 Scan	Benzyl Chloride	100-44-7	Air	0.21	ppbv	1.1	ug/m3	0.21	ppbv	0.30	0.80	2.8	ug/m3	0.058	0.15
TO-15 Scan	Bromodichloromethane	75-27-4	Air	0.079	ppbv	1.1	ug/m3	0.16	ppbv	0.19	0.43	1.3	ug/m3	0.029	0.06
TO-15 Scan	Bromoform	75-25-2	Air	0.051	ppbv	1.1	ug/m3	0.11	ppbv	0.28	0.80	1.3	ug/m3	0.027	0.077
TO-15 Scan	Bromomethane	74-83-9	Air	0.13	ppbv	1.0	ug/m3	0.26	ppbv	0.19	0.40	1.3	ug/m3	0.048	0.10
TO-15 Scan	Carbon Disulfide	75-15-0	Air	0.35	ppbv	1.1	ug/m3	0.35	ppbv	0.40	1.4	2.8	ug/m3	0.13	0.43
TO-15 Scan	Carbon Tetrachloride	56-23-5	Air	0.083	ppbv	1.0	ug/m3	0.16	ppbv	0.19	0.43	1.3	ug/m3	0.029	0.07
TO-15 Scan	Chlorobenzene	108-90-7	Air	0.12	ppbv	1.1	ug/m3	0.24	ppbv	0.18	0.43	1.3	ug/m3	0.039	0.092
TO-15 Scan	Chloroethane	75-00-3	Air	0.19	ppbv	1.0	ug/m3	0.38	ppbv	0.17	0.78	1.3	ug/m3	0.063	0.29
TO-15 Scan	Chloroform	67-66-3	Air	0.11	ppbv	1.1	ug/m3	0.23	ppbv	0.18	0.43	1.4	ug/m3	0.036	0.09
TO-15 Scan	Chloromethane	74-87-3	Air	0.24	ppbv	1.0	ug/m3	0.48	ppbv	0.22	0.75	1.3	ug/m3	0.10	0.36
TO-15 Scan	cis-1,2-Dichloroethene	156-59-2	Air	0.13	ppbv	1.1	ug/m3	0.28	ppbv	0.19	0.43	1.3	ug/m3	0.047	0.11
TO-15 Scan	cis-1,3-Dichloropropene	10061-01-5	Air	0.12	ppbv	1.1	ug/m3	0.24	ppbv	0.21	0.45	1.4	ug/m3	0.046	0.099
TO-15 Scan	Cumene	98-82-8	Air	0.11	ppbv	1.1	ug/m3	0.22	ppbv	0.19	0.43	1.3	ug/m3	0.039	0.086
TO-15 Scan	Cyclohexane	110-82-7	Air	0.29	ppbv	1.0	ug/m3	0.29	ppbv	0.38	0.83	2.5	ug/m3	0.11	0.24
TO-15 Scan	Cyclohexanone	108-94-1	Air	0.12	ppbv	0.98	ug/m3	0.24	ppbv	0.21	0.73	1.2	ug/m3	0.052	0.18
TO-15 Scan	Dibromochloromethane	124-48-1	Air	0.063	ppbv	1.1	ug/m3	0.13	ppbv	0.18	0.43	1.4	ug/m3	0.021	0.050
TO-15 Scan	Dichlorodifluoromethane (CFC 12)	75-71-8	Air	0.11	ppbv	1.0	ug/m3	0.20	ppbv	0.22	0.78	1.3	ug/m3	0.044	0.16
TO-15 Scan	Diisopropyl Ether	108-20-3	Air	0.13	ppbv	1.1	ug/m3	0.26	ppbv	0.18	0.80	1.4	ug/m3	0.042	0.19
TO-15 Scan	d-Limonene	5989-27-5	Air	0.092	ppbv	1.0	ug/m3	0.18	ppbv	0.28	0.75	1.3	ug/m3	0.049	0.13
TO-15 Scan	Ethanol	64-17-5	Air	2.7	ppbv	5.1	ug/m3	2.7	ppbv	0.93	2.1	13	ug/m3	0.49	1.1
TO-15 Scan	Ethyl Acetate	141-78-6	Air	0.31	ppbv	1.1	ug/m3	0.31	ppbv	0.70	1.6	2.8	ug/m3	0.19	0.45
TO-15 Scan	Ethyl tert-Butyl Ether	637-92-3	Air	0.13	ppbv	1.1	ug/m3	0.26	ppbv	0.16	0.43	1.3	ug/m3	0.038	0.10
TO-15 Scan	Ethylbenzene	100-41-4	Air	0.12	ppbv	1.0	ug/m3	0.23	ppbv	0.19	0.43	1.3	ug/m3	0.043	0.098
TO-15 Scan	Hexachlorobutadiene	87-68-3	Air	0.050	ppbv	1.1	ug/m3	0.10	ppbv	0.28	0.80	1.3	ug/m3	0.026	0.075
TO-15 Scan	Isopropyl Acetate	108-21-4	Air	0.24	ppbv	1.0	ug/m3	0.24	ppbv	0.43	1.6	2.5	ug/m3	0.10	0.37
TO-15 Scan	m,p-Xylenes	179601-23-1	Air	0.25	ppbv	1.1	ug/m3	0.25	ppbv	0.35	0.85	2.8	ug/m3	0.081	0.20
TO-15 Scan	Methyl Methacrylate	80-62-6	Air	0.27	ppbv	1.1	ug/m3	0.27	ppbv	0.48	1.6	2.8	ug/m3	0.12	0.39
TO-15 Scan	Methyl tert-Butyl Ether	1634-04-4	Air	0.15	ppbv	1.1	ug/m3	0.31	ppbv	0.16	0.43	1.4	ug/m3	0.044	0.12
TO-15 Scan	Methylene Chloride	75-09-2	Air	0.16	ppbv	1.1	ug/m3	0.32	ppbv	0.38	0.80	1.4	ug/m3	0.11	0.23
TO-15 Scan	Naphthalene	91-20-3	Air	0.097	ppbv	1.0	ug/m3	0.19	ppbv	0.33	0.78	1.3	ug/m3	0.062	0.15
TO-15 Scan	n-Butyl Acetate	123-86-4	Air	0.11	ppbv	1.1	ug/m3	0.23	ppbv	0.18	0.43	1.4	ug/m3	0.038	0.089
TO-15 Scan	n-Butylbenzene	104-51-8	Air	0.097	ppbv	1.1	ug/m3	0.20	ppbv	0.19	0.43	1.3	ug/m3	0.035	0.077
TO-15 Scan	n-Decane	124-18-5	Air	0.093	ppbv	1.1	ug/m3	0.19	ppbv	0.18	0.43	1.4	ug/m3	0.031	0.073
TO-15 Scan	n-Dodecane	112-40-3	Air	0.075	ppbv	1.0	ug/m3	0.14	ppbv	0.38	0.78	1.3	ug/m3	0.054	0.11
TO-15 Scan	n-Heptane	142-82-5	Air	0.13	ppbv	1.1	ug/m3	0.27	ppbv	0.21	0.80	1.4	ug/m3	0.052	0.20

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METHOD	ANALYTE	CAS No.	MATRIX	MRL	UNITS	Alternate MRL	UNITS	Alternate MRL	UNITS	1L Canister MDL	1L Canister LOD	1L Canister MRL	UNITS	1L Canister MDL	1L Canister LOD
TO-15 Scan	n-Hexane	110-54-3	Air	0.15	ppbv	1.1	ug/m3	0.31	ppbv	0.28	0.80	1.4	ug/m3	0.078	0.23
TO-15 Scan	n-Nonane	111-84-2	Air	0.10	ppbv	1.1	ug/m3	0.21	ppbv	0.22	0.80	1.4	ug/m3	0.042	0.15
TO-15 Scan	n-Octane	111-65-9	Air	0.12	ppbv	1.1	ug/m3	0.24	ppbv	0.30	0.80	1.4	ug/m3	0.064	0.17
TO-15 Scan	n-Propylbenzene	103-65-1	Air	0.11	ppbv	1.1	ug/m3	0.22	ppbv	0.19	0.43	1.4	ug/m3	0.039	0.086
TO-15 Scan	n-Undecane	1120-21-4	Air	0.083	ppbv	1.1	ug/m3	0.17	ppbv	0.35	0.80	1.3	ug/m3	0.055	0.13
TO-15 Scan	o-Xylene	95-47-6	Air	0.12	ppbv	1.1	ug/m3	0.25	ppbv	0.19	0.43	1.3	ug/m3	0.044	0.098
TO-15 Scan	Propene	115-07-1	Air	0.30	ppbv	1.0	ug/m3	0.58	ppbv	0.33	0.78	1.3	ug/m3	0.19	0.45
TO-15 Scan	sec-Butylbenzene	135-98-8	Air	0.097	ppbv	1.1	ug/m3	0.20	ppbv	0.18	0.43	1.3	ug/m3	0.033	0.077
TO-15 Scan	Styrene	100-42-5	Air	0.12	ppbv	1.1	ug/m3	0.26	ppbv	0.22	0.80	1.3	ug/m3	0.051	0.19
TO-15 Scan	tert-Amyl Methyl Ether	994-05-8	Air	0.13	ppbv	1.1	ug/m3	0.26	ppbv	0.16	0.43	1.4	ug/m3	0.039	0.10
TO-15 Scan	tert-Butylbenzene	98-06-6	Air	0.097	ppbv	1.1	ug/m3	0.20	ppbv	0.20	0.80	1.3	ug/m3	0.036	0.15
TO-15 Scan	Tetrachloroethene	127-18-4	Air	0.078	ppbv	1.1	ug/m3	0.16	ppbv	0.17	0.43	1.3	ug/m3	0.025	0.063
TO-15 Scan	Tetrahydrofuran (THF)	109-99-9	Air	0.18	ppbv	1.1	ug/m3	0.37	ppbv	0.17	0.43	1.3	ug/m3	0.057	0.14
TO-15 Scan	Toluene	108-88-3	Air	0.14	ppbv	1.1	ug/m3	0.29	ppbv	0.16	0.43	1.3	ug/m3	0.043	0.11
TO-15 Scan	trans-1,2-Dichloroethene	156-60-5	Air	0.13	ppbv	1.1	ug/m3	0.28	ppbv	0.19	0.43	1.3	ug/m3	0.047	0.11
TO-15 Scan	trans-1,3-Dichloropropene	10061-02-6	Air	0.12	ppbv	1.1	ug/m3	0.24	ppbv	0.28	0.80	1.3	ug/m3	0.061	0.18
TO-15 Scan	Trichloroethene	79-01-6	Air	0.099	ppbv	1.1	ug/m3	0.20	ppbv	0.18	0.43	1.3	ug/m3	0.034	0.08
TO-15 Scan	Trichlorofluoromethane	75-69-4	Air	0.094	ppbv	1.1	ug/m3	0.20	ppbv	0.20	0.80	1.3	ug/m3	0.036	0.14
TO-15 Scan	Trichlorotrifluoroethane	76-13-1	Air	0.069	ppbv	1.1	ug/m3	0.14	ppbv	0.19	0.43	1.3	ug/m3	0.025	0.06
TO-15 Scan	Vinyl Acetate	108-05-4	Air	1.5	ppbv	5.3	ug/m3	1.5	ppbv	3.0	6.5	13	ug/m3	0.85	1.8
TO-15 Scan	Vinyl Chloride	75-01-4	Air	0.21	ppbv	1.1	ug/m3	0.43	ppbv	0.14	0.43	1.3	ug/m3	0.056	0.17
TO-15 Scan	1,1,1,2-Tetrachloroethane	630-20-6	Air	0.073	ppbv	1.0	ug/m3	0.15	ppbv	0.58	-	1.3	ug/m3	0.084	-
TO-15 Scan	1,1-Dichloropropene	563-58-6	Air	0.11	ppbv	1.0	ug/m3	0.22	ppbv	0.60	-	1.3	ug/m3	0.13	-
TO-15 Scan	1,1-Difluoroethane	75-37-6	Air	0.19	ppbv	1.0	ug/m3	0.37	ppbv	0.65	-	1.3	ug/m3	0.24	-
TO-15 Scan	1,2,3,4-Tetramethylbenzene	488-23-3	Air	0.091	ppbv	1.0	ug/m3	0.18	ppbv	0.63	-	1.3	ug/m3	0.11	-
TO-15 Scan	1,2,3,5-Tetramethylbenzene	527-53-7	Air	0.091	ppbv	1.0	ug/m3	0.18	ppbv	0.60	-	1.3	ug/m3	0.11	-
TO-15 Scan	1,2,3-Trichlorobenzene	87-61-6	Air	0.067	ppbv	1.0	ug/m3	0.13	ppbv	0.68	-	1.3	ug/m3	0.091	-
TO-15 Scan	1,2,3-Trichloropropane	96-18-4	Air	0.083	ppbv	1.0	ug/m3	0.17	ppbv	0.63	-	1.3	ug/m3	0.10	-
TO-15 Scan	1,2,4,5-Tetramethylbenzene	95-93-2	Air	0.091	ppbv	1.0	ug/m3	0.18	ppbv	0.55	-	1.3	ug/m3	0.10	-
TO-15 Scan	1,3-Dichloropropane	142-28-9	Air	0.11	ppbv	1.0	ug/m3	0.22	ppbv	0.65	-	1.3	ug/m3	0.14	-
TO-15 Scan	1-Chloro-1,1-Difluoroethane	75-68-3	Air	0.12	ppbv	1.0	ug/m3	0.24	ppbv	0.58	-	1.3	ug/m3	0.14	-
TO-15 Scan	1-Chlorohexane	544-10-5	Air	0.10	ppbv	1.0	ug/m3	0.20	ppbv	0.63	-	1.3	ug/m3	0.13	-
TO-15 Scan	2,2-Dichloro-1,1,1-trifluoroethane (CF(	306-83-2	Air	0.080	ppbv	1.0	ug/m3	0.16	ppbv	0.60	-	1.3	ug/m3	0.096	-
TO-15 Scan	2,2-Dichloropropane	594-20-7	Air	0.11	ppbv	1.0	ug/m3	0.22	ppbv	0.35	-	1.3	ug/m3	0.076	-
TO-15 Scan	2,3-Dimethylpentane	565-59-3	Air	0.12	ppbv	1.0	ug/m3	0.24	ppbv	0.60	-	1.3	ug/m3	0.15	-
TO-15 Scan	2-Chlorotoluene	95-49-8	Air	0.097	ppbv	1.0	ug/m3	0.19	ppbv	0.65	-	1.3	ug/m3	0.13	-
TO-15 Scan	2-Methylbutane	78-78-4	Air	0.17	ppbv	1.0	ug/m3	0.34	ppbv	0.65	-	1.3	ug/m3	0.22	-
TO-15 Scan	2-Methylpentane	107-83-5	Air	0.14	ppbv	1.0	ug/m3	0.28	ppbv	0.60	-	1.3	ug/m3	0.17	-
TO-15 Scan	4-Chlorotoluene	106-43-4	Air	0.097	ppbv	1.0	ug/m3	0.19	ppbv	0.65	-	1.3	ug/m3	0.13	-
TO-15 Scan	Bromobenzene	108-86-1	Air	0.078	ppbv	1.0	ug/m3	0.16	ppbv	0.63	-	1.3	ug/m3	0.097	-
TO-15 Scan	Chlorodifluoromethane (CFC 22)	75-45-6	Air	0.14	ppbv	1.0	ug/m3	0.28	ppbv	0.63	-	1.3	ug/m3	0.18	-

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METHOD	ANALYTE	CAS No.	MATRIX	MRL	UNITS	Alternate MRL	Alternate UNITS	Alternate MRL	Alternate UNITS	1L Canister MDL	1L Canister LOD	1L Canister MRL	1L Canister UNITS	1L Canister MDL	1L Canister LOD
TO-15 Scan	Chloropentafluoroethane	76-15-3	Air	0.079	ppbv	1.0	ug/m3	0.16	ppbv	0.58	-	1.3	ug/m3	0.091	-
TO-15 Scan	Dibromomethane	74-95-3	Air	0.070	ppbv	1.0	ug/m3	0.14	ppbv	0.50	-	1.3	ug/m3	0.070	-
TO-15 Scan	Fluorodichloromethane	75-43-4	Air	0.12	ppbv	1.0	ug/m3	0.24	ppbv	0.60	-	1.3	ug/m3	0.14	-
TO-15 Scan	Indan	496-11-7	Air	0.10	ppbv	1.0	ug/m3	0.21	ppbv	0.60	-	1.3	ug/m3	0.12	-
TO-15 Scan	Indene	95-13-6	Air	0.11	ppbv	1.0	ug/m3	0.21	ppbv	0.50	-	1.3	ug/m3	0.11	-
TO-15 Scan	Methyl Acetate	79-20-9	Air	0.17	ppbv	1.0	ug/m3	0.33	ppbv	0.60	-	1.3	ug/m3	0.20	-
TO-15 Scan	Methylcyclohexane	108-87-2	Air	0.12	ppbv	1.0	ug/m3	0.25	ppbv	0.65	-	1.3	ug/m3	0.16	-
TO-15 Scan	Norflurane (R134a)	811-97-2	Air	0.12	ppbv	1.0	ug/m3	0.24	ppbv	0.58	-	1.3	ug/m3	0.14	-
TO-15 Scan	Thiophene	110-02-1	Air	0.15	ppbv	1.0	ug/m3	0.29	ppbv	0.55	-	1.3	ug/m3	0.16	-
TO-15 Scan	Vinyl Bromide	593-60-2	Air	0.11	ppbv	1.0	ug/m3	0.23	ppbv	0.53	-	1.3	ug/m3	0.12	-
TO-15 Scan (Low Level)	Propene	115-07-1	Air	0.30	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Dichlorodifluoromethane (CFC 12)	75-71-8	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Chloromethane	74-87-3	Air	0.097	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	Air	0.073	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Vinyl Chloride	75-01-4	Air	0.043	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,3-Butadiene	106-99-0	Air	0.095	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Bromomethane	74-83-9	Air	0.052	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Chloroethane	75-00-3	Air	0.076	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Ethanol	64-17-5	Air	2.7	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Acetonitrile	75-05-8	Air	0.31	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Acrolein	107-02-8	Air	0.44	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Acetone	67-64-1	Air	2.3	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Trichlorofluoromethane	75-69-4	Air	0.094	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	2-Propanol (Isopropyl Alcohol)	67-63-0	Air	0.85	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Acrylonitrile	107-13-1	Air	0.24	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,1-Dichloroethene	75-35-4	Air	0.028	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	2-Methyl-2-Propanol (tert-Butyl Alcohc	75-65-0	Air	0.36	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Methylene Chloride	75-09-2	Air	0.16	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	3-Chloro-1-propene (Allyl Chloride)	107-05-1	Air	0.17	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Trichlorotrifluoroethane	76-13-1	Air	0.069	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Carbon Disulfide	75-15-0	Air	0.35	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	trans-1,2-Dichloroethene	156-60-5	Air	0.028	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,1-Dichloroethane	75-34-3	Air	0.025	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Methyl tert-Butyl Ether	1634-04-4	Air	0.15	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Vinyl Acetate	108-05-4	Air	1.5	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	2-Butanone (MEK)	78-93-3	Air	0.34	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	cis-1,2-Dichloroethene	156-59-2	Air	0.028	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Diisopropyl Ether	108-20-3	Air	0.13	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Ethyl Acetate	141-78-6	Air	0.31	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	n-Hexane	110-54-3	Air	0.15	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Chloroform	67-66-3	Air	0.023	ppbv	-	-	-	-	-	-	-	-	-	-

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	MRL	UNITS	Alternate MRL	UNITS	Alternate MRL	UNITS	1L Canister MDL	1L Canister LOD	1L Canister MRL	UNITS	1L Canister MDL	1L Canister LOD
TO-15 Scan (Low Level)	Tetrahydrofuran (THF)	109-99-9	Air	0.18	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Ethyl tert-Butyl Ether	637-92-3	Air	0.13	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,2-Dichloroethane	107-06-2	Air	0.027	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,1,1-Trichloroethane	71-55-6	Air	0.020	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Isopropyl Acetate	108-21-4	Air	0.24	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1-Butanol	71-36-3	Air	0.33	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Benzene	71-43-2	Air	0.031	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Carbon Tetrachloride	56-23-5	Air	0.016	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Cyclohexane	110-82-7	Air	0.29	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	tert-Amyl Methyl Ether	994-05-8	Air	0.13	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,2-Dichloropropane	78-87-5	Air	0.024	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Bromodichloromethane	75-27-4	Air	0.016	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Trichloroethene	79-01-6	Air	0.020	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,4-Dioxane	123-91-1	Air	0.15	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	2,2,4-Trimethylpentane (Isooctane)	540-84-1	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Methyl Methacrylate	80-62-6	Air	0.27	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	n-Heptane	142-82-5	Air	0.13	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	cis-1,3-Dichloropropene	10061-01-5	Air	0.12	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	4-Methyl-2-pentanone	108-10-1	Air	0.13	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	trans-1,3-Dichloropropene	10061-02-6	Air	0.12	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,1,2-Trichloroethane	79-00-5	Air	0.020	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Toluene	108-88-3	Air	0.14	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	2-Hexanone	591-78-6	Air	0.13	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Dibromochloromethane	124-48-1	Air	0.013	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,2-Dibromoethane	106-93-4	Air	0.014	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	n-Butyl Acetate	123-86-4	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	n-Octane	111-65-9	Air	0.12	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Tetrachloroethene	127-18-4	Air	0.016	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Chlorobenzene	108-90-7	Air	0.12	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Ethylbenzene	100-41-4	Air	0.12	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	m,p-Xylenes	179601-23-1	Air	0.25	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Bromoform	75-25-2	Air	0.051	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Styrene	100-42-5	Air	0.12	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	o-Xylene	95-47-6	Air	0.12	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	n-Nonane	111-84-2	Air	0.10	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,1,2,2-Tetrachloroethane	79-34-5	Air	0.016	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Cumene	98-82-8	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	alpha-Pinene	80-56-8	Air	0.093	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	n-Propylbenzene	103-65-1	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	3-Ethyltoluene	620-14-4	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	4-Ethyltoluene	622-96-8	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,3,5-Trimethylbenzene	108-67-8	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-

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METHOD	ANALYTE	CAS No.	MATRIX	MRL	UNITS	Alternate MRL	UNITS	Alternate MRL	UNITS	1L Canister MDL	1L Canister LOD	1L Canister MRL	UNITS	1L Canister MDL	1L Canister LOD
TO-15 Scan (Low Level)	alpha-Methylstyrene	98-83-9	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	2-Ethyltoluene	611-14-3	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,2,4-Trimethylbenzene	95-63-6	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	n-Decane	124-18-5	Air	0.093	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Benzyl Chloride	100-44-7	Air	0.21	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,3-Dichlorobenzene	541-73-1	Air	0.090	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,4-Dichlorobenzene	106-46-7	Air	0.090	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	sec-Butylbenzene	135-98-8	Air	0.097	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	4-Isopropyltoluene (p-Cymene)	99-87-6	Air	0.095	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,2,3-Trimethylbenzene	526-73-8	Air	0.11	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,2-Dichlorobenzene	95-50-1	Air	0.090	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	d-Limonene	5989-27-5	Air	0.092	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,2-Dibromo-3-chloropropane	96-12-8	Air	0.054	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	n-Undecane	1120-21-4	Air	0.083	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	1,2,4-Trichlorobenzene	120-82-1	Air	0.071	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Naphthalene	91-20-3	Air	0.097	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	n-Dodecane	112-40-3	Air	0.075	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Hexachlorobutadiene	87-68-3	Air	0.050	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	Cyclohexanone	108-94-1	Air	0.12	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	tert-Butylbenzene	98-06-6	Air	0.097	ppbv	-	-	-	-	-	-	-	-	-	-
TO-15 Scan (Low Level)	n-Butylbenzene	104-51-8	Air	0.097	ppbv	-	-	-	-	-	-	-	-	-	-

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	1L Canister MRL	UNITS	MW	MDL Effective	LOD Effective	MRL Effective	DOD LOQ Effective	Instrument and MDL Study Date
TO-15 SIM	1,1,1-Trichloroethane	71-55-6	Air	-	-	133.4					
TO-15 SIM	1,1,2,2-Tetrachloroethane	79-34-5	Air	-	-	167.9					
TO-15 SIM	1,1,2-Trichloroethane	79-00-5	Air	-	-	133.4					
TO-15 SIM	1,1-Dichloroethane	75-34-3	Air	-	-	98.96					
TO-15 SIM	1,1-Dichloroethene	75-35-4	Air	-	-	96.94					
TO-15 SIM	1,2,4-Trichlorobenzene	120-82-1	Air	-	-	181.5					
TO-15 SIM	1,2,4-Trimethylbenzene	95-63-6	Air	-	-	120.2					
TO-15 SIM	1,2-Dibromo-3-chloropropane	96-12-8	Air	-	-	236.33					
TO-15 SIM	1,2-Dibromoethane	106-93-4	Air	-	-	187.9					
TO-15 SIM	1,2-Dichlorobenzene	95-50-1	Air	-	-	147					
TO-15 SIM	1,2-Dichloroethane	107-06-2	Air	-	-	98.96					
TO-15 SIM	1,2-Dichloropropane	78-87-5	Air	-	-	113					
TO-15 SIM	1,3,5-Trimethylbenzene	108-67-8	Air	-	-	120.2					
TO-15 SIM	1,3-Butadiene	106-99-0	Air	-	-	54.09					
TO-15 SIM	1,3-Dichlorobenzene	541-73-1	Air	-	-	147					
TO-15 SIM	1,4-Dichlorobenzene	106-46-7	Air	-	-	147					
TO-15 SIM	1,4-Dioxane	123-91-1	Air	-	-	88.11					
TO-15 SIM	Acetone	67-64-1	Air	-	-	58.08					
TO-15 SIM	Acrolein	107-02-8	Air			56.06					
TO-15 SIM	Benzene	71-43-2	Air	-	-	78.11					
TO-15 SIM	Bromodichloromethane	75-27-4	Air	-	-	163.8					
TO-15 SIM	Bromomethane	74-83-9	Air	-	-	94.94					
TO-15 SIM	Carbon Tetrachloride	56-23-5	Air	-	-	153.8					
TO-15 SIM	Chlorobenzene	108-90-7	Air	-	-	112.6					
TO-15 SIM	Chloroethane	75-00-3	Air	-	-	64.52					
TO-15 SIM	Chloroform	67-66-3	Air	-	-	119.4					
TO-15 SIM	Chloromethane	74-87-3	Air	-	-	50.49					
TO-15 SIM	cis-1,2-Dichloroethene	156-59-2	Air	-	-	96.94					
TO-15 SIM	cis-1,3-Dichloropropene	10061-01-5	Air	-	-	111					
TO-15 SIM	Dibromochloromethane	124-48-1	Air			208.3					
TO-15 SIM	Dichlorodifluoromethane	75-71-8	Air	-	-	120.9	3/17/2015	3/4/2019	########		MS19 (03/04/15)
TO-15 SIM	Ethylbenzene	100-41-4	Air	-	-	106.2					
TO-15 SIM	Hexachloro-1,3-butadiene	87-68-3	Air	-	-	260.8					
TO-15 SIM	m- & p-Xylene	179601-23-1	Air	-	-	106.2					
TO-15 SIM	Methyl tert-Butyl Ether	1634-04-4	Air	-	-	88.15					
TO-15 SIM	Methylene Chloride	75-09-2	Air	-	-	84.94					
TO-15 SIM	Naphthalene	91-20-3	Air	-	-	128.17					
TO-15 SIM	o-Xylene	95-47-6	Air	-	-	106.2					
TO-15 SIM	Styrene	100-42-5	Air	-	-	104.1					
TO-15 SIM	Tetrachloroethene	127-18-4	Air	-	-	165.8					
TO-15 SIM	Toluene	108-88-3	Air	-	-	92.14					
TO-15 SIM	trans-1,2-Dichloroethene	156-60-5	Air	-	-	96.94					

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METHOD	ANALYTE	CAS No.	MATRIX	1L Canister MRL	UNITS	MW	MDL Effective	LOD Effective	MRL Effective	DOD LOQ Effective	Instrument and MDL Study Date
TO-15 SIM	trans-1,3-Dichloropropene	10061-02-6	Air	-	-	111					
TO-15 SIM	Trichloroethene	79-01-6	Air	-	-	131.4					
TO-15 SIM	Trichlorofluoromethane	75-69-4	Air	-	-	137.4					
TO-15 SIM	Trichlorotrifluoroethane	76-13-1	Air	-	-	187.38					
TO-15 SIM	Vinyl Chloride	75-01-4	Air	-	-	62.5					
TO-15 SIM	1,1,1,2-Tetrachloroethane	630-20-6	Air	-	-	167.85	5/15/2015	-	5/15/2015	-	MS19 (05/12/15)
TO-15 SIM	1,2,3-Trichloropropane	96-18-4	Air	-	-	147.43					
TO-15 SIM	Bromobenzene	108-86-1	Air	-	-	157.01	10/6/2017	-	10/6/2017	-	MS19 (10/05/17)
TO-15 Scan	1,1,1-Trichloroethane	71-55-6	Air	0.25	ppbv	133.4					
TO-15 Scan	1,1,2,2-Tetrachloroethane	79-34-5	Air	0.19	ppbv	167.9					
TO-15 Scan	1,1,2-Trichloroethane	79-00-5	Air	0.25	ppbv	133.4					
TO-15 Scan	1,1-Dichloroethane	75-34-3	Air	0.32	ppbv	98.96					
TO-15 Scan	1,1-Dichloroethene	75-35-4	Air	0.34	ppbv	96.94					
TO-15 Scan	1,2,3-Trimethylbenzene	526-73-8	Air	0.26	ppbv	120.1938					
TO-15 Scan	1,2,4-Trichlorobenzene	120-82-1	Air	0.18	ppbv	181.5					
TO-15 Scan	1,2,4-Trimethylbenzene	95-63-6	Air	0.27	ppbv	120.2					
TO-15 Scan	1,2-Dibromo-3-chloropropane	96-12-8	Air	0.13	ppbv	236.33					
TO-15 Scan	1,2-Dibromoethane	106-93-4	Air	0.18	ppbv	187.9					
TO-15 Scan	1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	Air	0.18	ppbv	170.9					MS16 (2018)
TO-15 Scan	1,2-Dichlorobenzene	95-50-1	Air	0.22	ppbv	147					
TO-15 Scan	1,2-Dichloroethane	107-06-2	Air	0.33	ppbv	98.96					
TO-15 Scan	1,2-Dichloropropane	78-87-5	Air	0.29	ppbv	113					
TO-15 Scan	1,3,5-Trimethylbenzene	108-67-8	Air	0.27	ppbv	120.2					
TO-15 Scan	1,3-Butadiene	106-99-0	Air	0.59	ppbv	54.09					
TO-15 Scan	1,3-Dichlorobenzene	541-73-1	Air	0.22	ppbv	147					
TO-15 Scan	1,4-Dichlorobenzene	106-46-7	Air	0.22	ppbv	147					
TO-15 Scan	1,4-Dioxane	123-91-1	Air	0.37	ppbv	88.11					
TO-15 Scan	1-Butanol	71-36-3	Air	0.82	ppbv	74.1224					
TO-15 Scan	2,2,4-Trimethylpentane (Isooctane)	540-84-1	Air	0.28	ppbv	114.23					
TO-15 Scan	2-Butanone (MEK)	78-93-3	Air	0.85	ppbv	72.11					
TO-15 Scan	2-Ethyltoluene	611-14-3	Air	0.27	ppbv	120.2					
TO-15 Scan	2-Hexanone	591-78-6	Air	0.33	ppbv	100.16					
TO-15 Scan	2-Methyl-2-Propanol (tert-Butyl Alcohc	75-65-0	Air	0.91	ppbv	74.12					
TO-15 Scan	2-Propanol (Isopropyl Alcohol)	67-63-0	Air	2.1	ppbv	60.1					
TO-15 Scan	3-Chloro-1-propene (Allyl Chloride)	107-05-1	Air	0.42	ppbv	76.53					
TO-15 Scan	3-Ethyltoluene	620-14-4	Air	0.27	ppbv	120.2					
TO-15 Scan	4-Ethyltoluene	622-96-8	Air	0.27	ppbv	120.2					
TO-15 Scan	4-Isopropyltoluene (p-Cymene)	99-87-6	Air	0.24	ppbv	134.2206					
TO-15 Scan	4-Methyl-2-pentanone	108-10-1	Air	0.32	ppbv	100.2					

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	1L Canister MRL	UNITS	MW	MDL Effective	LOD Effective	MRL Effective	DOD LOQ Effective	Instrument and MDL Study Date
TO-15 Scan	Acetone	67-64-1	Air	5.7	ppbv	58.08					
TO-15 Scan	Acetonitrile	75-05-8	Air	0.77	ppbv	41.05					
TO-15 Scan	Acrolein	107-02-8	Air	1.1	ppbv	56.06					
TO-15 Scan	Acrylonitrile	107-13-1	Air	0.60	ppbv	53.06					
TO-15 Scan	alpha-Methylstyrene	98-83-9	Air	0.27	ppbv	118.19					
TO-15 Scan	alpha-Pinene	80-56-8	Air	0.23	ppbv	136.24					
TO-15 Scan	Benzene	71-43-2	Air	0.41	ppbv	78.11					
TO-15 Scan	Benzyl Chloride	100-44-7	Air	0.53	ppbv	126.59					
TO-15 Scan	Bromodichloromethane	75-27-4	Air	0.20	ppbv	163.8					
TO-15 Scan	Bromoform	75-25-2	Air	0.13	ppbv	252.8					
TO-15 Scan	Bromomethane	74-83-9	Air	0.32	ppbv	94.94					
TO-15 Scan	Carbon Disulfide	75-15-0	Air	0.88	ppbv	76.14					
TO-15 Scan	Carbon Tetrachloride	56-23-5	Air	0.21	ppbv	153.8					
TO-15 Scan	Chlorobenzene	108-90-7	Air	0.29	ppbv	112.6					
TO-15 Scan	Chloroethane	75-00-3	Air	0.48	ppbv	64.52					
TO-15 Scan	Chloroform	67-66-3	Air	0.28	ppbv	119.4					
TO-15 Scan	Chloromethane	74-87-3	Air	0.61	ppbv	50.49					MS13 (2018)
TO-15 Scan	cis-1,2-Dichloroethene	156-59-2	Air	0.33	ppbv	96.94					
TO-15 Scan	cis-1,3-Dichloropropene	10061-01-5	Air	0.31	ppbv	111					
TO-15 Scan	Cumene	98-82-8	Air	0.27	ppbv	120.2					
TO-15 Scan	Cyclohexane	110-82-7	Air	0.73	ppbv	84.16					
TO-15 Scan	Cyclohexanone	108-94-1	Air	0.31	ppbv	98.14					
TO-15 Scan	Dibromochloromethane	124-48-1	Air	0.16	ppbv	208.3					
TO-15 Scan	Dichlorodifluoromethane (CFC 12)	75-71-8	Air	0.26	ppbv	120.9					MS09 (2018)
TO-15 Scan	Diisopropyl Ether	108-20-3	Air	0.32	ppbv	102.18					
TO-15 Scan	d-Limonene	5989-27-5	Air	0.23	ppbv	136.24					
TO-15 Scan	Ethanol	64-17-5	Air	6.8	ppbv	46.07					
TO-15 Scan	Ethyl Acetate	141-78-6	Air	0.76	ppbv	88.106					
TO-15 Scan	Ethyl tert-Butyl Ether	637-92-3	Air	0.32	ppbv	102.176					
TO-15 Scan	Ethylbenzene	100-41-4	Air	0.30	ppbv	106.2					
TO-15 Scan	Hexachlorobutadiene	87-68-3	Air	0.12	ppbv	260.8					
TO-15 Scan	Isopropyl Acetate	108-21-4	Air	0.60	ppbv	102.13					
TO-15 Scan	m,p-Xylenes	179601-23-1	Air	0.63	ppbv	106.2					
TO-15 Scan	Methyl Methacrylate	80-62-6	Air	0.67	ppbv	100.12					
TO-15 Scan	Methyl tert-Butyl Ether	1634-04-4	Air	0.37	ppbv	88.15					
TO-15 Scan	Methylene Chloride	75-09-2	Air	0.39	ppbv	84.94					
TO-15 Scan	Naphthalene	91-20-3	Air	0.24	ppbv	128.17					
TO-15 Scan	n-Butyl Acetate	123-86-4	Air	0.28	ppbv	116.16					
TO-15 Scan	n-Butylbenzene	104-51-8	Air	0.24	ppbv	134.22					
TO-15 Scan	n-Decane	124-18-5	Air	0.23	ppbv	142.28					
TO-15 Scan	n-Dodecane	112-40-3	Air	0.19	ppbv	170.34					
TO-15 Scan	n-Heptane	142-82-5	Air	0.33	ppbv	100.2					

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METHOD	ANALYTE	CAS No.	MATRIX	1L Canister MRL	UNITS	MW	MDL Effective	LOD Effective	MRL Effective	DOD LOQ Effective	Instrument and MDL Study Date
TO-15 Scan	n-Hexane	110-54-3	Air	0.38	ppbv	86.17					
TO-15 Scan	n-Nonane	111-84-2	Air	0.26	ppbv	128.26					
TO-15 Scan	n-Octane	111-65-9	Air	0.29	ppbv	114.23					
TO-15 Scan	n-Propylbenzene	103-65-1	Air	0.27	ppbv	120.1938					
TO-15 Scan	n-Undecane	1120-21-4	Air	0.21	ppbv	156.31					
TO-15 Scan	o-Xylene	95-47-6	Air	0.31	ppbv	106.2					
TO-15 Scan	Propene	115-07-1	Air	0.76	ppbv	42.08	5/7/2018	3/4/2019	8/23/2018	8/23/2018	MS08 (2018)
TO-15 Scan	sec-Butylbenzene	135-98-8	Air	0.24	ppbv	134.2206					
TO-15 Scan	Styrene	100-42-5	Air	0.31	ppbv	104.1					
TO-15 Scan	tert-Amyl Methyl Ether	994-05-8	Air	0.32	ppbv	102.176					
TO-15 Scan	tert-Butylbenzene	98-06-6	Air	0.24	ppbv	134.22					
TO-15 Scan	Tetrachloroethene	127-18-4	Air	0.20	ppbv	165.8					
TO-15 Scan	Tetrahydrofuran (THF)	109-99-9	Air	0.45	ppbv	72.11					
TO-15 Scan	Toluene	108-88-3	Air	0.35	ppbv	92.14					
TO-15 Scan	trans-1,2-Dichloroethene	156-60-5	Air	0.33	ppbv	96.94					
TO-15 Scan	trans-1,3-Dichloropropene	10061-02-6	Air	0.29	ppbv	111					
TO-15 Scan	Trichloroethene	79-01-6	Air	0.25	ppbv	131.4					
TO-15 Scan	Trichlorofluoromethane	75-69-4	Air	0.24	ppbv	137.4					
TO-15 Scan	Trichlorotrifluoroethane	76-13-1	Air	0.17	ppbv	187.38					
TO-15 Scan	Vinyl Acetate	108-05-4	Air	3.8	ppbv	86.09					
TO-15 Scan	Vinyl Chloride	75-01-4	Air	0.52	ppbv	62.5					
TO-15 Scan	1,1,1,2-Tetrachloroethane	630-20-6	Air	0.18	ppbv	167.85					
TO-15 Scan	1,1-Dichloropropene	563-58-6	Air	0.27	ppbv	112.99					
TO-15 Scan	1,1-Difluoroethane	75-37-6	Air	0.46	ppbv	66.05					MS09 (05/07/12)
TO-15 Scan	1,2,3,4-Tetramethylbenzene	488-23-3	Air	0.23	ppbv	134.22					
TO-15 Scan	1,2,3,5-Tetramethylbenzene	527-53-7	Air	0.23	ppbv	134.22					
TO-15 Scan	1,2,3-Trichlorobenzene	87-61-6	Air	0.17	ppbv	181.45					
TO-15 Scan	1,2,3-Trichloropropane	96-18-4	Air	0.21	ppbv	147.43					
TO-15 Scan	1,2,4,5-Tetramethylbenzene	95-93-2	Air	0.23	ppbv	134.22					
TO-15 Scan	1,3-Dichloropropane	142-28-9	Air	0.27	ppbv	112.99					
TO-15 Scan	1-Chloro-1,1-Difluoroethane	75-68-3	Air	0.30	ppbv	100.5					MS16 (05/14/12)
TO-15 Scan	1-Chlorohexane	544-10-5	Air	0.25	ppbv	120.62					
TO-15 Scan	2,2-Dichloro-1,1,1-trifluoroethane (CF(	306-83-2	Air	0.20	ppbv	152.93					
TO-15 Scan	2,2-Dichloropropane	594-20-7	Air	0.27	ppbv	112.99					
TO-15 Scan	2,3-Dimethylpentane	565-59-3	Air	0.31	ppbv	100.2					
TO-15 Scan	2-Chlorotoluene	95-49-8	Air	0.24	ppbv	126.59					
TO-15 Scan	2-Methylbutane	78-78-4	Air	0.42	ppbv	72.15					
TO-15 Scan	2-Methylpentane	107-83-5	Air	0.35	ppbv	86.18					
TO-15 Scan	4-Chlorotoluene	106-43-4	Air	0.24	ppbv	126.59					
TO-15 Scan	Bromobenzene	108-86-1	Air	0.19	ppbv	157.01					
TO-15 Scan	Chlorodifluoromethane (CFC 22)	75-45-6	Air	0.35	ppbv	86.47					MS13 (05/07/12)

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METHOD	ANALYTE	CAS No.	MATRIX	1L Canister MRL	UNITS	MW	MDL Effective	LOD Effective	MRL Effective	DOD LOQ Effective	Instrument and MDL Study Date
TO-15 Scan	Chloropentafluoroethane	76-15-3	Air	0.20	ppbv	154.47	7/9/2012	-	-		MS03 (06/25/12)
TO-15 Scan	Dibromomethane	74-95-3	Air	0.18	ppbv	173.83					
TO-15 Scan	Fluorodichloromethane	75-43-4	Air	0.30	ppbv	102.92					
TO-15 Scan	Indan	496-11-7	Air	0.26	ppbv	118.18					
TO-15 Scan	Indene	95-13-6	Air	0.26	ppbv	116.16					
TO-15 Scan	Methyl Acetate	79-20-9	Air	0.41	ppbv	74.08					
TO-15 Scan	Methylcyclohexane	108-87-2	Air	0.31	ppbv	98.19					
TO-15 Scan	Norflurane (R134a)	811-97-2	Air	0.30	ppbv	102.03					MS08 (01/20/12)
TO-15 Scan	Thiophene	110-02-1	Air	0.36	ppbv	84.14					
TO-15 Scan	Vinyl Bromide	593-60-2	Air	0.29	ppbv	106.95					
TO-15 Scan (Low Level)	Propene	115-07-1	Air	-	-	42.08	5/7/2018	-	8/23/2018	-	MS08 (2018)
TO-15 Scan (Low Level)	Dichlorodifluoromethane (CFC 12)	75-71-8	Air	-	-	120.9					MS09 (2018)
TO-15 Scan (Low Level)	Chloromethane	74-87-3	Air	-	-	50.49					MS16 (2018)
TO-15 Scan (Low Level)	1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	Air	-	-	170.9					
TO-15 Scan (Low Level)	Vinyl Chloride	75-01-4	Air	-	-	62.5					
TO-15 Scan (Low Level)	1,3-Butadiene	106-99-0	Air	-	-	54.09					
TO-15 Scan (Low Level)	Bromomethane	74-83-9	Air	-	-	94.94					
TO-15 Scan (Low Level)	Chloroethane	75-00-3	Air	-	-	64.52					
TO-15 Scan (Low Level)	Ethanol	64-17-5	Air	-	-	46.07					
TO-15 Scan (Low Level)	Acetonitrile	75-05-8	Air	-	-	41.05					
TO-15 Scan (Low Level)	Acrolein	107-02-8	Air	-	-	56.06					
TO-15 Scan (Low Level)	Acetone	67-64-1	Air	-	-	58.08					
TO-15 Scan (Low Level)	Trichlorofluoromethane	75-69-4	Air	-	-	137.4					
TO-15 Scan (Low Level)	2-Propanol (Isopropyl Alcohol)	67-63-0	Air	-	-	60.1					
TO-15 Scan (Low Level)	Acrylonitrile	107-13-1	Air	-	-	53.06					
TO-15 Scan (Low Level)	1,1-Dichloroethene	75-35-4	Air	-	-	96.94					
TO-15 Scan (Low Level)	2-Methyl-2-Propanol (tert-Butyl Alcohc	75-65-0	Air	-	-	74.12					
TO-15 Scan (Low Level)	Methylene Chloride	75-09-2	Air	-	-	84.94					
TO-15 Scan (Low Level)	3-Chloro-1-propene (Allyl Chloride)	107-05-1	Air	-	-	76.53					
TO-15 Scan (Low Level)	Trichlorotrifluoroethane	76-13-1	Air	-	-	187.38					
TO-15 Scan (Low Level)	Carbon Disulfide	75-15-0	Air	-	-	76.14					
TO-15 Scan (Low Level)	trans-1,2-Dichloroethene	156-60-5	Air	-	-	96.94					
TO-15 Scan (Low Level)	1,1-Dichloroethane	75-34-3	Air	-	-	98.96					
TO-15 Scan (Low Level)	Methyl tert-Butyl Ether	1634-04-4	Air	-	-	88.15					
TO-15 Scan (Low Level)	Vinyl Acetate	108-05-4	Air	-	-	86.09					
TO-15 Scan (Low Level)	2-Butanone (MEK)	78-93-3	Air	-	-	72.11					
TO-15 Scan (Low Level)	cis-1,2-Dichloroethene	156-59-2	Air	-	-	96.94					
TO-15 Scan (Low Level)	Diisopropyl Ether	108-20-3	Air	-	-	102.18					
TO-15 Scan (Low Level)	Ethyl Acetate	141-78-6	Air	-	-	88.106					
TO-15 Scan (Low Level)	n-Hexane	110-54-3	Air	-	-	86.17					
TO-15 Scan (Low Level)	Chloroform	67-66-3	Air	-	-	119.4					

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METHOD	ANALYTE	CAS No.	MATRIX	1L Canister MRL	UNITS	MW	MDL Effective	LOD Effective	MRL Effective	DOD LOQ Effective	Instrument and MDL Study Date
TO-15 Scan (Low Level)	Tetrahydrofuran (THF)	109-99-9	Air	-	-	72.11					
TO-15 Scan (Low Level)	Ethyl tert-Butyl Ether	637-92-3	Air	-	-	102.176					
TO-15 Scan (Low Level)	1,2-Dichloroethane	107-06-2	Air	-	-	98.96					
TO-15 Scan (Low Level)	1,1,1-Trichloroethane	71-55-6	Air	-	-	133.4					
TO-15 Scan (Low Level)	Isopropyl Acetate	108-21-4	Air	-	-	102.13					
TO-15 Scan (Low Level)	1-Butanol	71-36-3	Air	-	-	74.1224					
TO-15 Scan (Low Level)	Benzene	71-43-2	Air	-	-	78.11					
TO-15 Scan (Low Level)	Carbon Tetrachloride	56-23-5	Air	-	-	153.8					
TO-15 Scan (Low Level)	Cyclohexane	110-82-7	Air	-	-	84.16					
TO-15 Scan (Low Level)	tert-Amyl Methyl Ether	994-05-8	Air	-	-	102.176					
TO-15 Scan (Low Level)	1,2-Dichloropropane	78-87-5	Air	-	-	113					
TO-15 Scan (Low Level)	Bromodichloromethane	75-27-4	Air	-	-	163.8					
TO-15 Scan (Low Level)	Trichloroethene	79-01-6	Air	-	-	131.4					
TO-15 Scan (Low Level)	1,4-Dioxane	123-91-1	Air	-	-	88.11					
TO-15 Scan (Low Level)	2,2,4-Trimethylpentane (Isooctane)	540-84-1	Air	-	-	114.23					
TO-15 Scan (Low Level)	Methyl Methacrylate	80-62-6	Air	-	-	100.12					
TO-15 Scan (Low Level)	n-Heptane	142-82-5	Air	-	-	100.2					
TO-15 Scan (Low Level)	cis-1,3-Dichloropropene	10061-01-5	Air	-	-	111					
TO-15 Scan (Low Level)	4-Methyl-2-pentanone	108-10-1	Air	-	-	100.2					
TO-15 Scan (Low Level)	trans-1,3-Dichloropropene	10061-02-6	Air	-	-	111					
TO-15 Scan (Low Level)	1,1,2-Trichloroethane	79-00-5	Air	-	-	133.4					
TO-15 Scan (Low Level)	Toluene	108-88-3	Air	-	-	92.14					
TO-15 Scan (Low Level)	2-Hexanone	591-78-6	Air	-	-	100.16					
TO-15 Scan (Low Level)	Dibromochloromethane	124-48-1	Air	-	-	208.3					
TO-15 Scan (Low Level)	1,2-Dibromoethane	106-93-4	Air	-	-	187.9					
TO-15 Scan (Low Level)	n-Butyl Acetate	123-86-4	Air	-	-	116.16					
TO-15 Scan (Low Level)	n-Octane	111-65-9	Air	-	-	114.23					
TO-15 Scan (Low Level)	Tetrachloroethene	127-18-4	Air	-	-	165.8					
TO-15 Scan (Low Level)	Chlorobenzene	108-90-7	Air	-	-	112.6					
TO-15 Scan (Low Level)	Ethylbenzene	100-41-4	Air	-	-	106.2					
TO-15 Scan (Low Level)	m,p-Xylenes	179601-23-1	Air	-	-	106.2					
TO-15 Scan (Low Level)	Bromoform	75-25-2	Air	-	-	252.8					
TO-15 Scan (Low Level)	Styrene	100-42-5	Air	-	-	104.1					
TO-15 Scan (Low Level)	o-Xylene	95-47-6	Air	-	-	106.2					
TO-15 Scan (Low Level)	n-Nonane	111-84-2	Air	-	-	128.26					
TO-15 Scan (Low Level)	1,1,2,2-Tetrachloroethane	79-34-5	Air	-	-	167.9					
TO-15 Scan (Low Level)	Cumene	98-82-8	Air	-	-	120.2					
TO-15 Scan (Low Level)	alpha-Pinene	80-56-8	Air	-	-	136.24					
TO-15 Scan (Low Level)	n-Propylbenzene	103-65-1	Air	-	-	120.1938					
TO-15 Scan (Low Level)	3-Ethyltoluene	620-14-4	Air	-	-	120.2					
TO-15 Scan (Low Level)	4-Ethyltoluene	622-96-8	Air	-	-	120.2					
TO-15 Scan (Low Level)	1,3,5-Trimethylbenzene	108-67-8	Air	-	-	120.2					

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	1L Canister MRL	UNITS	MW	MDL Effective	LOD Effective	MRL Effective	DOD LOQ Effective	Instrument and MDL Study Date
TO-15 Scan (Low Level)	alpha-Methylstyrene	98-83-9	Air	-	-	118.19					
TO-15 Scan (Low Level)	2-Ethyltoluene	611-14-3	Air	-	-	120.2					
TO-15 Scan (Low Level)	1,2,4-Trimethylbenzene	95-63-6	Air	-	-	120.2					
TO-15 Scan (Low Level)	n-Decane	124-18-5	Air	-	-	142.28					
TO-15 Scan (Low Level)	Benzyl Chloride	100-44-7	Air	-	-	126.59					
TO-15 Scan (Low Level)	1,3-Dichlorobenzene	541-73-1	Air	-	-	147					
TO-15 Scan (Low Level)	1,4-Dichlorobenzene	106-46-7	Air	-	-	147					
TO-15 Scan (Low Level)	sec-Butylbenzene	135-98-8	Air	-	-	134.2206					
TO-15 Scan (Low Level)	4-Isopropyltoluene (p-Cymene)	99-87-6	Air	-	-	134.2206					
TO-15 Scan (Low Level)	1,2,3-Trimethylbenzene	526-73-8	Air	-	-	120.1938					
TO-15 Scan (Low Level)	1,2-Dichlorobenzene	95-50-1	Air	-	-	147					
TO-15 Scan (Low Level)	d-Limonene	5989-27-5	Air	-	-	136.24					
TO-15 Scan (Low Level)	1,2-Dibromo-3-chloropropane	96-12-8	Air	-	-	236.33					
TO-15 Scan (Low Level)	n-Undecane	1120-21-4	Air	-	-	156.31					
TO-15 Scan (Low Level)	1,2,4-Trichlorobenzene	120-82-1	Air	-	-	181.5					
TO-15 Scan (Low Level)	Naphthalene	91-20-3	Air	-	-	128.17					
TO-15 Scan (Low Level)	n-Dodecane	112-40-3	Air	-	-	170.34					
TO-15 Scan (Low Level)	Hexachlorobutadiene	87-68-3	Air	-	-	260.8					
TO-15 Scan (Low Level)	Cyclohexanone	108-94-1	Air	-	-	98.14					
TO-15 Scan (Low Level)	tert-Butylbenzene	98-06-6	Air	-	-	134.22					
TO-15 Scan (Low Level)	n-Butylbenzene	104-51-8	Air	-	-	134.22					

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	Comments
TO-15 SIM	1,1,1-Trichloroethane	71-55-6	Air	Acrolein and Dibromochloromethane added to compound
TO-15 SIM	1,1,2,2-Tetrachloroethane	79-34-5	Air	
TO-15 SIM	1,1,2-Trichloroethane	79-00-5	Air	
TO-15 SIM	1,1-Dichloroethane	75-34-3	Air	
TO-15 SIM	1,1-Dichloroethene	75-35-4	Air	
TO-15 SIM	1,2,4-Trichlorobenzene	120-82-1	Air	
TO-15 SIM	1,2,4-Trimethylbenzene	95-63-6	Air	
TO-15 SIM	1,2-Dibromo-3-chloropropane	96-12-8	Air	
TO-15 SIM	1,2-Dibromoethane	106-93-4	Air	
TO-15 SIM	1,2-Dichlorobenzene	95-50-1	Air	
TO-15 SIM	1,2-Dichloroethane	107-06-2	Air	
TO-15 SIM	1,2-Dichloropropane	78-87-5	Air	Hexachloro-1,3-butadiene MRL raised to 0.10ug/m3
TO-15 SIM	1,3,5-Trimethylbenzene	108-67-8	Air	
TO-15 SIM	1,3-Butadiene	106-99-0	Air	
TO-15 SIM	1,3-Dichlorobenzene	541-73-1	Air	
TO-15 SIM	1,4-Dichlorobenzene	106-46-7	Air	
TO-15 SIM	1,4-Dioxane	123-91-1	Air	
TO-15 SIM	Acetone	67-64-1	Air	
TO-15 SIM	Acrolein	107-02-8	Air	
TO-15 SIM	Benzene	71-43-2	Air	list effective 03/17/15.
TO-15 SIM	Bromodichloromethane	75-27-4	Air	effective 03/17/15.
TO-15 SIM	Bromomethane	74-83-9	Air	1,3-Butadiene and 1,2-Dibromo-3-Chloropropane
TO-15 SIM	Carbon Tetrachloride	56-23-5	Air	
TO-15 SIM	Chlorobenzene	108-90-7	Air	
TO-15 SIM	Chloroethane	75-00-3	Air	added to compound list effective 10/28/13.
TO-15 SIM	Chloroform	67-66-3	Air	
TO-15 SIM	Chloromethane	74-87-3	Air	1,2-Dibromo-3-Chloropropane on 09/24/12.
TO-15 SIM	cis-1,2-Dichloroethene	156-59-2	Air	Acetone added to compound list effective 5/13/14.
TO-15 SIM	cis-1,3-Dichloropropene	10061-01-5	Air	
TO-15 SIM	Dibromochloromethane	124-48-1	Air	
TO-15 SIM	Dichlorodifluoromethane	75-71-8	Air	Removed Acetone, 1,3-Butadiene, Acrolein, and
TO-15 SIM	Ethylbenzene	100-41-4	Air	
TO-15 SIM	Hexachloro-1,3-butadiene	87-68-3	Air	
TO-15 SIM	m- & p-Xylene	179601-23-1	Air	
TO-15 SIM	Methyl tert-Butyl Ether	1634-04-4	Air	
TO-15 SIM	Methylene Chloride	75-09-2	Air	
TO-15 SIM	Naphthalene	91-20-3	Air	
TO-15 SIM	o-Xylene	95-47-6	Air	
TO-15 SIM	Styrene	100-42-5	Air	
TO-15 SIM	Tetrachloroethene	127-18-4	Air	
TO-15 SIM	Toluene	108-88-3	Air	
TO-15 SIM	trans-1,2-Dichloroethene	156-60-5	Air	added to compound list effective 03/28/14.

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	Comments
TO-15 SIM	trans-1,3-Dichloropropene	10061-02-6	Air	
TO-15 SIM	Trichloroethene	79-01-6	Air	
TO-15 SIM	Trichlorofluoromethane	75-69-4	Air	Control Limits Updated 11/28/18; Effective 12/05/18
TO-15 SIM	Trichlorotrifluoroethane	76-13-1	Air	Styrene, 1,3,5-Trimethylbenzene, 1,2,4-Trimethylbenzene
TO-15 SIM	Vinyl Chloride	75-01-4	Air	
TO-15 SIM	1,1,1,2-Tetrachloroethane	630-20-6	Air	
TO-15 SIM	1,2,3-Trichloropropane	96-18-4	Air	
TO-15 SIM	Bromobenzene	108-86-1	Air	
TO-15 Scan	1,1,1-Trichloroethane	71-55-6	Air	
TO-15 Scan	1,1,2,2-Tetrachloroethane	79-34-5	Air	
TO-15 Scan	1,1,2-Trichloroethane	79-00-5	Air	
TO-15 Scan	1,1-Dichloroethane	75-34-3	Air	
TO-15 Scan	1,1-Dichloroethene	75-35-4	Air	
TO-15 Scan	1,2,3-Trimethylbenzene	526-73-8	Air	Not on 75 cmpd List
TO-15 Scan	1,2,4-Trichlorobenzene	120-82-1	Air	
TO-15 Scan	1,2,4-Trimethylbenzene	95-63-6	Air	
TO-15 Scan	1,2-Dibromo-3-chloropropane	96-12-8	Air	
TO-15 Scan	1,2-Dibromoethane	106-93-4	Air	
TO-15 Scan	1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	Air	a max injection volume of 400ml.
TO-15 Scan	1,2-Dichlorobenzene	95-50-1	Air	
TO-15 Scan	1,2-Dichloroethane	107-06-2	Air	
TO-15 Scan	1,2-Dichloropropane	78-87-5	Air	
TO-15 Scan	1,3,5-Trimethylbenzene	108-67-8	Air	
TO-15 Scan	1,3-Butadiene	106-99-0	Air	Control Limits Updated 11/28/18; Effective 12/05/18
TO-15 Scan	1,3-Dichlorobenzene	541-73-1	Air	
TO-15 Scan	1,4-Dichlorobenzene	106-46-7	Air	
TO-15 Scan	1,4-Dioxane	123-91-1	Air	
TO-15 Scan	1-Butanol	71-36-3	Air	Not on 75 cmpd List
TO-15 Scan	2,2,4-Trimethylpentane (Isooctane)	540-84-1	Air	Not on 75 cmpd List
TO-15 Scan	2-Butanone (MEK)	78-93-3	Air	
TO-15 Scan	2-Ethyltoluene	611-14-3	Air	Not on 75 cmpd List
TO-15 Scan	2-Hexanone	591-78-6	Air	
TO-15 Scan	2-Methyl-2-Propanol (tert-Butyl Alcoho	75-65-0	Air	Not on 75 cmpd List
TO-15 Scan	2-Propanol (Isopropyl Alcohol)	67-63-0	Air	
TO-15 Scan	3-Chloro-1-propene (Allyl Chloride)	107-05-1	Air	
TO-15 Scan	3-Ethyltoluene	620-14-4	Air	Not on 75 cmpd List
TO-15 Scan	4-Ethyltoluene	622-96-8	Air	
TO-15 Scan	4-Isopropyltoluene (p-Cymene)	99-87-6	Air	Not on 75 cmpd List
TO-15 Scan	4-Methyl-2-pentanone	108-10-1	Air	

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	Comments
TO-15 Scan	Acetone	67-64-1	Air	
TO-15 Scan	Acetonitrile	75-05-8	Air	Effective 07/18/18 Chloroethane LOD raised to 0.30ug/m3
TO-15 Scan	Acrolein	107-02-8	Air	
TO-15 Scan	Acrylonitrile	107-13-1	Air	
TO-15 Scan	alpha-Methylstyrene	98-83-9	Air	Not on 75 cmpd List
TO-15 Scan	alpha-Pinene	80-56-8	Air	
TO-15 Scan	Benzene	71-43-2	Air	
TO-15 Scan	Benzyl Chloride	100-44-7	Air	
TO-15 Scan	Bromodichloromethane	75-27-4	Air	
TO-15 Scan	Bromoform	75-25-2	Air	
TO-15 Scan	Bromomethane	74-83-9	Air	
TO-15 Scan	Carbon Disulfide	75-15-0	Air	
TO-15 Scan	Carbon Tetrachloride	56-23-5	Air	
TO-15 Scan	Chlorobenzene	108-90-7	Air	
TO-15 Scan	Chloroethane	75-00-3	Air	Effective 11/06/17 Benzyl Chloride MRL/LOQ raised to 1ug/m3
TO-15 Scan	Chloroform	67-66-3	Air	
TO-15 Scan	Chloromethane	74-87-3	Air	1L Canister MDL/LOD/MRL calculated by dividing by
TO-15 Scan	cis-1,2-Dichloroethene	156-59-2	Air	
TO-15 Scan	cis-1,3-Dichloropropene	10061-01-5	Air	
TO-15 Scan	Cumene	98-82-8	Air	
TO-15 Scan	Cyclohexane	110-82-7	Air	
TO-15 Scan	Cyclohexanone	108-94-1	Air	Not on 75 cmpd List
TO-15 Scan	Dibromochloromethane	124-48-1	Air	
TO-15 Scan	Dichlorodifluoromethane (CFC 12)	75-71-8	Air	
TO-15 Scan	Diisopropyl Ether	108-20-3	Air	Not on 75 cmpd List
TO-15 Scan	d-Limonene	5989-27-5	Air	
TO-15 Scan	Ethanol	64-17-5	Air	
TO-15 Scan	Ethyl Acetate	141-78-6	Air	
TO-15 Scan	Ethyl tert-Butyl Ether	637-92-3	Air	Not on 75 cmpd List
TO-15 Scan	Ethylbenzene	100-41-4	Air	
TO-15 Scan	Hexachlorobutadiene	87-68-3	Air	
TO-15 Scan	Isopropyl Acetate	108-21-4	Air	Not on 75 cmpd List
TO-15 Scan	m,p-Xylenes	179601-23-1	Air	
TO-15 Scan	Methyl Methacrylate	80-62-6	Air	
TO-15 Scan	Methyl tert-Butyl Ether	1634-04-4	Air	
TO-15 Scan	Methylene Chloride	75-09-2	Air	
TO-15 Scan	Naphthalene	91-20-3	Air	
TO-15 Scan	n-Butyl Acetate	123-86-4	Air	
TO-15 Scan	n-Butylbenzene	104-51-8	Air	Not on 75 cmpd List
TO-15 Scan	n-Decane	124-18-5	Air	Not on 75 cmpd List
TO-15 Scan	n-Dodecane	112-40-3	Air	Not on 75 cmpd List
TO-15 Scan	n-Heptane	142-82-5	Air	

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	Comments
TO-15 Scan	n-Hexane	110-54-3	Air	
TO-15 Scan	n-Nonane	111-84-2	Air	
TO-15 Scan	n-Octane	111-65-9	Air	
TO-15 Scan	n-Propylbenzene	103-65-1	Air	
TO-15 Scan	n-Undecane	1120-21-4	Air	Not on 75 cmpd List
TO-15 Scan	o-Xylene	95-47-6	Air	
TO-15 Scan	Propene	115-07-1	Air	Effective 6/25/12 IPA MRL raised to 5.0ug/m3
TO-15 Scan	sec-Butylbenzene	135-98-8	Air	Not on 75 cmpd List
TO-15 Scan	Styrene	100-42-5	Air	
TO-15 Scan	tert-Amyl Methyl Ether	994-05-8	Air	Not on 75 cmpd List
TO-15 Scan	tert-Butylbenzene	98-06-6	Air	Not on 75 cmpd List
TO-15 Scan	Tetrachloroethene	127-18-4	Air	
TO-15 Scan	Tetrahydrofuran (THF)	109-99-9	Air	
TO-15 Scan	Toluene	108-88-3	Air	
TO-15 Scan	trans-1,2-Dichloroethene	156-60-5	Air	
TO-15 Scan	trans-1,3-Dichloropropene	10061-02-6	Air	
TO-15 Scan	Trichloroethene	79-01-6	Air	
TO-15 Scan	Trichlorofluoromethane	75-69-4	Air	
TO-15 Scan	Trichlorotrifluoroethane	76-13-1	Air	
TO-15 Scan	Vinyl Acetate	108-05-4	Air	
TO-15 Scan	Vinyl Chloride	75-01-4	Air	
TO-15 Scan	1,1,1,2-Tetrachloroethane	630-20-6	Air	
TO-15 Scan	1,1-Dichloropropene	563-58-6	Air	
TO-15 Scan	1,1-Difluoroethane	75-37-6	Air	1L Canister MDL/LOD/MRL calculated by dividing by
TO-15 Scan	1,2,3,4-Tetramethylbenzene	488-23-3	Air	
TO-15 Scan	1,2,3,5-Tetramethylbenzene	527-53-7	Air	
TO-15 Scan	1,2,3-Trichlorobenzene	87-61-6	Air	
TO-15 Scan	1,2,3-Trichloropropane	96-18-4	Air	
TO-15 Scan	1,2,4,5-Tetramethylbenzene	95-93-2	Air	
TO-15 Scan	1,3-Dichloropropane	142-28-9	Air	
TO-15 Scan	1-Chloro-1,1-Difluoroethane	75-68-3	Air	
TO-15 Scan	1-Chlorohexane	544-10-5	Air	
TO-15 Scan	2,2-Dichloro-1,1,1-trifluoroethane (CF(	306-83-2	Air	
TO-15 Scan	2,2-Dichloropropane	594-20-7	Air	
TO-15 Scan	2,3-Dimethylpentane	565-59-3	Air	
TO-15 Scan	2-Chlorotoluene	95-49-8	Air	
TO-15 Scan	2-Methylbutane	78-78-4	Air	
TO-15 Scan	2-Methylpentane	107-83-5	Air	
TO-15 Scan	4-Chlorotoluene	106-43-4	Air	
TO-15 Scan	Bromobenzene	108-86-1	Air	
TO-15 Scan	Chlorodifluoromethane (CFC 22)	75-45-6	Air	a max injection volume of 400ml.

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX	Comments
TO-15 Scan	Chloropentafluoroethane	76-15-3	Air	Cmpds not DoD Compliant
TO-15 Scan	Dibromomethane	74-95-3	Air	
TO-15 Scan	Fluorodichloromethane	75-43-4	Air	
TO-15 Scan	Indan	496-11-7	Air	
TO-15 Scan	Indene	95-13-6	Air	
TO-15 Scan	Methyl Acetate	79-20-9	Air	
TO-15 Scan	Methylcyclohexane	108-87-2	Air	
TO-15 Scan	Norflurane (R134a)	811-97-2	Air	
TO-15 Scan	Thiophene	110-02-1	Air	
TO-15 Scan	Vinyl Bromide	593-60-2	Air	
TO-15 Scan (Low Level)	Propene	115-07-1	Air	Effective 6/25/12 IPA MRL raised to 5.0ug/m3
TO-15 Scan (Low Level)	Dichlorodifluoromethane (CFC 12)	75-71-8	Air	Effective 11/06/17 Benzyl Chloride MRL raised to 1ug/m3
TO-15 Scan (Low Level)	Chloromethane	74-87-3	Air	Control Limits Updated 11/28/18; Effective 12/05/18
TO-15 Scan (Low Level)	1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	Air	
TO-15 Scan (Low Level)	Vinyl Chloride	75-01-4	Air	
TO-15 Scan (Low Level)	1,3-Butadiene	106-99-0	Air	
TO-15 Scan (Low Level)	Bromomethane	74-83-9	Air	Bromomethane MRL raised to 0.20ug/m3 10/19/15
TO-15 Scan (Low Level)	Chloroethane	75-00-3	Air	Chloroethane MRL raised to 0.20ug/m3 10/19/15
TO-15 Scan (Low Level)	Ethanol	64-17-5	Air	
TO-15 Scan (Low Level)	Acetonitrile	75-05-8	Air	
TO-15 Scan (Low Level)	Acrolein	107-02-8	Air	
TO-15 Scan (Low Level)	Acetone	67-64-1	Air	
TO-15 Scan (Low Level)	Trichlorofluoromethane	75-69-4	Air	
TO-15 Scan (Low Level)	2-Propanol (Isopropyl Alcohol)	67-63-0	Air	
TO-15 Scan (Low Level)	Acrylonitrile	107-13-1	Air	
TO-15 Scan (Low Level)	1,1-Dichloroethene	75-35-4	Air	
TO-15 Scan (Low Level)	2-Methyl-2-Propanol (tert-Butyl Alcoh	75-65-0	Air	Not on 75 cmpd List
TO-15 Scan (Low Level)	Methylene Chloride	75-09-2	Air	
TO-15 Scan (Low Level)	3-Chloro-1-propene (Allyl Chloride)	107-05-1	Air	
TO-15 Scan (Low Level)	Trichlorotrifluoroethane	76-13-1	Air	
TO-15 Scan (Low Level)	Carbon Disulfide	75-15-0	Air	
TO-15 Scan (Low Level)	trans-1,2-Dichloroethene	156-60-5	Air	
TO-15 Scan (Low Level)	1,1-Dichloroethane	75-34-3	Air	
TO-15 Scan (Low Level)	Methyl tert-Butyl Ether	1634-04-4	Air	
TO-15 Scan (Low Level)	Vinyl Acetate	108-05-4	Air	
TO-15 Scan (Low Level)	2-Butanone (MEK)	78-93-3	Air	
TO-15 Scan (Low Level)	cis-1,2-Dichloroethene	156-59-2	Air	
TO-15 Scan (Low Level)	Diisopropyl Ether	108-20-3	Air	Not on 75 cmpd List
TO-15 Scan (Low Level)	Ethyl Acetate	141-78-6	Air	
TO-15 Scan (Low Level)	n-Hexane	110-54-3	Air	
TO-15 Scan (Low Level)	Chloroform	67-66-3	Air	

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX		Comments
TO-15 Scan (Low Level)	Tetrahydrofuran (THF)	109-99-9	Air		
TO-15 Scan (Low Level)	Ethyl tert-Butyl Ether	637-92-3	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	1,2-Dichloroethane	107-06-2	Air		
TO-15 Scan (Low Level)	1,1,1-Trichloroethane	71-55-6	Air		
TO-15 Scan (Low Level)	Isopropyl Acetate	108-21-4	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	1-Butanol	71-36-3	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	Benzene	71-43-2	Air		
TO-15 Scan (Low Level)	Carbon Tetrachloride	56-23-5	Air		
TO-15 Scan (Low Level)	Cyclohexane	110-82-7	Air		
TO-15 Scan (Low Level)	tert-Amyl Methyl Ether	994-05-8	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	1,2-Dichloropropane	78-87-5	Air		
TO-15 Scan (Low Level)	Bromodichloromethane	75-27-4	Air		
TO-15 Scan (Low Level)	Trichloroethene	79-01-6	Air		
TO-15 Scan (Low Level)	1,4-Dioxane	123-91-1	Air		
TO-15 Scan (Low Level)	2,2,4-Trimethylpentane (Isooctane)	540-84-1	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	Methyl Methacrylate	80-62-6	Air		
TO-15 Scan (Low Level)	n-Heptane	142-82-5	Air		
TO-15 Scan (Low Level)	cis-1,3-Dichloropropene	10061-01-5	Air		
TO-15 Scan (Low Level)	4-Methyl-2-pentanone	108-10-1	Air		
TO-15 Scan (Low Level)	trans-1,3-Dichloropropene	10061-02-6	Air		
TO-15 Scan (Low Level)	1,1,2-Trichloroethane	79-00-5	Air		
TO-15 Scan (Low Level)	Toluene	108-88-3	Air		
TO-15 Scan (Low Level)	2-Hexanone	591-78-6	Air		
TO-15 Scan (Low Level)	Dibromochloromethane	124-48-1	Air		
TO-15 Scan (Low Level)	1,2-Dibromoethane	106-93-4	Air		
TO-15 Scan (Low Level)	n-Butyl Acetate	123-86-4	Air		
TO-15 Scan (Low Level)	n-Octane	111-65-9	Air		
TO-15 Scan (Low Level)	Tetrachloroethene	127-18-4	Air		
TO-15 Scan (Low Level)	Chlorobenzene	108-90-7	Air		
TO-15 Scan (Low Level)	Ethylbenzene	100-41-4	Air		
TO-15 Scan (Low Level)	m,p-Xylenes	179601-23-1	Air		
TO-15 Scan (Low Level)	Bromoform	75-25-2	Air		
TO-15 Scan (Low Level)	Styrene	100-42-5	Air		
TO-15 Scan (Low Level)	o-Xylene	95-47-6	Air		
TO-15 Scan (Low Level)	n-Nonane	111-84-2	Air		
TO-15 Scan (Low Level)	1,1,2,2-Tetrachloroethane	79-34-5	Air		
TO-15 Scan (Low Level)	Cumene	98-82-8	Air		
TO-15 Scan (Low Level)	alpha-Pinene	80-56-8	Air		
TO-15 Scan (Low Level)	n-Propylbenzene	103-65-1	Air		
TO-15 Scan (Low Level)	3-Ethyltoluene	620-14-4	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	4-Ethyltoluene	622-96-8	Air		
TO-15 Scan (Low Level)	1,3,5-Trimethylbenzene	108-67-8	Air		

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

METHOD	ANALYTE	CAS No.	MATRIX		Comments
TO-15 Scan (Low Level)	alpha-Methylstyrene	98-83-9	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	2-Ethyltoluene	611-14-3	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	1,2,4-Trimethylbenzene	95-63-6	Air		
TO-15 Scan (Low Level)	n-Decane	124-18-5	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	Benzyl Chloride	100-44-7	Air		
TO-15 Scan (Low Level)	1,3-Dichlorobenzene	541-73-1	Air		
TO-15 Scan (Low Level)	1,4-Dichlorobenzene	106-46-7	Air		
TO-15 Scan (Low Level)	sec-Butylbenzene	135-98-8	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	4-Isopropyltoluene (p-Cymene)	99-87-6	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	1,2,3-Trimethylbenzene	526-73-8	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	1,2-Dichlorobenzene	95-50-1	Air		
TO-15 Scan (Low Level)	d-Limonene	5989-27-5	Air		
TO-15 Scan (Low Level)	1,2-Dibromo-3-chloropropane	96-12-8	Air		
TO-15 Scan (Low Level)	n-Undecane	1120-21-4	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	1,2,4-Trichlorobenzene	120-82-1	Air		
TO-15 Scan (Low Level)	Naphthalene	91-20-3	Air		
TO-15 Scan (Low Level)	n-Dodecane	112-40-3	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	Hexachlorobutadiene	87-68-3	Air		
TO-15 Scan (Low Level)	Cyclohexanone	108-94-1	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	tert-Butylbenzene	98-06-6	Air	Not on 75 cmpd List	
TO-15 Scan (Low Level)	n-Butylbenzene	104-51-8	Air	Not on 75 cmpd List	

ALS Environmental/SIMI VALLEY DATA QUALITY OBJECTIVES

Method	Analyte	CAS No.	Matrix	MDL	MRL	Units	Accuracy (LCS %Rec.)	Matrix Spike (%Rec.)	Precision (% RPD)
TO-3 Mod	Methane	74-82-8	Air	0.28	1.0	ppm	70-130	NA	15

Abbreviations:

CAS: Chemical Abstracts Service

LCS: Laboratory Control Sample

MDL: Method Detection Limit

MRL: Method Reporting Limit

NA: Not Applicable

No.: Number

ppm: Parts per Million

RPD: Relative Percent Difference