QUALITY ASSURANCE MANUAL

Quality Assurance/Quality Control Policies and Procedures

Pace Analytical Services – Minneapolis
1700 Elm Street SE, Suite 200, Minneapolis, MN 55414
612-607-1700

Pace Analytical Services, Inc. – Montana
150 North 9th Street, Billings, Montana 59101
406-254-7226

Pace Analytical Services, Inc. – Virginia and Duluth
315 Chestnut Street, Virginia, MN 55792
1510 W Superior Street, Duluth, MN 55806
4730 Oneota Street, Duluth, MN 55807
218-735-6700

CORPORATE APPROVAL

Steve A. Vanderboom
President/CEO
1800 Elm Street, Suite 200
Minneapolis, MN 55414 (612) 607-1700

12-11-2015
Date

Richard M. Henson
Corporate Director of Quality
1800 Elm Street, Suite 200
Minneapolis, MN 55414 (612) 607-1700

12/11/2015
Date

MINNEAPOLIS LOCAL APPROVAL

Sarah Cherney
Laboratory Senior General Manager
612-607-6354
12/11/15
Date

Melanie Ollila
Laboratory Senior Quality Manager
612-607-6352
12/10/15
Date

Christine Bremer
Technical Client Services Manager
612-607-6390
12/10/15
Date

Amy Jacobson
Laboratory Specialty Manager
612-607-6450
12/10/15
Date

Keith Sturgeon
Laboratory Specialty Manager
612-607-6449
12/10/15
Date

BILLINGS, MONTANA LOCAL APPROVAL

Rhonda Johnson
Laboratory Services Manager
406-384-0569

12Dec15
Date

VIRGINIA AND DULUTH LOCAL APPROVAL

09 Dec 2015
Date

Deborah Griffiths
Assistant General Manager
218-735-6708

9-Dec-2015
Date

Craig Douglas
Laboratory Supervisor II/Technical Director
218-735-6702

12/9/15
Date

Christine Kelly
Laboratory Analyst II/Technical Director
218-248-0073

Table of Contents

1.0. INTRODUCTION AND ORGANIZATIONAL STRUCTURE

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

1.1. Introduction to PASI

1.1.1. Pace Analytical Services, Inc. (PASI) is a privately held, full-service analytical testing firm operating a nationwide system of laboratories. PASI 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. PASI has implemented a consistent Quality System in each of its laboratories and service centers. In addition, the company utilizes an advanced data management system that is highly efficient and allows for flexible data reporting. Together, these systems ensure data reliability and superior on-time performance. This document defines the Quality System and QA/QC protocols.

1.1.2. Our goal is to combine our expertise in laboratory operations with customized solutions to meet the specific needs of our customers.

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. PASI management is committed to maintaining the highest possible standard of service for our customers by following a documented quality system that is fully compliant with the applicable NELAC, TNI, 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 PASI 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. This daily focus on quality is applied with initial project planning, continued through all field and laboratory activities, and is ultimately included in the final report generation.

1.3.3. PASI management demonstrates its commitment to quality by providing the resources, including facilities, equipment, and personnel to ensure the adherence to these documented policies and procedures and to promote the continuous improvement of the quality system. All PASI personnel must comply with all current applicable state, federal, and industry standards (2003 NELAC Standard, 2009 TNI Standard, ISO/IEC 17025 Standard, etc.), and are required to perform all tests in accordance with stated methods and customer requirements.

1.4. Core Values

1.4.1. **Integrity-** Pace personnel are required to abide by the PASI Code of Ethics and all Pace employees must go through Data Integrity/Ethics training upon initial orientation and as an annual refresher.

1.4.2. **Value Employees-** Pace management views employees as our most important asset and communicates to them the relevance and importance of their activities within their job functions and how they contribute to the achievement of the objectives of the quality management system.

1.4.3. **Know Our Customers-** Pace makes every effort to know our customers and address their sampling and analytical needs. More information on this item can be found in section 2.0.

1.4.4. **Honor Commitments-** Pace labs focus on making solid commitments with regards to quality, capacity, and agreed upon turnaround time to our customers.

1.4.5. **Flexible Response To Demand-** Pace labs are equipped with both the material and personnel resources to enable them to be responsive to the demands of customers when situations or projects need change.

1.4.6. **Pursue Opportunities**- Pace is committed to pursuing opportunities for the growth of the company by constantly exploring markets and areas where we can expand.

1.4.7. **Continuously Improve**- Pace has committed much time and effort into establishing a continuous improvement program where company personnel meet on a regular basis to share ideas in cost reduction, production improvement and standardization in order to develop best practices. This information, as well as company financial and production metrics, are tracked, evaluated, and shared with each Pace facility.

1.5. Code of Ethics

1.5.1. PASI's fundamental ethical principles are as follows:

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

1.5.1.2. Each PASI 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 PASI does business or seeks to do business;

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

1.5.3. 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.

1.5.4. Any Pace employee can contact corporate management to report an ethical concern by calling the anonymous hotline at 612-607-6431.

1.6. Standards of Conduct

1.6.1. **Data Integrity**

1.6.1.1. The accuracy and integrity of the analytical results and its supporting documentation produced at PASI are the cornerstones of the company. Lack of data integrity is an assault on our most basic values putting PASI and its employees at grave financial and legal risk and will not be tolerated. Therefore, 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.

1.6.1.2. 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.

1.6.2. **Confidentiality**

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

1.6.2.2. Confidential or proprietary information, belonging to either PASI 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.

1.6.3. **Conflict of Interest**

1.6.3.1. PASI employees must avoid situations that might involve a conflict of interest or could appear questionable to others. The employee must be careful in two general areas:

1.6.3.1.1. Participation in activities that conflict or appear to conflict with the employees' PASI responsibilities.

1.6.3.1.2. 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. This includes bribes, gifts, kickbacks, or illegal payments.

1.6.3.2. 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.

1.6.4. **Compliance**

1.6.4.1. All employees are required to read, understand, and comply with the various components of the standards listed in this document. As confirmation that they understand their responsibility, each employee is required to sign an acknowledgment form annually that then becomes part of the employee's permanent record. Employees will be held accountable for complying with the Quality Systems as summarized in the Quality Assurance Manual.

1.7. Laboratory Organization

1.7.1. The PASI Corporate Office centralizes company-wide accounting, business development, financial management, human resources development, information systems, marketing, quality,

safety, and training activities. PASI's Director of Quality is responsible for assisting the development, implementation and monitoring of quality programs for the company. See Attachment IIB for the Corporate Organizational structure.

1.7.2. Each laboratory within the system operates with local management, but all labs share common systems and receive support from the Corporate Office.

1.7.3. 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 Quality.

1.7.4. 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 or the Administrative Business Manager at the discretion of the SGM/GM/AGM/OM.

1.7.5. 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.

1.7.6. 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 and Director of Quality will be called in to mediate the situation.

1.7.7. The lab is required to appoint deputies for key managerial personnel. These deputies must be documented for auditing purposes. For DoD labs, key managerial personnel for the local labs are defined as: Lab Director, Technical Managers (e.g., Technical Directors and Section Supervisors), Quality Managers, Support Systems and Administrative Managers (e.g., LIMS Manager, Purchasing Manager, Project Managers), and Customer Service Managers. All of these personnel must have documented deputies for DoD labs.

1.7.8. 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
- HRMS Analysis
- Radiochemical Analysis
- Microbiology

1.7.9. Appropriate support groups are present in each laboratory. The actual organizational structure for PASI – Minneapolis, Billing, Virginia and Duluth are 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 and revise the organizational chart in the Quality Assurance Manual (QAM) within 30 days. For changes in Department Managers or Supervisors or other laboratory personnel, no notifications will be sent to the laboratory's accrediting agencies; changes to the organizational chart will be updated during or prior to the annual review process. Changes or additions in these key personnel will also be noted by additional signatures on the QAM, as applicable. In any case, 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;
- Ensures compliance with all applicable state, federal and industry standards.

1.8.3. Assistant General Manager / Operations Manager

- In the absence of the SGM/GM, performs all duties as listed above for the SGM or GM;
- 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/GM 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.

1.8.4. 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 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 Quality Assurance/Quality Control activities to ensure that the laboratory achieves established standards of quality (as set forth by the Corporate Quality office). The Quality Manager is responsible for reporting the lab's level of compliance to these standards to the Corporate Director of 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 correctives actions;
- Maintains the currency of the Quality Manual.

1.8.5. 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 Quality. They may also report to a Senior Quality Manager within the same facility;
- 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 Quality Assurance/Quality Control activities to ensure that the laboratory achieves established standards of quality (as set forth by the Corporate Quality office). The Quality Manager is responsible for reporting the lab's level of compliance to these standards to the Corporate Director of 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 correctives actions;
- Maintains the currency of the Quality Manual.

1.8.6. Quality Analyst

- Assists the SQM/QM in the performance of quality department responsibilities as delegated by the SQM/QM;
- Assists in monitoring QA/QC data;
- Assists in internal audits;
- Assists in maintaining training records;
- Assists in maintaining the document control system;

1.8.7. 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.

1.8.8. 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.

1.8.9. 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.

1.8.10. Project Manager

- Coordinates daily activities including taking orders, reporting data and analytical results;
- Serves as the primary technical and administrative liaison between customers and PASI;
- 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 PASI 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.

1.8.11. Project Coordinator

- Responsible for preparation of project specifications and provides technical/project support;
- Coordinates project needs with other department sections and assists with proposal preparation;
- Prepares routine proposals and invoicing;
- Responsible for scanning, copying, assembling and binding final reports;
- Other duties include filing, maintaining forms, process outgoing mail, maintaining training database and data entry.

1.8.12. 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.

1.8.13. 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.

1.8.14. 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.

1.8.15. 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.

1.8.16. 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.

1.8.17. 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. 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 Learning Management System. After a new employee has been instructed in matters of human resources, they are given instructional materials for the LMS and a password for access.

1.9.2. A new hire training checklist is provided to the new employee that lists training items for the employee to work through either independently on LMS or with their supervisor or trainer. The training items that can be completed independently include:

- Reading through applicable Standard Operating Procedures;
- Reviewing the Quality Manual and Chemical Hygiene Plan;
- Core training modules such as quality control indicators, basic laboratory skills, etc.;
- Quality Systems training including traceability of measurements, method calibration, calibration verification, accuracy, precision and uncertainty of measurements, corrective actions, documentation, and root cause analysis;
- Data Integrity/Ethics training.

1.9.3. The new employee's Department Supervisor provides the employee with a basic understanding of the role of the laboratory within the structure of PASI and the basic elements of that individual's position. Supervised training uses the following techniques:

- Hands-on training
- Training checklists/worksheets
- Lectures and training sessions
- Method-specific training
- Conferences and seminars
- Short courses
- Specialized training by instrument manufacturers
- Proficiency testing programs.
- On-line courses

1.9.4. Group Supervisors/Leaders are responsible for providing documentation of training and proficiency for each employee under their supervision. The employee’s training file indicates what

procedures an analyst or a technician is capable of performing, either independently or with supervision. The files also include documentation of continuing capability, which are fully detailed in Section 3.4. Training documentation files for each person are maintained by the Quality Office either in hardcopy format or within the LMS.

1.9.5. All procedures and training records are maintained and available for review during laboratory audits. These procedures are reviewed/updated periodically by laboratory management. Additional information can be found in SOP S-ALL-Q-020 **Training and Employee Orientation** or its equivalent revision or replacement.

1.10. Data Integrity System

1.10.1. The data integrity system at PASI provides assurances to management that a highly ethical approach is being applied to all planning, training and implementation of methods. Data integrity is crucial to the success of our company and Pace Analytical is committed to creating and maintaining a culture of quality throughout the organization. To accomplish this goal, PASI has implemented a data integrity system that encompasses the following four requirements:

1.10.1.1. A data integrity training program: standardized training is given to each new employee and a yearly refresher is presented to all employees. Key topics addressed by this training include:

1.10.1.1.1. Need for honesty and transparency in analytical reporting
1.10.1.1.2. Process for reporting data integrity issues
1.10.1.1.3. Specific examples of unethical behavior and improper practices
1.10.1.1.4. Documentation of non-conforming data that is still useful to the data user
1.10.1.1.5. Consequences and punishments for unethical behavior
1.10.1.1.6. Examples of monitoring devices used by management to review data and systems

1.10.1.2. Signed data integrity documentation for all employees: this includes a written quiz following the Ethics training session and written agreement to abide by the Code of Ethics and Standards of Conduct explained in the employee manual.

1.10.1.3. In-depth, periodic monitoring of data integrity including peer data review and validation, internal raw data audits, proficiency testing studies, etc.

1.10.1.4. Documentation of any review or investigation into possible data integrity infractions. This documentation, including any disciplinary actions involved, corrective actions taken, and notifications to customers must be retained for a minimum of five years.

1.10.2. PASI management makes every effort to ensure that personnel are free from any undue pressures that affect the quality of their work including commercial, financial, over scheduling, and working condition pressures.

1.10.3. Corporate management also provides all PASI facilities a mechanism for confidential reporting of data integrity issues that ensures confidentiality and a receptive environment in which all employees are comfortable discussing items of ethical concern. The anonymous message line is monitored by the Corporate Director of Quality who will ensure that all concerns are evaluated and, where necessary, brought to the attention of executive management and investigated. Any Pace employee can contact corporate management to report an ethical concern by calling the anonymous hotline at 612-607-6431.

1.11. Laboratory Safety

1.11.1. It is the policy of PASI to make safety and health 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 corporate Safety Manual and Chemical Hygiene Plan.

1.12. Security and Confidentiality

1.12.1. Security is maintained by controlled access to laboratory buildings. Exterior doors to laboratory buildings remain either locked or continuously monitored by PASI staff. Keyless door lock combinations and computer access codes/logins are changed periodically. Posted signs direct visitors to the reception office and mark all other areas as off limits to unauthorized personnel. All visitors, including PASI 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. The last staff member to leave their department for the day must ensure that all outside access points to that area are secure.

1.12.2. 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. Security of sample storage areas is the responsibility of the Client Services Manager or Sample Management Personnel. Security of samples and data during analysis and data reduction is the responsibility of Group Supervisors. Security of customer report archives is the responsibility of the Client Services Manager. These secure areas are locked whenever these individuals or their designees are not present in the facility.

1.12.3. Access to designated laboratory sample storage locations is limited to authorized personnel only. Provisions for lock and key access are provided. No samples are to be removed without proper authorization. If requested by customer or contract, samples are not to be removed from secure storage areas without filling out an associated internal chain of custody.

1.12.4. Standard business practices of confidentiality are applied to all documents and information regarding customer analyses. Specific protocols for handling confidential documents are described in PASI SOPs. Additional protocols for sample identification by internal laboratory identification numbers only are implemented as required under contract specific Quality Assurance Project Plans (QAPPs).

1.12.5. 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.

1.13. Communications

1.13.1. 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.

1.13.2. 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. Sampling Support

2.1.1. Each individual PASI 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 PASI 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. PASI - Minneapolis, Billings, Virginia and Duluth may provide pick-up and delivery services to their customers when needed.

2.2. Field Services

2.2.1. Pace Analytical has a large Field Services Division which is based in their Minneapolis facility as well as limited field service capabilities in some of our other facilities. Field Services provides comprehensive nationwide service offerings including:

- Stack Testing
- Ambient Air
- CEM Certification Testing
- Air Quality Monitoring
- Onsite Analytical Services- FTIR and GC
- Real-time Process Diagnostic/Optimization Testing
- Wastewater, Groundwater and Drinking Water Monitoring
- Storm Water and Surface Water Monitoring
- Soil and Waste Sampling
- Mobile Laboratory Services

2.2.2. Field Services operates under the PASI 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 Standard Operating Procedures and Procedure Manuals.

2.3. Project Initiation

2.3.1. 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.

2.3.2. The laboratory maintains records of all such reviews, including discussions with customers. Routine analytical project documentation of quotes, notes, dates, initials, and/or recordings is maintained in a project folder by project management. Conditions for new and more complex contracts are determined by the SGM/GM/AGM/OM and sales representatives. Quality Management

is consulted on technical requirements and operations staff provides input on volume capacities. Evidence of these reviews is maintained in the form of awarded Request for Proposals (RFPs), signed quotes or contracts, and a Customer Relationship Management (CRM) database. If a review identifies a potential mismatch between customer requirements and laboratory capabilities and/or capacities, Pace will specify its level of commitment by listing these exceptions to the requirements within the RFP, quote or contract.

2.3.3. Additional information regarding specific procedures for reviewing new work requests can be found in SOP S-MN-Q-270 **Review of Analytical Requests** or its equivalent revision or replacement.

2.4. Chain of Custody

2.4.1. A chain of custody (COC) provides the legal documentation of samples from time of collection to completion of analysis. PASI has implemented Standard Operating Procedures to ensure that sample custody traceability and responsibility objectives are achieved for every project.

2.4.2. Field personnel or client representatives must complete a chain of custody for all samples that are received by the laboratory. The importance of completeness of COCs is stressed to the samplers and is critical to efficient sample receipt and to insure the requested methods are used to analyze the correct samples.

2.4.3. 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.

2.4.4. The sampler is responsible for providing the following information on the chain of custody form:

- Customer project name
- Project location or number
- Field sample number/identification
- Date and time sampled
- Sample matrix
- Preservative
- Requested analyses
- Sampler signature
- Relinquishing signature
- Date and time relinquished
- Sampler remarks as needed
- Custody Seal Number if present
- Regulatory Program Designation
- The state where the samples were collected to ensure all applicable state requirements are met
- Turnaround time requested
- Purchase order number

2.4.5. 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.

2.4.6. Additional information can be found in S-MN-C-001 **Sample Management** or its equivalent revision or replacement.

2.5. Sample Acceptance Policy

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

2.5.2. 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 qualified on the final report.

2.5.2.1. For Ohio VAP samples, the narrative for any report that includes qualified data must also include a discussion of any bias in the results.

2.5.3. All samples must:

- Have unique customer identification that is clearly marked with indelible ink on durable waterproof labels affixed to the sample containers that match the chain of custody.
- Have clear documentation on the chain of custody related to the location of the sampling site with the time and date of sample collection.
- Have the sampler's name and signature.
- Have all requested analyses clearly designated on the COC.
- Have clear documentation of any special analytical or data reporting requirements.
- Be in appropriate sample containers with clear documentation of the preservatives used.
- Be correctly preserved unless the method allows for laboratory preservation.
- Be received within holding time. Any samples with hold times that are exceeded will not be processed without prior customer approval.
- Have sufficient sample volume to proceed with the analytical testing. If insufficient sample volume is received, analysis will not proceed without customer approval.
- Be received within appropriate temperature ranges - not frozen but ≤6°C (See Note 1), unless program requirements or customer contractual obligations mandate otherwise (see Note 2). The cooler temperature is recorded directly on the COC and the SCUR. Samples that are delivered to the laboratory immediately after collection are considered acceptable if there is evidence that the chilling process has been started. For example, by the arrival of the samples on ice. If samples arrive that are not compliant with these temperature requirements, the customer will be notified. The analysis will NOT proceed unless otherwise directed by the customer. If less than 72 hours remain in the hold time for the analysis, the analysis may be started while the customer is contacted to avoid missing the hold time. Data associated with any deviations from the above sample acceptance policy requirements will be appropriately qualified.

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

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: frozen at $\leq 0^{o}$C; frozen at $\leq -10^{o}$C, or cooled $\leq 6^{o}$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).

2.5.4. 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.

2.5.5. Samples for drinking water analysis that are improperly preserved, or are received past holding time, are rejected at the time of receipt, with the exception of VOA samples that are tested for pH at the time of analysis.

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

2.6. Sample Log-in

2.6.1. After sample inspection, all sample information on the chain of custody is entered into the Laboratory Information Management System (LIMS). This permanent record documents receipt of all sample containers including:

- 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

2.6.2. All samples received are logged into the LIMS within one working day of receipt. Sample login may be delayed due to customer clarification of analysis needed, corrective actions for sample receipt non-conformance, or other unusual circumstances. If the time collected for any sample is unspecified and Pace is unable to obtain this information from the customer, the laboratory will use 00:00 as the time sampled. All hold times will be based on this sampling time and qualified accordingly if exceeded.

2.6.3. 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.

2.6.4. The LIMS automatically generates a unique identification number for each sample created in the system. The LIMS sample number follows the general convention of BB-XXXXXX-YYY. The BB represents the laboratory identification within Pace's laboratory network. The 5 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 (e.g. 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.

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

2.6.6. Samples with hold times that are near expiration date/time may be sent directly to the laboratory for analysis at the discretion of the Project Manager and/or SGM/GM/AGM/OM.

2.6.7. Additional information can be found in S-MN-C-001 **Sample Management** or its equivalent revision or replacement.

2.7. Sample Storage

2.7.1. **Storage Conditions**

2.7.1.1. 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.

2.7.1.2. Storage blanks, consisting of two 40mL aliquots of reagent water, are stored with volatile samples and are used to measure cross-contamination acquired during storage. If applicable, laboratories must have documented procedures and criteria for evaluating storage blanks, appropriate to the types of samples being stored.

2.7.1.3. Additional information can be found in S-MN-Q-263 **Monitoring Temperature Controlled Units.**

2.7.2. **Temperature Monitoring**

2.7.2.1. 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.

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

- The temperature is rechecked after 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.
- Documentation is provided on analytical report.

Additional information can be found in S-MN-Q-263 **Monitoring Temperature Controlled Units.**

2.7.3. **Hazardous Materials**

2.7.3.1. Pure product or potentially heavily contaminated samples must be tagged as "hazardous" or "lab pack" and stored separately from other samples.

2.7.4. **Foreign/Quarantined Soils**

2.7.4.1. Depending on the soil disposal practices of the laboratory, foreign soils and soils from USDA regulated areas are adequately segregated to enable proper sample disposal. The USDA requires these samples to be incinerated or sterilized by an approved treatment procedure. Additional information regarding USDA regulations and sample handling can be found in applicable local laboratory SOPs.

2.7.4.2. Additional information on sample storage can be found in S-MN-C-001 **Sample Management** or its equivalent revision or replacement and in S-MN-S-003 **Waste Handling and Management**.

2.8. Sample Protection

2.8.1. PASI laboratory facilities are operated under controlled access protocols to ensure sample and data integrity. Visitors must register at the front desk and be properly escorted at all times.

2.8.2. Samples are removed from storage areas by designated personnel and returned to the storage areas, if necessary, immediately after the required sample quantity has been taken.

2.8.3. Upon customer request, additional and more rigorous chain of custody protocols for samples and data can be implemented. For example, some projects may require internal chain-of-custody protocols.

2.8.4. Additional information can be found in S-MN-C-001 **Sample Management** or its equivalent revision or replacement.

2.9. Subcontracting Analytical Services

2.9.1. Every effort is made to perform all analyses for PASI customers within the laboratory that receives the samples. When subcontracting to a laboratory other than the receiving laboratory, whether inside or outside the PASI 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.

2.9.2. Prior to subcontracting samples to a laboratory outside Pace Analytical, the potential sub-contract laboratory will be pre-qualified by verifying that the subcontractor meets the following criteria:

- All certifications required for the proposed subcontract are in effect,
- Sufficient professional liability and other required insurance coverage is in effect, and

- Is not involved in legal action by any federal, state, or local government agency for data integrity issues and has not been convicted in such investigation at any time during the past 5 years.

2.9.3. The contact and preliminary arrangements are made between the PASI Project Manager and the appropriate subcontract laboratory personnel. The specific terms of the subcontract laboratory agreement include:

- Method of analysis
- Number and type of samples expected
- Project specific QA/QC requirements
- Deliverables required
- Laboratory certification requirement
- Price per analysis
- Turn-around time requirements

2.9.4. Chain-of-custody forms are generated for samples requiring subcontracting to other laboratories. Sample receiving personnel re-package the samples for shipment, create a transfer chain of custody form and record the following information:

- Pace Analytical Laboratory Number
- Matrix
- Requested analysis
- Special instructions regarding turnaround, required detection or reporting limits, or any unusual information known about the samples or analytical procedure.
- Signature in "Relinquished By"

2.9.5. All subcontracted sample data reports are sent to the PASI Project Manager. Pace will provide a copy of the subcontractor's report to the client when requested.

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

2.9.7. Additional information can be found in S-MN-C-004 **Subcontracting Samples** or its equivalent revision or replacement.

2.9.8. 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.

2.10. Sample Retention and Disposal

2.10.1. 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.

- Air canisters are submitted for cleaning upon data validation. Due to media capacity, air canister samples are not retained as standard environmental samples.

2.10.2. Unused portions of samples are retained by each laboratory based on program or customer requirements for sample retention and storage. 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.

2.10.3. 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 PASI to dispose of excess samples, proper arrangements will be made for disposal by an approved contractor.

2.10.4. Additional information can be found in S-MN-S-003 **Waste Handling and Management** and S-MN-C-001 or their equivalent revisions or replacements.

3.0. ANALYTICAL CAPABILITIES

3.1. Analytical Method Sources

3.1.1. PASI 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. The latest valid editions of methodologies are applied from regulatory and professional sources including EPA, ASTM, USGS, NIOSH, Standard Methods, and State Agencies. Section 11 is a representative listing of general analytical protocol references. PASI discloses in writing to its customers and regulatory agencies any instances in which modified methods are being used in the analysis of samples.

3.1.2. In the event of a customer-specific need, instrumentation constraint or regulatory requirement, PASI laboratories reserve the right to use valid versions of methods that may not be the most recent edition available.

3.2. Analytical Method Documentation

3.2.1. The primary form of PASI laboratory documentation of analytical methods is the Standard Operating Procedure (SOP). SOPs contain pertinent information as to what steps are required by an analyst to successfully perform a procedure. The required contents for the SOPs are specified in the company-wide SOP for Preparation of SOPs (S-ALL-Q-001).

3.2.2. The SOPs may be supplemented by other training materials that further detail how methods are specifically performed. This training material will undergo periodic, documented review along with the other Quality System documentation.

3.3. Analytical Method Validation and Instrument Validation

3.3.1. In some situations, PASI 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.

3.3.2. Additional information can be found in SOP S-MN-Q-252 **Method Validation and Modification Studies**, or equivalent replacement.

3.4. Demonstration of Capability (DOC)

3.4.1. Analysts complete an initial demonstration of capability (IDOC) study prior to performing a method or when there is a change in instrument type, personnel, or test method, or at any time that a method has not been performed by the laboratory or analyst in a 12-month period. The mean recovery and standard deviation of each analyte, taken from 4 replicates of a quality control standard is calculated and compared to method criteria (if available) or established laboratory criteria for evaluation of acceptance. Each laboratory maintains copies of all demonstrations of capability, including those that fail acceptance criteria and corresponding raw data for future reference and must document the acceptance criteria prior to the analysis of the DOC. Demonstrations of capability are verified on an annual basis.

3.4.2. For Continuing Demonstrations of Capability, the laboratories may use Performance Testing (PT) samples in lieu of the 4-replicate approach listed above. For methods or procedures that do not lend themselves to the "4-replicate" approach, the demonstration of capability requirements will be specified in the applicable SOP. Drinking Water DOCs must be done at or below the MCL.

3.4.3. Additional information can be found in SOP S-ALL-Q-020 **Training and Employee Orientation** or its equivalent revision or replacement.

3.5. Regulatory and Method Compliance

3.5.1. PASI understands that expectations of our customers commonly include the assumption that laboratory data will satisfy specific regulatory requirements. Therefore PASI attempts to ascertain, prior to beginning a project, what applicable regulatory jurisdiction, agency, or protocols apply to that project. This information is also required on the chain of custody submitted with samples.

3.5.2. PASI makes every effort to detect regulatory or project plan inconsistencies, based upon information from the customer, and communicate them immediately to the customer in order to aid in the decision making process. PASI will not be liable if the customer chooses not to follow PASI recommendations.

3.5.3. It is PASI 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. QUALITY CONTROL PROCEDURES

The method SOPs will define the following criteria in a more detailed procedures for the corrective actions as applicable to each analytical method. Quality control data is analyzed and where they are found to be outside pre-defined criteria, planned action is taken to correct the problem in order to prevent incorrect results from being reported. Quality control samples are to be processed in the same manner as client samples.

4.1. Method Blank

4.1.1. A method blank is used to evaluate contamination in the preparation/analysis system and is processed through all preparation and analytical steps with its associated samples.

4.1.2. A method blank is processed at a minimum frequency of one per preparation batch (see glossary section of this document for further clarification of the definition of batch). In the case of a method that has no separate preparation step, a method blank is processed with no more than 20 samples of a specific matrix performed by the same analyst, using the same method, standards, and reagents.

4.1.3. The method blank consists of a matrix similar to the associated samples that is known to be free of analytes of interest. Method blanks are not applicable for certain analyses, such as pH, conductivity, flash point and temperature.

4.1.4. Each method blank is evaluated for contamination. The source of any contamination is investigated and documented corrective action is taken when the concentration of any target analyte is detected above the reporting limit and is greater than 1/10 of the amount of that analyte found in any associated sample. Some labs, due to client requirements, etc., may have to evaluate their method blanks down to ½ the reporting limit or down to the method detection limit as opposed to the reporting limit itself. 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 considered affected by contamination in a method blank.

4.1.5. 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.

4.1.6. Deviations made from this policy must be approved by the SQM/QM prior to release of the data.

4.1.7. For Ohio VAP projects, the laboratory must minimize the use of qualified data. In the case of method blank having any reportable contamination, the laboratory is required to reanalyze the associated samples with an acceptable method blank if there is sufficient sample remaining. Acceptable method blanks are those that are free of contamination below the reporting limit. The laboratory must make every effort to take the appropriate corrective actions and resolve any

anomalies regarding method blanks for Ohio VAP projects. The narrative for any report that includes qualified data must also include a discussion of any bias in the results.

4.2. Laboratory Control Sample

4.2.1. The Laboratory Control Sample (LCS) is used to evaluate the performance of the entire analytical system including preparation and analysis.

4.2.2. An LCS is processed at a minimum frequency of one per preparation batch. In the case of a method that has no separate preparation step, an LCS will be processed with no more than 20 samples of a specific matrix performed by the same analyst, using the same method, standards, and reagents.

4.2.3. The LCS consists of a matrix similar to the associated samples that is known to be free of the analytes of interest that is then spiked with known concentrations of target analytes.

4.2.4. The LCS contains **all** analytes specified by a specific method or by the customer or regulatory agency, which may include full list of target compounds, with certain exceptions. These exceptions may include analyzing only specific Aroclors when PCB analysis is requested or not spiking with all EPA Appendix IX compounds when a full Appendix IX list of compounds is requested. However, the lab must ensure that all target components in its scope of accreditation 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.

  Note: This is not approved for South Carolina. South Carolina samples must be re-extracted and re-analyzed to report data with no recoveries exceeding limits.

4.2.5. The LCS is evaluated against the method default or laboratory-derived acceptance criteria. For those methods that require laboratory-derived limits, method default control limits may be used until the laboratory has a minimum of 20, but preferably greater than 30, data points from which to derive internal acceptance criteria. Any compound that is outside of these limits is considered to be 'out of control' and must be qualified appropriately. Any associated sample containing an 'out-of-control' compound must either be re-analyzed with a successful LCS or reported with the appropriate data qualifier. When the acceptance criteria for the LCS are exceeded high, and there are associated samples that are non-detects, then those non-detects can be reported with data qualifiers, or when the acceptance criteria are exceeded low, those associated sample results may be reported if they exceed the maximum regulatory limit/decision level with data qualifiers.

4.2.6. 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 less 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: This is not approved for South Carolina. South Carolina samples must be re-extracted and re-analyzed to report data with no recoveries exceeding limits.

4.2.7. 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). 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.

Note: This is not approved for South Carolina. South Carolina samples must be re-extracted and re-analyzed to report data with no recoveries exceeding limits.

4.2.8. Deviations made from this policy must be approved by the SQM/QM prior to release of the data.

4.2.9. For Ohio VAP projects, the laboratory must minimize the use of qualified data. 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 Ohio VAP projects. The narrative for any report that includes qualified data must also include a discussion of any bias in the results.

- For Ohio VAP projects, the MS cannot be used in place of the LCS.

4.2.10. For Department of Defense 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 Department of Defense projects. All LCS failures must be accounted for in project case narratives. See applicable method SOPs for further corrective action.

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

4.3.1. A matrix spike (MS) is used to determine the effect of the sample matrix on compound recovery for a particular method. The information from these spikes is sample or matrix specific and is not used to determine the acceptance of an entire batch unless the MS is actually used as the LCS.

4.3.2. A **Matrix Spike/Matrix Spike Duplicate** (MS/MSD) set is processed at a frequency specified in a particular method or as determined by a specific customer request. This frequency will be specified in the applicable method SOP or customer QAPP. In the absence of such requirements, an MS/MSD set is routinely analyzed once per every 20 samples per matrix per method.

4.3.3. The MS and MSD consist of the sample matrix that is then spiked with known concentrations of target analytes. Laboratory personnel spike customer samples that are specifically designated as MS/MSD samples or, when no designated samples are present in a batch, randomly select samples to spike that have adequate sample volume or weight. Spiked samples are prepared and analyzed in the same manner as the original samples and are selected from different customers if possible.

4.3.4. The MS and MSD contain all analytes specified 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 in its scope of accreditation are included in the spike mixture for the MS/MSD over a two (2) year period.

4.3.5. The MS and MSD are evaluated against the method or laboratory derived criteria. 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.

4.3.6. 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.

4.3.7. Deviations made from this policy must be approved by the SQM/QM prior to release of the data.

4.3.8. For Ohio VAP projects, the laboratory must minimize the use of qualified data. In the case of MS/MSD failures, the laboratory is required to reanalyze the associated samples only when the associated LCS also fails acceptance criteria and if there is sufficient sample remaining. When an LCS is acceptable and the MS results are outside of criteria, and no system anomaly is detected, the samples will be reported with appropriate data qualifiers indicating matrix interference. The laboratory must make every effort to take the appropriate corrective actions and resolve any anomalies regarding LCSs for Ohio VAP projects.

- For Ohio VAP projects MS/MSD are optional and will be directed by the Certified Professional.

4.3.9. For DoD work, each preparation batch of samples must contain an associated MS and MSD (or sample duplicate) using the same matrix collected for the specific DoD project. 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 with the exception of PCB analysis, which is spiked per the method. 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.

4.3.10. For DoD work, the results of all MS/MSD must be evaluated using the same acceptance criteria used for the LCS.

4.4. Sample Duplicate

4.4.1. 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.

- For Ohio VAP projects Sample duplicate is optional and will be directed by the Certified Professional.

4.4.2. The sample and duplicate are evaluated against the method or laboratory derived criteria 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.

4.4.3. Deviations made from this policy must be approved by the SQM/QM prior to release of the data.

4.4.4. For Ohio VAP projects, the laboratory must minimize the use of qualified data. In the case of duplicate samples exceeding the RPD criteria found in applicable analytical SOPs, the laboratory is required to reanalyze the associated sample and duplicate as long as no sampling error was detected if there is sufficient sample remaining. If the sample and duplicate still do not agree, a comment would be made stating there may be sample non-homogeneity. The laboratory must make every effort to take the appropriate corrective actions and resolve any anomalies regarding sample duplicates for Ohio VAP projects. The narrative for any report that includes qualified data must also include a discussion of any bias in the results.

4.5. Surrogates

4.5.1. Surrogates are compounds that reflect the chemistry of target analytes and are typically added to samples for organic analyses to monitor the effect of the sample matrix on compound recovery.

4.5.1.1. Surrogates are added to each customer sample (for applicable organics), method blank, LCS, MS, and calibration standard prior to extraction or analysis. The surrogates are evaluated against the method or laboratory derived acceptance criteria or against project-specific acceptance criteria specified by the client, if applicable. 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 systematic error. An exception to this would be samples that have high surrogate values but no reportable hits for target compounds. These samples would be reported, with a qualifier, because the implied high bias would not affect the final results. For methods with multiple surrogates, documentation regarding acceptance and associated compounds will be found in the individual method SOPs.

4.5.1.2. For Ohio VAP samples, the narrative for any report that includes qualified data must also include a discussion of any bias in the results.

4.5.1.3. For the TO-15 method, surrogates are not evaluated for Ohio VAP samples.

4.5.2. Deviations made from this policy must be approved by the SQM/QM prior to release of the data.

4.6. Internal Standards

4.6.1. Internal Standards are method-specific analytes added to every standard, method blank, laboratory control sample, matrix spike, matrix spike duplicate, sample, and calibration standard at a known concentration, prior to analysis for the purpose of adjusting the response factor used in quantifying target analytes. At a minimum, the laboratory will follow method specific guidelines for the treatment of internal standard recoveries as they are related to the reporting of data. Deviations made from this policy must be approved by the SQM/QM prior to release of the data.

4.6.2. For Ohio VAP projects, samples with internal standard that are outside of method criteria must be reanalyzed to confirm sample matrix effect. The laboratory must make every effort to take the appropriate corrective actions and resolve any anomalies regarding internal standards for Ohio VAP projects. The narrative for any report that includes qualified data must also include a discussion of any bias in the results.

4.7. Field Blanks

4.7.1. Field blanks are blanks prepared at the sampling site in order to monitor for contamination that may be present in the environment where samples are collected. These field quality control samples are often referenced as field blanks, rinsate blanks, or equipment blanks. The laboratory analyzes these field blanks as normal samples and informs the customer if there are any target compounds detected above the reporting limits.

4.8. Trip Blanks

4.8.1. Trip blanks are blanks that originate from the laboratory as part of the sampling event and are used to monitor for contamination of samples during transport. These blanks accompany the empty sample containers to the field and then accompany the collected samples back to the laboratory. These blanks are routinely analyzed for volatile methods where ambient background contamination is likely to occur.

4.9. Limit of Detection (LOD)

4.9.1. PASI laboratories are required to use a documented procedure to determine a limit of detection for each analyte of concern in each matrix reported. All sample processing steps of the preparation and analytical methods are included in this determination including any clean ups. For any test that does not have a valid LOD, sample results below the limit of quantitation (LOQ) cannot be reported.

4.9.2. The LOD is initially established for the compounds of interest for each method in a clean matrix with no target analytes present and no interferences at a concentration that would impact the results. The LOD is then determined every time there is a change in the test method that affects how the test is performed or when there has been a change in the instrument that affects the sensitivity. If required by customer, method or accreditation body, the LOD will be re-established annually for all applicable methods.

4.9.3. Unless otherwise noted, the method used by PASI laboratories to determine LODs is based on the Method Detection Limit (MDL) procedure outlined in 40 CFR Part 136, Appendix B. Where required by regulatory program or customer, the above referenced procedure will be followed.

4.9.4. Where specifically stated in the published method, LODs or MDLs will be performed at the listed frequency.

4.9.5. The validity of the LOD must be shown by detection (a value above zero) of the analytes in a QC sample in each quality system matrix. The QC sample must contain the analyte at no more than 3X the LOD for a single analyte test and 4X the LOD for multiple analyte tests. This verification must be performed on each instrument used for sample analysis and reporting of data. The validity of the LOD must be verified as part of the LOD determination process. This verification must be done prior to the use of the LOD for sample analysis.

4.9.6. An LOD study is not required for any analyte for which spiking solutions or quality control samples are not available such as temperature.

4.9.7. The LOD, if required, shall be verified annually for each quality system matrix, technology and analyte. In lieu of performing full LOD (MDL) studies annually, the laboratory can verify the LOD (MDL) on an annual basis, providing this verification is fully documented and does not contradict other customer or program requirements that the laboratory must follow. The requirements of this verification are:

- The spike concentration of the verification must be no more than 3X times the LOD for single analyte tests and 4X the LOD for multiple analyte tests.
- The laboratory must verify the LOD on each instrument used for the reporting of sample data.
- The laboratory must be able to identify all target analytes in the verification standard (distinguishable from noise).

4.9.8. For Ohio VAP projects, a valid MDL must be in place prior to sample analysis. MDLs must be spiked at or below the reporting limit and will not be accepted if it was spike higher than the reporting limit.

4.9.9. 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%.

4.9.10. Additional information can be found in SOP S-MN-Q-269 **Determination of LOD and LOQ** or its equivalent revision or replacement.

4.10. Limit of Quantitation (LOQ)

4.10.1. A limit of quantitation (LOQ) for every analyte of concern must be determined. For PASI laboratories, this LOQ is referred to as the RL, or Reporting Limit. This RL is based on the lowest calibration standard concentration that is used in each initial calibration. Results below this level are not allowed to 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 out below the LOQ but above the LOD if they are properly qualified (e.g., J flag).

4.10.2. The LOQ must be higher than the LOD.

4.10.3. To verify the LOQ, the laboratory will prepare a sample in the same matrix used for the LCS. The sample will be spiked with each target analyte at a concentration equivalent to the RL or 2X the RL. This sample must undergo the routine sample preparation procedure including any routine sample cleanup steps. The sample is then analyzed and the recovery of each target analyte determined. The recovery for each target analyte must meet the laboratories current control limits for an LCS. The annual LOQ verification is not required if the LOD was determined or verified annually on that instrument.

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

4.10.5. Additional information can be found in SOP S-MN-Q-269 **Determination of LOD and LOQ** or its equivalent revision or replacement.

4.11. Estimate of Analytical Uncertainty

4.11.1. PASI 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, PASI laboratories base this estimation on the recovery data obtained from the Laboratory Control Spikes. 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-MN-Q-255 **Estimation of Measurement Uncertainty** or its equivalent revision or replacement.

4.11.2. 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.

4.12. Proficiency Testing (PT) Studies

4.12.1. PASI laboratories participate in the TNI defined proficiency testing program. PT samples are obtained from TNI and state regulatory approved providers and analyzed and reported at a minimum of two times per year for the relevant fields of testing per matrix.

4.12.2. The laboratory initiates an investigation whenever PT results are deemed 'unacceptable' 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 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.

4.12.3. PT samples are treated as typical customer samples, utilizing the same staff, methods, equipment, facilities, and frequency of analysis. PT samples are included in the laboratory's normal analytical processes and do not receive extraordinary attention due to their nature.

4.12.4. Comparison of analytical results with anyone participating in the same PT study is prohibited prior to the close of the study.

4.12.5. Additional information can be found in SOP S-MN-Q-258 **Proficiency Testing Program** or its equivalent revision or replacement.

4.13. Rounding and Significant Figures

4.13.1. In general, the PASI laboratories report data to no more than three significant digits. 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.

4.13.2. Data is compared to the reporting limits and MDLs to determine if qualifiers are needed before the rounding step occurs.

4.13.3. **Rounding:** PASI- Minneapolis, Billings, Virginia and Duluth follow 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).

4.13.4. **Significant Digits**

4.13.4.1. PASI- Minneapolis, Billings, Virginia and Duluth follow 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 digits
Values ≤ 10 – Reported to 2 significant digits

4.14. Retention Time Windows

4.14.1. 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.

4.14.2. One process for the production of retention time windows: Make 3 injections of all single component or multi-component analytes over a 72-hour period. Record the retention time in minutes for each analyte and surrogate to 3 decimal places. Calculate the mean and standard deviation of the three absolute retention times for each target analyte and surrogate. For multi-component analytes, choose 3-5 major peaks and calculate the mean and standard deviation for each of the peaks. If the standard deviation of the retention times of a target analyte is 0.000, the lab may use a default standard deviation of 0.01. The width of the retention time window for each analyte and surrogate and major peak in a multi-component analyte is defined as +/- 3 times the standard deviation of the mean absolute retention time established during that 72-hour period or 0.03 minutes, whichever is greater.

4.14.3. The center of the retention time window is established for each analyte and surrogate by using the absolute retention times from the CCV at the beginning of the analytical shift. For samples run with an initial calibration, use the retention time of the mid-point standard of the initial calibration curve.

4.14.4. For more information, please reference the local facility's analytical SOPs.

5.0. DOCUMENT MANAGEMENT AND CHANGE CONTROL

5.1. Document Management

5.1.1. Additional information can be found in SOP S-MN-Q-258 **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.

5.1.2. Pace Analytical Services, Inc. has an established procedure for managing documents that are part of the quality system. The list of managed documents includes, but is not limited to, Standard Operating Procedures (both technical and non-technical), Quality Assurance Manuals, quality policy statements, training documents, work-processing documents, charts, posters, memoranda, notices, forms, software, and any other procedures, tables, plans, etc. that have a direct bearing on the quality system (including applicable data records and non-technical documents).

5.1.3. A master list of all managed documents is maintained at each facility identifying the current revision status and distribution of the controlled documents. This establishes that there are no invalid or obsolete documents in use in the facility. All documents are reviewed periodically and revised if necessary. Obsolete documents are systematically discarded or archived for audit or knowledge preservation purposes. Copies of all quality systems documentation provided to DoD for review must be in English.

5.1.4. 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-MN-Q-258 **Document Numbering**.

5.1.5. SOPs, specifically, are available to all laboratory staff via the Learning Management System (LMS) which is a secure repository that is accessed through an internet portal. As a local alternative to the hard copy system of controlled documents, secured electronic copies of controlled documents may be maintained on the laboratory's local server. These document files must be read-only for all personnel except the Quality Department and system administrator. Other requirements for this system are as follows:

- Electronic documents must be readily accessible to all facility employees.
- Electronic documents must be locked from printing. All hardcopy SOPs must be obtained from the Quality Department.

5.1.6. **Quality Assurance Manual (QAM):** The Quality Assurance Manual is the company-wide document that describes all aspects of the quality system for PASI. The base QAM template is distributed by the Corporate 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 Quality for review. Once approved and signed by both the CEO and the Director of Quality; the SGM/GM/AGM/OM, the SQM/QM, and any Technical Directors 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 by all of the PASI SQMs/QMs and revised accordingly by the Director of Quality.

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

5.1.7.1. SOPs fall into two categories: company-wide documents and facility specific documents. Company-wide SOPs start with the prefix S-ALL- and local SOPs start with the individual facility prefix.

5.1.7.2. The purpose of the company-wide SOPs is to establish policies and procedure that are common and applicable to all PASI facilities. Company-wide SOPs are document-controlled by the corporate quality office and signed copies are distributed to all of the SQMs/QMs. The local management personnel sign the company-wide SOPs. The SQM/QM is then in charge of distribution to employees, external customers, or regulatory agencies and maintaining a distribution list of controlled document copies.

5.1.7.3. Local PASI facilities are responsible for developing facility-specific SOPs applicable to their respective facility. The local facility develops these facility-specific SOPs based on the corporate-wide SOP template. This template is written to incorporate a set of minimum method requirements and PASI best practice requirements. The local facilities may add to or modify the corporate-wide SOP template provided there are no contradictions to the minimum method or best practice requirements. Facility-specific SOPs are controlled by the applicable SQM/QM according to the corporate document management policies.

5.1.7.4. 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.

5.1.7.5. 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 PASI employees use the most current version of each SOP and provides the SQM/QM with a historical record of each SOP.

5.1.7.6. Additional information can be found in SOP S-MN-Q-273 **Preparation of SOPs** or its equivalent revision or replacement.

5.1.7.7. For Ohio VAP certification, it is required by the Ohio Administrative Code that the laboratory must seek Ohio VAP review and approval of all SOPs and Quality Manual subsequent modifications prior to implementation.

5.1.7.8. 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.

5.2. Document Change Control

5.2.1. 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. Copies may be kept for audit or knowledge preservation purposes.

5.2.2. All controlled copies of the previous document are replaced with controlled 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.

5.3. Management of Change

5.3.1. The process for documenting necessary changes within the laboratory network are not typically handled using the corrective or preventive action system as outlined in section 9.0. Management of Change is a proactive approach to dealing with change to minimize the potential negative impact of systematic change in the laboratory and to ensure that each change has a positive desired outcome. This process will primarily be used for the implementation of large scale projects and information system changes as a means to apply consistent systems or procedures within the laboratory network. The request for change is submitted by the initiator and subsequently assigned to an individual or team for development and planning. The final completion of the process culminates in final approval and verification that the procedure was effectively implemented. Additional information can be found in SOP S-MN-Q-257 **Management of Change** or its equivalent revision or replacement.

6.0. EQUIPMENT AND MEASUREMENT TRACEABILITY

Each PASI facility is equipped with sufficient instrumentation and support equipment to perform the relevant analytical testing or field procedures performed by each facility. Support equipment includes chemical standards, thermometers, balances, disposable and mechanical pipettes, etc. This section details some of the procedures necessary to maintain traceability and to perform proper calibration of instrumentation and support equipment. See Attachment III for a list of equipment currently used at the (Minneapolis, Billings, Virginia and Duluth) PASI facility.

6.1. Standards and Traceability

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

6.1.2. 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.

6.1.3. 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 PASI 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.

6.1.4. All prepared standard or reagent containers include the PASI identification number, the standard or chemical name, the date of preparation, the date of expiration, the concentration with units, and the preparer's initials. This ensures traceability back to the standard preparation logbook or database.

6.1.5. For containers that are too small to accommodate labels that list all of the above information associated with a standard, the minimum required information will be PASI standard ID, concentration, and expiration date. This assures that no standard will be used past its assigned expiration date.

6.1.6. If a second source standard is required to verify an existing calibration or spiking standard, this standard must be obtained from a different manufacturer or from a different lot unless client specific QAPP requirements state otherwise.

6.1.7. Additional information concerning standards and reagent traceability can be found in the SOP S-MN-Q-275 **Standard and Reagent Management and Traceability** or its equivalent revision or replacement.

6.2. General Analytical Instrument Calibration Procedures (Organic and Inorganic)

6.2.1. All support equipment and instrumentation are calibrated or checked before use to ensure proper functioning and verify that the laboratory's 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.

6.2.2. 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. Any specific method requirement for number and type of calibration standards supersedes the general requirement. Instrument and method specific calibration criteria are explained within the specific analytical standard operating procedures for each facility.

- For Ohio VAP projects, samples must be reanalyzed to obtain results within the linear range unless there is insufficient sample volume for reanalysis

6.2.3. Results from all calibration standards analyzed must be included in constructing the calibration curve with the following exceptions:

6.2.3.1. The lowest level calibration standard may be removed from the calibration as long as the remaining number of concentration levels meets the minimum established by the method and standard operating procedure. For multi-parameter methods, this may be done on an individual analyte basis. The reporting limit must be adjusted to the lowest concentration included in the calibration curve;

6.2.3.2. The highest level calibration standard may be removed from the calibration as long as the remaining number of concentration levels meets the minimum established by the method and standard operating procedure. For multi-parameter methods, this may be done an individual analyte basis. The upper limit of quantitation must be adjusted to the highest concentration included in the calibration curve;

6.2.3.3. Multiple points from either the high end or the low end of the calibration curve may be excluded as long as the remaining points are contiguous in nature and the minimum number of levels remains as established by method or standard operating procedure. The reporting limit or quantitation range, whichever is appropriate, must be adjusted accordingly;

6.2.3.4. Results from a concentration level between the lowest and highest calibration levels can only be excluded from an initial calibration curve for a documentable and acceptable cause with approval from the responsible department supervisor and the local SQM/QM or their designee. An acceptable cause is defined as an obvious sample introduction issue that resulted in no response, documentation of an incorrectly prepared standard, or a documented response of a single standard that is greater than 2X the difference from the expected value of that standard. The results for all analytes are to be excluded and the point must be replaced by re-analysis. Re-analysis of this interior standard must occur within the same method specified tune time period for GC/MS methodologies and within 8 hours of the initial analysis of that standard for non-GC/MS methodologies. All samples analyzed prior to the re-analyzed calibration curve point must be re-analyzed after the calibration curve is completed and re-processed against the final calibration curve.

6.2.4. 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.

6.2.5. 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.

6.2.6. 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.

6.2.7. **General Organic Calibration Procedures**

6.2.7.1. Calibration standards are prepared at a minimum of five concentrations for organic analyses (unless otherwise stipulated in the method).

6.2.7.2. Initial calibration curves are evaluated against appropriate statistical models as required by the analytical methods. Curves that do not meet the appropriate criteria require corrective action that may include re-running the initial calibration curve. Rounding to meet initial calibration criteria is not allowed, that is, 15.3 cannot be rounded down to meet a $\leq$ 15% RSD requirement. This also applies to linear and non-linear fit requirements. All initial calibrations are verified with an initial calibration verification standard (ICV) obtained from a second manufacturer or second lot from the same manufacturer if that lot can be demonstrated as prepared independently from other lots prior to the analysis of samples. Sample results are quantitated from the initial calibration unless otherwise required by regulation, method, or program.

6.2.7.3. The calibration curve is periodically verified by the analysis of a mid-level continuing calibration verification (CCV) standard during the course of sample analysis. This standard is from the same source as the initial calibration unless otherwise specified in the source method to be from an alternate source material. Rounding to meet continuing calibration criteria is not allowed. Continuing calibration verification is performed at the beginning and end of each analytical batch except if an internal standard is used, then only one verification at the beginning of the batch is needed, whenever it is expected that the analytical system may be out of calibration, if the time period for calibration has expired, or for analytical systems that have specific calibration verification requirements. This verification standard must meet acceptance criteria in order for sample analysis to proceed.

6.2.7.4. In the event that the CCV does not meet the acceptance criteria, a second CCV may be injected as part of the diagnostic evaluation and corrective action investigation. If the second CCV is acceptable, the analytical sequence may be continued. If both CCVs fail, the analytical sequence is terminated and corrective action is initiated. Sample analysis cannot begin until after documented corrective action has been completed and either two consecutive passing CCVs have been analyzed or the instrument has successfully passed a new initial calibration. All samples analyzed since the last compliant CCV are re-analyzed for methodologies utilizing external calibration.

6.2.7.4.1. For DoD labs: the lab must re-analyze CCVs and all samples analyzed since the last successful calibration verification. If re-analysis is not possible, the lab must notify the client

prior to reporting data associated with a non-compliant CCV. If these data are reported, the data must be qualified and explained in the case narrative. If the lab routinely analyzes two CCVs, then both CCVs must be evaluated. If either CCV fails, the lab must perform all required corrective actions and re-analyze all samples since the last acceptable calibration verification.

6.2.7.5. When instruments are operating unattended, autosamplers may be programmed to inject consecutive CCVs as a preventative measure against CCV failure with no corrective action. In this case, both CCVs must be evaluated to determine potential impact to the results. A summary of the decision tree and necessary documentation are listed below:

- If both CCVs meet the acceptance criteria, the analytical sequence is allowed to continue without corrective action. The method specified clock begins with the injection of the second CCV.
- If the first CCV does not meet the acceptance criteria and the second CCV is acceptable, the analytical sequence is continued and the results are reported.
- If the first CCV meets the acceptance criteria and the second CCV is out of control, the samples after the out of control CCV must be re-analyzed in a compliant analytical sequence.
- If both CCVs are out of control, all samples since the last acceptable CCV must be re-analyzed in a compliant analytical sequence.

6.2.7.6. Some analytical methods require that samples be bracketed by passing CCVs analyzed both before and after the samples. This is specific to each method but, as a general rule, all external calibration methods require bracketing CCVs. Most internal standard calibrations do not require bracketing CCVs.

6.2.7.7. Some analytical methods require verification based on a time interval; some methods require a frequency based on an injection interval. The type and frequency of the calibration verifications is dependent on both the analytical method and possibly on the quality program associated with the samples. The type and frequency of calibration verification will be documented in the method specific SOP employed by each laboratory.

6.2.8. General Inorganic Calibration Procedures

6.2.8.1. The instrument is initially calibrated with standards at multiple concentrations to establish the linearity of the instrument's response. A calibration blank is also included. Initial calibration curves are evaluated against appropriate statistical models as required by the analytical methods. Rounding to meet initial calibration criteria is not allowed. This also applies to linear and non-linear fit requirements. The number of calibration standards used depends on the specific method criteria or customer project requirements, although normally a minimum of three standards is used.

6.2.8.2. The ICP and ICP/MS can be standardized with a zero point and a single point calibration if:

- Prior to analysis, the zero point and the single point calibration are analyzed and a linear range has been established,
- Zero point and single point calibration standards are analyzed with each batch
- A standard corresponding to the LOQ is analyzed with the batch and meets the established acceptance criteria
- The linearity is verified at the frequency established by the method or manufacturer.

6.2.8.3. All initial calibrations are verified with an initial calibration verification standard (ICV) obtained from a second manufacturer or second lot from the same manufacturer if the lot can be demonstrated as prepared independently from other lots prior to the analysis of samples. Sample results are quantitated from the initial calibration unless otherwise required by regulation, method, or program.

6.2.8.4. During the course of analysis, the calibration curve is periodically verified by the analysis of calibration verification standards (CCV). A calibration verification standard is analyzed within each analytical batch at method/program specific intervals to verify that the initial calibration is still valid. The CCV is also analyzed at the end of the analytical batch.

6.2.8.5. A calibration blank is also run with each calibration verification standard to verify the cleanliness of the system. All reported results must be bracketed by acceptable CCVs. Instrument and method specific calibration acceptance criteria are explained within the specific analytical standard operating procedures for each facility.

6.2.8.6. Interference check standards are also analyzed per method requirements and must meet acceptance criteria for metals analyses.

6.3. Support Equipment Calibration Procedures

6.3.1. All support equipment is calibrated or verified at least annually using NIST traceable references over the entire range of use. The results of calibrations or verifications must be within the specifications required or the equipment will be removed from service until repaired. The laboratory maintains records to demonstrate the correction factors applied to working thermometers.

6.3.2. On each day the equipment is used, balances, ovens, refrigerators (those used to keep samples and standards at required temperatures), freezers, and water baths are checked in the expected use range with NIST traceable references in order to ensure the equipment meets laboratory specifications and these checks are documented appropriately.

6.3.3. **Analytical Balances**

6.3.3.1. 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 Quality department.

6.3.4. **Thermometers**

6.3.4.1. 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.

6.3.4.2. Working thermometers are compared with the reference thermometers annually according to corporate metrology procedures. 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.

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

6.3.5. **pH/Electrometers**

6.3.5.1. The meter is calibrated before use each day, using fresh buffer solutions. See the analytical method SOP for more specific information.

6.3.6. **Spectrophotometers**

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

6.3.7. **Mechanical Volumetric Dispensing Devices**

6.3.7.1. 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.

6.3.7.2. Additional information regarding calibration and maintenance of laboratory support equipment can be found in SOP S-MN-Q-264 **Support Equipment** or its equivalent revision or replacement.

6.4. Instrument/Equipment Maintenance

6.4.1. 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.

6.4.2. 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.

6.4.3. To minimize downtime and interruption of analytical work, preventative maintenance is 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.

6.4.4. 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.

6.4.5. 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

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

6.4.7. 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.

6.4.8. 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.

7.0. 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 well-defined, well-documented multi-tier review process prior to being reported to the customer. This section describes procedures used by PASI for translating raw analytical data into accurate final sample reports as well as PASI data storage policies.

7.1. Analytical Results Processing

7.1.1. When analytical, field, or product testing data is generated, it is either recorded in a bound laboratory logbook (e.g., Run log or Instrument log) or copies of computer-generated printouts that are appropriately labeled and filed. These logbooks and other laboratory records are kept in accordance with each facility's Standard Operating Procedure for documentation storage and archival. If the laboratory chooses to minimize or eliminate its paper usage, these records can be kept on electronic media. In this case, the laboratory must ensure that there are sufficient redundant electronic copies so no data is lost due to unforeseen computer issues.

7.1.2. The primary analyst is responsible for initial data reduction and 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 and LIMS fields.

7.1.3. The primary analyst then compiles the initial data package for verification. This compilation must include sufficient documentation for data review. It may include standard calibrations, chromatograms, manual integration documentation, electronic printouts, chain of custody forms, and logbook copies.

7.1.4. Some agencies or customers require different levels of data reporting. For these special levels, the primary analyst may need to compile additional project information, such as initial calibration data or extensive spectral data, before the data package proceeds to the verification step.

7.2. Data Verification

7.2.1. Data verification 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.

7.2.2. Analysts performing the analysis and subsequent data reduction have primary responsibility for quality of the data produced. The primary analyst initiates the data verification process by reviewing and accepting the data, provided QC criteria have been met for the samples being reported. Data review checklists, either hardcopy or electronic, are used to document the data review process. The primary analyst is responsible for the initial input of the data into the LIMS. The primary analyst and reviewer must be clearly identified on all applicable data review checklists.

7.2.3. The completed data package is then sent to a designated qualified reviewer (this cannot be the primary analyst). The following criteria have been established to qualify someone as a data reviewer. To perform secondary data review, the reviewer must:

7.2.3.1. Have a current Demonstration of Capability (DOC) study on file and have an SOP acknowledgement form on file for the method/procedure being reviewed; or, See Note

7.2.3.2. Have a DOC on file for a similar method/technology (i.e., GC/MS) and have an SOP acknowledgment form on file for the method/procedure being reviewed; or, See Note

7.2.3.3. Supervise or manage a Department and have an SOP acknowledgment form on file for the method/procedure being reviewed; or,

7.2.3.4. Have significant background in the department/methods being reviewed through education or experience and have an SOP acknowledgment form on file for the method/procedure being reviewed.

7.2.4. **Note:** Secondary reviewer status must be approved personally by the SQM/QM or SGM/GM/AGM/OM in the event that this person has no prior experience on the specific method or general technology.

7.2.5. This 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.

7.2.6. Once the data have been technically reviewed and approved, authorization for release of the data from the analytical section is indicated by initialing and dating the data review checklist or otherwise initialing and dating the data (or designating the review of data electronically). The Operations or Project Manager examines the report for method appropriateness, detection limits and QC acceptability. Any deviations from the referenced methods are checked for documentation and validity, and QC corrective actions are reviewed for successful resolution. Alternately, final reports can be set to auto email to the client after the analytical results are final and have been run through the Data Checker program for errors. These are set up on a case-by-case basis.

7.2.7. Additional information regarding data review procedures can be found in SOP S-MN-L-132 **Data Review** or its equivalent revision or replacement, as well as in SOP S-MN-Q-214 **Manual Integration** or its equivalent revision or replacement.

7.2.8. The Data Checker program will process validated data for a given project against a set of pre-determined requirements and known chemistry relationships. The program creates a report that includes a series of warnings and errors for any requirement or condition determined to be suspect or incorrect. These warnings and error counts are displayed on the "Project Inquiry by Client" screen and on the final Data Checker reports. For projects that have any number of warnings or errors, the Data Checker report will provide a message that identifies the source and condition of the error or warning.

7.2.9. 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 S-MN-Q-271 (or equivalent replacement), **Audits and Inspections**, for full Quality department final report and raw data review requirements.

7.3. Data Reporting

7.3.1. Data for each analytical fraction pertaining to a particular PASI 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.

7.3.2. 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 PASI final report consists of the following components:

7.3.2.1. A title which designates the report as “Final Report”, “Laboratory Results”, “Certificate of Results”, etc.;

7.3.2.2. Name and address of laboratory (or subcontracted laboratories, if used);

7.3.2.3. Phone number and name of laboratory contact to where questions can be referred;

7.3.2.4. A unique identification number for the report. The pages of the report shall be numbered and a total number of pages shall be indicated;

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

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

7.3.2.7. Identification of any sample that did not meet acceptable sampling requirements of the relevant governing agency, such as improper sample containers, holding times missed, sample temperature, etc.;

7.3.2.8. Date and time of collection of samples, date of sample receipt by the laboratory, dates of sample preparation and analysis, and times of sample preparation and analysis when the holding time for either is 72 hours or less;

7.3.2.9. Identification of the test methods used;

7.3.2.10. Identification of sampling procedures if sampling was conducted by the laboratory;

7.3.2.11. Deviations from, additions to, or exclusions from the test methods. These can include failed quality control parameters, deviations caused by the matrix of the sample, etc., and can be shown as a case narrative or as defined footnotes to the analytical data;

7.3.2.12. Identification of whether calculations were performed on a dry or wet-weight basis;

7.3.2.13. Reporting limits used;

7.3.2.14. Final results or measurements, supported by appropriate chromatograms, charts, tables, spectra, etc.;

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

7.3.2.16. Date report was issued;

7.3.2.17. 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;

7.3.2.18. If necessary, a statement indicating that the report must not be reproduced except in full, without the written approval of the laboratory;

7.3.2.19. Identification of all test results provided by a subcontracted laboratory or other outside source;

7.3.2.20. Identification of results obtained outside of quantitation levels.

In addition to the requirements listed above, final reports shall also contain the following items when necessary for the interpretation of results:

7.3.2.21. Deviations from, additions to, or exclusions from the test method, and information on specific test conditions, such as environmental conditions;

7.3.2.22. Where relevant, a statement of compliance/non-compliance with requirements and/or specifications (e.g., the TNI standard);

7.3.2.23. Where applicable, a statement on the estimated uncertainty of measurement; information on uncertainty is needed in test reports when it is relevant to the validity or application of the test results, when a customer's instruction so requires, or when the uncertainty affects compliance to a specification limit;

7.3.2.24. Where appropriate and needed, opinions and interpretations, which may include opinions on the compliance/non-compliance of the results with requirements, fulfillment of contractual requirements, recommendations on how to use the results, and guidance to be used for improvement;

7.3.3. Additional items may be required per Client QAPPs or different state regulations. Ohio VAP requires an Affidavit that must summarize if there are any exceptions to what has been reported, this includes, but is not limited to, itemizing any analytes that the laboratory is not approved for under the VAP program. Any analytes reported that are not part of a scope of accreditation or approval program must be clearly indicated on the final report and associated paperwork such as an Affidavit.

7.3.4. For DoD labs, in reference to item 7.3.2.8 listed above, 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.

7.3.5. 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. When possible, the PASI facility will provide electronic data deliverables (EDD) as required by contracts or upon customer request.

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

7.3.7. The following positions are the only approved signatories for PASI final reports:

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

7.4. Data Security

7.4.1. 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 PASI facility.

7.5. Data Archiving

7.5.1. All records compiled by PASI are maintained legible and retrievable and stored secured in a suitable 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. These records may include, but are not limited to, customer data reports, calibration and maintenance of equipment, raw data from instrumentation, quality control documents, observations, calculations, and logbooks. These records are retained in order to provide for possible historical reconstruction including sampling, receipt, preparation, analysis, and personnel involved. 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.

7.5.2. Records that are computer generated have either a hard copy or electronic write protected 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.

7.5.3. In the event of a change in ownership, accountability or liability, reports of analyses performed pertaining to accreditation will be maintained by the acquiring entity for a minimum of five years. In the event of bankruptcy, laboratory reports and/or records will be transferred to the customer and/or the appropriate regulatory entity upon request.

7.6. Data Disposal

7.6.1. 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.

7.6.2. For Ohio VAP labs, all documents and data prepared or acquired in connection to VAP work must be retained for a period of 10 years after the data of reporting. After 10 years, if the laboratory wishes to dispose of the records, the laboratory must notify the VAP agency by certified mail of such intent and provide the agency an opportunity to request the materials from Pace. The documents must not be disposed of until notification has been received in response to the Pace request for disposal.

8.0. QUALITY SYSTEM AUDITS AND REVIEWS

8.1. Internal Audits

8.1.1. Responsibilities

8.1.1.1. The SQM/QM is responsible for designing 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 functionally 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.

8.1.2. Scope and Frequency of Internal Audits

8.1.2.1. The complete internal audit process consists of the following four sections:

- Raw Data Review audits- conducted according to a schedule per local SQM/QM. A certain number of these data review audits are 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.

8.1.2.2. 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.

8.1.2.3. 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. Examples of system-wide elements that can be audited include:

- Quality Systems documents, such as Standard Operating Procedures, training documents, Quality Assurance Manual, and all applicable addenda
- Data records and non-technical documents
- Personnel and training files.
- General laboratory safety protocols.
- Chemical handling practices, such as labeling of reagents, solutions, and standards as well as all associated documentation.
- Documentation concerning equipment and instrumentation, calibration/maintenance records, operating manuals.
- Sample receipt and management practices.
- Analytical documentation, including any discrepancies and corrective actions.
- General procedures for data security, review, documentation, reporting, and archiving.
- Data integrity issues such as proper manual integrations.

8.1.2.4. When the operations of a specific department are evaluated, a number of additional functions are reviewed including:

- Detection limit studies
- Internal chain of custody documentation
- Documentation of standard preparations
- Quality Control limits and Control charts

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

8.1.2.6. A representative number of data audits are completed annually. Findings from these data audits are handled in the same manner as those from other internal and external audits.

8.1.2.7. 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.

8.1.3. Internal Audit Reports and Corrective Action Plans

8.1.3.1. Additional information can be found in SOP S-MN-Q-271 **Internal and External Audits** or its equivalent revision or replacement.

8.1.3.2. 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.

8.1.3.3. 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.

8.1.3.4. Once completed, the internal audit report is issued jointly to the SGM/GM/AGM/OM and the manager(s)/supervisor(s) of the audited operation at a minimum. The responsible manager(s)/supervisor(s) responds within 14 days with a proposed plan to correct all of the deficiencies cited in the audit report. The SQM/QM may grant additional time for responses to large or complex deficiencies (not to exceed 30 days). Each response must include timetables for completion of all proposed corrective actions.

8.1.3.5. The SQM/QM reviews the audit responses. If the response is accepted, the SQM/QM uses the action plan and timetable as a guideline for verifying completion of the corrective action(s). If the SQM/QM determines that the audit response does not adequately address the correction of cited deficiencies, the response will be returned for modification.

8.1.3.6. To complete the audit process, the SQM/QM performs a re-examination of the areas where deficiencies were found to verify that all proposed corrective actions have been implemented. An audit deficiency is considered closed once implementation of the necessary

corrective action has been audited and verified. This is usually within 60-90 days after implementation. If corrective action cannot be verified, the associated deficiency remains open until that action is completed.

8.2. External Audits

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

8.2.2. Audit teams external to the company review the laboratory to assess the effectiveness of systems and degree of technical expertise. The SQM/QM and other QA staff host the audit team and assist in facilitation of the audit process. Generally, the auditors will prepare a formalized audit report listing deficiencies observed and follow-up requirements for the laboratory. In some cases, items of concern are discussed during a debriefing convened at the end of the on-site review process.

8.2.3. The laboratory staff and supervisors develop corrective action plans to address any deficiencies with the guidance of the SQM/QM. The SGM/GM/AGM/OM provides the necessary resources for staff to develop and implement the corrective action plans. The SQM/QM collates this information and provides a written response to the audit team. The response contains the corrective action plan and expected completion dates for each element of the plan. The SQM/QM follows-up with the laboratory staff to ensure corrective actions are implemented and that the corrective action was effective.

8.3. Quarterly Quality Reports

8.3.1. The SQM/QM is responsible for preparing a quarterly report to management summarizing the effectiveness of the laboratory Quality Systems. This status report will include:

- Overview of quality activities for the quarter
- Certification status
- Proficiency Testing study results
- SOP revision activities
- Internal audit (method/system) findings
- Manual integration audit findings (Mintminer)
- Raw Data and Final Report review findings
- MDL activities
- Other significant Quality System items

8.3.2. The Corporate Director of Quality utilizes the information from each laboratory to make decisions impacting the quality program compliance of the company as a whole. Each SGM/GM/AGM/OM utilizes the quarterly report information to make decisions impacting Quality Systems and operational systems at a local level.

8.3.3. Additional information can be found in SOP S-ALL-Q-014 **Quality System Review** or its equivalent revision or replacement.

8.4. Annual Managerial Review

8.4.1. 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.

8.4.2. 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.

8.4.3. 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.

8.5. Customer Service Reviews

8.5.1. As part of the annual managerial review listed previously, the sales staff is responsible for reporting on customer feedback, including complaints. The acquisition of this information is completed by performing surveys.

8.5.2. The sales staff continually receives customer feedback, both positive and negative, and reports this feedback to the laboratory management in order for them to evaluate and improve their management system, testing activities and customer service.

8.5.3. In addition, the labs must be willing to cooperate with customers or their representatives to clarify customer requests and to monitor the laboratory's performance in relation to the work being performed for the customers. This cooperation may include providing the customer reasonable access to relevant areas of the lab for the witnessing of tests being performed; or the preparation of samples or data deliverables to be used for verification purposes.

8.5.4. Customer service is an important aspect to Pace's overall objective of providing a quality product. Good communication should be provided to the customer's throughout projects. The lab should inform the customer of any delay or major deviations in the performance of analytical tests.

9.0. CORRECTIVE ACTION

Additional information can be found in SOP S-MN-Q-262 **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 PASI 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 PASI's LabTrack system or other system that lists among at a minimum, the deficiency by issue number, the deficiency source, responsible party, root cause, resolution, due date, and date resolved.

9.1. Corrective Action Documentation

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

- Internal Laboratory Non-Conformance Trends
- PE/PT Sample Results
- Internal and External Audits
- Data or Records Review (including non-technical records)
- Client Complaints
- Client Inquiries
- Holding Time violations

9.1.2. 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.

9.1.3. The person who discovers the deficiency or non-conformance initiates the corrective action documentation on the Non-Conformance Corrective/ Preventive Action report and/or LabTrack. The documentation must include 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.

9.1.4. In the event that the laboratory is unable to determine the cause, 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 or on the Corrective/Preventive Action Report.

9.1.5. After all the documentation is completed, the routing of the Corrective/Preventive Action Report and /or LabTrack will continue from the person initiating the corrective action, to their

immediate supervisor or the applicable Project Manager and finally to the SQM/QM, if applicable, who may be responsible for final review and signoff of corrective/preventive actions.

9.1.6. In the event that analytical testing or results do not conform to documented laboratory policies or procedures, customer requirements, or standard specifications, the laboratory shall investigate the significance of the non-conformance and document appropriate corrective actions. The proper level of laboratory management will review any departure from these requirements for technical suitability. These departures are permitted only with the approval of the SGM/GM/AGM/OM or the SQM/QM. Where necessary, Project Management will notify the customer of the situation and will advise of any ramifications to data quality (with the possibility of work being recalled). The procedures for handling non-conforming work are detailed in SOP S-MN-Q-262 **Corrective and Preventive Actions** or its equivalent revision or replacement.

9.2. Corrective Action Completion

9.2.1. Internal Laboratory Non-Conformance Trends

9.2.1.1. 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

9.2.2. PE/PT Sample Results

9.2.2.1. 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.

9.2.2.2. 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-MN-Q-258 **Proficiency Testing Program** or its equivalent replacement.

9.2.3. Internal and External Audits

9.2.3.1. 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.

9.2.4. **Data Review**

9.2.4.1. 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.

9.2.5. **Client Complaints**

9.2.5.1. 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.

9.2.6. **Client Inquiries**

9.2.6.1. 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.

9.2.7. **Holding Time Violations**

9.2.7.1. 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.

9.2.7.2. 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.

9.3. Preventive Action Documentation

9.3.1. Pace laboratories can take advantage of several available information sources in order to identify needed improvements in all of their systems including technical, managerial, and quality. These sources may include:

- Management Continuous Improvement Plan (CIP) metrics which are used by all production departments within Pace. When groups compare performance across the company, ways to improve systems may be discovered. These improvements can be made within a department or laboratory-wide.
- Annual managerial reviews- part of this TNI-required and NVLAP-required review is to look at all processes and procedures used by the laboratory over the past year and to determine ways to improve these processes in the future.
- Quality systems reviews- any frequent checks of quality systems (monthly logbook reviews, etc.) can uncover issues that can be corrected or adjusted before they become a larger issue.

9.3.2. When improvement opportunities are identified or if preventive action is required, the laboratory can develop, implement, and monitor preventive action plans.

10.0. 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 Analytical continuous improvement program that focuses on Process, Productivity, and Performance. Best Practices are identified that can be used by all PASI labs.
Acceptance Criteria	TNI and DoD- Specified limits placed on characteristics of an item, process, or service defined in requirement documents.
Accreditation	TNI and DoD- 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	DoD- Authoritative body that performs accreditation.
Accuracy	TNI and DoD- 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.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.
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 and DoD- 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	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 Uncertainty	TNI- A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis.
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- The evaluation process used to measure the performance or effectiveness of a system and its elements against specific criteria. Note: In this standard (DoD), assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation, peer review, inspection, or surveillance.
Atomic Absorption Spectrometer	Instrument used to measure concentration in metals samples.
Atomization	DoD -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. DoD- A systematic evaluation to determine the conformance to quantitative and qualitative specifications of some operational function or activity.
Batch	TNI and DoD- 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. South Carolina- same definition as TNI except 24 hours should be changed to 8 hours.
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.
Blind Sample	DoD-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 and DoD- 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. DoD- The graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.
Calibration Method	DoD- 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. DoD- A substance or reference material used to calibrate an instrument.
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. DoD- A reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body.
Chain of Custody	DoD- An unbroken trail of accountability that verifies the physical security of samples, data, and records.
Chain of custody Form (COC)	TNI and DoD- 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)	DoD- 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 and DoD- 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	DoD- 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	DoD- 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 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.
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.
Customer	DoD- Any individual or organization for which products or services are furnished or work performed in response to defined requirements and expectations.

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	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).
Detection Limit (DL)	DoD- The smallest analyte concentration that can be demonstrated to be different than zero or a blank concentration at the 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.
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 sample to a more easily measured form.
Document Control	DoD- 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)	DoD- 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	DoD- A solvent used to carry the components of a mixture through a stationary phase.
Elute	DoD- To extract, specifically, to remove (absorbed material) from an absorbent by means of a solvent.
Elution	DoD- 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	DoD- The process of measuring or collecting environmental data.
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.
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.
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 (DoD QSM), 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	DoD- 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).
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-AES 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.
Inspection	DoD- An activity such as measuring, examining, testing, or gauging one or more characteristics of an entity and comparing the results with specified requirements in order to establish whether conformance is achieved for each characteristic.
Instrument Blank	DoD- 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	DoD- 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	DoD- Results from the various chemical processes that occur during atomization and later the absorption characteristics of the analyte.
Internal Standards	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.
Intermediate Standard Solution	Reference solutions prepared by dilution of the stock solutions with an appropriate solvent.
International System of Units (SI)	DoD- 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	DoD- A body that calibrates and/or tests.

Laboratory Control Sample (LCS)	TNI and DoD- (however named, such 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	DoD- Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently.
Laboratory Information Management System (LIMS)	A computer system that is used to maintain all sample information from sample receipt, through preparation and analysis and including sample report generation.
LabTrack	Database used by Pace Analytical 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- A laboratory's estimate of the minimum amount of an analyte in a given matrix that an analytical process can reliably detect in their facility. DoD- The smallest 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%.
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 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	A quantity of bulk material of similar composition processed or manufactured at the same time.
Management	DoD- Those individuals directly responsible and accountable for planning, implementing, and assessing work.

Management System	DoD- System to establish policy and objectives and to achieve those objectives.
Manager (however named)	DoD- 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 and DoD- 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. DoD- A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate 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 and DoD- 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)	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 System	TNI and DoD- A test method, as implemented at a particular laboratory, and which includes the equipment used to perform the sample preparation, 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. 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 and DoD- 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)	DoD- 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	DoD- 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.
MintMiner	Program used by Pace Analytical 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 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	DoD- 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	DoD- 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	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.
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	DoD- 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 and DoD- 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- Any conditions under which a sample must be kept in order to maintain chemical, physical, and/or biological integrity prior to analysis. DoD- Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample.
Procedure	TNI- A specified way to carry out an activity or process. Procedures can be documented or not.
Proficiency Testing	TNI and DoD- A means of evaluating 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	TNI and DoD- 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 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. DoD- A sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria.
Protocol	TNI and DoD- 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. DoD- An integrated system of activities involving planning, quality control, quality assessment, reporting, and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence.
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)	DoD- 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. DoD- The overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of the users.
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. DoD- 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.
Quality Manual	TNI and DoD- 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 are to be used for purposes of batch and quality control requirements: • **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. The quantitation range 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. DoD- Any original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments. If exact copies of raw data have been prepared (e.g., tapes which have been transcribed verbatim, data and verified accurate by signature), the exact copy or exact transcript may be submitted.
Reagent Blank (method reagent blank)	DoD- 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. DoD- A material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
Reference Standard	TNI- Standard used for the calibration of working measurement standards in a given organization or at a given location. DoD- A standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived.
Reference Toxicant	DoD- The toxicant used in performing toxicity tests to indicate the sensitivity of a test organism and to demonstrate the laboratory's ability to perform the test correctly and obtain consistent results.
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 (or otherwise named)	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	DoD- Denotes a mandatory specification; often designated by the term "shall".
Retention Time	DoD- The time between sample injection and the appearance of a solute peak at the detector.
Sample	DoD- 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 Pace Analytical 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.
Selective 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. DoD- The capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances.
Sensitivity	TNI and DoD- 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	DoD- 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	DoD- Denotes a guideline or recommendation whenever noncompliance with the specification is permissible.
Signal-to-Noise Ratio (S/N)	DoD- S/N is a measure of signal strength relative to background noise. The signal carries information about the analyte, while noise is made up of extraneous information that is unwanted because it degrades the accuracy and precision of an analysis and also places a lower limit on the amount of analyte that can be detected. 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.
Spike	DoD- 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 and DoD- 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)	DoD- 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	DoD- 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. DoD- A written document which details the method of an operation, analysis or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks.
Standard Reference Material (SRM)	DoD- 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	DoD- 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 environment samples and is added to them for quality control purposes.
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	DoD- 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	DoD- 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.
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. DoD- The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons.
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	DoD- 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 Measurement	The parameter associated with the result of a measurement that characterized the dispersion of the values that could be reasonably attributed to the measurand (i.e. the concentration of an analyte).
Unethical actions	DoD- Deliberate falsification of analytical or quality control results, where failed method or contractual requirements are made to appear acceptable.
Unregulated Contaminate Monitoring Rule (UCMR)	EPA program to monitor unregulated contaminates 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 and DoD- Confirmation by examination and objective evidence that specified requirements have been met. Note: 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. The result of verification leads to a decision either to restore in service, to perform adjustment, to repair, to downgrade, or to declare obsolete. In all cases, it is required that a written trace of the verification performed shall be kept on the measuring instrument's individual record.
Whole Effluent Toxicity (WET)	The aggregate toxic effect to aquatic organisms from all pollutants contained in a facility's wastewater (effluent).
Work Cell	DoD- A well-defined group of analysts that together perform the method analysis. The members of the group and their specific functions within the work cell must be fully documented.

11.0. REFERENCES

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

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

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

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

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

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

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

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

11.9. "NIOSH Manual of Analytical Methods", Third Edition, 1984, U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health.

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

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

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

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

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

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

11.16. Quality Assurance Manual for Industrial Hygiene Chemistry, AIHA, 1988.

11.17. National Environmental Laboratory Accreditation Conference, Constitution, Bylaws, and Standards. Most recent version.

11.18. ISO/IEC 17025:2005, General requirements for the competence of testing and calibration laboratories.

11.19. Department of Defense Quality Systems Manual (QSM), version 5.0, March 2013.

11.20. TNI (The NELAC Institute) Standards; most recent version.

11.21. UCMR3 Laboratory Approval Requirements and Information Document, version 2.0, January 2012.

12.0. REVISIONS

The PASI Corporate Quality Office files both a paper copy and electronic version of a Microsoft Word document with tracked changes detailing all revisions made to the previous version of the Quality Assurance Manual. This document is available upon request. All revisions are summarized in the table below.

Document Number	Reason for Change	Date
Quality Assurance Manual 18.0	Header – added "Effective date of last signature" 1.3.1 and 1..3 – reworded to match ISO/TNI standards 1.7.7 – added section regarding key personnel deputies 1.12.2 – Changed Sample Custodian title to Client Services Manager/Sample Management Personnel Removed 2.6.5 – LIMS codes 6.2.3.4 and 6.2.7.5 – changed "12 hour" to "method specified" 9.2.2.2 – added section for PT SOP Attachment II_{A-D} updated to current revision Attachment III_{A-D} updated to current revision Attachment IV_{A} updated to current revision Attachment V_{A-B} updated to current revision Attachment VI_{A-D} updated to current revision Attachment VIII updated to current revision	07July2015
Quality Assurance Manual 18.1	Updated formatting throughout Added attachments – IIIE, IVE, VE, VIE Attachment IIA, IIB,IIC, IID Attachment IVA – Updated to current revision Attachment VIII – added note 5 to table	10Dec2015

ATTACHMENT I- QUALITY CONTROL CALCULATIONS

PERCENT RECOVERY (%REC)

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

NOTE: The SampleConc is zero (0) for theLCS 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

$$\%Drift = \frac{Calculated\,Concentration - TheoreticalConcentration}{TheoreticalConcentrtion} * 100$$

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 ($\overline{X}$)

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

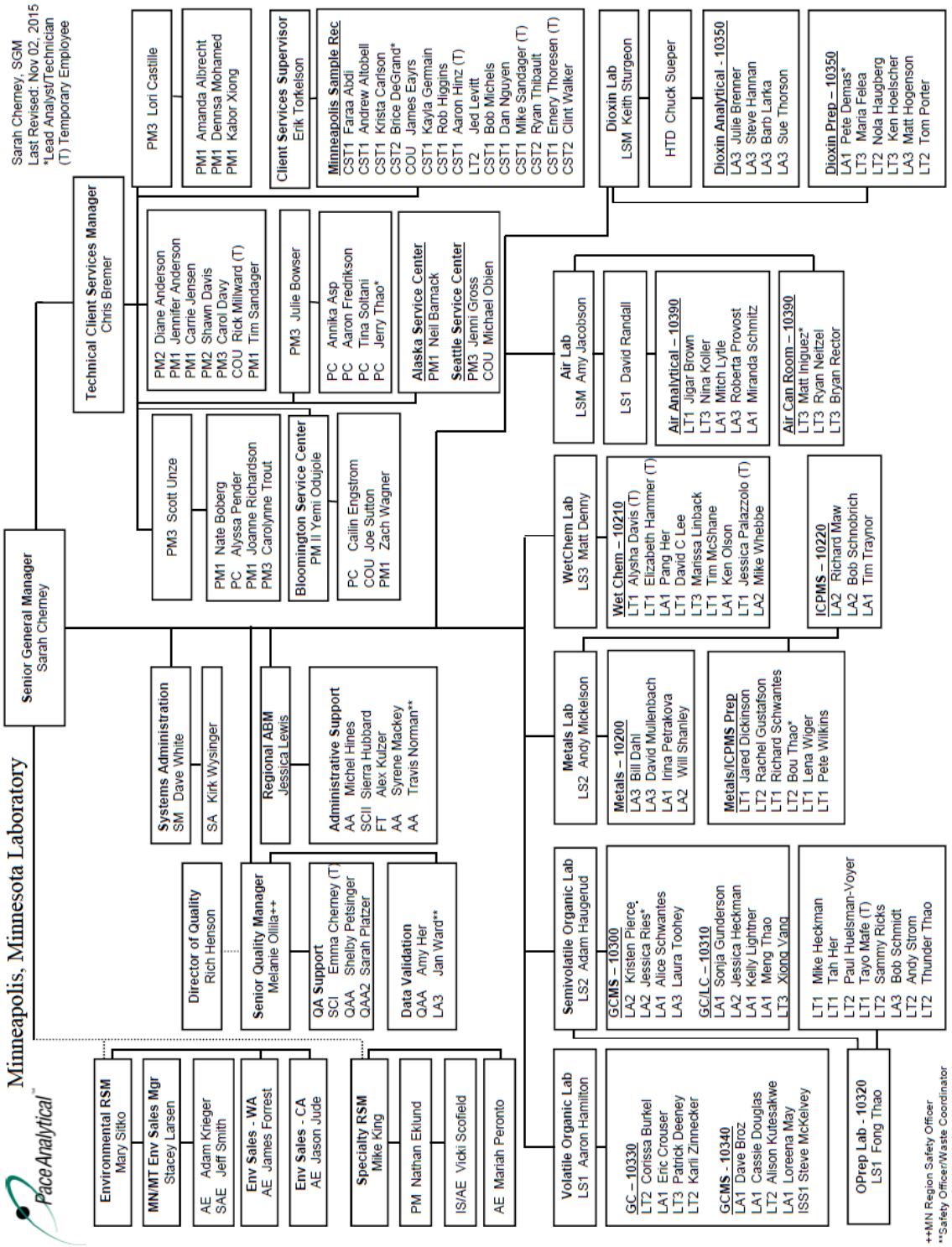
where:
n = number of data points
X_i = individual data point

RELATIVE STANDARD DEVIATION (RSD)

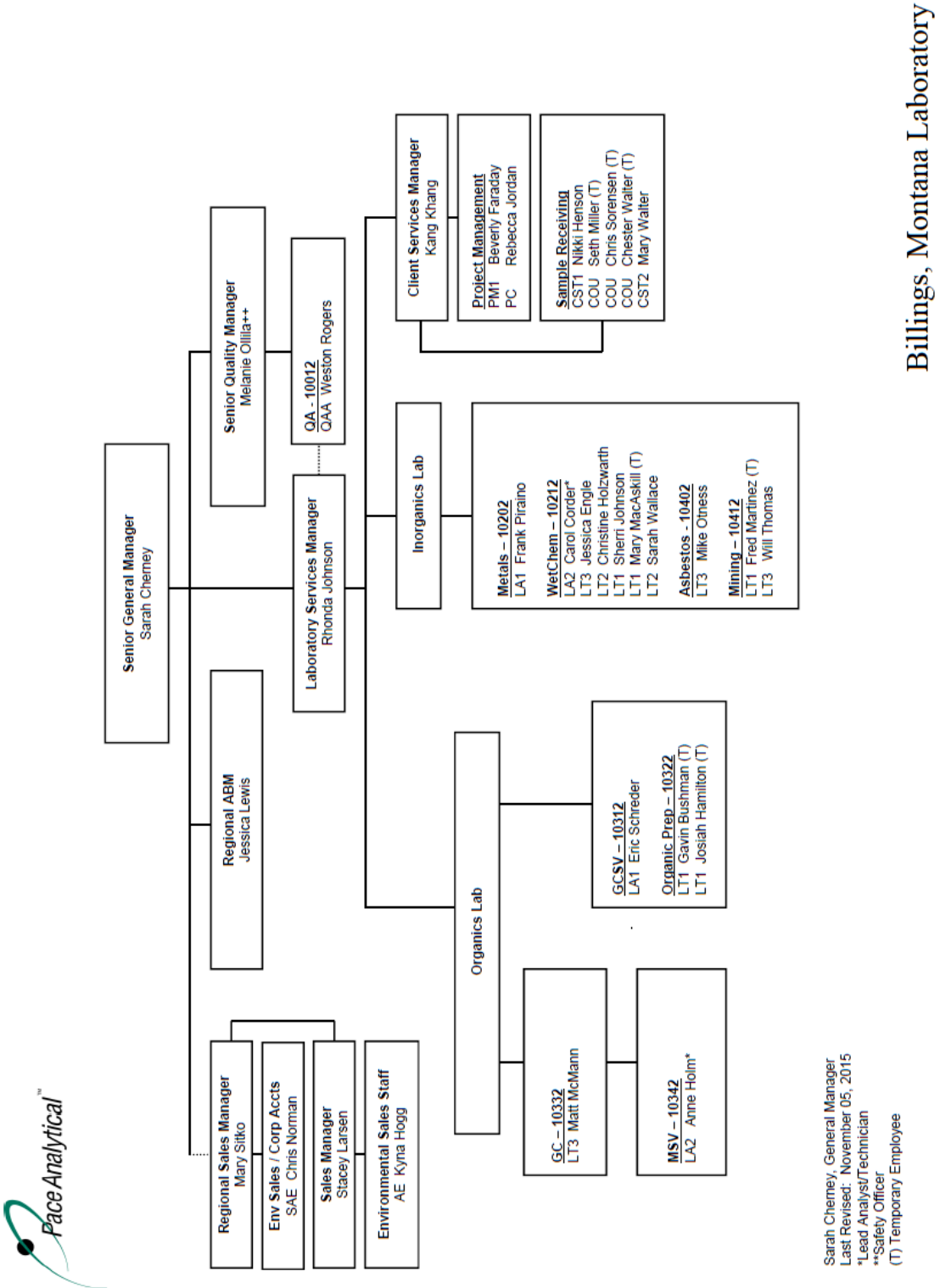
$$RSD = \frac{S}{\overline{X}} * 100$$

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

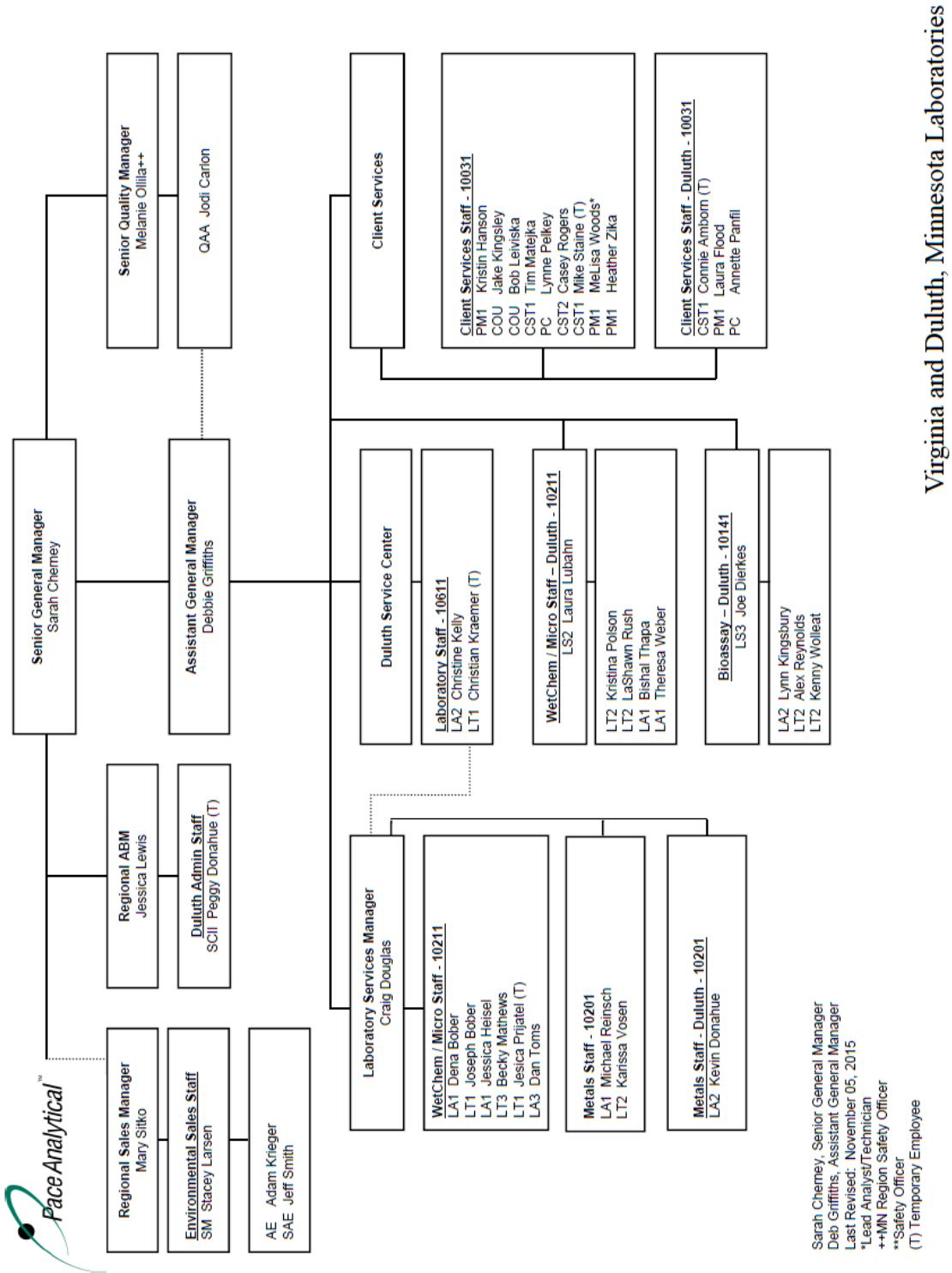
ATTACHMENT IIA- MINNEAPOLIS LABORATORY ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



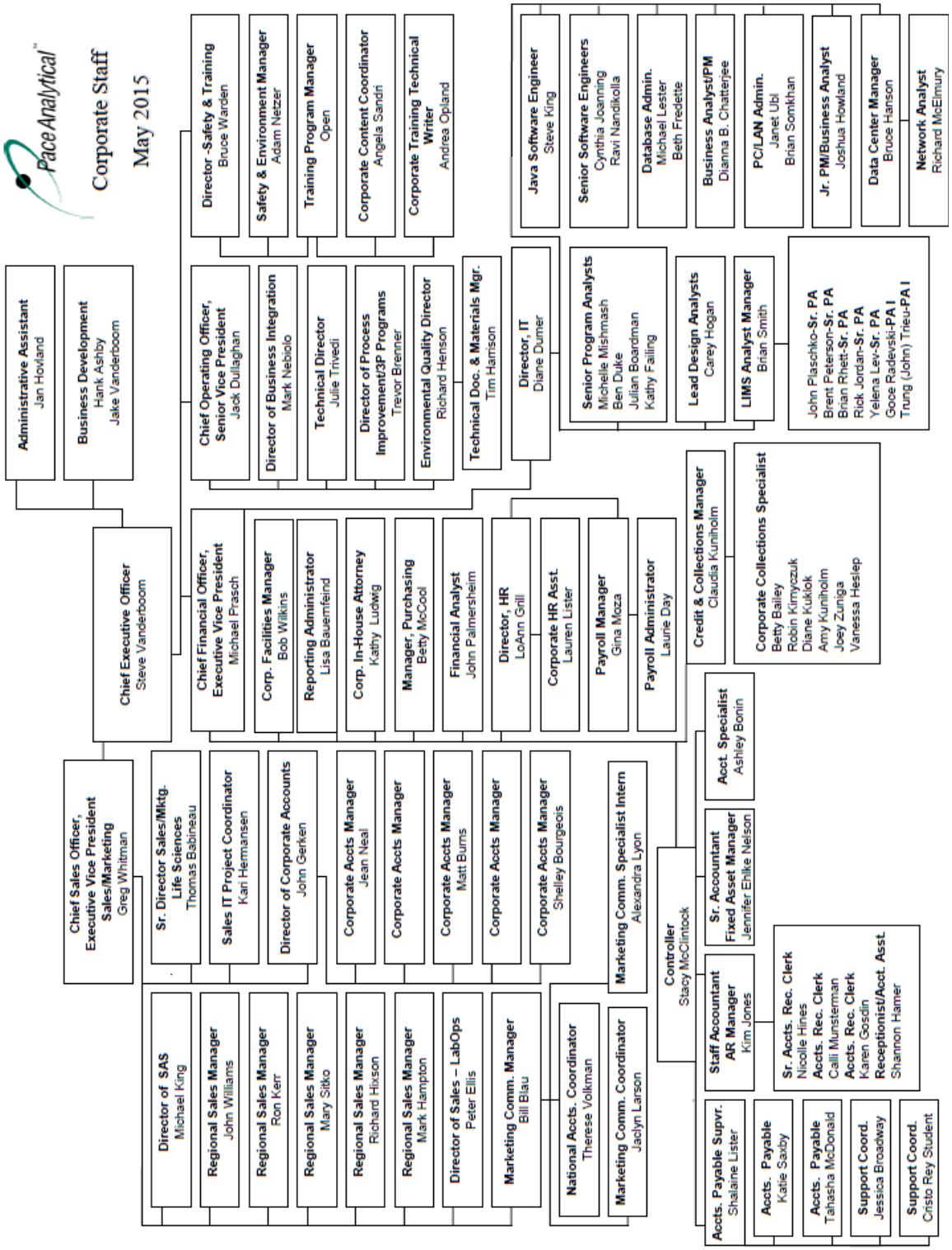
ATTACHMENT IIB- MONTANA LABORATORY ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



ATTACHMENT IIC- VIRGINIA AND DULUTH LABORATORY ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



ATTCHMENT IID- CORPORATE ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



ATTACHMENT IIIA- MINNEAPOLIS EQUIPMENT LIST (CURRENT AS OF ISSUE DATE)

DEPT	INSTRUMENT	ID	MANUFACTURER	MODEL	ANALYSIS
Air	GC	10AIR0	Agilent Technologies	6890N	GC/MS
Air	MS	10AIR0	Agilent Technologies	5973 Network	GC/MS
Air	Concentrator	10AIR0	Entech Instruments, Inc.	7100A	GC/MS
Air	GC	10AIR5	HP	5890	TCD
Air	GC	10AIR7	Agilent Technologies	6890N	GC/MS
Air	MS	10AIR7	Agilent Technologies	5973 Network	GC/MS
Air	Concentrator	10AIR7	Entech Instruments, Inc.	7100A	GC/MS
Air	GC	10AIR9	Agilent Technologies	G1530A	GC/FID/TCD
Air	Headspace Sampler	10AIR9	Agilent Technologies	G1888	GC/FID/TCD
Air	GC	10AIRA	ALS Ready	6890A	GC
Air	Concentrator	10AIRA	Entech Instruments, Inc.	7100A	GC
Air	MS	10AIRB	Agilent Technologies	5973 inert	GC/MS
Air	GC	10AIRB	Agilent Technologies	6890	GC/MS
Air	Concentrator	10AIRB	Markes	Unity2	GC/MS
Air	Autosampler	10AIRB	Markes	CIA Advantage/CIA Satellite	GC/MS
Air	GC	10AIRD	Agilent Technologies	7890A	GC/MS
Air	MS	10AIRD	Agilent Technologies	5975C	GC/MS
Air	Concentrator	10AIRD	Entech Instruments, Inc.	7100A	GC/MS
Air	Autosampler	10AIRE	Agilent Technologies	7693	GC/MS
Air	MS	10AIRE	Agilent Technologies	5975C	GC/MS
Air	GC	10AIRE	Agilent Technologies	7890A	GC/MS
Air	Thermal Desorber	10AIRE	Perkin Elmer	Turbomatrix 650	GC/MS
Air	GC	10AIRF	Perkin Elmer	Clarus 680	GC/MS
Air	MS	10AIRF	Perkin Elmer	Clarus SQ 8 C	GC/MS
Air	Thermal Desorber	10AIRF	PerkinElmer	Turbomatrix 650	GC/MS
Air	Canister Autosampler	AIR7T1	Entech Instruments, Inc.	7016 CA	n/a
Air	Canister Autosampler	AIR7T2	Entech Instruments, Inc.	7016 CA	n/a
Air	Canister Autosampler	AIRBT1	Entech Instruments, Inc.	7016 CA	n/a
Air	Canister Autosampler	AIRBT2	Entech Instruments, Inc.	7016 CA	n/a
Air	Canister Autosampler	AIR0T1	Entech Instruments, Inc.	7016 CA	n/a
Air	Canister Autosampler	AIR0T3	Entech Instruments, Inc.	7016 CA	n/a
Air	Canister Autosampler	AIRD	Entech Instruments, Inc.	7016 CA	n/a
Air	Canister Autosampler	AIRD	Entech Instruments, Inc.	7016 CA	n/a
Air	GC	10AIR0	Agilent Technologies	6890N	GC/MS

ATTACHMENT IIIA- MINNEAPOLIS EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Air	Can Cleaning Rack	Rack 1	Pace	na	n/a
Air	Can Cleaning Rack	Rack 2	Pace	na	n/a
Air	Can Cleaning Rack	Rack 3	Pace	na	n/a
Air	Oven	10AIR10	Despatch	LDB Series	n/a
Air	Tube Conditioner/Dry Purger	10AIR24	Perkin Elmer	Turbomatrix TC220	n/a
HRMS	GCMS	10MSHR09	Agilent	6890N	GC/MS
HRMS	GCMS	10MSHR09	Waters/Micromass	Autospec Premier	GC/MS
HRMS	GCMS	10MSHR06	Agilent	6890A	GC/MS
HRMS	GCMS	10MSHR06	Waters/Micromass	Autospec Ultima	GC/MS
HRMS	GCMS	10MSHR10	Thermo Scientific	Trace GC Ultra	GC/MS
HRMS	GCMS	10MSHR10	Thermo Scientific	Trace GC Ultra	GC/MS
HRMS	GCMS	10MSHR10	Thermo Scientific	DFS High Resolution Magnetic Sector MS	GC/MS
HRMS	GCMS	10MSHR12	Waters/Micromass	Autospec Premier	GC/MS
HRMS	GCMS	10MSHR12	Agilent		GC/MS
HRMS	GCMS - Autosampler	10MSHR12	Agilent		GC/MS
HRMS	GCMS	10MSHR05	Agilent	6890A	GC/MS
HRMS	GCMS	10MSHR05	Waters/Micromass	Autospec Ultima	GC/MS
Dioxin Prep	Micro 100 Turbidimeter	10HR14	Scientific Inc.	Micro 100 Turbidimeter	n/a
Dioxin Prep	Microwave extraction	10HR13	CEM	MarsXpress	n/a
Dioxin Prep	N-EVAP	N-EVAP 1	Organomation	112	n/a
Dioxin Prep	N-EVAP	N-EVAP 2	Organomation	112	n/a
Dioxin Prep	N-EVAP	N-EVAP 3	Organomation	112	n/a
Dioxin Prep	Accelerated Solvent Extractor	10HR12	ACE	200	n/a
Dioxin Prep	N-EVAP	DW1	Organomation	8125	n/a
Dioxin Prep	N-EVAP	DW2	Organomation	8125	n/a
Dioxin Prep	N-EVAP	N-EVAP 4	Organomation	8125	n/a
Dioxin Prep	N-EVAP	N-EVAP 5	Organomation	8125	n/a
Dioxin Prep	N-EVAP	N-EVAP 6	Organomation	8125	n/a
Dioxin Prep	Oven	DP4	Lindberg Blue	GO1340A-1	n/a
Dioxin Prep	Balance	10BAL1	Denver Inst	MXX-5001	n/a
Dioxin Prep	Balance	10BALJ	Sartorius	ENTRIS2202-1S	n/a
Metals	ICPMS	10ICM3	Thermo Scientific	Xseries 2	MS
Air	Can Cleaning Rack	Rack 1	Pace	na	n/a
Air	Can Cleaning Rack	Rack 2	Pace	na	n/a

ATTACHMENT IIIA- MINNEAPOLIS EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Metals	ICPMS	10ICM4	Thermo Scientific	XII	MS
Metals	ICPMS	10ICM8	Aglient 7700	G3281A	MS
Metals	ICPMS	10ICM9	Aglient 7700	G3281A	MS
Metals	ICPMS	10ICMA	Perkin Elmer	Elan 6000 DRC-e	MS
Metals	ICP	10ICP2	Perkin Elmer Instruments	Optima 4300 DV	SCCD
Metals	ICP	10ICP3	Perkin Elmer Instruments	Optima 4300 DV	SCCD
Metals	ICP	10ICP4	Agilent Technologies	700 Series-ICP-OES	n/a
Metals	ICP	10ICP5			n/a
Metals	Mercury Analyzer	10HG06	Cetac	M-7500	n/a
Metals	Mercury Analyzer	10HG3	Cetac Quick Trace	M-7500	NA
Metals	Mercury Autosampler	10HG3	ASX-520	MAS Ver w/Diluter	NA
Metals	Mercury Analyzer	10HG4	Cetac	M7600	NA
Metals	Mercury Autosampler	10HG4	Cetac	AX-520	NA
Metals	Hot Block	10MET02	Environmental Express	SC154	n/a
Metals	Hot Block	10MET04	Environmental Express	na	n/a
Metals	Hot Block	10MET08	Environmental Express	NA	n/a
Metals	Hot Block	10MET10	Environmental Express	NA	n/a
Metals	Hot Block	10MET22	Environmental Express	SC154	n/a
Metals	Hot Block	10MET23	Environmental Express	SC154	n/a
Metals	Hot Block	10MET26	Environmental Express	SC154	n/a
Metals	Tumbler	10MET06	Associated Design & Mfg. Co.	3740-24**BRE**	n/a
Metals	Tumbler	10MET30	Braun Intertec	NA	NA
Metals	Tumbler	10MET21	Associated Design & Mfg. Co.	3740-8-BRE	n/a
Metals	Hot Block	10MET09	Environmental Express	NA	n/a
Metals Prep	Hot Plate	10MP02	Cole Parmer	n/a	n/a
Metals Prep	Hot Plate	10MP03	Cole Parmer	n/a	n/a
Metals	TCLP agitator/tumbler	10MET34	Analytical Testing Corp	DC-20	n/a
Metals	Hot Plate/hot block	10MET35	Thermolyne	HP47135	n/a
Metals	Turbidity Meter	10MP04	Hach	2100P	n/a
Metals	pH meter	10MP05	Scientific Instruments	IQ180GLP	n/a
Metals	pH meter	10MP06	Orion Research	Expandable Ion Analyzer EA 940	n/a
Metals	Tumbler	10MET36	Analytical Testing Corp	42R5BFC1-E3	n/a
Metals	Water Bath	10MET37	Fisher Scientific	128	n/a
Metals	Balance	10BAL5	A&D	FX1200i	n/a

ATTACHMENT IIIA- MINNEAPOLIS EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Metals	Balance	10WETD	Mettler-Toledo	PB602-5	n/a
O-Prep	UltraSonicator	10OP17	Branson	8510	n/a
O-Prep	Sonicator	10OP01	Misonix	XL 2020	n/a
O-Prep	Sonicator	10OP02	Misonix	XL 2015	n/a
O-Prep	Sonicator	10OP04	Misonix	Sonicator 3000	n/a
O-Prep	Soxtherm	10OP06	Gerhardt	na	n/a
O-Prep	Soxtherm	10OP07	Gerhardt	na	n/a
O-Prep	Soxtherm	10OP08	Gerhardt	na	n/a
O-Prep	Soxtherm	10OP09	Gerhardt	na	n/a
O-Prep	N-EVAP	10OP10	Organomation	112	n/a
O-Prep	N-EVAP	10OP11	Organomation	112	n/a
O-Prep	Centrifuge	10OP13	IEC	Centra GP8	n/a
O-Prep	Centrifuge	10OP14	Damon/IEC Division	na	n/a
O-Prep	Centrifuge	10OP15	International Clinical Centrifuge	CL28899M	n/a
O-Prep	N-EVAP	10OP18	Organomation	II2	n/a
O-Prep	Turbo Vap	10OP20	Caliper Life Sciences	Turbo Vap II	n/a
O-Prep	Buchi Concentrator-vacuum controller	10OP21	Buchi Labortenchik Ag	V-855	n/a
O-Prep	Buchi Concentrator-vacuum pump	10OP21	Buchi Labortenchik Ag	V-700	n/a
O-Prep	Buchi Concentrator-Recirculating Chiller	10OP21	Buchi Labortenchik Ag	F-108	n/a
O-Prep	Buchi Concentrator System	10OP21	Buchi Labortenchik Ag	Q101	n/a
O-Prep	Microwave extraction	10OP19	CEM	MarsXpress 230/60	n/a
O-Prep	Smart System 5 Intella-tempcalibrator	10OP19	Smart System	4014	n/a
O-Prep	Line Conditioner TSI Power VRp series	10OP19	Tsi Power	VRp-3000-0238	n/a
O-Prep	Sonicator	10OP23	Bransonic	B8200R-3	n/a
O-Prep	Sonicator	10OP22	Heat Systems	XL2020	n/a
O-Prep	Buchi Concentrator-vacuum controller	10OP24	Buchi Labortenchik Ag	V-855	n/a
O-Prep	Buchi Concentrator-vacuum pump	10OP24	Buchi Labortenchik Ag	V-700	n/a
O-Prep	Buchi Concentrator-Recirculating Chiller	10OP24	Buchi Labortenchik Ag	F-108	n/a
O-Prep	Buchi Concentrator System	10OP24	Buchi Labortenchik Ag	Q101	n/a
O-Prep	Buchi Concentrator-vacuum controller	10OP25	Buchi Labortenchik Ag	V-855	n/a
O-Prep	Buchi Concentrator-vacuum pump	10OP25	Buchi Labortenchik Ag	V-700	n/a
O-Prep	Buchi Concentrator-Recirculating Chiller	10OP25	Buchi Labortenchik Ag	F-108	n/a
O-Prep	Buchi Concentrator System	10OP25	Buchi Labortenchik Ag	Q101	n/a
Metals	Balance	10WETD	Mettler-Toledo	PB602-5	n/a
O-Prep	UltraSonicator	10OP17	Branson	8510	n/a

ATTACHMENT IIIA- MINNEAPOLIS EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

O-Prep	Buchi Concentrator-vacuum controller	10OP26	Buchi Labortenchik Ag	V-855	n/a
O-Prep	Buchi Concentrator-vacuum pump	10OP26	Buchi Labortenchik Ag	V-700	n/a
O-Prep	Buchi Concentrator-Recirculating Chiller	10OP26	Buchi Labortenchik Ag	F-108	n/a
O-Prep	Buchi Concentrator System	10OP26	Buchi Labortenchik Ag	Q101	n/a
O-Prep	Balance	10BALK	A&D	EK-610i	n/a
O-Prep	Balance	10BAL6	A&D	EK-410i	n/a
O-Prep	Balance	10BAL7	Denver Inst	MXX-612	n/a
SR	Oven	10WET49	Fisher Scientific	851F	n/a
SR	Dessicator	10WET50	Baxter Scientifica	DS-64	n/a
SR	Oven	C19	VWR	1330F	n/a
SR	Balance	10MPR2	Mettler	AE 200	
SVOA	GC System	10MSSA	Agilent	7890A	MS
SVOA	Autosampler Tower	10MSSA	Agilent/HP	7693 Series	MS
SVOA	Autosampler Tray	10MSSA	Agilent/HP	7693 Series	MS
SVOA	MS Detector	10MSSA	Agilent/HP	5975C	MS
SVOA	Peltier Cooling System	10MSSA	Gersel	CIS 4	MS
SVOA	AutoSampler Tower	10MSSB	Agilent	7863B	MS
SVOA	GC/Oven	10MSSB	Agilent	7890	MS
SVOA	MS Detector	10MSSB	Agilent	5975C	MS
SVOA	AutoSampler Tray	10MSSB	Agilent	7683	MS
SVOA	Peltier Cooling System	10MSSB	Gersel	CIS 4	MS
SVOA	GC	10MSSD	Agilent	6890N	MS
SVOA	MS	10MSSD	Agilent	5975	MS
SVOA	Autosampler	10MSSD	Agilent	G2614 A	MS
SVOA	Tower 7683B	10MSSD	Agilent	62915A	MS
SVOA	MS	10MSS3	HP	5973	MS
SVOA	GC	10MSS3	HP	6890	MS
SVOA	Autosampler Tray	10MSS3	Agilent/HP	7683	MS
SVOA	Injector Tower	10MSS3	Agilent/HP	7683	MS
SVOA	Autosampler Tray	10MSS3	Agilent/HP	7683	MS
SVOA	GC	10MSS6	Agilent	6890N	MS
SVOA	Autosampler Tower	10MSS6	Agilent/HP	7683	MS
SVOA	MS	10MSS6	Agilent/HP	5973N	MS
O-Prep	Buchi Concentrator-vacuum controller	10OP26	Buchi Labortenchik Ag	V-855	n/a
O-Prep	Buchi Concentrator-vacuum pump	10OP26	Buchi Labortenchik Ag	V-700	n/a
O-Prep	Buchi Concentrator-Recirculating Chiller	10OP26	Buchi Labortenchik Ag	F-108	n/a
O-Prep	Buchi Concentrator System	10OP26	Buchi Labortenchik Ag	Q101	n/a

ATTACHMENT IIIA- MINNEAPOLIS EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

SVOA	Autosampler Tray	10MSS6	Agilent/HP	7683	MS
SVOA	GC	10MSS7	Agilent	6890N	MS
SVOA	Tower 7683	10MSS7	Agilent	62613A	MS
SVOA	Turret 7683	10MSS7	Hewlet Packard	62614A	MS
SVOA	Mass Spec 5973	10MSS7	Agilent	62579A	MS
SVOA	AutoSampler Tower	10MSS8	Agilent/HP	7683	MS
SVOA	GC/Oven	10MSS8	Agilent	6890 N	MS
SVOA	MS Detector	10MSS8	Agilent	5973 N	MS
SVOA	AutoSampler Tray	10MSS8	Agilent/HP	7683	MS
SVOA	GC/Oven	10MSS9	Agilent	6890 A	MS
SVOA	AutoSampler Tower	10MSS9	Agilent	18593B	MS
SVOA	MS Detector	10MSS9	Agilent	5973 N	MS
SVOA	AutoSampler Tray	10MSS9	Agilent	18596C	MS
SVOA	AutoSampler Tray	10MSSE	Agilent	18596M	MS
SVOA	Injector Tower	10MSSE	Agilent	G1513A	MS
SVOA	GC/Oven	10MSSE	Agilent	G1530A	MS
SVOA	MS Detector	10MSSE	Agilent	G1098A	MS
SVOA	Autosampler Tray	10MSSF	Agilent	7683B Series	MS
SVOA	Injector Tower	10MSSF	Agilent	7683	MS
SVOA	MS Detector	10MSSF	Agilent	5975C	MS
SVOA	GC	10MSSF	Agilent	7890A	MS
SVOA	GC	10MSSG	Agilent	G1530A	
SVOA	MS	10MSSG	Agilent	G1098A	
SVOA	Autosampler Tray	10MSSG	HP	18596M	
SVOA	Injector Tower	10MSSG	HP	G1513A	
SVOA	Dual Microcell ECD	10GCSA	Agilent	6890N	Dual FID
SVOA	Autosampler	10GCSA	Agilent	G2614 A	Dual FID
SVOA	Tower	10GCSB	Agilent	64513A	Dual FID
SVOA	Tray	10GCSB	Agilent	64514A	Dual FID
SVOA	GCECD	10GCSB	Agilent	7890A	Dual FID
SVOA	GC Oven	10GCS4	HP	5890	Dual FID
SVOA	AutoSampler /Tower	10GCS4	HP	7673A	Dual FID
SVOA	AutoSampler Tray	10GCS4	HP	7673A	Dual FID
SVOA	GCECD	10GCS7	Agilent	6890 N	Dual ECD
SVOA	AutoSampler Tray	10GCS7	Agilent/HP	64514A	Dual ECD
SVOA	Tower	10GCS7	HP N279	N279	Dual ECD

ATTACHMENT IIIA- MINNEAPOLIS EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

SVOA	GC Oven	10GCS8	Agilent	6890 N	Dual FID
SVOA	AutoSampler	10GCS8	Agilent/HP	7683	Dual FID
SVOA	Tower	10GCS8	Agilent/HP	7683	Dual FID
SVOA	GC	10GCS9	Agilent	7890	Dual FID
SVOA	Tower	10GCS9	Agilent	64513A	Dual FID
SVOA	Autosampler Tray	10GCS9	Agilent	64514A	Dual FID
SVOA	GC Oven	10GCSC	Agilent	6890 N	Dual FID
SVOA	AutoSampler	10GCSC	Agilent/HP	62614A	Dual FID
SVOA	Tower	10GCSC	Agilent/HP	62614A	Dual FID
SVOA	10GCS7	10GCSD			n/a
SVOA	10GCSA	10GCSE			n/a
SVOA	GC	10GCSF	Agilent		
SVOA	Tower	10GCSF	Agilent	7683	
SVOA	Autosampler	10GCSF	Agilent	7683	
VOA	AutoSampler	10MSV1	Environmental Sample Tech, Inc.	na	n/a
VOA	Concentrator	10MSV1	Tekmar	3000	GC/MS
VOA	GC	10MSV1	HP	6890	GC/MS
VOA	MS	10MSV1	HP	5973	GC/MS
VOA	GC	10MSV3	Agilent	6890	GC/MS
VOA	AutoSampler	10MSV3	EST Analytical	Centurion	MS
VOA	Concentrator	10MSV3	Encon Evolution	na	GC/MS
VOA	MS	10MSV3	Agilent	5973	GC/MS
VOA	AutoSampler	10MSV5	EST Analytical	Centurion	n/a
VOA	Concentrator	10MSV5	Encon Evolution	na	GC/MS
VOA	GC	10MSV5	HP	6890	GC/MS
VOA	MS	10MSV5	HP MS	5973	GC/MS
VOA	Concentrator	10MSV6	Tekmar	3000	GC/MS
VOA	AutoSampler	10MSV6/10MSV9	Varian Archon	na	n/a
VOA	GC	10MSV6/10MSV9	Agilent	6890A	GC/MS
VOA	MS	10MSV6/10MSV9	Agilent	5973	GC/MS
VOA	AutoSampler	10MSV7	Environmental Sample Tech, Inc.	na	n/a
VOA	GC	10MSV7	Agilent Technologies	6850	GC/MS
VOA	Concentrator	10MSV7	Tekmar	3000	GC/MS

ATTACHMENT IIIA- MINNEAPOLIS EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

VOA	MS	10MSV7	Agilent Technologies	5975C	GC/MS
VOA	GC	10MSV8	5975C	5975C	GC/MS
VOA	AutoSampler	10MSV8	EST Analytical	Centurion	n/a
VOA	Concentrator	10MSV8	Encon Evolution	na	GC/MS
VOA	MS	10MSV8	Agilent	5975C	GC/MS
VOA	Concentrator	10MSV9	Tekmar	14-3100-OEL	GC/MS
VOA	GC	10MSVA	Agilent	6890	n/a
VOA	MS	10MSVA	Agilent	5973	n/a
VOA	autosampler/concentrator	10MSVA	Tekmar	Atomx 15-0000-100	n/a
VOA	Concentrator	10MSVB	EST	Evolution	n/a
VOA	GC	10MSVC	Agilent	6890N	n/a
VOA	AutoSampler	10MSVC	O-I-Analytical Eclipse	Archon 4552	n/a
VOA	Concentrator	10MSVC	O-I-Analytical Eclipse	4660	n/a
VOA	GC	10MSVD	HP	6890	MS
VOA	Concentrator	10MSVD	Teledyne Tekmar	14-9800-100	
VOA	Autosampler	10MSVD	Teledyne Tekmar	15-0500-000	
VOA	MS	10MSVD	HP	5973	
VOA	GC	10MSVE	HP	6890	MS
VOA	Concentrator	10MSVE	Teledyne Tekmar	14-9800-100	
VOA	AutoSampler	10MSVE	Teledyne Tekmar	15-0500-000	
VOA	MS	10MSVE	HP	5973	
VOA	AutoSampler	10GCV1	Environmental Sample Tech, Inc.	na	n/a
VOA	Concentrator	10GCV1	Tekmar Dohrmann	3100	n/a
VOA	AutoSampler	10GCV3	EST Analytical	Centurion	n/a
VOA	Concentrator	10GCV3	Tekmar Dohrmann	3000	n/a
VOA	GC	10GCV3	HP	5890 Series II	PID/FID
VOA	AutoSampler	10GCV5	Environmental Sample Tech, Inc.	na	n/a
VOA	Concentrator	10GCV5	Tekmar	3100	n/a
VOA	GC	10GCV5	HP	G1530A	PID/FID
VOA	AutoSampler	10GCV6	EST Analytical	Archon 8100	n/a
VOA	Concentrator	10GCV6	Tekmar	14-3100-EOL	n/a
VOA	GC	10GCV6	Agilent/HP	HP 6890	PID/FID
VOA	AutoSampler	10GCV9	EST Analytical	Centurion	

ATTACHMENT IIIA- MINNEAPOLIS EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

VOA	GC	10GCV9	Agilent Technologies	7890A	
VOA	Oven	10VOA03	Thermo Scientific	NA	n/a
VOA	Sonicator	10VOA04	Fisher Scientific	FS220	n/a
VOA	Concentrator		O I Analytical	Eclipse 4660	n/a
VOA	Autosampler		Archon	5100A	n/a
VOA	Balance	10BAL9	A&D	FX-3200	n/a
VOA	Balance	10BALA	A&D	EK-300i	n/a
VOA	Balance	10BALE	Mettler	AE200	n/a
VOA	Balance	10BALI	Fisher Science Education	ALF402	n/a
Wet Chem	Incubator	10WET16	Fisher Scientific	Isotemp Incubator	n/a
Wet Chem	Incubator	10WET22	Fisher Scientific	307	n/a
Wet Chem	Incubator	10WET35	Fisher Scientific	307C	n/a
Wet Chem	Incubator	10WET60	Thermo Forma	3940	n/a
Wet Chem	Autotitrator	10WET6	Metrohm	888 Titrando Titrator	n/a
Wet Chem	Autosampler	10WET6	Metrohm	778 Sample Processor	n/a
Wet Chem	Diss. Oxy Meter	10WET51	YSI	5000	n/a
Wet Chem	Oven	10WET17	Precision Scientific	130 DM	n/a
Wet Chem	Oven	10WET20	Fisher Scientific	Isotemp Oven	n/a
Wet Chem	AutoClave	10WET29	Harvey	na	n/a
Wet Chem	pH Meter	10WET7	Orion	na	n/a
Wet Chem	pH Meter	10WET31	IQ Scientific Instruments	na	n/a
Wet Chem	Thermoreactor	10WET26	Neutec Group Inc.	ECO 25	n/a
Wet Chem	COD Reactor	10WET11	Bioscience, Inc.	na	n/a
Wet Chem	KoneLab Discrete Analyzer	10WET3	Thermo Fisher Scientific	Konelab 20	n/a
Wet Chem	Conductivity meter	10WET9	Oaktom	Con 110 Series	n/a
Wet Chem	Colony Counter	10WET30	Gallenkamp	Colony Counter	n/a
Wet Chem	Colony Counter	10WET38	Darkfield Quebec	Colony Counter	n/a
Wet Chem	Water Bath	10WET27	Fisher Scientific	Isotemp 210	n/a
Wet Chem	Distillation Block	10WET12	Environmental Express	na	n/a
Wet Chem	Distillation Block	10WET13	MIDI-STIL	na	n/a
Wet Chem	Spectrometer	10WETA	Hach	DR 2700	n/a
Wet Chem	Hot Plate	10WET34	Presto	Tilt'n Drain Big Griddle	n/a
Wet Chem	Smart Chem Discrete Analyzer	10WT36	West Co Scientific Instruments	Smart Chem 200	n/a
Wet Chem	Hot Plate	10WET40	Corning	na	n/a
Wet Chem	Stir Plate	10WET41	Fisher Scientific	na	n/a
Wet Chem	Stir Plate	10WET42	Barnstead/ Thermolyne	S46725/Cimarec 2	n/a
Wet Chem	Stir Plate	10WET43	Fisher Scientific	na	n/a

ATTACHMENT IIIA- MINNEAPOLIS EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Wet Chem	Vortex Mixer	10WET44	American Scientific Prod.	S8223-1	n/a
Wet Chem	Extractor	10WET45	Horizon Technology	Spe-dex 4790	n/a
Wet Chem	Extractor	10WET46	Horizon Technology	Spe-dex 4791	n/a
Wet Chem	Extractor	10WET47	Horizon Technology	Spe-dex 4792	n/a
Wet Chem	Extractor	10WET48	Horizon Technology	Spe-dex 4793	n/a
Wet Chem	Closed Cup - Penske	10WT49	Precision Scientific	na	n/a
Wet Chem	pH/BOD meter	10WT54	Hach	LBOD10101	n/a
Wet Chem	pH probe	10WT54	HACH		n/a
Wet Chem	pH/BOD meter	10WT53	Hach	HQ40d	n/a
Wet Chem	Hot Block	10WET55	Environmental Express	na	n/a
Wet Chem	Oven	10WT56	Lindberg/Blue M	MO1450PSA-1	n/a
Wet Chem	Oven	10WET65	Fisher Scientific	13-247-650G(6905)	n/a
Wet Chem	pH Probe	11662571034	Hach	PHC301	n/a
Wet Chem	pH Probe	121952571033	Hach	PHC301	n/a
Wet Chem	pH Probe	122143032067	Hach	LBOD101	n/a
Wet Chem	pH Probe	712202002	Switchcraft	PHW77-SS	n/a
Wet Chem	Turbidity Meter	10WT59	Hach	2100Q	n/a
Wet Chem	Hand Held Brix Refractometer	10WT60	Fisher	na	n/a
Wet Chem	Oven	10WET19	VWR Scientific	1370F	n/a
Wet Chem	Quanti-Tray Sealer Model 2x	10WET56	Quanti-Tray	89-10894-02	n/a
Wet Chem	IC	10WT61	Metrohm	881 Compact IC	n/a
Wet Chem	Lachat	10WT62	Quick Chem	8500	n/a
Wet Chem	Autotitrator	10WT63	Metromn	905 USB Sample Processor	n/a
Wet Chem	Fluoride Probe	10WET64	Hanna Instruments	HI 98402	n/a
Wet Chem	JT Backer Speedisk Expanded Extration Station	10WET66	J.T. Baker	Speedisk Expanded Extraction Station	n/a
Wet Chem	COD/Cyanide Block (dual reactor, two heat blocks)	10WET67	Hach	DRB 200	n/a
Wet Chem	Desiccator	10WET68	Sanplatec Corp	DryKeeper	n/a
Wet Chem	Desiccator	10WET69	Boekel	na	n/a
Wet Chem	Desiccator	10WET70	Boekel	na	n/a
Wet Chem	Desiccator	10WET71	Boekel	na	n/a
Wet Chem	Desiccator	10WET72	Boekel	na	n/a
Wet Chem	Desiccator	10WET73	Boekel	na	n/a
Wet Chem	Desiccator	10WET74	Boekel	na	n/a
Wet Chem	Desiccator	10WET75	Boekel	na	n/a
Wet Chem	Meter	10WETE	Hach	HQ440d	n/a
Wet Chem	Oven	10WT77	Fisher Isotemp Oven	6905	n/a
Wet Chem	Oven	10WET78	Fisher Isotemp Oven	6905	n/a

ATTACHMENT IIIA- MINNEAPOLIS EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Wet Chem	Lachat	10WT82	Hach Quick Chem QC 8500 Series 2	8500	n/a
Wet Chem	COD Reactor	10WT83	HACH	45600	n/a
Wet Chem	COD Reactor	10WT84	HACH	16500-10	n/a
Wet Chem	Distillation Block	10WT85	Environmental Express	na	n/a
Wet Chem	Balance	10WETB	Sartorius	RC 210 P	n/a
Wet Chem	Balance	10BALF	Mettler	AJ100	n/a
Wet Chem	Balance	10BALG	Ohaus	EP114C	n/a
Wet Chem	Balance	10BALH	Denver Instrument	MXX-612	n/a
Wet Chem	Balance	10BALB	Ohaus	Scout Pro (SPE 202)	n/a
Wet Chem	Balance	10WETC	Sartorius	AC 210 S	n/a
Wet Chem	Balance	10WET4	Mettler-Toledo	AB135-S	n/a
Wet Chem	Balance	10BALC	Sartorius	LA3200D	n/a

ATTACHMENT IIIB- MONTANA EQUIPMENT LIST (CURRENT AS OF ISSUE DATE)

PACE ID	INSTRUMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER
2201	NIST Thermometer	ThermoFisher	-1 to 201 C	2201
111877001	NIST Thermometer	Fisher Scientific	15-077-55; 255NK; FB50262	111855001
140821733	IR Gun	Milwaukee		140821733
11BAL0 (24353410)	Balance	Denver	MXX-212	24353410
11BAL1 (14138)	Balance	Fisher	7227DA	14138
11MT09 (40020019)	Balance	Sartorius	LC620S	40020019
11MT07 (B027060)	Balance	Fisher	A200DS	B027060
11BAL2 (G3251202300491)	Balance	Ohaus	ARC120	G3251202300491
11BAL3 (E86392)	Balance	Mettler	AE100	E86392
11MT04	Autosampler	Hewlett-Packard	7673	3225A31213
11MT04	Autosampler	Hewlett-Packard	7673	3120A28856
11MT04	SVOA GC	Hewlett-Packard	5890	275A16778
11MT05	IC Autosampler	Dionex	AS40-1	7101378
11MT05	Ion Chromatograph	Dionex	ICS1000	05120175
11MT06	Autoanalyzer Autosampler	Astoria Pacific	311	311162
11MT06	Autoanalyzer Detector	Astoria Pacific	305A	305352
11MT06	Autoanalyzer Heater Unit	Astoria Pacific	303A	303437
11MT06	Autoanalyzer Photometer	Astoria Pacific	350	350376
11MT06	Autoanalyzer Power Supply	Astoria Pacific	304A	304224
11MT06	Autosampler power supply	Perstorp	509	5766
11MT06	Autosampler pump	Perstorp	502	818?5??-212
11MT08	Spectrophotometer	Spectronic	Aquamate	104218
11MT10	Oven	Fisher	Isotemp 255D	1451
11MT11	Oven	Fisher	Isotemp 630F	20900168
11MT12	Muffle Furnace	Sybron	Thermolyne	32400731
11MT13	Concentrator	Zymark	TurboVap II	TB9814N8062
11MT14	Concentrator	Zymark	TurboVap II	4082
11MT15	Furnace	Sybron Thermolyne	1300	0479 16654
11MT16	N-Evap	Organomation	112	11771
11MT17	Waterbath	Northwest Fixtures	l5505	246T
11MT19	Sonicator	Fisher	FS60	RUA080390744
11MT22	Furnace	Leco	S-144DR	3167
11MT23	Turbidimeter	HF Scientific	Micro 1000	610064
11MT24	Sonicator	Heat Systems	Sonicator XL	Can't read
11MT25	Sonicator	Branson	Sonfier 450	B1090019
11MT28	Microscope*	Olympus	BH-2	217295
11MT29	Microscope*	Olympus	BH-2	230579
11MT30	Stereoscope	Fisher	8711	

ATTACHMENT IIIB- MONTANA EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

11MT31	Steroscope	Olympus	G10X	340704
11MT32	Microscope*	Olympus	BH-2	242833
11MT38	Concentrator	Tekmar Dohrmann	3100	99274012
11MT38	GC System	Agilent	6890	US00032765
11MT38	MS Detector	Agilent	5973	US94240027
11MT40	pH meter	Accumet	AR50	81207936
11MT41	Oven	Fisher	Isotemp 630F	
11MT42	Oven	Precision Scientific	Thelco 130 DM	9212-016
11MT43	GC System	Agilent	6890	US00021845
11MT43	Concentrator	EST	Evolution	EV431073112
11MT43	AutoSampler	EST	Centurion	CENT-W-416041012
11MT44	Flow Analyzer	Lachat	8500	120400001407
11MT45	For Calculation acodes			
11MT46	listed as generic instrument in Epic			
11MT47	Sieve Shaker	Gilson	SS-15	6290
11MT48	Sieve Shaker	W.S. Tyler	RX_29	10-2394
11MT49	Sieve Shaker	Gilson	SS-15	6289
11MT50	Sieve Shaker	Gilson	SS-84	1587
11MT51	Concentrator	Zymark	Turbo Vap II	4254
11MT52	GC System	HP	5890 series 2	336A53379
11MT52	Autoinjectors (2)	HP	7673	3120A27091 & 3249A33250
11MT55	Custom Shaker	Custom	NA	NA
11MT56	Oven	Fisher516G		801N0068
11MT57	Autoclave	ThermoFisher	ST75925	1277081210300
11MT58	Metals Block Digester	Environmental Express	Hot Block	S388CEC2479
11MT59	UV VIS Spectophotometer	Varian	Cary50BIO	EL98033269
11MT60	ICP	ThermoFisher	ICAP6500 Duo	20071505
11MT60	Autosampler	CETAC	ASX-520	71011378
11MT60	Chiller	ThermoFisher	ThermoFlex900	51520175
11MT61	Centrifuge	Damon	IEC HN-S	34721368
11MT62	Block Digestor	Lachat	BD-46	1800-296
11MT63	unused			
11MT64	Handheld pH	Thermo Scientific	Star A121	H00013
11MT65	Spectrophotometer	Thermo Scientific	Evolution 201	5A4S008017
11MT66	Hood			
11MT67	Hood			
11MT68	Hood			
11MT69	Hood			
11MT70	Hood			
11MT71	Hood			
11MT72	Hood			
11MT73	Hood			
11MT74	Concentrator	Caliper Life Science	Turbo Vap II	04316
11MT75	pH meter	Fisher Scientific	accumet XL200	XL94104028
11MT43	AutoSampler	EST	Centurion	CENT-W-416041012

ATTACHMENT IIIB- MONTANA EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

11MT76	Oven	Fisher Scientific	116G	972
11MT77	GC System	Agilent	G1540N	US10238089
11MT77	Autosampler	Agilent	G2913A	CN81047578
11MT77	Autosampler	Agilent	G2913A	CN82750941
11MT77	Autosampler Tray	Agilent	G2614A	CN21720602
11MT78	TCLP Rotator A	NA	NA	NA
11MT78	TCLP Rotator B	NA	NA	NA
11MT78	TCLP Rotator C	NA	NA	NA
11MT79	Filter Pump 1.5	Edwards	NA	9996305884
11MT80	Filter Pump 2	Edwards	5KC37NN470GX	PFL080760
FSA4	Autopipette	Hamilton	1000 uL Adj. Vol.	078490
FSA5	Autopipette	Hamilton	999 uL Adj. Vol.	078778
FSA6	Autopipette	Hamilton	300 uL Adj. Vol.	078528
FSA7	Autopipette	Thermo Scientific	2-5mL	
IN-1103 - WC4	Autopipette	Oxford	1000-5000uL	E02008781
IN-1106 - IC3	Autopipette	Gilson	50-2000uL	Z54657M
WC2	Autopipette	Eppendorf	0.1-1mL	4035876
WC5	Autopipette	Hamilton	.25-1mL	033269
WC6	Autopipette	Eppendorf	20-200uL	4078539
WC7	Autopipette	Finnpipette	1-10mL	GJ45632
WC8	Autopipette	Thermo Scientific	2-5mL	
MET1	Autopipette	Hamilton	.05-0.3mL	080395
MET2	Autopipette	Hamilton	0.1-1mL	80953
IC1	Autopipette	Hamilton	0.1-1mL	39492
IC5	Autopipette	Finnpipette	0.5-5mL	KH11148
IC6	Autopipette	Hamilton	0.1-1mL	82121
BT13 HNO3	Bottletop Dispenser	Fisher	BTD-513615514	14024994
BT1 MeCl2	Bottletop Dispenser	Brinkmann		
BT2 MeOH	Bottletop Dispenser	Fisher		
BT3 MeCl2	Bottletop Dispenser	Eppendorf		
BT4 Hexane	Bottletop Dispenser	Dispensette		
BT5 Ammonium Acetate	Bottletop Dispenser	Fisher		AF 2153
BT6 Sodium Acetate	Bottletop Dispenser	Fisher		AF6770
BT7 Ethanol	Bottletop Dispenser	Fisher		AF6862
BT8 Digest Solution	Bottletop Dispenser	Fisher		
BT9 Potassium Dichromate	Bottletop Dispenser	Fisher		AG4962
BT10 2M KCl	Bottletop Dispenser	Fisher		14024979
BT11 NaHCl3	Bottletop Dispenser	Fisher		14024938
BT 12 CaCO3	Bottletop Dispenser	Fisher		14024929
BT 14 ICP/Metals	Bottletop Dispenser	Fisher		14200358
BT 15 Metals/HMP	Bottletop Dispenser	Brinkmann		
MTC-11	Refrigerator	Frigidaire	FRU17B2JW18	WA93300079
MTC-13	Freezer	SPT	UF-160S	A100600186

ATTACHMENT IIIB- MONTANA EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

MTC-14	Refrigerator	Saturn	S494	A94B200112T
MTC-15	Refrigerator	Black & Decker		
MTC-16	Refrigerator	Centaur Plus	CSD-2DR-BAL	1201CENH00159
MTC-17	Freezer	SPT	UF-150W	NB37116248F40631
MTC-18	Refrigerator			
MTC-4	Refrigerator	Kenmore	546.9901741	920940742
MTC-9	Refrigerator	Traulsen	620010	T33587106
N/A	Freezer	Kenmore	253.165421	W864429495
N/A	Pulverizer	Retsch	RS100	
N/A	Vacuum Pump	Edwards	E2M2	41032
N/A	Vacuum Pump	Dayton	SA55NXGTB-4142	E22922
DocuTemp	Automated Temperature Monitoring System	DocuTemp	2.0.365	
MDT20-MTC-9	Temperature probe	DocuTemp		E1018118845450
MDT25-MTC-16	Temperature probe	DocuTemp		E10180A0244223
MTD29-MTC-18	Temperature probe	DocuTemp		E1018058065569
MTD28-MTC-1	Temperature probe	DocuTemp		E1018174968619
MTD22-MTC-13	Temperature probe	DocuTemp		E10180C0244223
MTD21-MTC-11	Temperature probe	DocuTemp		E1018120936302
MTD19-MTC-4	Temperature probe	DocuTemp		E10180E8185688
MTD23-MTC-14	Temperature probe	DocuTemp		E10181834939352
MDT26-MTC-17	Temperature probe	DocuTemp		E10180D4214956
MDT34-MTC-15	Temperature probe	DocuTemp		E1018144971668

*All microscopes cleaned 10-25-10

ATTACHMENT IIIC- VIRGINIA EQUIPMENT LIST (CURRENT AS OF ISSUE DATE)

DESCRIPTION	MANUFACTURER	MODEL #/SN#
CVAA Mercury Analyzer	Cetac	M-6100/060402 QT6
Autosampler	Cetac	ASX-400/070401 ASX-4
Hardware	Venture Systemax	SYX PHM800PRO/106381144
Software	Cetac	Quicktrace Hg Analyzer System Version 1.2.1
Graphite Furnace AA	Perkin Elmer	A/S 800/8444
Autosampler	Perkin Elmer	ASX 520 / 090511A520-06
FIAS 400 Hydride Chemifold	Perkin Elmer	400511051103
Hardware	Dell	Optiplex GX1/06UQ4
Software	Perkin Elmer	AA Winlab Instrument Control Software Ver3.9
ICP Atomic Emission Spectrometer	Perkin Elmer	Optima 3000XL/069N4081202
Autosampler	Cetac	ASX-520/090511A520-new in 2006
Hardware	Compudyne	X86 Model 7/4747
Software	Perkin Elmer	Winlab 32 ICP Optical Emission Software Ver2.2
ICPMS Atomic Emission Spectrometer	Perkin Elmer	ELAN 9000 / AJ11920712
Autosampler/Pump	Perkin Elmer	S10/102S8010517
Recirculator	Polyscience	NA
Software	Perkin Elmer	Version 3.4
Hardware	Dell XP	X12-51522
Lachat	Zellweger Analytics	Lachat Quikchem FIA+ 8000 Series/A83000-1480
Lachat Reagent Pump	Zellweger Analytics	RP-150 Series/A82000-1527 replacement 2005
Autosampler	Cetac	ASX-500 Model No 510/109932ASX
Autodilutor	Zellweger Analytics	8000 Series/A81010-277 Out of service ~2002
Micro Distillation Equipment (Ammonia)	Lachat MicroDist 5/09	081200001033
Block Digester	Lachat	BD-46/1800-408
Hardware	Midwest Comp Depot	3035
Software	Omnion	FIA Data System
Ion Chromatograph 12WTA2	Metrohm	861 Advanced Compact IC/48614011
Regenerant Dispenser	Metrohm	None
Autosampler	Metrohm	Model 838 Advanced Sample Processor
Hardware	Dell	SN#CBDUC284-70821-553-OGIP
Software	Metrohm	IC Net 2.3
Ion Chromatograph 12WTA7	Metrohm	Model 881 Advanced Compact IC 1881000122119
Regenerant Dispenser	Metrohm	800 Dosino
Autosampler	Metrohm	Model 858 Advanced Sample Processor
Hardware	Dell	Optiplex 790
Software	Metrohm	IC Net 2.3
BOD Warmer #1	Thermo Precision	60541072
BOD Incubator #1	VWR	Model 2020/09065105
BOD Incubator #2	VWR	Model 2020/0902090

ATTACHMENT IIIC- VIRGINIA EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

BOD Incubator #3	VWR	Model 2020/2107705
BOD Reader	Thermo Electron Corp	BOD Auto EZ BOD Reader 10060020/A0074
BOD Hardware	Hewlett Packard/Compaq	24A41601N8
BOD Software	Thermosystems	BOD Auto EZ 2001
TOC 12WTA3	OI Analyzer	SN H129732449E
TOC	OI Autosampler	SN E129788451
TOC	OI Solids Analyzer	SN A129733824
Autosampling Module	OI Corporation	No Model/621290637-92120
IR Detector	OI Corporation	No Model/2A0002T
Hardware	HP	Compaq
Software	OI Corporation	V1.4.2
TOC 12WTA8	OI Analyzer	SN P407730312P
Autosampling Module	OI Corporation	Model 1088 AS
IR Detector	OI Corporation	Model 1030
Hardware	Lenovo	Thinkcentre
Software	OI Corporation	1.4.2
Drying Oven 1996	Blue M	OV-18C
Furnace 2005	Barnstead/Thermolyne	62700/BT010507A
Solids Balance	ADA	71/L/AE04260556
Hardware 2004	ABS	52X MTRP/10085322
Software 2004	EZ Solids	EZ_Solids Program June 23, 2004
Expandable Ion Analyzer	Orion	940/6673
Autosampler	Orion	AS 3000/B0019
Bacteria Incubator	Shel Lab / New 3/07	1545/11052906
Coliform Incubator Bath	ThermoFisher/New 4/07	253/SN202682-185
Microscope 10X/30X	National Optical/New 2/07	446TBL-10
Bacteria Incubator	Shel Lab 1996 (Sterility chk)	1520
Quanti Tray Sealer	IDEXX	89-10894-02 4788
Oven 2005	VWR	1330GM/05039804
Oven	TEMPCON	P10734
Water Bath	Fisher Scientific	FS140/FS010507
Metals Digestion Blocks (HB1; HB2)	CPI	05-C0530/000424 1005-CPI ModBlock Inst
Balance (Metals) 12BAL3	AND	GF 1200 / 10318953
Balance	Sartorius	LA 3200D / 13407528
Balance	Sartorius	Genius / 13003773
Stir Plate	Thermoline Type 7200	903971255007
Refrigerator 2R (Metals)	Sanyo	SR-362OK/051105496-new 6/30/06
Refrigerator #3	True Mfg Co.	T-49/1-2953805
Refrigerator #5	True Mfg Co.	T-49/1-3060851
Refrigerator #8	True Mfg Co	T-35/I-3016399
Refrigerator #10	Gibson	NTS Fridge #10 at 526 NTS
Refrigerator #12	Beverage-Air	9029136/KR481AS
Refrigerator #13	US Cooler Walk-in	29716
Mixer	Thermolyne	M37615/376950140798
Stir/Hotplate	VWR	12365-392 / 050914023

ATTACHMENT IIIC- VIRGINIA EQUIPMENT LIST CONTINUED (CURRENT AS OF ISSUE DATE)

COD Reactor-Hot block	HACH	45600-00/920600007477
COD Reactor- Hot block	HACH	16500-10/5944
Dessicator	Labconco	55300/171400
Dessicator	Labconco	55300/232878
Dessicator	Glass	
Mixer	Fisher Scientific	Model 15/103
Rotator	Lab-Line	Model 1345/1002-1791
Balance Extraction/Solids	Acculab	VI 600/027UC1079
Autoclave	Tuttnauer/Brinkmann	3545EP
pH Meter	Orion	550A / 016948
Turbidimeter 12WET4	HF Scientific	39957 / 10621
Dissolved Oxygen Meter	YSI	5100
BOD Software	YSI	5120 BODANALYST
Spectrophotometer	HACH	DR 5000
Closed Cup Flashpoint Tester	Koehler	K16200
Water Purification System, DI	Barnstead	E-Pure
Water Purification System, RO pure LP Low pressure RO System	Barnstead Thermolyne	Model D2622 SN 496000209600 Cartridge Changes noted in log book
Resistivity Meter for RO system	Sybron Barnstead	Model 02770 Resistivity Log Sheet is posted by system

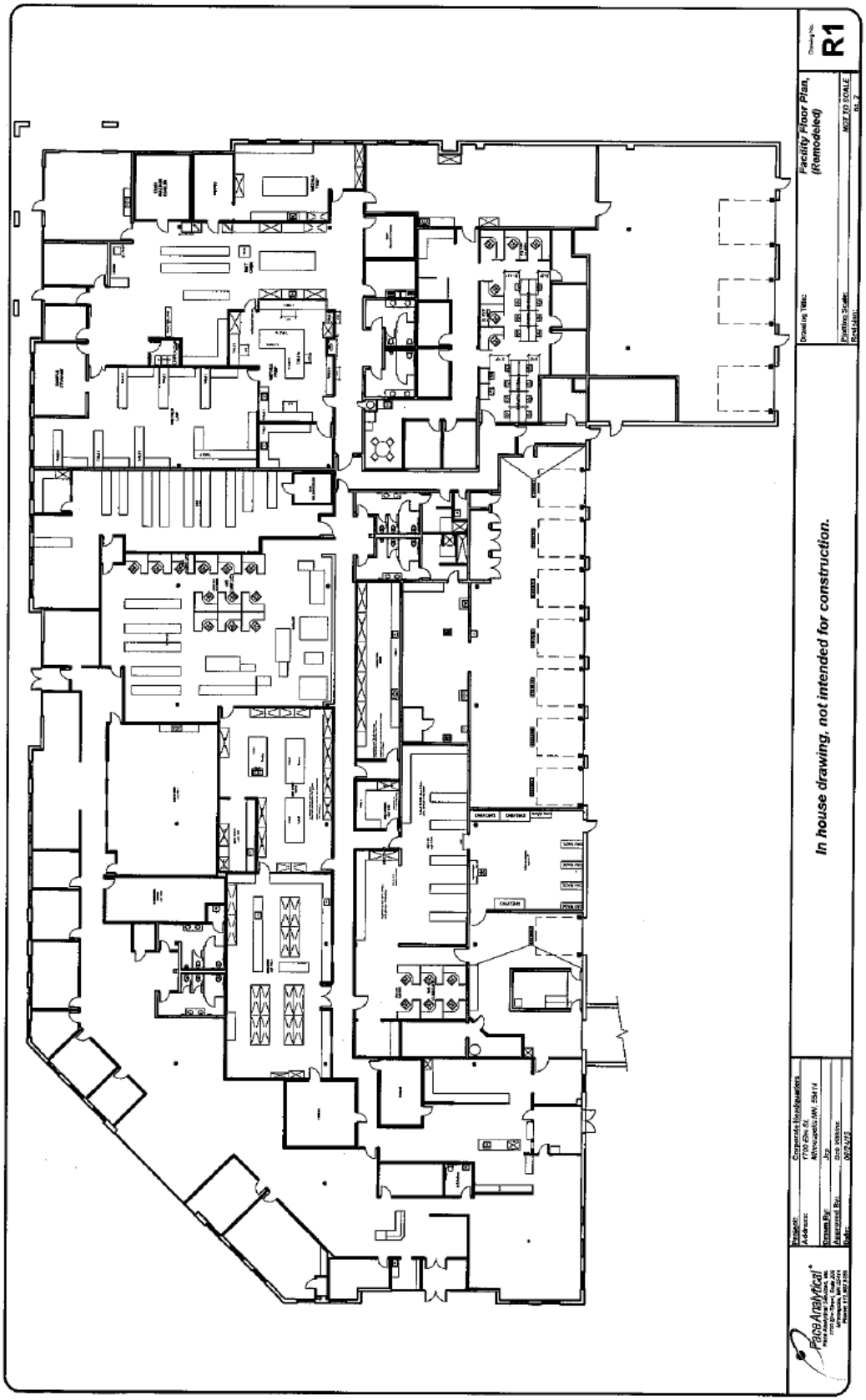
ATTACHMENT IIID- DULUTH EQUIPMENT LIST (CURRENT AS OF ISSUE DATE)

DESCRIPTION	MANUFACTURER	MODEL #/SN#
Water Purification System	Barnstead D4641	1090090938202
Refrigerator D-1	Admiral	LTS2112ARW
Refrigerator D-2	Estate Whirlpool	TT18AK
Mercury Analyzer CVAFS	Brooks Rand Model III	11026201
Autosampler	Brooks Rand PS	4936A14632
Total Hg Purge and Trap	Brooks Rand Merx	11078001
Hg Speciation Purge and Trap	Brooks Rand Merx	41107301
Hardware	XPRO Systems	
Software	Mercury Guru	4.1
Balance	Sartorius ME14145	13003775
Hood DB-1	Esco	04ESC
Hood DB-2	Esco	04ESC
Hood 3 DE-1 Perchloric Acid Hood	Labconco	
Bacteria Incubator	Thermco Precision	605031678

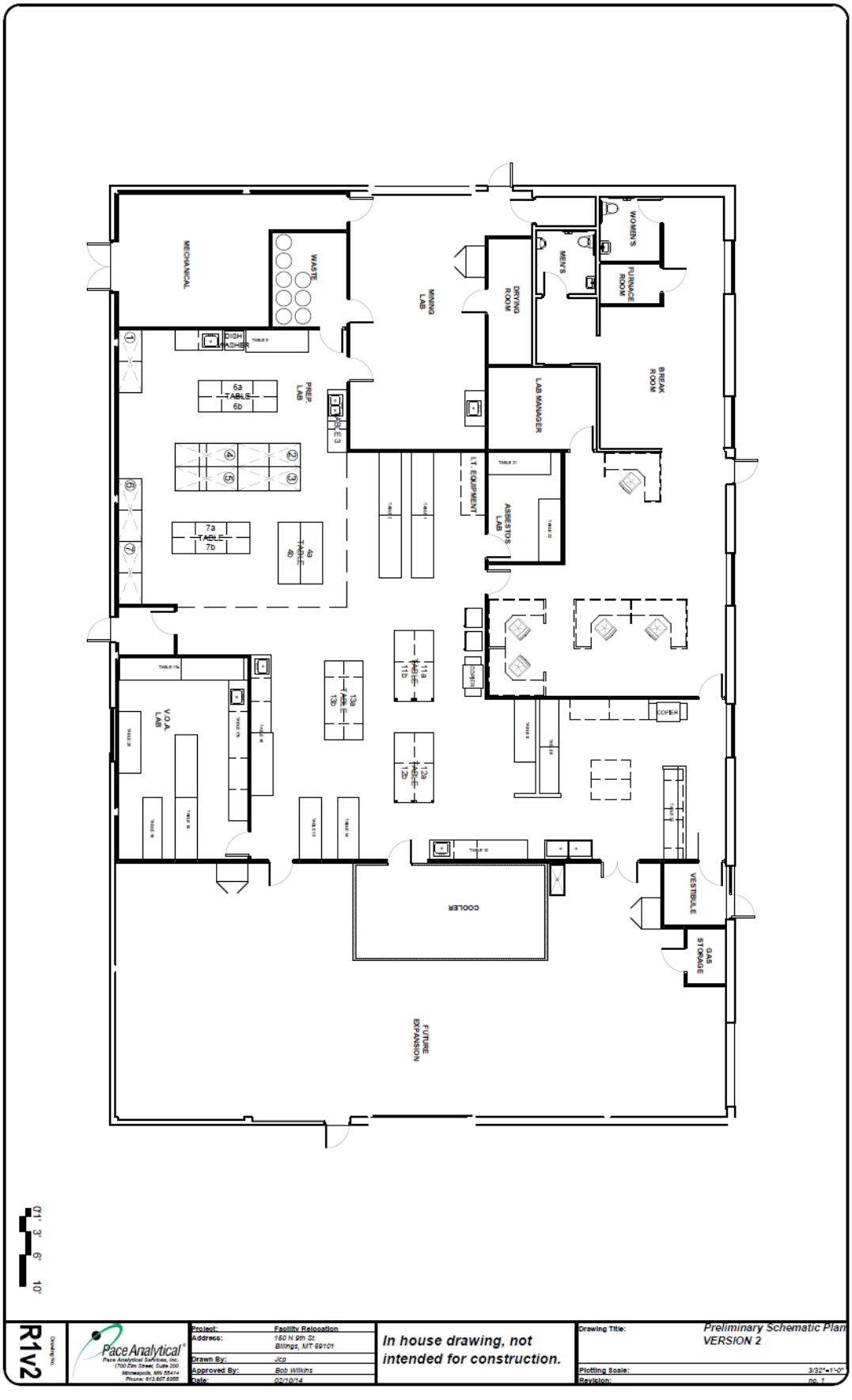
ATTACHMENT IIIE- DULUTH ONEOTA EQUIPMENT LIST (CURRENT AS OF ISSUE DATE)

DESCRIPTION	MANUFACTURER	MODEL #/SN#
Oven (Metals)	Blue M	OV-8A / SA-365
Mercury Analyzer	Cetac	M6000A / 129904MAS
Turbidimeter	HACH	18900-00 / 931000007018
Centrifuge	Beckman	TJ-6 /
Furnace, Muffle (Wet Chem)	Lindberg	51442, Controller 58114
Spectrophotometer, UV VIS	Thermo	9423AQ2100E / HEDN238001
Microscope	American Optical Corporation	Forty / 814602
Digester, Block	SPC Science	Digi Prep /
Incubator, 35°	VWR	1525 /
Turbidimeter (Nephelometer)	HACH	2100AN / 100002146
Oven, Drying (modified w/PID)	VWR (Shel Lab)	1370G / 1200600
Incubator, 44.5° (modified w/PID)	LabLine	3010/12
Oven, Drying (modified w/PID)	Thelco	Model 28
Incubator	LabLine	Model 460NS
Balance, Top Loading	Mettler	P1200 / 304562
Balance, Analytical	AND	HR-120 / 12200149
Balance, Analytical	AND	/ 010910-1
Lachat	Zellweger Analytics	8500 / 50100000097
Ion Chromatograph	Zellweger Analytics	8500 / 091708136940
Lachat Autosampler	Zellweger Analytics	ASX 520 / 010591A520
Lachat	Zellweger Analytics	8500 / 40900000051
Lachat Autosampler	Zellweger Analytics	ASX 600 / A81010-007
Distillation Unit (Microblock)	Environmental Express	
Micro Distillation Unit	Lachat (21 place)	
pH Meter	Thermo Orion	Star Series / B07284
LDO Meter / Probe	HACH	HQ30d flexi /
pH Meter	Orion	720A / 13043
Stir Plate	Thermolyne	SP18425 / 757960584897
COD Reactor	HACH	45600-00 / 950900013204
pH Meter	Orion	301 / 43996
Hotblock, (TKN)	Technicon	BD-40 /
HotPlate	Thermolyne	Ciramec 3 /
HotPlate	Thermolyne	Ciramec 3 /
Refrigerator	Turbo Air	M3R47-2 / M3R4L43095
Refrigerator	Turbo Air Cooler	TSR-49 / 017495044MR
Digester (Phosphorus)	CAI	Smartblock 226 /
Furnace, Muffle w/Thermolyne12900 controller	Thelco	F1630 /
Water Bath (Fecal Bacteria)		
Sealer, QuantiTray		Model 2X / 89-10894-00 / 01174
Freezer, Chest	Wood's	
Sterilizer	EZE	
CO2 Incubator	LabLine	460NS / 8098-0037
Refrigerator	Maximum	MSR-23RM / MR23101012
Refrigerator (bacteria)	Absocold	Table Top
Light Box (Bioassay)	Hall Productions	Model No 1218 /
pH Meter	Thermo Orion	Model 420 / 069292
Conductivity Meter	HACH	Sension 5 /
D.O. Probe	HACH	HQ 30d Flex /
Refrigerator	TurboAir Maximum	TSR 49 / 009495009MR
Refrigerator	Under Counter	Not listed
Sir Plate	Corning	PC 520 /
Autoclave	Market Forge	Strerilmatic STM-E /
Refrigerator (Bioassay con't)	Turbo Air	TSR-49 /
Refrigerator	Turbo Air	TSR-49 /
Autoclave	Napco	DSE Model 8000 /
Titrator, amperometric	HACH	19299-00 / 96090001089
Water Purification System:	Culligan	Dual activated Carbon/mixed bed deionizers
Water Purification System (subsequent)	Barnstead	'B-Pure' system/mixed bed deionizers/0.45 µm final filter

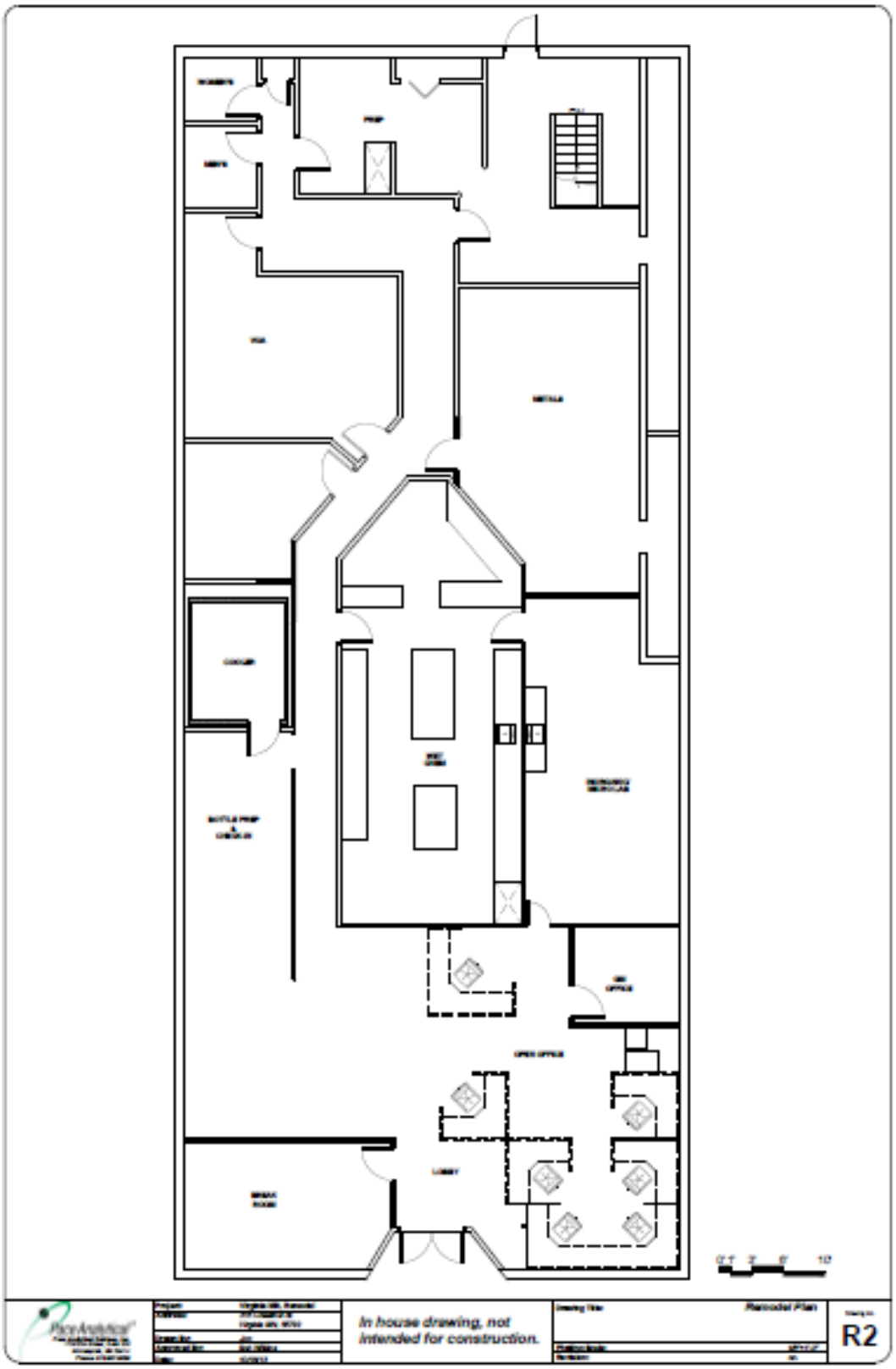
ATTACHMENT IVA- MINNEAPOLIS LABORATORY FLOOR PLAN (CURRENT AS OF ISSUE DATE)



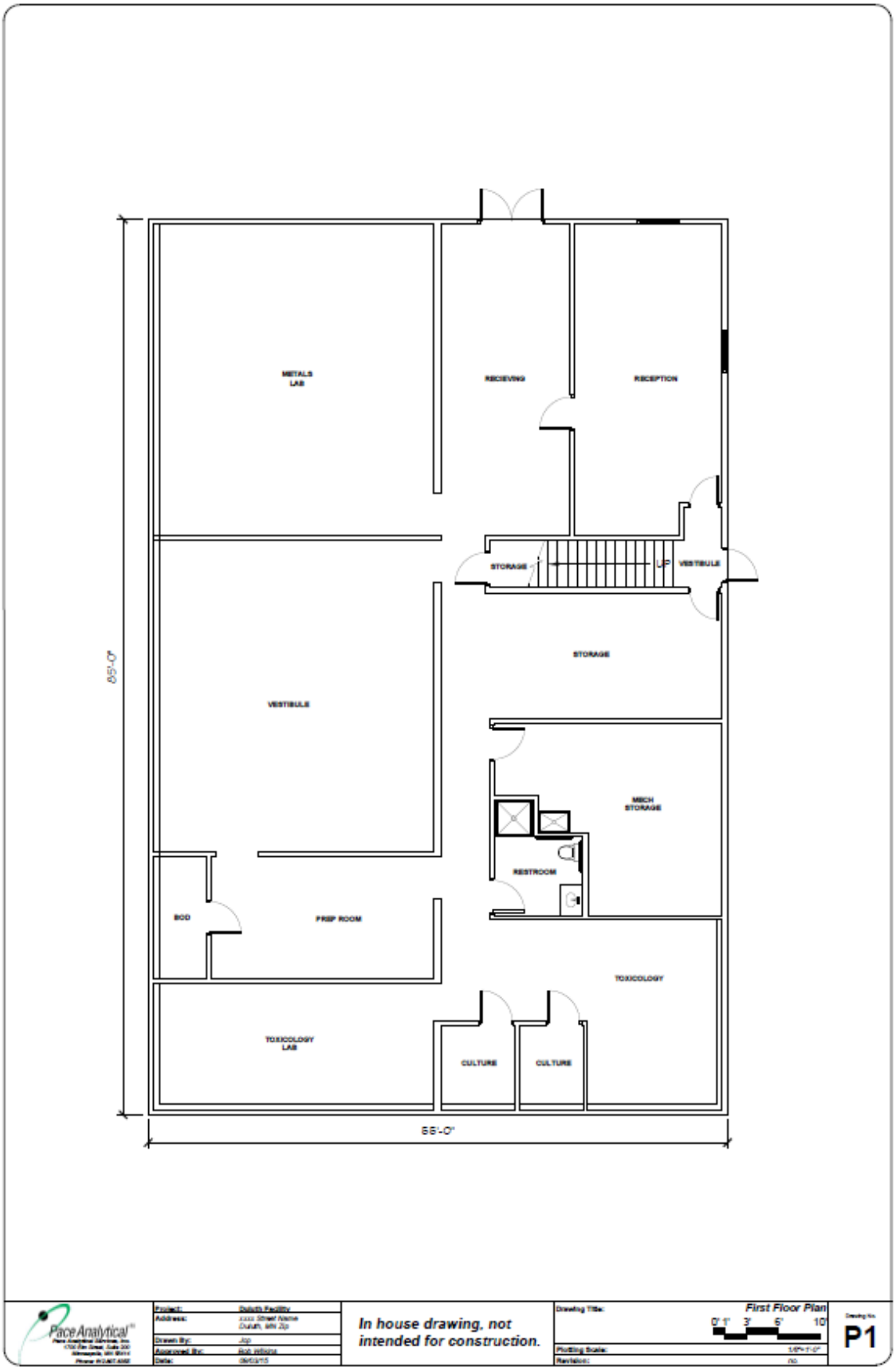
ATTACHMENT IVB- MONTANA LABORATORY FLOOR PLAN (CURRENT AS OF ISSUE DATE)



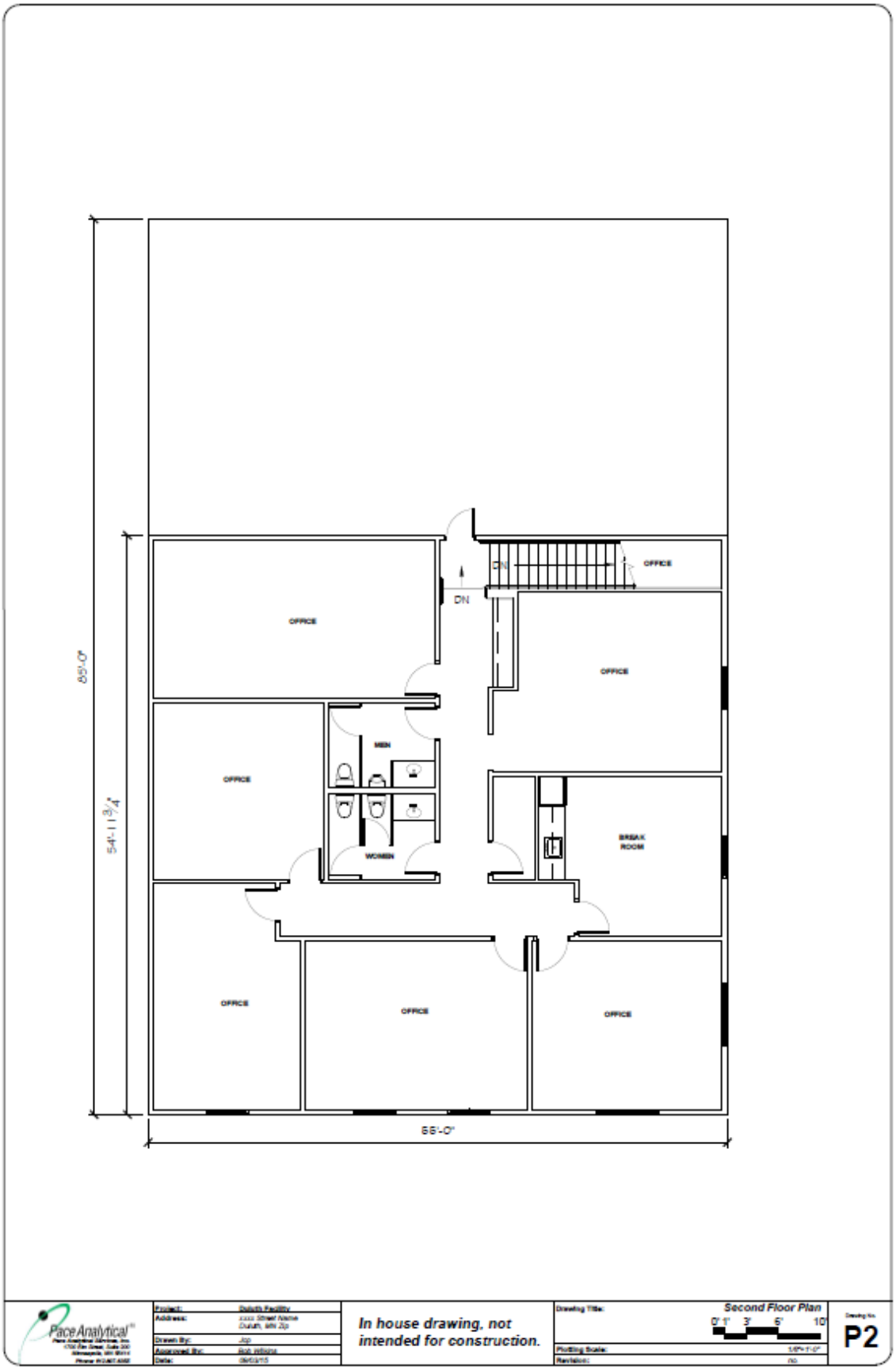
ATTACHMENT IVC- VIRGINIA LABORATORY FLOOR PLANS (CURRENT AS OF ISSUE DATE)



ATTACHMENT IVD- DULUTH LABORATORY FLOOR PLANS (CURRENT AS OF ISSUE DATE)



ATTACHMENT IVD- DULUTH LABORATORY FLOOR PLANS (CURRENT AS OF ISSUE DATE)



ATTACHMENT VA- MINNEAPOLIS SOP LIST (CURRENT AS OF ISSUE DATE)

Title	SOP Number
Determination of Methane, Ethane, and Ethene in Air Modified TO-3	S-MN-A-002
Analysis of Air Samples for Volatile Organic Compounds by Gas Chromatography/PID-FID method TO-3	S-MN-A-003
Cleaning, Certification, Leak Checking and Preparation for Shipment of SUMMA Passivated Canisters	S-MN-A-004
Determination of Fixed Gases in Air by Modified 3C	S-MN-A-005
Methane, Ethane, Ethene, and Propane in Water by GCFID mod. 3810 and RSK 175	S-MN-A-007
Analysis of Whole Air Sample for Volatile Organic Compound by GC/MS EPA TO15/TO14	S-MN-A-013
Determination of Hydrocarbons in Air using Radiello Passive Sample Tubes	S-MN-A-017
Analysis of TO17 Active Air Samples	S-MN-A-018
Analysis of BTEX and PAHs in Whole Air Using Thermal Desorption Tubes and GC/MS	S-MN-A-019
The Determination OF Hydrocarbons in Air Samples via RAD145 RADIELLO® Passive Sample Tubes	S-MN-A-020
Sample Management	S-MN-C-001
Bottle Preparatation	S-MN-C-003
Subcontracting Samples	S-MN-C-004
Internal Chain of Custody	S-MN-C-005
Percent Solids (Moisture)	S-MN-I-367
The Determination of Specific Aromatic Compounds and Gasoline Range Organic in Water and Soils	S-MN-O-427
Purgeable Total Petroleum Hydrocarbons in Water (8015 Mod / CA LUFT)	S-MN-O-525
Purgeable Total Petroleum Hydrocarbons in Water (NWTPH)	S-MN-O-555
Determination of Gasoline Range Organices by Method AK101	S-MN-O-556
Volatiles Water Sample Compositing Procedure	S-MN-O-541
Analysis of Polychlorinated Biphenyls in Oil, Soil, Water, Wipe and Air Matrixes	S-MN-O-432
Determination of Diesel Range Organics in Water and Soil (Wisconsin modified DRO)	S-MN-O-466
Ethylene glycol, Propylene Glycol, Triethylene Glycol by Modified 8015	S-MN-O-533
Saturated Hydrocarbons (Alkanes/Isoprenoids Compounds) and Total Extractable Hydrocarbons	S-MN-O-567
Determination of Pesticides in Water and Soil	S-MN-O-574
Determination of EDB and DBCP in Aqueous Samples	S-MN-O-576
The Determination of Diesel Range Organics, Residual Range Organics and Total Extractable Hydrocarbons	S-MN-O-578
Preparation and Analysis of Samples for the Determination of Dioxins and Furans by USEPA Method 8290/8290A	S-MN-H-001
Preparation and Analysis of Samples for the Determination of 2,3,7,8-TCDD using USEPA Method 1613B, Drinking Water	S-MN-H-003
Preparation and Analysis of Samples for the Determination of PCDDs, PCDFs, and PCBs by modified USEPA Method 23, TO9, or NY State Guidelines	S-MN-H-005
Method 1668, PCB Congenger (WHO List)	S-MN-H-009
Preparation and Analysis of Samples for the Determination of Dioxins and Furans by 8280M	S-MN-H-013
Preparation and Analysis of Samples for the Determination of Chlorinated Biphenyl Congeners	S-MN-H-014
Preparation and Analysis of Samples for the Determination of Polybrominated Diphenyl Ether Congeners	S-MN-H-016
Mercury Prep Round Glass	S-MN-I-306
TCLP/SPLP	S-MN-I-312

ATTACHMENT VA- MINNEAPOLIS SOP LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Inductively Coupled Plasma Atomic Emission Spectroscopy (RCRA)	S-MN-I-313
Hardness by Calculation	S-MN-I-338
Mercury in Liquid and Solid/Semis-Solid Waste	S-MN-I-359
Digest Procedure for Aqueous Samples to be Analyzed by Induct Coupled Plasma (SW-846)	S-MN-I-458
Metals Preparation for Solid samples, Wipes and Filters	S-MN-I-460
Metals Analysis by ICP/MS - Method 6020 and 200.8	S-MN-I-492
Preparation of Aqueous Samples for ICPMS Analysis	S-MN-I-523
Lead in Ambient Air	S-MN-I-601
Microwave Digestion of Oil	S-MN-I-602
Extractable Base/Neutral and Acid Organic Compounds in Liquid, Solid, and TCLP Matrices by Gas Chromatography/Mass Spectrometry Capillary Column Technique	S-MN-O-436
8270-L Extractable Base/Neutral and Acid Organic Compounds in Water and Liquid Matrices by GC/MS Capillary Column Technique w/Selective Ion Monitoring	S-MN-O-507
Extractable Base/Neutral and Acid Organic Compounds in Liquid by EPA Method 625	S-MN-O-532
Determination of Parent and Alkylated PAH Compounds in Solid and Liquid Matrices by GC/MS SIM	S-MN-O-561
Analysis of Air samples by GC/MS - Method TO-13	S-MN-O-534
Sulfolane Extraction and Analysis in Liquid Matrices by GCMS	S-MN-O-569
High Volume Injection for 8270C SIM	S-MN-O-570
Analysis of Volatile Organic Compounds by GC/MS Method 8260	S-MN-O-521
Analysis of Volatile Organic Compounds by GC/MS Method 624	S-MN-O-529
Analysis of Volatile Organic Compounds in Water Method 524.2	S-MN-O-546
Method For Sonicator Tuning	S-MN-O-414
Cleaning Glassware in the Organic Laboratory	S-MN-O-465
Sonication Extraction Technique for Base/Neutral and Acid Compounds (3550C Modified)	S-MN-O-495
Continuous Liquid-Liquid Extraction (SW3520) for Base/Neutral and Acid Compounds	S-MN-O-496
Spike Verification in the Organic Prep Lab	S-MN-O-497
Preparation of Anhydrous Sodium Sulfate for Extraction Purposes	S-MN-O-500
Nitrogen Evaporation Technique	S-MN-O-503
Sample Concentration Technique	S-MN-O-504
Separatory Funnel Extraction for Polyaromatic Hydrocarbons by 8270-SIM	S-MN-O-506
Solvent Exchange into Hexane	S-MN-O-509
Continuous Liq/Liq extraction for Method 8270C (Dual pH) by SW 3520C	S-MN-O-539
Soil Extraction for PAH Analysis by GC/MS:SIM (3550C)	S-MN-O-540
Separatory Funnel Extraction	S-MN-O-566
Data Archiving and Retrieval	S-MN-L-106
Reagent Water Quality	S-MN-L-110
Generation of EDD	S-MN-L-112
Preventative, Routine, and Non-routine Maintenance	S-MN-L-114
Receipt and Storage of Laboratory Supplies	S-MN-L-117
Data Review Process	S-MN-L-132
Syringe Technique	S-MN-L-139

ATTACHMENT VA- MINNEAPOLIS SOP LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Procedure for Handling Aqueous Organic Extractable Samples Containing Sediment	S-MN-L-142
Purchasing Laboratory Supplies	S-MN-L-143
Laboratory Housekeeping	S-MN-L-145
Sample Homogenization and Sub-Sampling	S-MN-L-147
Quality Manual	17.1
Control Chart Generation and Trend Analysis	S-MN-Q-205
Manual Integration	S-MN-Q-214
Control of Hazardous Energy Program - Lockout/Tagout	S-MN-Q-249
Method Validation and Modification Studies	S-MN-Q-252
Procedure for Handling of USDA regulated soils	S-MN-Q-253
Estimation of Measurement Uncertainty	S-MN-Q-255
Management of Change	S-MN-Q-257
Proficiency Testing Program	S-MN-Q-258
Evaluation and Qualification of Vendors	S-MN-Q-259
Use of A2LA Terms and Symbols	S-MN-Q-260
Conflict of Interest Plan	S-MN-Q-261
Corrective and Preventative Actions	S-MN-Q-262
Monitoring Temperature Controlled Units	S-MN-Q-263
Support Equipment	S-MN-Q-264
Document Control and Management	S-MN-Q-268
Determination of Limit of Detection and Limit of Quantitation	S-MN-Q-269
Review of Analytical Requests	S-MN-Q-270
Internal and External Audits	S-MN-Q-271
MCL Violation Reporting	S-MN-Q-272
Preparation of Standard Operating Procedures	S-MN-Q-273
Spreadsheet Validation	S-MN-Q-274
Standard and Reagent Management and Traceability	S-MN-Q-275
Use of the Pacelink System	S-MN-Q-276
Chemical Hygiene Plan/Safety Manual	S-MN-S-001
Waste Management Training Requirements	S-MN-S-002
Waste Handling and Management	S-MN-S-003
MN Contingency Plan	2014
Air Quality Monitoring and Fume Hood Monitoring	S-MN-S-004
Biochemical Oxygen Demand (BOD) and Carbonaceous Biochemical Oxygen Demand (CBOD)	S-MN-I-348
Determination of Hexane Extractable material (HEM) and Silica Gel Treated – Hexane Extractable Material (SGT-HEM) in Solids	S-MN-I-357
Hexavalent Chromium in Water and Wastewater	S-MN-I-358
Alkalinity, Titrimetric	S-MN-I-365
Fluoride in Water and Wastewater	S-MN-I-470

ATTACHMENT VA- MINNEAPOLIS SOP LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Determination of Total Phosphorus in Aqueous Samples by SmartChem	S-MN-I-473
Specific Conductivity	S-MN-I-474
Ortho Phosphorus in Water by the Konelab, Ascorbic Acid Method	S-MN-I-477
Settleable Solids	S-MN-I-486
Standard Test Method for Screening Apparent Specific Gravity and Bulk Density Waste	S-MN-I-493
Determination of Total Recoverable Phenolics by Flow Injection Colorimetry	S-MN-I-494
Turbidity	S-MN-I-501
Chlorine, Total Residual in Water	S-MN-I-502
Use and Maintenance of the Konelab	S-MN-I-507
Determination of Nitrate/Nitrite in Surface and Wastewater by SmartChem Colorimetric Analysis	S-MN-I-508
Determination of Chloride by Konelab	S-MN-I-509
Determination of Sulfate by Konelab	S-MN-I-510
Determination of Nitrite by Konelab (Spectrophotometric Method)	S-MN-I-514
Paint Filter Liquids Test	S-MN-I-516
Determination of Hexane Extractable material (HEM) and Silica Gel Treated – Hexane Extractable Material (SGT-HEM) in Water	S-MN-I-520
Dissolved Oxygen	S-MN-I-524
Measurement of pH in Water, Soil, and Waste	S-MN-I-526
Determination of TSP and PM 10	S-MN-I-527
Measurement of Solids in Water and Wastewater	S-MN-I-528
Total CN in Water - Macro Distillation	S-MN-I-529
Weak Acid Disociable Cyanide in Water - Macro Distillation	S-MN-I-530
Total Coliform Bacteria	S-MN-MB-001
Fecal Coliform by MF	S-MN-MB-002
Heterotrophic Plate Count	S-MN-MB-003
Total Coliform Bacteria by Membrane Filtration	S-MN-MB-005
Sample Container Sterility Verification	S-MN-MB-006
Total Coliform Bacteria and E. Coliform Bacteria	S-MN-MB-007
The Determination of Ammonia by SmartChem	S-MN-I-559
Determination of NO3/NO2 by SmartChem	S-MN-I-560
Data Correctness Calculations	S-MN-I-562
COD by Hach 2700	S-MN-I-563
Total Recoverable Cyanide and Amenable Cyanide in Water	S-MN-I-564
Delta Airlines Anodizing Line	S-MN-I-582
Determination of Inorganic Anions by Ion Chromatography	S-MN-I-583
Determination of Nitrate/Nitrite on the Lachat by Cadmium Reduction	S-MN-I-584
Determination of Sulfate on the Lachat	S-MN-I-585
Sample Appearance	S-MN-I-586
Net Acid Generation (NAG)	S-MN-I-589

ATTACHMENT VA- MINNEAPOLIS SOP LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Humidity Cells	S-MN-I-590
Determination of Phenolic Compounds by Flow Injection Analysis Colorimetry	S-MN-I-591
Determination of Chloride by Flow Injection Analysis Colormetry	S-MN-I-592
Determination of Ortho Phosphate in Waters by Flow Injection Analysis Colorimetry	S-MN-I-593
Determination of Hexavalent Chromium by Flow Injection Analysis	S-MN-I-594
Drierite Regeneration Procedure	S-MN-O-557
Bottle Order Database	S-ALL-C-002
Operation of Paceport Customer Feedback Form	S-ALL-C-005
Document Numbering	S-ALL-Q-003
EPIC PRO: Acode Addition/Modification	S-ALL-Q-008
Laboratory Documentation	S-ALL-Q-009
Quarterly Quality Report	S-ALL-Q-014
Review of Laboratory Management System	S-ALL-Q-015
Training Procedures	S-ALL-Q-020
3P Program: CIP	S-ALL-Q-022
Use and Operation of Lab Track System	S-ALL-Q-028
Mint Miner Data File Review	S-ALL-Q-029
Operation of Data Checker For Epic Pro	S-ALL-Q-030
Data Recall	S-ALL-Q-035
Processing Tentatively Identified Compounds (TICS) for GC/MS	S-ALL-O-038
Hazard Assessments	S-ALL-S-001
LMS Sub-Learn Center System and Training Administrator Responsibilities	S-ALL-T-002
Anonymous Hotline Procedure	S-COR-Q-034

ATTACHMENT VB- MONTANA SOP LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Title	SOP Number
Microscope Adjustment - Phase Contrast	S-MT-ASB-015
Microscope Alignment - Polarized Light Microscope	S-MT-ASB-016
Bulk Analysis Using Polarized Light Microscopy	S-MT-ASB-023
Asbestos Data Review	S-MT-ASB-026
Fiber Counts By NIOSH 7400 Using Excel Spreadsheet	S-MT-ASB-027
Quality Control for Asbestos Analysis	S-MT-ASB-028
The Determination of Extractable Petroleum Hydrocarbons by Method MA-EPH	S-MT-O-001
Petroleum Hydrocarbons as Diesel in Water and Soil	S-MT-O-002
Purgeable Total Petroleum Hydrocarbons in Water and Soil	S-MT-O-003
Volatile Petroleum Hydrocarbons (VPH)	S-MT-O-005
Coarse Fragment	S-MT-ME-035
Acid-Base Accounting - Sobek	S-MT-ME-004
pH Paste	S-MT-ME-006
Soil Sieve for Black Eagle	S-MT-ME-017
Organic Matter	S-MT-ME-001
Available Nitrate and Ammonia	S-MT-ME-022
Particle Size Analysis	S-MT-ME-024
Volatile Organic Compounds by 8260B	S-MT-O-004
Preparation of Anhydrous Sodium Sulfate for Extraction Purposes	S-MT-O-008
Referencing NVLAP Accreditation	S-MT-Q-001
MT Contingency plan	2014
Waste Handling and Management	S-MT-S-001
Nitrite by SM4500 NO2B	S-MT-I-036
Acidity	S-MT-I-032
Turbidity	S-MT-I-034
Phosphorus, Ortho and Total	S-MT-I-002
Sulfides	S-MT-I-005
Specific Conductivity SW2510B	S-MT-I-007
Measurement of Solids in Water and Wastewater	S-MT-I-008
The Determination of Nitrate-Nitrite by Flow Analyzer	S-MT-I-009
TKN By Colorimetry	S-MT-I-010
Total Sufur by LECO	S-MT-ME-012
Water Soluble Sulfate and Chloride	S-MT-I-013
The Determination of Percent Moisture in Soil and Solid Samples	S-MT-I-014
Determination of Inorganic Anions by Ion Chromatography	S-MT-I-018
Determination of Ammonia Nitrogen by Automated Phenate	S-MT-I-019
Chlorophyll-a	S-MT-I-020

ATTACHMENT VB- MONTANA SOP LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Measurement of pH in Water, Soil, and Waste	S-MT-I-021
Determination of Oxidation-Reduction Potential in Water	S-MT-I-029
Settleable Solids	S-MT-I-030
Determination of Dissolved Oxygen	S-MT-I-031
Multi Increment Soil Sampling	S-MT-I-033
Soil Agronmy Metals Extraction Procedures	S-MT-M-032
Inductively Coupled Plasma Atomic Emission Spectroscropy	S-MT-M-033
DocuTemp System	S-MT-Q-002
USDA Regulated Soils	S-MT-Q-003
Soil Sieve	S-MT-ME-041
Preparation of Aqueous Samples for Analysis by ICP	S-MT-M-037
TPN	S-MT-I-042
Toxicity Characteristic Leaching Procedure (TCLP)	S-MT-M-039

ATTACHMENT VC- VIRGINIA SOP LIST (CURRENT AS OF ISSUE DATE)

Title	SOP Number
Sample Management	S-VM-C-001
Bottle Preparation	S-VM-C-002
Subcontracting Samples	S-VM-C-003
Alkalinity, Titrimetric (Automated Titration)	S-VM-I-002
Acidity Titration Method	S-VM-I-003
Conductivity	S-VM-I-005
Turbidity	S-VM-I-006
Color	S-VM-I-007
Total Residual Chlorine	S-VM-I-008
Chlorine Automated Ferricyanide Method	S-VM-I-009
pH	S-VM-I-010
Measurement of Solids in Water and Wastewater	S-VM-I-011
Determination of Hexavalent Chrome by Colorimetric Analysis	S-VM-I-012
Determination of Phosphorus by Automated Colorimetry	S-VM-I-013
Determination of Orthophosphate by Colorimetry	S-VM-I-014
Ammonia-Nitrogen by Semi-Automated Colorimetry	S-VM-I-015
Total Kjeldahl Nitrogen by Semi-Automated Colorimetry	S-VM-I-016
Nitrogen, NO3+NO2 and NO2 by EPA 353.2 Colorimetric, Automated	S-VM-I-017
Determination of Anions by Ion Chromatography	S-VM-I-018
Total Organic Carbon and Dissolved Organic Carbon	S-VM-I-019
Determination of Chemical Oxygen Demand in Water, Wastewater and Industrial Wastes Using the Hach	S-VM-I-020
Biochemical Oxygen Demand and Carbonaceous Biochemical Oxygen Demand	S-VM-I-021
Total and Fecal Coliform Bacteria Membrane Filter	S-VM-I-022
Total Coliform Bacteria	S-VM-I-023
Heterotropic Plate Count Simplate Procedure	S-VM-I-024
Sample Container Sterility Verification	S-VM-I-025
Total Coliform Bacteria and E Coliform Bacteria	S-VM-I-026
Chlorophyll A	S-VM-I-027
Formaldehyde	S-VM-I-028
The Determination of Cation Anion Balance	S-VM-I-029
Determination of Percent Total Solids	S-VM-I-031
Total Amine Analysis in Water by Spectrometry	S-VM-I-032
Total Sulfide, Iodometric Titration	S-VM-I-033
The Determination of Oxidation Reduction Potential (ORP)	S-VM-I-034
Determination of Water Soluble Sulfate in Soil, ASTM C1580-09	S-VM-I-035
Determination of Metals by Inductively Coupled Plasma (ICP) Spectroscopy	S-VM-M-001
Mercury in Liquid and Solid/Semi-Solid Waste	S-VM-M-004

ATTACHMENT VC- VIRGINIA SOP LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Metals Analysis by ICP/MS	S-VM-M-006
Determination of Selenium, Total and Speciated, in Liquid and Soil by Hydride Generation	S-VM-M-008
The Determination of Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (Mining)	S-VM-MIN-001
Size Analysis Using Sieves (Mining)	S-VM-MIN-002
Mechanical Hydrometer / Grain Size Analysis (Mining)	S-VM-MIN-003
Filtering Slurry Samples for Metals Analysis (Mining)	S-VM-MIN-004
Digestion of Samples for Metals Analysis ASTM E507-93(Mining)	S-VM-MIN-005
Digestion of Samples for Metals Analysis Internal Digestion Method(Mining)	S-VM-MIN-006
The Pulverization of Ore and Solid Matrices (Mining)	S-VM-MIN-007
Atterberg Limits (Mining)	S-VM-MIN-008
Determination of Ferrous Iron in D.R.I. Iron Ore and Concentrates Dichromate Method Manual Titration (Mining)	S-VM-MIN-010
Flashpoint: Closed Cup (Mining)	S-VM-MIN-011
Visual Soil Classification (Mining)	S-VM-MIN-012
Moisture in the Analysis Sample of Coal and Coke (Mining)	S-VM-MIN-013
Gross Caloric Value of Coal and Coke	S-VM-MIN-014
Ash in Coal and Coke	S-VM-MIN-015
Ash from Petroleum Products	S-VM-MIN-016
Loss on Ignition of Solid Combustion Residues	S-VM-MIN-017
Classification of Soils for engineering Purposes	S-VM-MIN-019
Water (Moisture) Content of Soil and Rock by Mass	S-VM-MIN-020
Bulk Density and Voids in Aggregate	S-VM-MIN-021
Specific Gravity of Water and Brine	S-VM-MIN-023
Ash in Biomass	S-VM-MIN-024
Gross Caloric Value of Refuse-Derived Fuel by Bomb Calorimeter	S-VM-MIN-025
Determination of Silica in Iron Ores and Related Materials	S-VM-MIN-026
Total Iron in Iron Ores and Related materials by Dichromate Titrimetry	S-VM-MIN-027
Total Iron in Iron Ores by Dichromate-Free Titrimetry	S-VM-MIN-028

ATTACHMENT VD- DULUTH SOP LIST (CURRENT AS OF ISSUE DATE)

Title	SOP Number
Mercury Analysis by Cold Vapor Atomic Fluorescence Spectrometry	S-VM-M-003
Methyl Mercury Analysis by Aqueous Ethylation, Purge and Trap GC with CVAFS Detection	S-VM-M-007
Mercury Analysis by Cold Vapor Atomic Fluorescence Spectrometry of Solid Samples	S-VM-M-010

ATTACHMENT VE- DULUTH ONEOTA SOP LIST (CURRENT AS OF ISSUE DATE)

Title	SOP Number
Activate Sludge, Respiration Inhibition Test	S-DUL-BIO-001
Termination of Acute and Chronic Toxicity Tests	S-DUL-BIO-002
Fish Acquistiion, Holding and Euthanization	S-DUL-BIO-003
Reference Toxicant Control Chart Limits and Maintenance	S-DUL-BIO-004
Conducting Acute Reference Toxicant Tests	S-DUL-BIO-005
Chronic Reference Toxicant Tests	S-DUL-BIO-006
Training and Documentation for Toxicity Lab	S-DUL-BIO-007
Analytical Balance Usage for Aquatic Toxicity Laboratory	S-DUL-BIO-008
Culturing Ceriodaphnia dubia	S-DUL-BIO-009
Conducting Acute Toxicity Tests	S-DUL-BIO-010
Culturing Daphnia magna	S-DUL-BIO-011
Conducting Chronic Toxicity Tests	S-DUL-BIO-012
Brine Shrimp Preparation	S-DUL-BIO-013
Reconstituted and Culture Waters	S-DUL-BIO-014
Glassware Preparation	S-DUL-BIO-015
Aquatic Toxicity Laboratory Instruments	S-DUL-BIO-016
HPC Simplate by SM9215E	S-DUL-MB-001
Fecal Coliforms Membrane Filter Method SM9222D	S-DUL-MB-002
Total Coliforms, & E.coli Colilert 18 Procedures SM9223B	S-DUL-MB-003
Oil and Grease in Soils and Sludges	S-DUL-I-001
Hexane Extractable Material for Sludge, Sediment and Solid Samples	S-DUL-I-002
Residual Chlorine, DPD Colorimetric Method	S-DUL-I-003
Total and Ortho Phosphorus Automated by 365.1	S-DUL-I-004
Specific Gravity	S-DUL-I-005
Oil and Grease, Hexane Extraction	S-DUL-I-006
Ion Chromatography	S-DUL-I-007
Organic Nitrogen	S-DUL-I-008
Sulfide in Water, Colorimetric Procedure	S-DUL-I-009
Surfactants in Water as MBAS	S-DUL-I-010
Total Suspended Solids by USGS I3765	S-DUL-I-011
pH by SM4500H+B and EPA 150.1	S-DUL-I-012
Alkalinity	S-DUL-I-013
Turbidity	S-DUL-I-014
Total and Ortho Phosphorus	S-DUL-I-015
Total Dissolved Solids	S-DUL-I-016
Biochemical Oxygen Demand (BOD)	S-DUL-I-017
Color, Visual Comparison Method	S-DUL-I-018
Conductivity, Specific Conductance	S-DUL-I-019
Chemical Oxygen Demand (COD)	S-DUL-I-020
Eh	S-DUL-I-021
Dissolved Oygen	S-DUL-I-022
Total Solids by SM2540B	S-DUL-I-023
Volatile Solids by EPA 160.4	S-DUL-I-024

ATTACHMENT VE- DULUTH ONEOTA SOP LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Cyanide, Total and Available by SM4500CN-E and G	S-DUL-I-025
Phenolics	S-DUL-I-026
Nitrate Nitrogen - Electrode Method SM4500NO3 D	S-DUL-I-027
Chlorophyll A	S-DUL-I-028
Nitrate+Nitrite Nitrogen (Automated Cadmium Reduction) by EPA 353.2	S-DUL-I-029
Ammonia Nitrogen Automated Phenate Method	S-DUL-I-030
Total Kjeldahl Nitrogen (TKN)	S-DUL-I-031
Chloride Automated Mercuric Thiocyanate Method, SM4500 Cl-E	S-DUL-I-032
Total Residual Chlorine Amperometric Titration Method	S-DUL-I-033
Nitrite Nitrogen Colorimetric Method	S-DUL-I-034
Dishroom Procedures	S-DUL-I-035
Hexavalent Chromium	S-DUL-I-036
Fluoride, Ion-Selective Electrode Method	S-DUL-I-037
Sulfite in Water	S-DUL-I-038
Ammonia Nitrogen - Selective Electrode Method by SM4500NH3-D	S-DUL-I-039
Tannin and Lignin	S-DUL-I-040
Hardness by USGS I-1338-85	S-DUL-I-041
SOUR (Specific Oxygen Uptake Rate) Test	S-DUL-I-042

ATTACHMENT VIA- MINNEAPOLIS CERTIFICATION LIST (CURRENT AS OF ISSUE DATE)
SCOPE AND APPLICATION CERTIFICATES ARE MAINTAINED AND FILED IN THE LOCAL QUALITY DEPARTMENT

EPA ID: MN00064				
State	**Agency**	**Program**	**Cert #**	**Expiration**
A2LA	A2LA	DW – Dioxin, WW, HZ; Envi – WW. HZ; Air; DOD	2926.01	10/31/2015
Alabama	Dept of Environmental Mgmt	Dioxin - DW	40770	12/31/2015
Alaska	Dept. of Environmental Conservation	Contaminated Sites (6010B, 6020, 8260B, PCBs, PAHs)	UST-078	8/10/2015
Alaska	Dept. of Environmental Conservation	Dioxin - DW	MN00064	6/30/2015
Arizona	Dept of Health Services	Dioxin/Envi -DW, WW, HW; Air	AZ0014	12/14/2015
Arkansas	Dept of Environmental Quality	Dioxins/Env	88-0680	6/19/2015
California	Dept of Health Services	Dioxin/Envi -DW, WW, HW	01155CA	8/31/2015
Colorado	Dept. of Public Health & Environment	Dioxins/Envi – DW	Pace Analytical	12/31/2015
Connecticut	Dept of Public Health	Dioxin/Envi -DW, WW, HW	PH-0256	12/31/2015
EPA Region 8 - Wyhoming	Water Division	Dioxins/Envi – DW	8TMS	12/31/2015
Florida (NELAP)	Dept of Health Services	Dioxin/Envi -DW, WW, HW; Air	E87605	6/30/2015
Georgia	Environmental Protection Division	Dioxin/Envi - WW, HW	Pace	12/31/2015
Georgia	Dept of Natural Resources	Dioxin - DW	959	12/31/2015
Guam	Guam EPA	Dioxin - DW	Pace Analytical	10/21/2015
Idaho	Dept. of Health & Welfare	Dioxins/Envi – DW	MN00064	12/31/2015
Hawaii	Dept of Health	Dioxins/Envi – DW	MN00064	12/31/2015
Illinois	Illinois EPA	Dioxin/Envi - DW, HW, WW	200011	12/11/2015
Indiana	Dept of Health	Dioxin - DW	C-MN-01	12/31/2015
Iowa	Dept.of Natural Resources	Dioxin - DW	368	6/1/2016
Kansas	Dept of Health and Environment	Dioxin/Envi - DW, WW, HW	E-10167	10/31/2015
Kentucky	Dept of Environmental Protection	Dioxin – DW	90062	12/31/2015
Kentucky	Dept of Environmental Protection	Dioxin – WW	90062	12/31/2015
Louisiana DEQ	Department of Environmental Quality	Dioxin/Envi - WW, HW; Air	3086	6/30/2016
Louisiana DHH	Department of Health and Hospitals	Dioxin – DW	LA140001	12/31/2015
Maine	Dept of Human Services	Dioxin/Envi - DW	2013011	5/27/2016
Maryland	Dept. of Heath and Mental Hygiene	Dioxin/Envi - DW	322	6/30/2016
Michigan	Dept. of Public Health	Dioxin/Envi - DW	9909	12/31/2015
Minnesota	Dept of Health	Envi - DW, WW, HW	027-053-137	12/31/2015
Minnesota	Department of Commerce	Petrofund	1240	4/16/2016

ATTACHMENT VIA- MINNEAPOLIS CERTIFICATION LIST CONTINUED (CURRENT AS OF ISSUE DATE)

Mississippi	Dept. of Health and Environmental Control	Dioxin - DW	Pace	12/31/2015
Montana	Dept of Health	Dioxin/Envi - DW	92	1/1/2016
Nebraska	Dept. of Health & Human Services.	Dioxin /Envi - DW	Pace	12/31/2015
Nevada	Health Division	Dioxin/Envi - DW, WW, HW	MN_00064_2000_72	7/31/2016
New Jersey	Dept of Environmental Protection	Dioxin/Envi - DW, WW, HW	MN002	6/30/2016
New York	Dept of Health	Dioxin - DW, WW, Air	11647	4/1/2016
North Carolina	Dept of Environment, Health and Natural Resources	Envir - WW, HW	530	12/31/2015
North Carolina	State Public Health Laboratory	Dioxin - DW	27700	7/31/2015
North Dakota	Dept of Health and Consolidated Labs	Dioxin/Envi - DW, WW, HW	R-036	12/31/2015
Ohio	Ohio EPA	Dioxin - DW	4150	12/31/2015
Ohio Vap	VAP	Air	CL101	1/29/2016
Oklahoma	Dept of Environmental Quality	Dioxin/Envi - DW	9507	8/31/2015
Oregon	ELAP	Dioxin - DW, WW, HW; Air	MN200001-005	8/14/2015
Oregon	ELAP	NwTPH	MN300001-001	5/25/2016
Pennsylvania	Dept of Environmental Protection	Dioxin/Envi - DW, WW, HW	68-00563	3/31/2016
Puerto Rico	Departamento de Salud	Dioxin /Envi – DW		1/30/2016
Saipan (CNMI)	Div. Of Environmental Quality	Dioxin - DW	MP0003	12/31/2015
South Carolina	Dept. of Health and Environmental Control	Dioxin - DW, WW, HW	74003001	12/31/2015
Texas	Department of Health	Dioxin/Envi -DW, WW, HW; Air	T104704192	2/28/2016
Tennessee	Dept of Health	Dioxin/Envi -DW	TN02818	12/31/2015
Utah	Department of Health	Dioxin/Envi - DW, WW, HW	MN00064	6/30/2016
Virginia - ELAP	VELAP	Dioxin/Envi - DW, WW, HW	460163	6/14/2016
Washington	Dept of Ecology	Dioxin/Envi -DW, WW, HW; Air	C486	2/18/2016
Wisconsin	Dept of Natural Resources	Dioxin/Envi - DW, WW, HW	999407970	8/31/2015
Wyoming	Via EPA Region 8	Dioxin/Envir - DW	8TMS-L	12/31/2015
West Virginia	Dept of Env. Protection	Envi/Dioxin - HW, WW	382	8/31/2015
West Virginia	Dept of Health and Human Resources	Dioxin - DW	9952C	12/31/2015

ATTACHMENT VIB- MONTANA CERTIFICATION LIST (CURRENT AS OF ISSUE DATE)

EPA ID: MT00012				
State	**Agency**	**Program**	**Cert #**	**Expiration**
A2LA	A2LA	Envi – DW, WW. HZ	2926.01	10/31/2015
Colorado	Dept. of Public Health & Environment	Asbestos Registration	17119	3/15/2015
EPA Region 8	Water Division	DW	8TMS-L	12/31/2015
Idaho	Dept. of Health & Welfare	DW	MT00012	12/31/2015
Minnesota	Dept of Health	Envi-DW, WW	11610AA	12/31/2015
Montana	Dept of Health	DW	40	12/31/2015
North Dakota	Dept of Health and Consolidated Labs	Envi-DW, WW, HW	R-209	12/31/2015
NVLAP	NVLAP	Asbestos	101292-0	3/31/2016
Washington	Dept. of Ecology	DW, NPW,SCM	C993	11/15/2015

ATTACHMENT VIC-VIRGINIA CERTIFICATION LIST (CURRENT AS OF ISSUE DATE)

EPA ID: MN01084				
State	**Agency**	**Program**	**Cert #**	**Expiration**
Alaska	Dept. of Environmental Conservation	Contaminated Sites (6010B, 6020)	UST-078	8/10/2014
Alaska	Dept. of Environmental Conservation	DW	MN01084	6/30/2014
Arizona	Dept. of Health Services	Envi-DW, WW, HW (TOC)	AZ0785	9/9/2014
Minnesota	Dept. of Health	Envi-DW, WW, HW	027-137-445	12/31/2014
North Dakota	Dept. of Health	Envi-DW, WW, HW	R-203	12/31/2014
Nevada	Health Division	Envi-CWA, RCRA	MN0108520151	7/31/2015
Washington	Dept. of Ecology	WW, HZ - TOC	C1007	3/23/2015

ATTACHMENT VID- DULUTH CERTIFICATION LIST (CURRENT AS OF ISSUE DATE)

EPA ID: MN01085				
State	**Agency**	**Program**	**Cert #**	**Expiration**
Minnesota	Dept. of Health	Dioxin-WW; Micro-SDW	027-137-446	12/31/2014
Nevada	Health Division	Envi-CWA, RCRA		7/31/2015
Wisconsin	Dept. of Natural Resources	Envi-WW (Hg)	399066580	8/31/2014

ATTACHMENT VIE- DULUTH ONEOTA CERTIFICATION LIST (CURRENT AS OF ISSUE DATE)

EPA ID: MN00037				
State	**Agency**	**Program**	**Cert #**	**Expiration**
Minnesota	Dept of Health	Envir-WW, HW	027-137-152	12/31/2016
North Dakota	DHS	DW, WW, HZ	R-105	12/31/2015
Wisconsin	Dept of Natural Resources	Envir-WW, HW	999446800	8/31/2016

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

Pace Analytical™ www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A **Required** Client Information:	Section B **Required** Project Information:	Section C Invoice Information:	Page: of
Company:	Report To:	Attention:	
Address:	Copy To:	Company Name:	REGULATORY AGENCY
		Address:	☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
Email To:	Purchase Order No.:	Pace Quote Reference:	☐ UST ☐ RCRA ☐ OTHER _____
Phone: Fax:	Project Name:	Pace Project Manager:	Site Location STATE: _____
Requested Due Date/TAT:	Project Number:	Pace Profile #:	

ITEM #	Section D **Required** Client Information — SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	Matrix Codes MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test ↓ Y/N	Requested Analysis Filtered (Y/N)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS

SAMPLER NAME AND SIGNATURE		Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER:					
SIGNATURE of SAMPLER:	DATE Signed (MM/DD/YY):				

ATTACHMENT VIII- 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	Additional Volume for MS/MSD
Acidity	SM2310B	Water	Plastic/Glass	$\leq 6^oC$	14 Days	
Actinides	HASL-300	Water		pH<2 HNO_3	180 Days	
Actinides	HASL-300	Solid		None	180 Days	
Alkalinity	SM2320B/310.2	Water	Plastic/Glass	$\leq 6^oC$	14 Days	
Alkylated PAHs		Water		$\leq 6^oC$; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	Yes
Alkylated PAHs		Solid		$\leq 10^oC$	1 Year/40 Days	
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		None	180 days	
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0/300.1/SM 4110B	Water	Plastic/Glass	$\leq 6^oC$; 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.	Yes
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0	Solid	Plastic/Glass	$\leq 6^oC$	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	$\leq 6^oC$	28 days	
Aromatic and Halogenated Volatiles (see note 1)	8021	Solid	5035 vial kit	See note 1	14 days	Yes
Aromatic and Halogenated Volatiles	602/8021	Water	40mL vials	pH<2 HCl; $\leq 6^oC$; $Na_2S_2O_3$ if Cl present	14 Days (7 Days for aromatics if unpreserved)	
Acid Volatile Sulfide	Draft EPA 1629	Solid	8oz Glass	$\leq 6^oC$	14 Days	
Bacteria, Total Plate Count	SM9221D	Water	Plastic/WK	$\leq 6^oC$; $Na_2S_2O_3$	24 Hours	Yes
Base/Neutrals and	8270	Solid	8oz Glass	$\leq 6^oC$	14/40 Days	

Parameter	Method	Matrix	Container	Preservative	Max Hold Time	Additional Volume for MS/MSD
Acids						
Base/Neutrals and Acids	625/8270	Water	1L Amber Glass	$\leq 6^oC$; $Na_2S_2O_3$ if Cl present	7/40 Days	Yes
Base/Neutrals, Acids & Pesticides	525.2	Water	1L Amber Glass	pH<2 HCl; $\leq 6^oC$; Na sulfite if Cl present	14/30 Days	Yes
Biomarkers		Water	$\leq 6^oC$; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	$\leq 6^oC$; pH<2 1:1 HCl (optional)	Yes
Biomarkers		Solid	$\leq 10^oC$	1 Year/40 Days	$\leq 10^oC$	
BOD/cBOD	SM5210B	Water	Plastic/Glass	$\leq 6^oC$	48 hours	Yes
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; $\leq 6^oC$	28 Days	
Cation/Anion Balance	SM1030E	Water	Plastic/Glass	None	None	
Cation Exchange	9081	Solid	8oz Glass	None	unknown	
Chloride	SM4500Cl-C,E	Water	Plastic/Glass	None	28 Days	Yes
Chlorine, Residual	SM4500Cl-D,E,G/330.5/Hach 8167	Water	Plastic/Glass	None	15 minutes	
Chlorophyll	SM10200H	Water	Opaque bottle or aluminum foil	$\leq 6^oC$	48 Hours to filtration	
COD	SM5220C, D/410.4/Hach 8000	Water	Plastic/Glass	pH<2 H_2SO_4; $\leq 6^oC$	28 Days	Yes
Coliform, Fecal	SM9222D	Water	100mL Plastic	$\leq 10^oC$	8 Hours	
Coliform, Fecal	SM9222D	Solid	100mL Plastic	$\leq 10^oC$	24 Hours	
Coliform, Fecal	SM9221E	Water	100mL Plastic	$\leq 10^oC$	8 Hours	
Coliform, Fecal	SM9221E	Solid	100mL Plastic	$\leq 10^oC$	24 Hours	
Coliform, Total	SM9222B	Water	100mL Plastic	$\leq 10^oC$	8 Hours	
Coliform, Total	SM9221B	Solid	100mL Plastic	$\leq 10^oC$	8 Hours	
Coliform, Total and E. coli	SM9223B	Drinking Water	100mL Plastic	$\leq 10^oC$	30 Hours after collection	
Color	SM2120B,E	Water	Covered Plastic/Acid Washed Amber Glass	$\leq 6^oC$	24 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	

Parameter	Method	Matrix	Container	Preservative	Max Hold Time	Additional Volume for MS/MSD
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)	Yes
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	Yes
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	Yes
Diesel Range Organics- TPH DRO	8015	Tissue	1L Amber Glass	≤ - 10°C	1 Year if frozen/40 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	250mL Amber Glass	pH <2 HCl; ≤ 6°C	14/40 Days; 7 Days from collection to extraction if unpreserved	Yes
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	Yes
Dioxins and Furans	1613B	Solid	8oz Glass	≤ 6°C	1 year	Yes
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	Yes
Dioxins and Furans	8290	Solid	8oz Glass	≤ 6°C	30/45 Days	Yes
Dioxins and Furans	8290	Fish/ Tissue	Not specified	< -10°C	30/45 Days	
Dioxins and Furans	TO-9	Air	PUF	None	30/45 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	Yes
Endothall	548.1	Water	Amber Glass	≤ 6°C; $Na_2S_2O_3$	7/14 Days	
Enterococci	EPA 1600	Water	100mL Plastic	≤ 6°C	8 Hours	

Parameter	Method	Matrix	Container	Preservative	Max Hold Time	Additional Volume for MS/MSD
Explosives	8330/8332	Water	1L Amber Glass	≤ 6°C	7/40 Days	Yes
Explosives	8330/8332	Solid	8oz 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	≤ 6°C	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	Yes
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	Yes
Gasoline Range Organics	8015	Solid	5035 vial kit	See note 1	14 days	
Gasoline Range Organics- Alaska GRO	AK101	Solid	5035 vial kit	See 5035 note*	28 Days if GRO only (14 Days with BTEX)	Yes
Gasoline Range Organics- Alaska GRO	AK101	Water	40mL vials	pH<2 HCl; ≤ 6°C	14 Days	Yes
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Water	40mL vials	pH<2 HCl; ≤ 6°C	7 Days unpreserved; 14 Days preserved	Yes
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Solid	40mL vials	≤ 6°C; packed jars with no headspace	14 Days	Yes
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)	
Gross Alpha (NJ 48Hr Method)	NJAC 7:18-6	Water	Plastic/Glass	pH<2 HNO_3	48 Hrs	
Gross Alpha and	9310/900.0	Water	Plastic/Glass	pH<2 HNO_3	180 Days	

Parameter	Method	Matrix	Container	Preservative	Max Hold Time	Additional Volume for MS/MSD
Gross Beta						
Gross Alpha and Gross Beta	9310	Solid	Glass	None	180 Days	
Haloacetic Acids	552.1/552.2	Water	40mL Amber vials	NH_4Cl; $\leq 6^oC$	14/7 Days if extracts stored $\leq 6^oC$ or 14/14 Days if extracts stored at $\leq -10^oC$	Yes
Hardness, Total ($CaCO_3$)	SM2340B,C/ 130.1	Water	Plastic/Glass	pH<2 HNO_3	6 Months	
Heterotrophic Plate Count (SPC/HPC)	SM9215B	Water	100mL Plastic	$\leq 6^oC$	24 Hours	
Heterotrophic Plate Count (SPC/HPC)	SimPlate	Water	100mL Plastic	$\leq 6^oC$	8 Hours	
Herbicides, Chlorinated	8151	Solid	8oz Glass Jar	$\leq 6^oC$	14/40 Days	
Herbicides, Chlorinated	8151	Water	1L Amber Glass	$\leq 6^oC$; $Na_2S_2O_3$ if Cl present	7/40 Days	Yes
Herbicides, Chlorinated	515.1/515.3	Water	1L Amber Glass	$\leq 6^oC$; $Na_2S_2O_3$ if Cl present	14/28 Days	Yes
Hexavalent Chromium	7196/218.6/ SM3500Cr-B, C, D	Water	Plastic/Glass	$\leq 6^oC$	24 Hours (see note 4)	Yes
Hexavalent Chromium	7196/218.6/ SM3500Cr-B, C, D	Water	Plastic/Glass	Ammonium Buffer pH 9.3-9.7	28 Days (see note 4)	Yes
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		$\leq 6^oC$	24 Hours after extraction	
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	
Lipids	Pace Lipids	Tissue	Plastic/Glass	$\leq -10^oC$	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	Yes
Mercury, Low-Level	1631E	Tissue	Plastic/Glass	$\leq -10^oC$	28 Days if frozen	
Mercury, Methyl	1630	Water	Teflon/fluoropol	4 mL/L HCl for	6 months if	Yes

Parameter	Method	Matrix	Container	Preservative	Max Hold Time	Additional Volume for MS/MSD
			ymer or Glass	fresh water, 2 mL/L H2SO4 for saline samples, or fill to the top with sample so there is no headspace and maintain 0-4 oC until preservation	preserved; Distillate – one week if refrigerated; Ethylated distillate – analyze within 48 hours; Or the samples must be acid preserved within 48 hours of sampling	
Mercury	7471	Solid	8oz Glass Jar	$\leq 6^oC$	28 Days	
Mercury	7470/245.1/ 245.2	Water	Plastic/Glass	pH<2 HNO_3	28 Days	Yes
Mercury	7471/245.6	Tissue	Plastic/Glass	$\leq -10^oC$	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	$\leq -10^oC$	180 Days if frozen	
Methane, Ethane, Ethene	8015 modified	Water	40mL vials	HCl	14 Days	Yes
Methane, Ethane, Ethene	RSK-175	Water	20mL vials	unpreserved	7 Days	Yes
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	$\leq 6^oC$	14 Days	Yes
Methanol, Ethanol	8015 modified	Solid	2oz Glass	$\leq 6^oC$	14 Days	
Nitrogen, Ammonia	SM4500NH3/ 350.1	Water	Plastic/Glass	pH<2 H_2SO_4; $\leq 6^oC$	28 Days	Yes
Nitrogen, Kjeldahl (TKN)	351.2	Solid	Plastic/Glass	$\leq 6^oC$	28 Days	
Nitrogen, Kjeldahl (TKN)	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; $\leq 6^oC$	28 Days	Yes
Nitrogen, Nitrate	SM4500-NO3/ 352.1	Water	Plastic/Glass	$\leq 6^oC$	24 Hours preferred	Yes
Nitrogen, Nitrate & Nitrite combination	353.2	Solid	Plastic/Glass	$\leq 6^oC$	28 Days	
Nitrogen, Nitrate & Nitrite combination	SM4500-NO3/ 353.2	Water	Plastic/Glass	pH<2 H_2SO_4; $\leq 6^oC$	28 Days	Yes
Nitrogen, Nitrite or Nitrate separately	SM4500-NO2/ 353.2	Water	Plastic/Glass	$\leq 6^oC$	48 Hours	Yes
Nitrogen, Organic	SM4500-Norg/ 351.2	Water	Plastic/Glass	pH<2 H_2SO_4; $\leq 6^oC$	28 Days	Yes

Parameter	Method	Matrix	Container	Preservative	Max Hold Time	Additional Volume for MS/MSD
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	$\leq 6^oC$	24 Hours	
Oil and Grease/HEM	1664A/ SM5520B/9070	Water	Glass	pH<2 H_2SO_4 or HCl; $\leq 6^oC$	28 Days	Yes
Oil and Grease/HEM	9071	Solid	Glass	$\leq 6^oC$	28 Days	
PBDEs	1614	Water	1L Amber Glass	$\leq 6^oC$	1 Year/1 Year	Yes
PBDEs	1614	Solid	Wide Mouth Jar	$\leq 6^oC$	1 Year/1 Year	
PBDEs	1614	Tissue	Aluminum Foil	$\leq -10^oC$	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		Pest: 7/40 Days; PCB: 1 Year/1 Year	
PCBs, Pesticides (OC), Herbicides	508.1	Water	Glass	Na2SO3; pH<2 HCl; $< 6^oC$	14/30 Days	
Perchlorate	331	Water	Plastic/Glass	$>0\text{-}6^oC$	28 Days	
Pesticides, Organochlorine (OC)	8081	Water	1L Amber Glass	$\leq 6^oC$; $Na_2S_2O_3$ if Cl present	7/40 Days	
Pesticides, Organochlorine (OC)	8081	Solid	8oz Glass Jar	$\leq 6^oC$	14/40 Days	
Pesticides, Organochlorine (OC)	8081	Tissue	8oz Glass Jar	$\leq -10^oC$	1 Year if frozen/40 Days	
Pesticides, Organophosphorous (OP)	8141	Solid	8oz Glass Jar	$\leq 6^oC$	14/40 Days	
Pesticides, Organophosphorous (OP)	8141	Water	1L Amber Glass	pH 5-8 with NaOH or H_2SO_4; $\leq 6^oC$; $Na_2S_2O_3$ if Cl present	7/40 Days	Yes
PCBs (Aroclors)	8082	Water	1L Amber Glass	$\leq 6^oC$; $Na_2S_2O_3$ if Cl present	1 Year/1 Year	Yes
PCBs (Aroclors)	8082	Solid	8oz Glass Jar	$\leq 6^oC$	1 Year/1 Year	
PCBs (Aroclors)	8082	Tissue	Plastic/Glass	$\leq -10^oC$	1 Year if frozen/1 Year	
PCB Congeners	1668A	Water	1L Amber Glass	$\leq 6^oC$ but above freezing	1 Year/1 Year	Yes
PCB Congeners	1668A	Solid	4-8oz Glass Jar	$\leq 6^oC$ but above freezing	1 Year/1 Year	
PCB Congeners	1668A	Tissue	4-8oz Glass Jar	$\leq -10^oC$	1 Year/1 Year	

Parameter	Method	Matrix	Container	Preservative	Max Hold Time	Additional Volume for MS/MSD
Oil Range Organics-ORO		Solid	8oz Glass Jar	$\leq 6^oC$	14/40 Days	
Oil Range Organics-ORO		Water	1L Amber Glass	$\leq 6^oC$; $Na_2S_2O_3$ if Cl present	7/40 Days	Yes
Oxygen, Dissolved (Probe)	SM4500-O	Water	Glass	None	15 minutes	
Paint Filter Liquid Test	9095	Water	Plastic/Glass	None	N/A	Yes
Particulates	PM-10	Air	Filters	None	180 Days	Yes
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	Yes
pH	9045	Solid	Plastic/Glass	None	Contact local lab	Yes
Phenol, Total	420.1/420.4/ 9065/9066	Water	Glass	pH<2 H_2SO_4; $\leq 6^oC$	28 Days	Yes
Phosphorus, Orthophosphate	SM4500P/ 365.1/365.3	Water	Plastic	Filter; $\leq 6^oC$	Filter within 15 minutes, Analyze within 48 Hours	Yes
Phosphorus, Total	SM4500P/ 365.1/365.3/ 365.4	Water	Plastic/Glass	pH<2 H_2SO_4; $\leq 6^oC$	28 Days	Yes
Phosphorus, Total	365.4	Solid	Plastic/Glass	$\leq 6^oC$	28 Days	Yes
Polynuclear Aromatic Hydrocarbons (PAH)	TO-13	Air	PUF	None	7/40 Days	
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Solid	8oz Glass Jar	$\leq 6^oC$	14/40 Days	
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Water	1L Amber Glass	$\leq 6^oC$; $Na_2S_2O_3$ if Cl present	7/40 Days	Yes
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Tissue	Plastic/Glass	$\leq -10^oC$	1 Year if frozen/ 40 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				
Residual Range	AK103	Solid	8oz Glass	$\leq 6^oC$	14/40 Days	

Parameter	Method	Matrix	Container	Preservative	Max Hold Time	Additional Volume for MS/MSD
Organics- Alaska RRO						
Saturated Hydrocarbons	SOP S-MN-O-567	Water	$\leq 6^oC$; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	$\leq 6^oC$; pH<2 1:1 HCl (optional)	Yes
Saturated Hydrocarbons	SOP S-MN-O-567	Solid	$\leq 10^oC$	1 Year/40 Days	$\leq 10^oC$	
Silica, Dissolved	SM4500Si-D	Water	Plastic	$\leq 6^oC$	28 Days	
Solids, Settleable	SM2540F	Water	Glass	$\leq 6^oC$	48 Hours	Yes
Solids, Total	SM2540B	Water	Plastic/Glass	$\leq 6^oC$	7 Days	Yes
Solids, Total	SM2540G	Solid	Plastic/Glass	$\leq 6^oC$	7 Days	
Solids, Total (FOC, OM, Ash)	ASTM D2974	Solid	Plastic/Glass	$\leq 6^oC$	7 Days	
Solids, Total Dissolved	SM2540C	Water	Plastic/Glass	$\leq 6^oC$	7 Days	Yes
Solids, Total Suspended	SM2540D/USGS I-3765-85	Water	Plastic/Glass	$\leq 6^oC$	7 Days	Yes
Solids, Total Volatile	160.4/SM2540E	Water	Plastic/Glass	$\leq 6^oC$	7 Days	Yes
Solids, Total Volatile	160.4	Solid	Plastic/Glass	$\leq 6^oC$	7 Days	Yes
Specific Conductance	SM2510B/9050/120.1	Water	Plastic/Glass	$\leq 6^oC$	28 Days	Yes
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	$\leq 6^oC$	28 Days	Yes
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; $\leq 6^oC$	7 Days	
Sulfite	SM4500SO3	Water	Plastic/Glass	None	15 minutes	
Surfactants (MBAS)	SM5540C	Water	Plastic/Glass	$\leq 6^oC$	48 Hours	Yes
Total Organic Carbon (TOC)	SM5310B,C,D/9060	Water	Glass	pH<2 H_2SO_4 or HCl; $\leq 6^oC$	28 Days	
Total Organic Carbon (TOC)	9060/Walkley Black	Solid	Glass	$\leq 6^oC$	14 Days	
Total Organic	SM5320/9020/9	Water	Glass; no	$\leq 6^oC$	14 Days	Yes

Parameter	Method	Matrix	Container	Preservative	Max Hold Time	Additional Volume for MS/MSD
Halogen (TOX)	021		headspace			
Tritium	906.0	Water	Glass	None	180 days	
Turbidity	SM2130B/180.1	Water	Plastic/Glass	$\leq 6^oC$	48 Hours	Yes
Total Uranium	908.0/ASTM D5174-97	Water	Plastic/Glass	pH<2 HCl	180 days	
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Water	40mL vials	pH<2 HCl; $\leq 6^oC$	14 Days preserved	Yes
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Solid	4-8oz Glass Jar	$\leq 6^oC$; 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	None	28 Days	
Volatiles	TO-15	Air	Tedlar Bag or equivalent	None	72 Hours	
Volatiles	TO-18/8260	Air	Tedlar Bag or equivalent	None	72 Hours	
Volatiles	8260	Solid	5035 vial kit	See note 1	14 days	Yes
Volatiles (see note 5)	8260	Water	40mL vials	pH<2 HCl; $\leq 6^oC$; $Na_2S_2O_3$ if Cl present	14 Days	Yes
Volatiles	8260	Conc. Waste	5035 vial kit or 40mL vials	$\leq 6^oC$	14 Days	
Volatiles	624	Water	40mL vials	pH<2 HCl; $\leq 6^oC$; $Na_2S_2O_3$ if Cl present	14 Days (7 Days for aromatics if unpreserved)	Yes
Volatiles (see note 2)	524.2	Water	40mL vials (in duplicate)	pH<2 HCl; $\leq 6^oC$; Ascorbic acid or $Na_2S_2O_3$ if Cl present[2]	14 Days	Yes
UCMR3 Metals	200.8	Water	Plastic or glass	pH<2 HNO_3	28 Days	
UCMR3 Hexavalent Chromium	218.7	Water	HDPE or propylene	Na_2CO_3/$NaHCO_3$/$(NH_4)_2SO_4$; pH>8	14 Days	
UCMR3 Chlorate	300.1	Water	Plastic or glass	EDA	28 Days	
UCMR3 Hormones	539	Water	Amber glass	$Na_2S_2O_3$, 2-mercaptopyridine-1-oxide, sodium salt	28 Days	
UCMR3 Perfluorinated Compounds	537	Water	Polypropylene	Trizma	14 Days	
UCMR3 Volatiles	524.3	Water	40 mL amber glass vials	Ascorbic acid. Maleic acid pH~2	14 Days	

Parameter	Method	Matrix	Container	Preservative	Max Hold Time	Additional Volume for MS/MSD
UCMR3 1, 4 Dioxane	522	Water	Glass	Na_2SO_3, $NaHSO_4$; pH<4	28 Days	
UV254	SM5910B	Water	Glass	$\leq 6^oC$	48 Hours	

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

[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 bufferto 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 UCMR3 program.

5 Acrolein, acrylonitrile, and 2-chloroethylvinyl ether must have the pH value documented to within one pH unit when preservation pH has not been met. Ensure case narrative of the laboratory reports properly identifies when a sample is received at a pH outside of that specified within SW-846.