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QUALITY ASSURANCE MANUAL

Columbia Analytical Services, Inc.
1317 South 13th Avenue
Kelso, Washington 98626
(360) 577-7222
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Approved by:

Laboratory Director/Technical Director: _____
Jeff Christian

Quality Assurance Manager/Technical Director: _____
Lee Wolf

Technical Director - Metals: _____
Jeff Coronado

Technical Director - Inorganics: _____
Todd Poyfer

Technical Director - Organics: _____
Jeff Grindstaff

Technical Director - Microbiology: _____
Paula Wiest

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3.0 INTRODUCTION AND COMPANY QUALITY ASSURANCE POLICY

Columbia Analytical Services, Inc. (CAS) is an employee-owned professional analytical services laboratory which performs chemical and microbiological analyses on a wide variety of sample matrices, including drinking water, groundwater, surface water, wastewater, soil, sludge, sediment, tissue, industrial and hazardous waste, and other material.

It is a policy at CAS that there will be sufficient Quality Assurance (QA) activities conducted in the laboratory to ensure that all analytical data generated and processed will be scientifically sound, legally defensible, of known and documented quality, and will accurately reflect the material being tested. This goal is achieved by ensuring that adequate Quality Control (QC) procedures are used throughout the monitoring process, and by establishing a means to assess performance of these Quality Control and other QA activities. Policies and procedures are established in order to meet the quality objectives of clients, accrediting authorities, and certifying organizations. The Quality System is established to meet the requirements of the National Environmental Laboratory Accreditation Conference (NELAC).

CAS maintains control of analytical results by adhering to written standard operating procedures (SOPs) and by observing sample custody requirements. All analytical results are calculated and reported in units consistent with project specifications to allow comparability of data.

We recognize that quality assurance requires a commitment to quality by everyone in the organization - individually, within each operating unit, and throughout the entire laboratory.

CAS is a network of laboratories. In addition to the Kelso, WA facility, to which this manual is applicable, CAS also operates laboratories in California, Florida, New York, Arizona, and Texas.

The information in this document has been organized according to the format described in *EPA Requirements for Quality Management Plans, EPA QA/R-2,* USEPA, 2001; and *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5,* USEPA, 2001.

4.0 PROGRAM DESCRIPTION

The purpose of the QA program at CAS is to ensure that our clients are provided with analytical data that is scientifically sound, legally defensible, and of known and documented quality. The concept of Quality Assurance can be extended, and is expressed in the mission statement of CAS:

> "The mission of Columbia Analytical Services, Inc., is to provide high quality, cost-effective, and timely professional testing services to our customers. We recognize that our success as a company is based on our ability to maintain customer satisfaction. To do this requires constant attention to customer needs, maintenance of state-of-the-art testing capabilities and successful management of our most important asset - our people - in a way that encourages professional growth, personal development and company commitment."

In support of this mission, our QA program addresses all aspects of laboratory operations, including laboratory organization and personnel, standard operating procedures, sample management, sample and quality control data, calibration practices, standards traceability data, equipment maintenance records, method proficiency data (such as method detection limit studies and control charts), document control/storage and staff training records.

4.1 Facilities and Equipment

CAS features over 25,000 square feet of laboratory and administrative workspace. The laboratory has been designed and constructed to provide safeguards against cross-contamination of samples and is arranged according to work function, which enhances the efficiency of analytical operations. The ventilation system has been specially designed to meet the needs of the analyses performed in each work space. Also, CAS minimizes laboratory contamination sources by employing janitorial and maintenance staff to ensure that good housekeeping and facilities maintenance are performed. In addition, the segregated laboratory areas are designed for safe and efficient handling of a variety of sample types. These specialized areas (and access restrictions) include:

- Shipping and Receiving/Purchasing
- Sample Management Office
  - Controlled-access sample storage areas
- Inorganic/Metals Sample Preparation Laboratories (2)
- Inorganic/Metals “clean room” sample preparation laboratory
- ICP-AES Laboratory

- ICP-MS Laboratory
- AA Laboratory
- Water Chemistry & General Chemistry Laboratories
- Semi-volatile Organics Sample Preparation Laboratories (3)
- Gas Chromatography Laboratory
- Gas Chromatography/Mass Spectrometry Laboratory
- Petroleum Hydrocarbon Laboratory
- Semi-volatile Organics Drinking Water Laboratory
- Volatile Organics Laboratory
  - Separate sample preparation laboratory
  - Access by semi-volatile sample preparation staff only after removing lab coat and solvent-contaminated gloves, etc.
- Microbiology Laboratory
- Laboratory Deionized Water System
- Laboratory Management, Client Service, Report Generation and Administration
- Data Archival, Data Review and support functions areas
- Information Technology (IT) and LIMS

In addition, the designated areas for sample receiving, refrigerated sample storage, dedicated sample container preparation and shipping provide for the efficient and safe handling of a variety of sample types. Figure 4-1 shows the facility floor plan. The laboratory is equipped with state-of-the-art analytical and administrative support equipment. The equipment and instrumentation are appropriate for the procedures in use. Appendix C lists the major equipment, illustrating the laboratory's overall capabilities and depth.

4.2 Technical Elements of the Quality Assurance Program

The Quality Assurance Program provides a platform on which technical operations are based. The program provides laboratory organization, procedures, and policies by which the laboratory operates. The necessary certifications and approvals administered by external agencies are maintained. This includes method approvals and audit administration. In addition, internal audits are performed to assess compliance with policies and procedures. Standard Operating Procedures (SOPs) are maintained for technical and administrative functions. A document control system is used for SOPs, as well as laboratory notebooks, and this QA Manual. A list of QA Program documents is provided in Appendix A.

Acceptable calibration procedures are defined in the SOP for each test procedure. Calibration procedures for other laboratory equipment (balances, thermometers, etc.) are also defined. Quality Control (QC) procedures are used to monitor the testing performed. Each analytical procedure has associated QC requirements to be achieved in order to demonstrate data quality. The use of method detection limit studies, control charting, and preventative maintenance procedures further ensure the quality of data produced. Proficiency Testing (PT) samples are used as an external

means of monitoring the quality and proficiency of the laboratory. PT samples are obtained from qualified vendors and are performed on a regular basis. In addition to method proficiency, documentation of analyst training is performed to ensure proficiency and competency of laboratory analysts and technicians. Sample handling and custody procedures are defined in SOPs. Procedures are also in place to monitor the sample storage areas. The technical elements of the QA program are discussed in further detail in later sections of this QA manual.

4.3 Operational Assessments

There are a number of methods used to assess the laboratory and its daily operations. In addition to the routine quality control (QC) measurements to measure quality, the senior laboratory management examines a number of other indicators to assess the overall ability of the laboratory to successfully perform analyses for its clients. On-time performance, report quality, training, and Quality Assurance are a few of the items that are used to assess performance from an external perspective. A frequent, routine assessment must also be made of the laboratory's facilities and resources in anticipation of accepting an additional or increased workload.

CAS utilizes a number of different methods to ensure that adequate resources are available in anticipation of the demand for service. Regularly scheduled senior staff meetings, tracking of outstanding proposals and an accurate, current synopsis of incoming work all assist the senior staff in properly allocating resources to achieve the required results. All Requests for Proposal (RFP) documents are reviewed by the Project Chemist and appropriate managerial staff to identify any project specific requirements that differ from the standard practices of the laboratory. Any requirements that cannot be met are noted and communicated to the client, as well as requesting the client to provide any project specific Quality Assurance Plans (QAPP's) if available. A weekly status meeting is also conducted with the laboratory staff by the Client Services Manager to inform the staff of the status of incoming work, future projects, or project requirements.

4.4 Document Control

Procedures for control and maintenance of documents are described in the *SOP for Document Control (ADM-DOC_CTRL).* The procedures described in the SOP include distribution, tracking, filing, and copyrighting of CAS controlled documents. The requirements of the SOP apply to all standards preparation logbooks, instrument maintenance logbooks, run logbooks, standard operating procedures (SOPs), quality assurance manuals (QAMs), quality assurance project plans (QAPPs), safety manuals (SFM), and other controlled CAS documents.

Each controlled copy of a controlled document will be released only after a document control number is assigned and the recipient is recorded on a document distribution

list. Filing and distribution is performed by the Quality Assurance Manager, or designee, and ensure that only the most current version of the document is distributed and in use. A document control number is assigned to logbooks. Completed logbooks that are no longer in use are archived in a master logbook file.

CAS maintains a records system that ensures all laboratory records (including raw data, reports, and supporting records) are retained and available. The archiving system is described in the *SOP for Data Archiving (ADM-ARCH).*

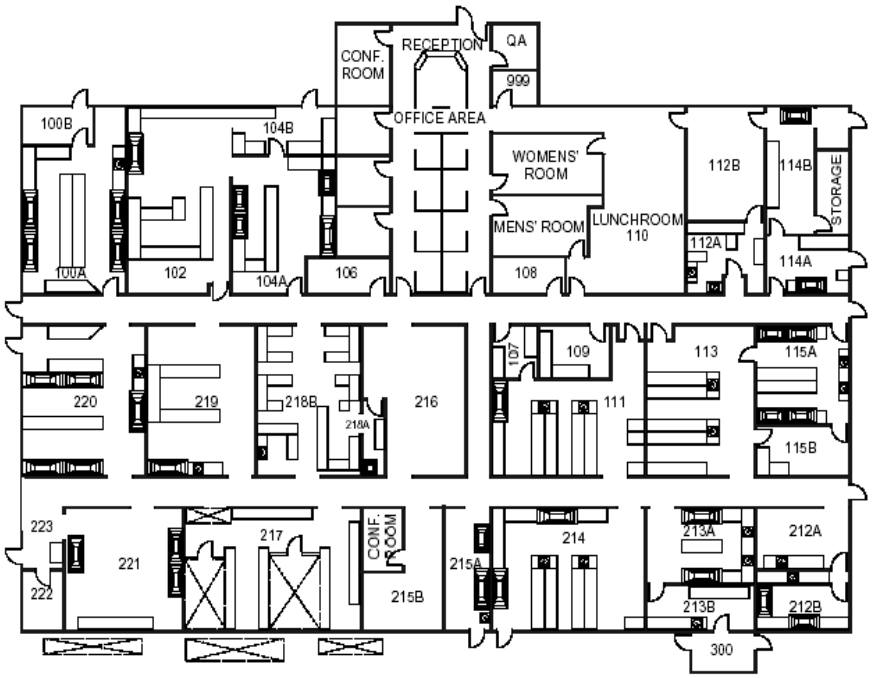
4.5 Subcontracting

Analytical services are subcontracted when CAS/Kelso needs to balance workload or when the requested analyses are not performed by CAS/Kelso. Subcontracting is only done with the knowledge and approval of the client. Subcontracting to another CAS laboratory is preferred over external-laboratory subcontracting. Further, sub-contracting is done using capable and qualified laboratories. Established procedures are used to qualify external subcontract laboratories. These procedures are described in the *SOP for Qualification of Subcontract Laboratories (ADM-SUBLAB).* The Quality Assurance Director is responsible for qualifying and oversight of subcontract laboratories.

4.6 Procurement

The quality level of reagents and materials (grade, traceability, etc.) required is specified in analytical SOPs. Department supervisors ensure that the proper materials are purchased. Inspection and verification of material ordered is performed at the time of receipt by receiving personnel. The receiving staff labels the material with the date received. Expiration dates are assigned (by the laboratory user) as appropriate for the material. Storage conditions and expiration dates are specified in the analytical SOP. The procedures for purchasing and procurement are described in the *SOP for Purchasing Through CAS Purchasing Agent (SOP ADM-PUR).* Also, refer to section 10.18 for a discussion of reference materials.

Figure 4-1
CAS/Kelso Laboratory Floor Plan



Room Designations			
100A Organic Extractions Lab	111 General Chemistry Lab	213A Digestion Lab	220 Organic Extraction Lab
100B Electrical Room	112A Microbiology Lab	213B Sample Preparation	221 Bottle Preparation Room
102 Chromatography Lab	112B Copy Center	214 General Chemistry Lab	222 Purchasing Room
104A Organics Extraction Lab	113 Atomic Absorption Lab	215A Drinking Water Lab	223 General Receiving
104B Chromatography Lab	114A SMO / Receiving	215B Records/Admin	300 Janitorial Room
106 Glasswashing Room	114B SMO / Receiving	216 VOA/IT	999 Switchboard
107 Oven Room	115A Metals Digestion Lab	217 Sample Storage	
108 TCLP Lab	115B ICP Lab	218A VOA Prepration	
109 Sample Preparation	212A ICP / MS Lab	218B VOA Lab	
110 Lunchroom	212B Clean Digestion Lab	219 GC/MS Lab	

TITLE	CAS Kelso Floor Plans
FILENAME: KELSOLABFLRPLAN.VSD	PAGE: 1 OF 2
DATE: 9/24/03	DESCRIPTION: Laboratory

Legend

- Fume Hood
- Sink
- Emergency Shower
- Sink
- Cooler

5.0 PROFESSIONAL CONDUCT AND ETHICAL PRACTICES

One of the most important aspects of the success of CAS as a company is the emphasis placed on the integrity of the data that are provided and the services that are performed. To promote product quality, CAS requires certain standards of conduct and ethical performance among our employees. The following examples of documented CAS policy are representative of these standards, and are not intended to be limiting or all-inclusive:

- Under no circumstances is the willful act of fraudulent manipulation of analytical data condoned. Such acts are to be reported immediately to senior management for appropriate corrective action. Unless specifically required in writing by a client, alteration, deviation or omission of written contractual requirements is not permitted. Such changes must be in writing and approved by senior management.

- Falsification of data in any form will not be tolerated. While much analytical data is subject to professional judgment and interpretation, outright falsification, whenever observed or discovered, will be documented, and appropriate remedies and punitive measures will be taken toward those individuals responsible. Employee discipline is progressive in its severity and each situation is handled individually in that the discipline is designed to fit the circumstances. Potential disciplinary actions may include a verbal warning, written warning, a second written notice (more severe and more strongly worded than a warning), suspension without pay, demotion, or termination.

- It is the responsibility of all CAS employees to safeguard sensitive company and client information. The nature of our business and the economic well being of our company and of our clients is dependent upon protecting and maintaining proprietary company/client information. All information, data, and reports (except that in the public domain) collected or assembled on behalf of a client is treated as confidential. No information may be given to third parties without the consent of the client. Unauthorized release of confidential information about the company or its clients is taken very seriously and is subject to formal disciplinary action.

As a condition of employment, all employees are required to sign and adhere to the requirements set forth in the CAS *Confidentiality and Conflicts of Interest Employee Agreement* and the CAS *Commitment to Excellence in Data Quality Policy.* All employees receive in-house ethics training (*Assuring Ethical Practices in the Laboratory*) and are periodically reminded of their data quality and ethical conduct responsibilities.

CAS makes every attempt to ensure that employees are free from any commercial, financial, or other undue pressures that might affect their quality of work. Related policies and

responsibilities are described in the CAS Employee Handbook. This includes the CAS Ombudsman Program, the CAS Open Door Policy, and the use of flexible work hours. Operational assessments are regularly made to ensure that project planning is performed and that adequate resources are available during anticipated periods of increased workloads (Section 4.3). Procedures for subcontracting work are established, and within the CAS laboratory network additional capacity is typically available for subcontracting, if necessary.

6.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The CAS/Kelso staff, consisting of approximately 110 employees, includes chemists, technicians and support personnel. They represent diverse educational backgrounds and experience, and provide the comprehensive skills that the laboratory requires. During seasonal workload increases, additional temporary employees may be hired to perform specific tasks.

CAS is committed to providing an environment that encourages excellence. Everyone within CAS shares responsibility for maintaining and improving the quality of our analytical services. The responsibilities of key personnel within the laboratory are described below. Table 6-1 lists the CAS/Kelso personnel assigned to these key positions. Managerial staff members are provided the authority and resources needed to perform their duties. An organizational chart of the laboratory, as well as the resumes of these key personnel, can be found in Appendix B.

- The role of the **Laboratory Director** is to provide technical, operational, and administrative leadership through planning, allocation and management of personnel and equipment resources. The Laboratory Director provides leadership and support for the QA program and is responsible for overall laboratory efficiency and the financial performance of the Kelso facility. The Laboratory Director has the authority to stop work in response to quality problems. The Laboratory Director also provides resources for implementation of the QA program, reviews and approves this QA Manual, reviews and approves standard operating procedures (SOPs), and provides support for business development by identifying and developing new markets through continuing support of the management of existing client activities.
- The responsibility of the **Quality Assurance Manager** (QAM) is to oversee implementation of the quality program and to coordinate overall QA activities within the laboratory. The QAM works with individual laboratory production units to establish effective quality control and assessment plans. The QAM has the authority to stop work in response to quality problems. The QAM is responsible for maintaining the QA Manual and performing an annual review/revision of it; reviewing and approving SOPs and coordinating the annual review of each SOP; maintaining QA records such as metrological records, archived logbooks, PT sample results, etc.; document control; oversight of QC practices; conducting PT sample studies; approving nonconformity and corrective action reports; reviewing data; maintaining the laboratory's certifications and approvals; performing internal QA audits; preparing QA activity reports; etc. The QAM reports directly to the Laboratory Director. The QAM also interacts with the CAS Quality Assurance Director, who is responsible for the CAS laboratory-wide QA program. It is important to note that when evaluating data, the QAM does so in an objective manner and free of outside, or managerial, influence.

The Quality Assurance Director is responsible for the overall QA program at all the CAS laboratories. The QA Director is responsible for performing an annual on-site audit at each CAS laboratory and preparing a written report; maintaining a data base of information about state certifications and accreditation programs; writing laboratory-wide SOPs; maintaining a data base of CAS-approved subcontract laboratories; providing assistance to the laboratory QA staff and laboratory managers; preparing a quarterly QA activity report; etc.

- In the case of absence of the Laboratory Director or QA Manager, deputies are assigned to act in that role. Default deputies for these positions are the Client Services Manager or Organics Department Manager (for the Laboratory Director) and the QA Director or Laboratory Director (for the QA manager).

- The **Environmental Health and Safety Officer** (EH&S) is responsible for the administration of the laboratory health and safety policies. This includes the formulation and implementation of safety policies, the supervision of new-employee safety training, the review of accidents, incidents and prevention plans, the monitoring of hazardous waste disposal and the conducting of departmental safety inspections. The EH&S officer is also designated as the Chemical Hygiene Officer. The EH&S Officer has a dotted-line reporting responsibility to CAS' EH&S Director.

- The **Client Services and Sample Management Office Manager** is responsible for the Client Services Department (customer services/project chemists, and Electronic Data Deliverables group) and the sample management office/bottle preparation sections. The Client Services Department provides a complete interface with clients from initial project specification to final deliverables. The sample management office handles all the activities associated with receiving, storage, and disposal of samples. The Client Services Manager has the authority to stop subcontractor work in response to quality problems.

- The **Project Chemist** is a senior-level scientist assigned to each client to act as a technical liaison between the client and the laboratory. The project chemist is responsible for ensuring that the analyses performed by the laboratory meet all project, contract, and regulatory-specific requirements. This entails coordinating with the CAS laboratory and administrative staff to ensure that client-specific needs are understood, and that the services CAS provides are properly executed and satisfy the requirements of the client.

- The Analytical Laboratory is divided into operational units based upon specific disciplines. Each department is responsible for establishing, maintaining and documenting a quality control program based upon the unique requirements within the department.. Each **Department Manager and Supervisor** has the responsibility to ensure that quality control functions are carried out as planned, and to guarantee the production of high quality data. Department managers and bench-level supervisors have the responsibility to monitor the day-to-day operations to ensure that productivity and data quality objectives are met. Each department manager has the authority to stop work in response to quality problems in their area. Each analyst in the laboratory has the responsibility to carry out testing according to prescribed methods, standard operating procedures and quality control guidelines particular to the laboratory in which he/she is working.

- The **Sample Management Office** plays a key role in the laboratory QA program by maintaining documentation for all samples received by the laboratory, and by assisting in the archival of all laboratory results. The sample management office staff is also responsible for the proper disposal of samples after analysis.
- **Information Technology** (IT) staff are responsible for the administration of the Laboratory Information Management System (LIMS) and other necessary support services. Other functions of the IT staff include laboratory network maintenance, IT systems development and implementation, education of analytical staff in the use of scientific software, Electronic Data Deliverable (EDD) generation, and data back-up, archival and integrity operations.

Table 6-1
Summary of Technical Experience and Qualifications

Personnel	Years of Experience	Project Role
Jeff Christian, B.S.	25	Laboratory Director
Lee Wolf, B.S.	18	Quality Assurance Manager
Lynda Huckestein, B.S.	15	Client Services Manager Sample Management Office Manager
Jeff Coronado, B.S.	14	Inorganics Department Manager
Todd Poyfair, B.S.	12	Gas Chromatography and Petroleum Hydrocarbons Department Manager
Jeff Grindstaff, B.S.	15	Volatiles and Semivolatiles GC/MS Department Manager
Jim Smith, B.S.	16	Organics Drinking Water Department Manager
Eileen Arnold, B.A.	22	Environmental Health and Safety Officer
Paul Gowan, B.A.	17	Technical Information Specialist
Lawrence Jacoby, Ph.D.	31	CAS Quality Assurance Director
Gary Ward, M.S.	28	CAS Information Technology Director CAS Chief Quality Officer
Steve Vincent, B.S.	28	CAS President

7.0 INFORMATION MANAGEMENT

The generation, compilation, reporting, and archiving of electronic data is a critical component of laboratory operations. In order to generate data of known and acceptable quality, the quality assurance systems and quality control practices for electronic data systems must be complete and comprehensive and in keeping with the overall quality assurance objectives of the organization. CAS management provides the tools and resources to implement electronic data systems and establishes information technology standards and policies. Appendix C lists major automated data processing equipment.

7.1 Software Quality Assurance Plan

CAS has defined practices for assuring the quality of the computer software used throughout all laboratory operations to generate, compile, report, and store electronic data. These practices are described in the CAS Software Quality Assurance Plan (SQAP). The purpose of the SQAP is to describe the policies and practices for the procurement, configuration management, development, validation and verification, data security, maintenance, and use of computer software. The policies and practices described in the plan apply to purchased computer software as well as to internally developed computer software. A key component of configuration management plan are policies for controlling the software version that is in use in the laboratory.

7.2 IT Support

The local CAS Information Technology (IT) department is established to provide technical support for all computing systems. The IT department staff continually monitor the performance and output of operating systems. The IT department oversees routine system maintenance and data backups to ensure the integrity of all electronic data. A software inventory is maintained. Additional IT responsibilities are described in the SQAP.

In addition to the local IT department, CAS corporate IT provides support for network-wide systems. CAS-Kelso also has personnel assigned to information management duties such as development and implementation of reporting systems; data acquisition, and Electronic Data Deliverable generation.

7.3 Information Management Systems

CAS has various systems in place to address specific data management needs. The CAS Laboratory Information Management System (LIMS) is used to manage sample information and invoicing. Access is controlled by password. This is a Unix-based network system, operating in an Oracle® database environment. This system is used to establish and define sample identification, analysis specifications, and provide a means of sample tracking. This system is used during sample login to generate the internal Service Request. The Service Request provides a summary of client information, sample information, required analyses, work instructions, deliverable requirements and other necessary information provided on the chain of custody. The LIMS also is the basis for valuable sample tracking mechanisms used throughout the laboratory. Laboratory analysts generate worklists from the LIMS and the barcoding system used for internal chain of custody (Section 8) interfaces with this system.

Where possible, instrument data acquired locally is immediately moved to a server (Microsoft Windows2000® local area network) dedicated to this function. This provides a reliable, easily maintained, high-volume acquisition and storage system for electronic data files. With password entry, users may access the system from many available computer stations, improving efficiency and flexibility. Another server is dedicated to data reporting, EDD generation, and administrative functions. Access to these systems is controlled by password. A standardized EDI (electronic data interchange) format is used as a reporting platform, providing functionality and flexibility for end users. With a common standardized communication platform, the EDI provides data reporting in a variety of hardcopy and electronic deliverable formats.

7.4 Backup and Security

CAS laboratory data is either acquired directly to the centralized acquisition server or acquired locally and then transferred to the server. All data is eventually moved to the centralized data acquisition server for reporting and archiving. Differential backups are performed on all file server information once per day, Sunday through Thursday. Full backups are performed on Friday and Saturday nights. Tapes are physically stored in a locked media cabinet within a locked, temperature controlled computer room.

Access to sample information and data is on a need-to-know basis. Access is restricted to the person's areas of responsibility. Passwords are required on all systems. No direct external, non-CAS access is allowed to any of our network systems.

The external e-mail system and Internet access is set up via a single gateway to discourage unauthorized entry. CAS uses a closed system for company e-mail. Files, such as electronic deliverables, are sent through the external e-mail system only via a

trusted agent. The external messaging system operates through a single secure gateway. All attachments sent in and out of the gateway are subject to a virus scan. Because the Internet is not regulated, we use a limited access approach to provide a firewall for added security. Virus screening is performed every week on all network systems.

8.0 SAMPLE MANAGEMENT

8.1 Sampling and Sample Preservation

The quality of analytical results is highly dependent upon the quality of the procedures used to collect, preserve and store samples. CAS recommends that clients follow sampling guidelines described in 40 CFR 136, 40 CFR 141, USEPA SW-846, and state-specific sampling guidelines, if applicable. Sampling factors that must be taken into account to insure accurate, defensible analytical results include:

- Amount of sample taken
- Type of container used
- Type of sample preservation
- Sample storage time
- Proper custodial documentation

CAS uses the sample preservation, container, and holding-time recommendations published in a number of documents. The primary documents of reference are: USEPA SW-846, Third Edition and Updates I, II, IIA, IIB, III for hazardous waste samples, and USEPA 600/4-79-020, 600/4-91-010, 600/4-82-057, 600/R-93/100, 600/4-88-039, 600/R-94-111, and Supplements; and *Standard Methods for the Examination of Water and Wastewater* for water and wastewater samples. The complete citation for each of these references can be found in Section 18.0 of this document. The container, preservation and holding time information for these references is summarized in Table 8-1 for soil, water, and drinking water. The current EPA CLP Statement of Work should be referred to for container, preservation and holding time information for CLP procedures. Where allowed by the project sampling and analytical protocols (such as Puget Sound Protocols) the holding time for sediment, soil, and tissue samples may be extended for a defined period when stored frozen at -20°C.

CAS routinely provides sample containers with appropriate preservatives for our clients. The containers are purchased as “precleaned” to a level 1 status, and conform to the requirements for analytical samples established by the USEPA. Certificates of analysis for the sampling containers are available to clients if requested. Reagent water used for sampling blanks (trip blanks, etc.) and chemical preservation reagents are tested by the laboratory to ensure that they are free of interferences and documented. Our sample kits typically consist of foam-lined, precleaned shipping coolers, (cleaned inside and out with appropriate cleaner, rinsed thoroughly and air-dried), specially prepared and labeled sample containers individually wrapped in protective material, (VOC vials are placed in a specially made, foam holder), chain-of-

custody (COC) forms, and custody seals. Container labels and custody seals are provided for each container. Figure 8-1 shows the chain-of-custody form routinely used at CAS and included with sample kits. For large sample container shipments, the containers may be shipped in their original boxes. Such shipments will consist of several boxes of labeled sample containers and sufficient materials (bubble wrap, COC forms, custody seals, shipping coolers, etc.) to allow the sampling personnel to process the sample containers and return them to CAS. The proper preservative is added to the sample containers prior to shipment, unless otherwise instructed by the client.

If any returning shipping cooler exhibits an odor or other abnormality after receipt and subsequent decontamination by laboratory personnel, a second, more vigorous decontamination process is employed. Containers exhibiting an odor or abnormality after the second decontamination process are promptly and properly discarded. CAS keeps client-specific shipping requirements on file and utilizes major transportation carriers to guarantee that sample shipping requirements (same-day, overnight, etc.) are met. CAS also provides courier service that makes regularly scheduled trips to the Greater Portland, Oregon Metropolitan area.

When CAS ships environmental samples to other laboratories for analysis each sample bottle is wrapped in protective material and placed in a plastic bag (preferably Ziploc®) to avoid any possible cross-contamination of samples during shipping. The sample management office (SMO) follows formalized procedures for maintaining the chain of custody of the sample(s) (SOP *for Chain of Custody for Sample Transfer between Laboratories* [SOP ADM-COC]), proper packaging and shipment, specification of proper methodology, etc. Blue or gel ice is the only temperature preservative used by CAS, unless otherwise specified by the client or receiving laboratory.

8.2 Sample Receipt and Handling

Standard Operating Procedures are established for the receiving of samples into the laboratory. These procedures ensure that samples are received and properly logged into the laboratory, and that all associated documentation, including chain of custody forms, is complete and consistent with the samples received. Complete documentation of all sample storage is maintained in order to preserve the integrity of the samples.

Once samples are delivered to the CAS sample management office (SMO), a Cooler Receipt and Preservation Check Form (CRF - See Figure 8-2 for an example) is used to assess the shipping cooler and its contents as received by the laboratory personnel. Verification of sample integrity includes the following activities:

- Assessment of custody seal presence/absence, location and signature;
- Temperature of sample containers upon receipt;
- Chain of custody documents properly used (entries in ink, signature present, etc.);
- Sample containers checked for integrity (broken, leaking, etc.);
- Sample is clearly marked and dated (bottle labels complete with required information);
- Appropriate containers (size, type) are received for the requested analyses;
- The minimum amount of sample material is provided for the analysis.
- Sample container labels and/or tags agree with chain of custody entries (identification, required analyses, etc.);
- Assessment of proper sample preservation (if inadequate, corrective action is employed); and
- VOC containers are inspected for the presence/absence of bubbles. (Assessment of proper preservation of VOC containers is performed by lab personnel).

Samples are logged into a Laboratory Information Management System (LIMS). Any anomalies or discrepancies observed during the initial assessment are recorded on the CRF and COC documents. Potential problems with a sample shipment are addressed by contacting the client and discussing the pertinent issues. When the Project Chemist and client have reached a satisfactory resolution, the login process may continue and analysis may begin. During the login process, each sample is given a unique laboratory code and a service request form is generated. The LIMS generates a Service Request that contains client information, sample descriptions, sample matrix information, required analyses, sample collection dates, analysis due dates and other pertinent information. The service request is reviewed by the appropriate Project Chemist for accuracy, completeness, and consistency of requested analyses and for client project objectives.

Samples are kept refrigerated until they undergo analysis, unless otherwise specified. CAS stores samples in various refrigerators or freezers, depending on the type of analysis and the matrix of the sample. CAS has five walk-in refrigerators which house the majority of sample containers received at the laboratory. In addition to the walk-in refrigerators, there are three additional refrigerators, including dedicated refrigerated storage of VOC samples. These refrigerators are segregated by matrix type (soil or water) and method of analysis. The dedicated storage areas for VOC samples are monitored using storage blanks, as described in the *SOP for VOA Storage Blanks (VOC-BLAN)*. CAS also has six sub-zero freezers capable of storing samples at -20° C; these are primarily used for tissue and sediment samples requiring specialized storage conditions. The temperature of each sample storage unit used at CAS is monitored daily and the data recorded in a bound logbook. Continuous-graph temperature recorders have also been placed in the walk-in refrigerators to provide a permanent record of the storage conditions to which samples are exposed.

CAS adheres to the method-prescribed or project-specified holding times for all analyses. In order to comply with holding time requirements, the sampling date and time are entered into the LIMS system at the time of sample receipt and login. Each analyst then monitors holding times by obtaining analysis-specific worklists (typically daily, or more often) from the LIMS. These worklists provide holding time information on all samples for the analysis, calculated from the sample date and the holding time requirement. In order to report adherence to holding time requirements, the date analyzed is printed or written on the analytical raw data. For analyses with holding time prescribed in hours, the time analyzed is also recorded.

Unless other arrangements have been made in advance, upon completion of all analyses and submittal of the final report, aqueous samples and sample extracts are retained at ambient temperature for 30 days, soil samples are retained at ambient temperature for 60 days, and tissue samples are retained frozen for 3 months. Upon expiration of these time limits, the samples are either returned to the client or disposed of according to approved disposal practices. All samples are characterized according to hazardous/non-hazardous waste criteria and are segregated accordingly. All hazardous waste samples are disposed of according to formal procedures outlined in the *CAS Environmental Health and Safety Manual.* All waste produced at the laboratory, including the laboratory's own various hazardous waste streams, is treated in accordance with applicable local and Federal laws. Documentation is maintained for each sample from initial receipt through final disposal. This ensures that an accurate history of the sample from "cradle to grave" is generated.

8.3 Sample Custody

Sample custody transfer at the time of sample receipt is documented using chain-of-custody (COC) forms accompanying the samples. During sample receipt, it is also noted if custody seals were present. This is described in the *SOP for Sample Receiving (SMO-GEN)*. Figure 8-1 is a copy of the chain-of-custody form routinely used at CAS.

Facility security and access is important in maintaining the integrity of samples received at CAS/Kelso. Access to the laboratory facility is limited by use of locked exterior doors with a coded entry, except for the reception area and sample receiving doors, which are manned during business hours and locked at all other times. In addition, the sample storage area within the laboratory is a controlled access area with locked doors with a coded entry. The CAS facility is equipped with an alarm system and CAS employs a private security firm to provide nighttime and weekend security.

A barcoding system is used to document internal sample custody. Each person removing or returning samples from/to sample storage while performing analysis is required to document this custody transfer. The system uniquely identifies the sample container and provides an electronic record of the custody of each sample. For sample extracts and digestates the analyst documents custody of the sample extract or

digestate by signing on the benchsheet, or custody record, that they have accepted custody. The procedures are described in the *SOP for Sample Tracking and Internal Chain of Custody (SMO-SCOC).*

8.4 Project Setup

The analytical method(s) to be used for sample analysis are chosen based on the COC information and project requirements. Unless specified otherwise, the most recent versions of reference methods are used. LIMS codes are chosen to identify the analysis method used for analysis. The Project Chemist ensures that the correct methods are selected for analysis, deliverable requirements are identified, and due dates are specified on the LIMS generated Service Request. To communicate and specify project-specific requirements, a Tier V form (Figure 8-3) is used and accompanies the service request form.

Table 8-1
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Bacterial Tests				
Coliform, Colilert	W, DW	P, Bottle or Bag	Cool, 4°C, 0.008% $Na_2S_2O_3$[d]	6-24 hours[e]
Coliform, Fecal and Total	W, DW	P,G	Cool, 4°C, 0.008% $Na_2S_2O_3$[d]	6-24 hours[e]
Fecal Streptococci	W	P,G	Cool, 4°C, 0.008% $Na_2S_2O_3$[d]	6-24 hours[e]
Inorganic Tests				
Acidity	W	P,G	Cool, 4°C	14 days
Alkalinity	W, DW	P,G	Cool, 4°C	14 days
Ammonia	W, DW	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Biochemical Oxygen Demand (BOD)	W	P,G	Cool, 4°C	48 hours
Bromate	W, DW	P,G	50mg/L EDA, cool to 4°C	28 days
Bromide	W, DW	P,G	None Required	28 days
Chemical Oxygen Demand (COD)	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Chloride	W, DW	P,G	None Required	28 days
Chlorine, Total Residual	W, DW	P,G	None Required	24 hours
Chlorite	W, DW	P,G	50mg/L EDA, cool to 4°C	14 days
Chlorophyll-A	W	G Amber	Cool, 4°C	Analyze immediately
Color	W, DW	P,G	Cool, 4°C	48 hours
Cyanide, Total and Amenable to Chlorination	W, DW	P,G	Cool, 4°C, NaOH to pH>12, plus 0.6 g Ascorbic Acid	14 days
Cyanide, Weak Acid Dissociable	W	P,G	Cool, 4°C, NaOH to pH >12	14 days
Ferrous Iron	W, DW	G Amber	Cool, 4°C	24 hours
Fluoride	W, DW	P,G	None Required	28 days
Hardness	W, DW	P,G	HNO_3 to pH<2	6 months
Hydrogen Ion (pH)	W, DW	P,G	None Required	24 hours
Kjeldahl and Organic Nitrogen	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Nitrate	W, DW	P,G	Cool, 4°C	48 hours
Nitrate	W, DW	P,G	Cool, 4°C	14 days
Nitrate-Nitrite	W, DW	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Nitrite	W, DW	P,G	Cool, 4°C	48 hours
Orthophosphate	W, DW	P,G	Filter Immediately, Cool, 4°C	48 hours
Oxygen, Dissolved (Probe)	W, DW	G, Bottle and Top	None Required	Analyze immediately
Oxygen, Dissolved (Winkler)	W, DW	G, Bottle and Top	Fix on Site and Store in Dark	8 hours
Perchlorate	W, DW	P,G	Protect from temperature extremes	28 days
Phenolics, Total	W	G Only	Cool, 4°C, H_2SO_4 to pH<2	28 days

Table 8-1 (continued)
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Phosphorus, Elemental	W	G Only	Cool, 4°C	48 hours
Phosphorus, Total	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Residue, Total	W	P,G	Cool, 4°C	7 days
Residue, Filterable (TDS)	W	P,G	Cool, 4°C	7 days
Residue, Nonfilterable (TSS)	W	P,G	Cool, 4°C	7 days
Residue, Settleable	W	P,G	Cool, 4°C	48 hours
Residue, Volatile	W	P,G	Cool, 4°C	7 days
Silica	W	P Only	Cool, 4°C	28 days
Specific Conductance	W, DW	P,G	Cool, 4°C	28 days
Sulfate	W, DW	P,G	Cool, 4°C	28 days
Sulfide	W	P,G	Cool, 4°C, Add Zinc Acetate plus Sodium Hydroxide to pH>9	7 days
Sulfite	W	P,G	None Required	24 hours
Surfactants (MBAS)	W	P,G	Cool, 4°C	48 hours
Tannin and Lignin	W	P,G	Cool, 4°C	28 days
Temperature	W	P,G	None Required	Analyze immediately
Turbidity	W, DW	P,G	Cool, 4°C	48 hours
Metals				
Metals, except CrVI and Mercury	W, DW	P,G	HNO_3 to pH<2	6 months
	S	G, Teflon-Lined Cap	Cool, 4°C	6 months
Chromium VI	W	P,G	Cool, 4°C	24 hours
Mercury	W	P,G	HNO_3 to pH<2	28 days
	S	P,G	Cool, 4°C	28 days
Organic Tests				
Oil and Grease, Hexane Extractable Material (EPA 1664)	W	G, Teflon-Lined Cap	Cool, 4°C, H_2SO_4 to pH<2	28 days
Organic Carbon, Total (TOC)	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Organic Halogens, Total (TOX)	W	G, Teflon-Lined Cap	Cool, 4°C, H_2SO_4 to pH<2, No headspace	28 days
Organic Halogens, Adsorbable (AOX)	W	G, Teflon-Lined Cap	Cool, 4°C, HNO_3 to pH<2	6 months
Petroleum Hydrocarbons, Total	W	G, Teflon-Lined Cap	Cool, 4°C, HCl or H_2SO_4 to pH<2	7 days until extraction; 40 days after extraction
	S	G, Teflon-Lined Cap	Cool, 4°C	14 days until extraction; 40 days after extraction

Table 8-1 (continued)
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Volatile Organics				
Petroleum Hydrocarbons, Volatile (Gasoline-Range Organics)	W	G, Teflon-Lined Septum Cap	Cool, 4°C, HCl to pH<2 No Headspace	14 days
	S	G, Teflon-Lined Cap	Cool, 4°C Minimize Headspace	14 days
Purgeable Halocarbons	W	G, Teflon-Lined Septum Cap, No Headspace	**No Residual Chlorine Present**: HCl to pH<2, Cool, 4°C, No Headspace **Residual Chlorine Present**: 10% $Na_2S_2O_3$, HCl to pH<2, Cool, 4°C	14 days
	S	G, Teflon-Lined Cap	Cool, 4°C, Minimize Headspace	14 days
	S	Method 5035	Encore, Freeze at -20°C Methanol, Cool, 4°C Sodium Bisulfate Cool, 4°C	7 days 48 hrs to prepare from Encore, 14 days after preparation. 48 hrs to prepare from Encore, 14 days after preparation.
Purgeable Aromatic Hydrocarbons (including BTEX and MTBE)	W	G, Teflon-Lined Septum Cap, No Headspace	**No Residual Chlorine Present**: HCl to pH<2, Cool, 4°C, No Headspace **Residual Chlorine Present**: 10% $Na_2S_2O_3$, HCl to pH<2, Cool 4°C	14 days
	S	G, Teflon-Lined Cap	Cool, 4°C, Minimize Headspace	14 days
	S	Method 5035	Encore, Freeze at -20°C Methanol, Cool, 4°C Sodium Bisulfate Cool, 4°C	7 days 48 hrs to prepare from Encore, 14 days after preparation. 48 hrs to prepare from Encore, 14 days after preparation.
Acrolein, Acrylonitrile, Acetonitrile	W	G, Teflon-Lined Septum Cap	Adjust pH to 4-5, Cool, 4°C, No Headspace	14 days
EDB and DBCP	W,S	G, Teflon-Lined Cap	Cool, 4°C, 3 mg $Na_2S_2O_3$, No Headspace	28 days

Table 8-1 (continued)
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Semivolatile Organics				
Petroleum Hydrocarbons, Extractable (Diesel-Range Organics)	W,S	G, Teflon-Lined Cap	Cool, 4°C	7 days until extraction;[f] 40 days after extraction
Alcohols and Glycols	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Phenols	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Phthalate Esters	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Nitrosamines	W,S	G, Teflon-Lined Cap	Cool, 4°C, Store in Dark[g]	7 days until extraction;[f] 40 days after extraction
Organochlorine Pesticides and PCBs	W,S	G, Teflon-Lined Cap	Cool, 4°C	7 days until extraction;[f] 40 days after extraction
Nitroaromatics and Cyclic Ketones	W,S	G, Teflon-Lined Cap	Cool, 4°C, Store in Dark[g]	7 days until extraction;[f] 40 days after extraction
Polynuclear Aromatic Hydrocarbons	W,S	G, Teflon-Lined Cap	Cool, 4°C, Store in Dark[g]	7 days until extraction;[f] 40 days after extraction
Haloethers	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Chlorinated Hydrocarbons	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Organophosphorus Pesticides	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Nitrogen- and Phosphorus-Containing Pesticides	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction

Table 8-1 (continued)
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Chlorinated Herbicides	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Chlorinated Phenolics	W	G, Teflon-Lined Cap	H_2SO_4 to pH<2, Cool, 4°C[g]	30 days until extraction; 30 days after extraction
Resin and Fatty Acids	W	G, Teflon-Lined Cap	NaOH to pH ≥10, Cool, 4°C[g]	30 days until extraction; 30 days after extraction
Drinking Water Organics				
Purgeable Organics	DW	G, Teflon-Lined Septum Cap,	Ascorbic Acid, HCl to pH≤2, Cool, 4°C, No Headspace	14 days
EDB, DBCP, and TCP	DW	G, Teflon-Lined Septum Cap	Cool, 4°C, 3 mg $Na_2S_2O_3$, No Headspace	14 days
Carbamates, Carbamoyloximes	DW	G, Amber, Teflon-Lined Cap	1.8 mL monochloroacetic acid to pH<3; 80 mg/L $Na_2S_2O_3$ if Res.Cl.; Cool, 4°C	28 days
Chlorianted Herbicides	DW	G, Amber, Teflon-Lined Cap	If Res.Cl, 2mg/4omL NaS; Cool, <6°C	14 days until extraction; 21 days after extraction
Chlorinated Pesticides	DW	G, Amber, Teflon-Lined Cap	50 mg/L NaS, HCl to pH≤ 2; Cool, 4°C	14 days until extraction; 30 days after extraction
Diquat and Paraquat	DW	G, Amber, Teflon-Lined Cap	100 mg/L $Na_2S_2O_3$ if Res.Cl., Cool, 4°C,	7days until extraction; 21 days after extraction
Endothall	DW	G, Amber, Teflon-Lined Cap	Cool, 4°C	7 days until extraction; 14 days after extraction
Glyphosate	DW	G, Amber, Teflon-Lined Cap	100 mg/L $Na_2S_2O_3$, Cool, 4°C	14 days
Haloacetic Acids	DW	G, Amber, Teflon-Lined Cap	100 mg/L NH_4Cl, Cool, 4°C	14 days until extraction; 7 days after extraction
Semivolatile Organics	DW	G, Amber, Teflon-Lined Cap	50 mg/L NaS, HCl to pH≤ 2; Cool, 4°C	14 days until extraction; 30 days after extraction

Table 8-1 (continued)
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Toxicity Characteristic Leaching Procedure (TCLP)				
Mercury	HW	P,G	Sample: Cool, 4°C TCLP extract: HNO_3 to pH<2	28 days until extraction; 28 days after extraction
Metals, except Mercury	HW	P,G	Sample: Cool, 4°C TCLP extract: HNO_3 to pH<2	180 days until extraction; 180 days after extraction
Volatile Organics	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C Minimize Headspace TCLP extract: Cool, 4°C, HCl to pH<2, No Headspace	14 days until extraction; 14 days after extraction
Semivolatile Organics	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C, Store in Dark[g] TCLP extract: Cool, 4°C, Store in Dark[g]	14 days until TCLP ext'n; 7 days until extraction; 40 days after extraction
Organochlorine Pesticides	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C TCLP extract: Cool, 4°C	14 days until TCLP ext'n; 7 days until extraction; 40 days after extraction
Chlorinated Herbicides	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C TCLP extract: Cool, 4°C	14 days until TCLP ext'n; 7 days until extraction; 40 days after extraction

a See Section 18.0 for sources of holding time information.
b DW = Drinking Water, W = Water; S = Soil or Sediment; HW = Hazardous Waste
c P = Polyethylene; G = Glass
d For chlorinated water samples
e The recommended maximum holding time is variable, and is dependent upon the geographical proximity of sample source to the laboratory.
f Fourteen days until extraction for soil, sediment, and sludge samples.
g If the water sample contains residual chlorine, 10% sodium thiosulfate is used to dechlorinate.

Figure 8-1
Chain of Custody Form

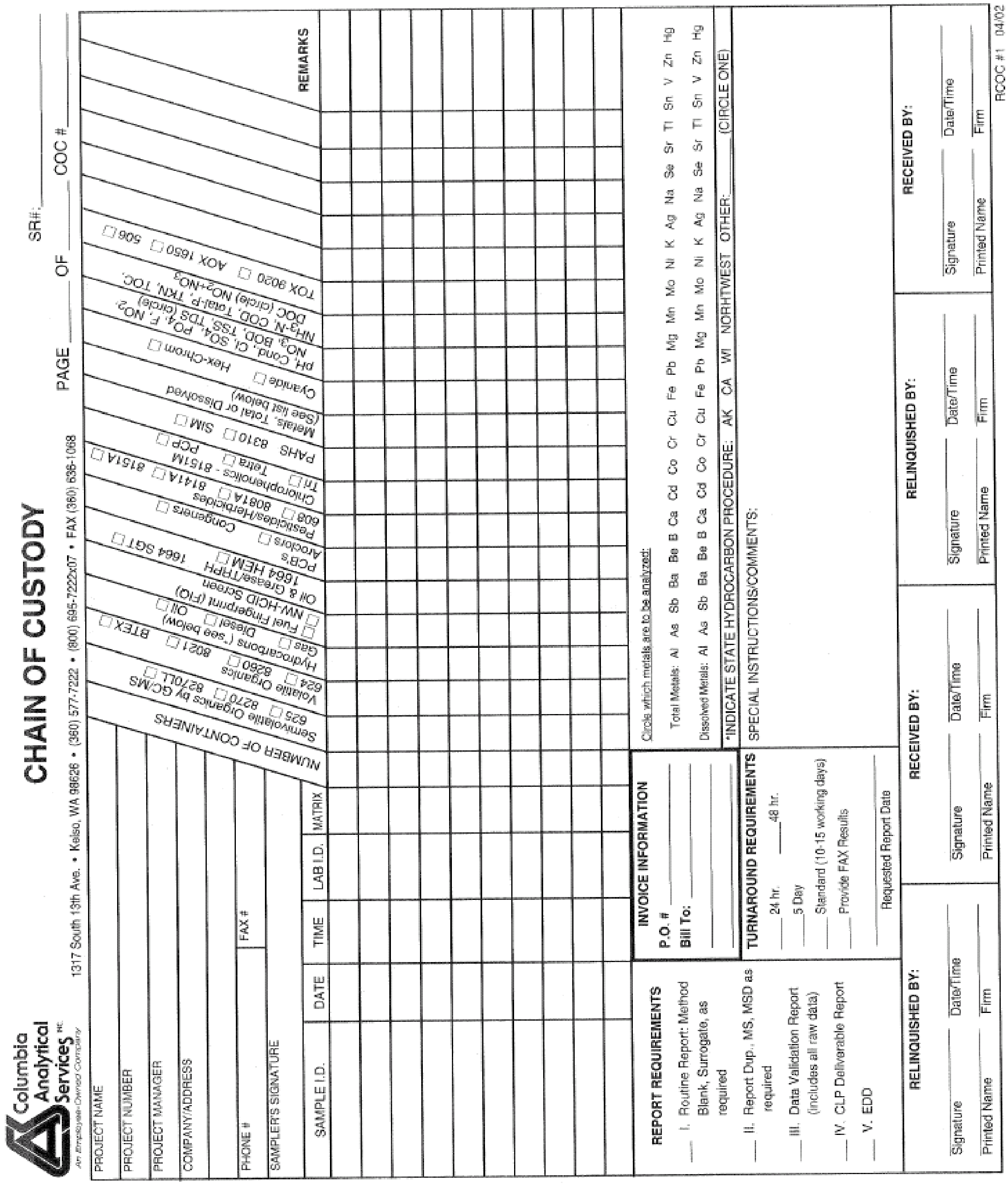


Figure 8-2

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client_____ Work Order K23_____

Cooler received on_____ and opened on _____ by_____

1.	Were custody seals on outside of cooler? If yes, how many and where?_____	Y N
2.	Were seals intact and signature & date correct?	Y N
3.	Is the shipper's airbill available and filed? If no, record airbill number:_____	Y N
4.	COC # _____ _____ _____ _____	
	Temperature of cooler(s) upon receipt: _____ _____ _____ _____	
	Temperature Blank: _____ _____ _____ _____	
5.	Were custody papers properly filled out (ink, signed, etc.)?	Y N
6.	Type of packing material present _____	
7.	Did all bottles arrive in good condition (unbroken)?	Y N
8.	Were all bottle labels complete (*i.e.* analysis, preservation, etc.)?	Y N
9.	Did all bottle labels and tags agree with custody papers?	Y N
10.	Were the correct types of bottles used for the tests indicated?	Y N
11.	Were all of the preserved bottles received at the lab with the appropriate pH?	Y N
12.	Were VOA vials checked for absence of air bubbles, and if present, noted below?	Y N
13.	Did the bottles originate from CAS/K or a branch laboratory?	Y N
14.	Are CWA Microbiology samples received with > ½ the 24 hr. hold time remaining from collection?	Y N
15.	Was Cl2/Res negative?	Y N

Explain any discrepancies:_____

_____

_____

_____

RESOLUTION:_____

Samples that required preservation or received out of temperature:

Sample ID	Reagent	Volume	Lot Number	Bottle Type	Rec'd out of Temperature	Initials

Figure 8-3
Tier V Form

Client :

Project Chemist :

Project Name :

Service Request :

Project Number :

SMO LimsTemplate ID :

Project Description :

QAPP/SOW Information :

Reporting

Tier Level :

PDF:

Report to :

In result field use :

EDD :

Flagging Requirements :

Other Requirements :

Sample Considerations

Sample Limitations :

Sample Prep/Analysis :

Non-Standard Holdtimes :

Historical Data :

Comments :

9.0 QUALITY CONTROL OBJECTIVES (PRECISION, ACCURACY, AND MDLS)

A primary focus of Columbia Analytical Services Quality Assurance (QA) Program is to ensure the accuracy, precision and comparability of all analytical results. Prior to using a procedure for the analysis of field samples, acceptable method performance is established by performing demonstration of capability analyses and performance characteristics are established by performing method detection limit studies and assessing accuracy and precision according to the reference method. CAS has established Quality Control (QC) objectives for precision and accuracy that are used to determine the acceptability of the data that is generated in its laboratories. These QC limits are either specified in the methodology or are statistically derived based on the laboratory's actual historical data obtained from the various QC measurements for each analytical method. The Quality Control objectives are defined below and the numeric values are shown in Appendix D.

9.1 Demonstration of Capability

Where required by mandatory test method, regulation, or accreditation protocols, a demonstration of capability (DOC) is made prior to using any test method. This demonstration is made following regulatory, accreditation, or method specified procedures. In general, this demonstration does not test the performance of the method in real world samples, but in the applicable clean matrix free of target analytes and interferences.

A quality control reference material or quality control sample is obtained. The analyte(s) is (are) diluted in a volume of clean matrix (for analytes which do not lend themselves to spiking, e.g., TSS, the demonstration of capability may be performed using quality control samples). Where specified, the method-required concentration levels are used. Four aliquots are prepared and analyzed according to the test procedure. The mean recovery and standard deviations are calculated and compared to the corresponding acceptance criteria for precision and accuracy in the test method or laboratory-generated acceptance criteria (if there are not established mandatory criteria). All parameters must meet the acceptance criteria. Where spike levels are not specified, actual Laboratory Control Sample results or MDL study results may be used to meet this requirement, provided acceptance criteria is met.

9.2 Accuracy

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the mean value of results from ongoing analyses of laboratory-fortified blanks,

standard reference materials, and standard solutions. In addition, laboratory-fortified (i.e. matrix-spiked) samples are also measured; this indicates the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery (% REC.) of the measured value, relative to the true or expected value. If a measurement process produces results whose mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). CAS utilizes several quality control measures to eliminate analytical bias, including systematic analysis of method blanks, laboratory control samples and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement

9.3 Precision

Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling and in laboratory analysis. The American Society of Testing and Materials (ASTM) recognizes two levels of precision: repeatability - the random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions, and reproducibility - the random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material.

"Within-batch" precision is measured using replicate sample or QC analyses and is expressed as the relative percent difference (RPD) between the measurements. The "batch-to-batch" precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples from multiple analytical batches.

9.4 Control Limits

The acceptance limits for accuracy and precision originate from two different sources: For analyses having enough QC data, control limits are calculated at the 99% confidence limits. For analyses not having enough QC data, or where the method is prescriptive, control limits are taken from the method on which the procedure is based. If the method does not have control limits stated in it, then control limits are assigned method-default or reasonable values. New control limits are generated periodically. After review of the data by the Quality Assurance Manager, the new acceptance criteria replace the previous criteria and data is assessed using the new values. These control limits are updated when new statistical limits are generated for the appropriate surrogate, laboratory control sample, and matrix spike compounds (typically once a year) or when method prescribed limits change.

The acceptance limits for accuracy and precision for selected analytes are shown in the table in Appendix D. For accuracy limits, the values listed are for laboratory control samples unless otherwise indicated. For inorganics, the precision limit values listed are for laboratory duplicates. For organics, the precision limit values listed are for duplicate laboratory control samples or duplicate matrix spike analyses.

9.5 Representativeness

Representativeness is the degree to which the field sample represents the overall sample site or material. This can be extended to the sample itself, in that representativeness is the degree to which the subsample that is analyzed represents the entire field sample submitted for analysis. CAS has sample handling procedures to ensure that the sample used for analysis is representative of the entire sample. These include the *SOP for Sample Preparation, Compositing, and Subsampling*, the *SOP for Solid Sample Preparation*, and the *SOP for Tissue Sample Preparation*. Further, analytical SOPs specify appropriate sample handling and sample sizes to further ensure the sample aliquot that is analyzed is representative in entire sample.

9.6 Completeness

Completeness is a measure of the amount of valid data that is obtained, compared to the amount that is expected. For the purposes of this plan, completeness is calculated by dividing the number of samples having valid data by the total number of samples in the project, expressed as a percentage. The CAS objective for completeness is 100%.

9.7 Comparability

Comparability expresses the confidence with which one data set can be compared to another. To ensure comparability, standard operating procedures are used for the preservation, handling, and analysis of all samples. Data is reported in units specified by the customer.

9.8 Method Detection Limits and Method Reporting Limits

Method Detection Limits (MDL) for analytical methods routinely performed at CAS/Kelso are determined annually, thus may change slightly from year to year. The MDLs are determined by following the *SOP for the Determination of Method Detection Limits,* which is based on the procedure in 40 CFR Part 136, Appendix B. The Method Reporting Limits (MRLs) used at CAS are the routinely reported lower limits of quantitation. These MRLs are the levels to which CAS routinely reports results in order to minimize false positive or false negative results. The MRLs take into account day-to-day fluctuations in instrument sensitivity as well as other factors. Analyses are calibrated to the MRL, or lower. The MRL is typically two to ten times the MDL.

10.0 QUALITY CONTROL PROCEDURES

The specific types, frequencies, and processes for quality control sample analysis are described in detail in method-specific standard operating procedures. These sample types and frequencies have been adopted for each method and a definition of each type of QC sample is provided below. In addition, a number of other quality control processes that may impact analytical results are also described below.

10.1 Standard Operating Procedures (SOPs) and Laboratory Notebooks.

CAS maintains a database of SOPs for use in both technical and administrative functions. SOPs are written following the format and content requirements described in the *SOP for Preparation of Standard Operating Procedures* (SOP No. ADM-SOP). Each SOP has been reviewed and approved by a minimum of two managers (the Laboratory Director and/or Department Manager and the Quality Assurance Manager). All SOPs undergo a documented annual review to make sure current practices are described. The QA Manager maintains a comprehensive list of current SOPs. The document control process ensures that only the most currently prepared version of an SOP is being used for guidance and instruction. The QA Manual, QAPPs, SOPs, standards preparation logbooks, maintenance logbooks, et al., are controlled documents. The procedures for document control are described in the *SOP for Document Control* (SOP No. ADM-DOC_CTRL). In addition to SOPs, each laboratory department maintains a current file, accessible to all laboratory staff, of the promulgated methodology used to perform analyses. Laboratory notebook entries have been standardized following the guidelines in the *Making Entries into Logbooks and onto Benchsheets* SOP (SOP No. ADM-DATANTRY). The entries made into laboratory notebooks are reviewed and approved by the appropriate supervisor at a regular interval (e.g., weekly, monthly, etc.).

10.2 Deviation from Standard Operating Procedures

When a customer requests a modification to an SOP (such as a change in reporting limit, addition or deletion of target analyte(s), etc.), the project chemist handling that project must discuss the proposed deviation with the department manager in charge of the analysis and obtain their approval to accept the project. The project chemist is responsible for documenting the approved or allowed deviation from the standard operating procedure by placing a detailed description of the deviation attached to the quotation or in the project file and also providing an appropriate comment on the service request when the samples are received.

For circumstances when a deviation or departure from company policies or procedures involving any non-technical function is found necessary, approval must be obtained from the appropriate supervisor, manager, the laboratory director, or other level of authority. Frequent departure from policy is not encouraged. However, if frequent departure from any policy is noted, the laboratory director will address the possible need for a change in policy.

10.3 Modified Procedures

CAS strives to perform published methods as described in the referenced documents. If there is a material deviation from the published method, the method is cited as a "Modified" method in the analytical report. Modifications to the published methods are listed in the standard operating procedure. Standard operating procedures are available to analysts and are also available to our clients for review, especially those for "Modified" methods. Client approval is obtained for the use of "Modified" methods prior to the performance of the analysis.

10.4 Analytical Batch

The basic unit for analytical quality control is the analytical batch. The definition that CAS has adopted for the analytical batch is listed below. The overriding principle for describing an analytical batch is that all the samples in a batch, both field samples and quality control samples, are to be handled exactly the same way, and all of the data from each analysis is to be manipulated in exactly the same manner.

The <u>minimum</u> requirements of an analytical batch are:

1) The number of (field) samples in a batch is not to exceed 20.

2) All (field) samples in a batch are of the same matrix.

3) The QC samples to be processed with the (field) samples include:

   a) Method Blank (a.k.a. Laboratory Reagent Blank)

      Function: Determination of laboratory contamination.

   b) Laboratory Control Sample (a.k.a. Laboratory Fortified Blank)

      Function: Assessment of method performance

   c) Matrix Spiked (field) Sample (a.k.a. Laboratory Fortified Sample Matrix)

      Function: Assessment of matrix problems

      NOTE: A sample identified as a field blank, an equipment blank, or a trip blank is <u>not</u> to be matrix spiked.

d) Duplicate Matrix Spiked (field) Sample or Duplicate (field) Sample (a.k.a. Laboratory Duplicate)

Function: Assessment of batch precision

NOTE: A sample identified as a field blank, an equipment blank, or a trip blank is not to be duplicated.

4) A single lot of reagents is used to process the batch of samples.

5) Each operation within the analysis is performed by a single analyst, technician, chemist, or by a team of analysts/technicians/chemists.

6) The time frame is not to exceed a 24-hour period. "Open batches" extending over more than one 24 hour period are not allowed.

7) (Field) samples are assigned to batches commencing at the time that sample processing begins. For example: for analysis of metals, sample processing begins when the samples are digested. For analysis of organic constituents, it begins when the samples are extracted.

8) The QC samples are to be analyzed in conjunction with the associated field samples prepared with them. However, for tests which have a separate sample preparation step that defines a batch (digestion, extraction, etc.), the QC samples in the batch do not require analysis each time a field sample within the preparation batch is analyzed (multiple instrument sequences to analyze all field samples in the batch need not include re-analyses of the QC samples).

9) The batch is is to be assigned a unique identification number that can be used to correlate the QC samples with the field samples.

10) Batch QC refers to the QC samples that are analyzed in a batch of (field) samples.

11) Specific project, program, or method SOP requirements may be exceptions. If project, program, or method SOP requirements are more stringent than these laboratory minimum requirements, then the project, program, or method SOP requirements will take precedence. However, if the project, program, or method SOP requirements are less stringent than these laboratory minimum requirements, these laboratory minimum requirements will take precedence.

10.5 Method Blank (a.k.a. Laboratory Reagent Blank)

The method blank is either analyte-free water or analyte-free soil (when available), subjected to the entire analytical process. When analyte-free soil is not available,

anhydrous sodium sulfate, organic-free sand, or an acceptable substitute may be used instead. The method blank is analyzed to demonstrate that the analytical system itself is not contaminated with the analyte(s) being measured. The method blank results should be below the Method Reporting Limit (MRL) or, if required for DoD projects, below half of the MRL for the analyte(s) being tested. Otherwise, corrective action must be taken. A method blank is included with the analysis of every sample preparation batch, every 20 samples, or as stated in the method, whichever is more frequent.

10.6 Calibration Blanks

For some methods, calibration blanks are prepared along with calibration standards in order to create a calibration curve. Calibration blanks are free of the analyte of interest and, where applicable, provide the zero point of the calibration curve.

10.7 Continuing Calibration Blanks

Continuing calibration blanks (CCBs) are solutions of either analyte-free water, reagent, or solvent that are analyzed in order to verify the system is contamination-free when CCV standards are analyzed. The frequency of CCB analysis is either once every ten samples or as indicated in the method, whichever is greater.

10.8 Calibration Standards

Calibration standards are solutions of known concentration prepared from primary standard solutions that are, in turn, prepared from stock standard materials. Calibration standards are used to calibrate the instrument response with respect to analyte concentration. Standards are analyzed in accordance with the requirements stated in the particular method being used.

10.9 Initial (or Independent) Calibration Verification Standards

Initial (or independent) calibration verification standards (ICVs) are standards that are analyzed *after* calibration with newly prepared standard(s) but *prior to* sample analysis, in order to verify the validity of the standards used in the calibration. Once it is determined that there is no systematic error in preparation of the calibration standard(s), they are considered valid standards and may be used for subsequent calibrations (as expiration dates and methods allow). The ICV standards are prepared from materials obtained from a source independent of that used for preparing the calibration standards. ICVs are also analyzed in accordance with method-specific requirements.

10.10 Continuing Calibration Verification Standards

Continuing calibration verification standards (CCVs) are midrange standards that are analyzed in order to verify that the calibration of the analytical system is still acceptable. The frequency of CCV analysis is either once every ten samples, or as indicated in the method.

10.11 Internal Standards

Internal standards consist of known amounts of specific compounds that are added to each sample following sample preparation or extraction. Internal standards are generally used for GC/MS and ICP-MS procedures to correct sample results that have been affected by changes in instrument conditions or changes caused by certain matrix effects. The integrated area of the internal standard compared to the continuing calibration check standard should vary by no more than the limits specified in each method.

10.12 Surrogates

Surrogates are organic compounds which are similar in chemical composition and chromatographic behavior to the analytes of interest, but which are not normally found in environmental samples. Depending on the analytical method, one or more of these compounds is added to method blanks, calibration and check standards, and samples (including duplicates, matrix spike samples, duplicate matrix spike samples and laboratory control samples) prior to extraction and analysis in order to monitor the method performance on each sample. The percent recovery is calculated for each surrogate, and the recovery is a measurement of the overall method performance. The acceptance criteria for these various analytes are listed in Appendix D, along with other data quality capabilities.

10.13 Matrix Spikes (a.k.a. Laboratory Fortified Sample Matrix)

Matrix spiked samples are aliquots of samples to which a known amount of the target analyte (or analytes) has been added. The samples are then prepared and analyzed in the same analytical batch, and in exactly the same manner as are routine samples. The stock solutions used for spiking the sample(s) are purchased and prepared independently of calibration standards. The spike recovery measures the effects of interferences caused by the sample matrix and reflects the accuracy of the method for the particular matrix in question. Spike recoveries are calculated as follows:

Recovery (%) = (S - A) x 100 ÷ T

Where: S = The observed concentration of analyte in the spiked sample,
A = The analyte concentration in the original sample, and
T = The theoretical concentration of analyte added to the spiked sample.

For the appropriate methods, matrix spiked samples are prepared and analyzed at a minimum frequency of one spiked sample (and one duplicate spiked sample, if appropriate) per twenty samples.

10.14 Laboratory Duplicates and Duplicate Matrix Spikes

Duplicates are additional replicates of samples that are subjected to the same preparation and analytical scheme as the original sample. Depending on the method of analysis, either a duplicate analysis (and/or a matrix spiked sample) or a matrix spiked sample and duplicate matrix spiked sample (MS/DMS) are analyzed. The relative percent difference between duplicate analyses or between an MS and DMS is a measure of the precision for a given method and analytical batch. The relative percent difference (RPD) for these analyses is calculated as follows:

Relative Percent Difference (RPD) = (S1 - S2) x 100 ÷ S_{ave}

Where S1 and S2 = The observed concentrations of analyte in the sample and its duplicate, or in the matrix spike and its duplicate matrix spike, and

S_{ave} = The average of observed analyte concentrations in the sample and its duplicate, or in the matrix spike and its duplicate matrix spike.

Depending on the method of analysis, either duplicates (and/or matrix spikes) or MS/DMS analyses are performed at a minimum frequency of one set per 20 samples.

10.15 Laboratory Control Samples (a.k.a. Laboratory Fortified Blanks or Quality Control Samples)

The laboratory control sample (LCS) is an aliquot of analyte-free water or analyte-free soil (or anhydrous sodium sulfate or equivalent) to which known amounts of the method analyte(s) is(are) added. A standard reference material (SRM) of known matrix type, containing certified amounts of target analytes, may also be used as an LCS. The LCS sample is prepared and analyzed in the same analytical batch, and in exactly the same

manner, as the other routine samples. Stock solutions used for LCSs are purchased or prepared independently of calibration standards. The percent recovery (% REC.) of the target analytes in the LCS assists in determining whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements at the required reporting limit. Comparison of batch-to-batch LCS analyses enables the laboratory to evaluate batch-to-batch precision and accuracy. Acceptance criteria for LCS analyses are obtained through the use of control charts. An LCS is prepared and analyzed at a minimum frequency of one LCS per 20 samples, with every analytical batch or as stated in the method, whichever is more frequent.

If an insufficient quantity of sample is available to perform a laboratory duplicate or duplicate matrix spikes, duplicate LCSs will be prepared and analyzed.

10.16 Interference Check Samples

An interference check sample (ICS) is a solution containing both interfering and analyte elements of known concentration that can be analyzed to verify background and interelement correction factors in metals analyses. The ICS is prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. The ICS is spiked with the elements of interest at concentrations of approximately ten times the instrument detection limits. The ICS is analyzed at the beginning and end of an analytical run or every eight hours, whichever is more frequent, and the results must be within ± 20% of the true values.

10.17 Post Digestion Spikes

Post digestion spikes are samples prepared for metals analyses that have an analyte spike added to determine if matrix effects may be a factor in the results. The spike addition should produce a method-specified minimum concentration above the instrument detection limit. A post digestion spike is analyzed with each batch of samples and recovery criteria are specified for each method.

10.18 Source and Preparation of Standard Reference Materials

All analytical measurements generated at CAS are performed using materials and/or processes that are traceable to a reference material. Metrology equipment (analytical balances, thermometers, etc.) is calibrated using reference materials traceable to the National Institute of Standards and Technology (NIST). These primary reference materials are themselves recertified on an annual basis. All sampling containers provided to the client by the laboratory are purchased as precleaned (Level 1) containers, with certificates of analysis available for each bottle type. This information is provided to the client when requested.

Consumable reference materials routinely purchased by the laboratories (e.g., analytical standards) are purchased from nationally recognized, reputable vendors. All vendors have fulfilled the requirements for ISO 9001 certification and/or are accredited by A_2LA. CAS relies on a primary vendor for the majority of its analytical supplies. In addition, consumable primary stock standards are obtained from certified commercial sources or from sources referenced in a specific method. Supelco, Ultra Scientific, AccuStandard, Chem Services, Inc., Aldrich Chemical Co., Baker, Spex, E. M. Science, etc. are examples of the vendors used by CAS. All reference materials that are received at CAS are recorded by the technical staff in the appropriate logbook(s) and are stored under conditions that provide maximum protection against deterioration and contamination. The logbook entry includes such information as an assigned logbook identification code, the source of the material (i.e. vendor identification), solvent (if applicable) and concentration of analyte(s), reference to the certificate of analysis and an assigned expiration date. In addition, the date that the standard is received in the laboratory is marked on the container. When the reference material is used for the first time, the date of usage and the initials of the analyst are also recorded on the container.

Stock solutions and/or calibration standard solutions are prepared fresh as often as necessary according to their stability. After preparation, all standard solutions are properly labeled as to analyte concentration, solvent, date, preparer, and expiration date; these entries are also recorded in the appropriate notebook(s) following the *SOP for Making Entries into Logbooks and onto Benchsheets* (SOP No. ADM-DATANTRY). Prior to introduction into the analytical system/process, all reference materials are verified with a second, independent source of the material (see section 10.9 above). Once the reference material has been verified to be accurate, it may then be used for instrument calibration and subsequent quantitative purposes. In addition, the independent source of reference material is also used to check the calibration standards for signs of deterioration.

10.19 Control Charting

The generation of control charts is routinely performed at CAS. Surrogate, Matrix Spike and LCS recoveries are all monitored and charted. In addition, the laboratory also monitors the Relative Percent Difference (RPD) measurement of precision. Control charts are available to each individual laboratory unit to monitor the data generated in its facility using control charts that have been programmed to identify various trends in the analytical results. If trends in the data are perceived, various means of corrective action may then be employed in order to prevent future problems with the analytical system(s). Finally, data quality reports using control charts are generated for specific clients and projects pursuant to contract requirements. The control charting procedure is described in the SOP for *Control Charting Quality Control Data* (ADM-CHRT).

10.20 Glassware Washing

Glassware washing and maintenance play a crucial role in the daily operation of a laboratory. The glassware used at CAS undergoes a rigorous cleansing procedure prior to every usage. A number of SOPs have been generated that outline the various procedures used at CAS; each is specific to the end-use of the equipment as well as to the overall analytical requirements of the project. In addition, other equipment that may be routinely used at the laboratory is also cleaned following instructions in the appropriate SOP.

11.0 CALIBRATION PROCEDURES AND FREQUENCY

All equipment and instruments used at CAS are operated, maintained and calibrated according to the manufacturer's guidelines and recommendations, as well as to criteria set forth in the applicable analytical methodology. Operation and calibration are performed by personnel who have been properly trained in these procedures. Documentation of calibration information is maintained in appropriate reference files. Brief descriptions of the calibration procedures for our major laboratory equipment and instruments are described below. Records are maintained to provide traceability of reference materials.

Any item of the equipment which has been subjected to overloading or mishandling, or has been shown by verification or otherwise to be defective; is taken out of service until it has been repaired. The equipment is placed back in service only after verifying by calibration that the equipment performs satisfactorily. An evaluation of the effect of this defect on previous calibrations or tests is made and documented appropriately.

Calibration verification is performed according to in the applicable analytical methodology. Calibration verification procedures and criteria are listed in laboratory Standard Operating Procedures. Documentation of calibration verification is maintained in appropriate reference files. For NELAP accredited methods, the concentration of calibration verification standards are varied within the calibration range periodically.

11.1 Temperature Control Devices

Temperatures are monitored and recorded for all of the temperature-regulating support equipment such as sample refrigerators, freezers, and standards refrigerators. Bound record books are kept which contain daily-recorded temperatures, identification and location of equipment, acceptance criteria and the initials of the technician who performed the checks. The procedure for performing these measurements is provided in the *SOP for Support Equipment Monitoring and Calibration (SOP ADM-SEMC).* The SOP also includes the use of acceptance criteria and correction factors.

Where the operating temperature is specified as a test condition (such as ovens, incubators, evaporators) the temperature is recorded on the raw data. All thermometers are identified according to serial number, and the calibration of these thermometers is checked annually against a National Institute of Standards and Technology (NIST) certified thermometer. The NIST thermometer is recertified by a professional metrology organization on an annual basis.

11.2 Analytical Balances

Analytical balances are serviced on a semi-annual basis by a professional metrology organization. New certificates of calibration for each balance are issued to the laboratory on a semi-annual basis. The calibration of each analytical balance is checked daily with three class S or S-1 weights, which assess the accuracy of the balance at low, mid-level and high levels within the working range. The weights are recertified using NIST traceable standards by a professional metrology organization on an annual basis.

As needed, the balances are recalibrated using the manufacturers recommended operating procedures. Bound record books are kept which contain the recorded measurements, identification and location of equipment, acceptance criteria and the initials of the technician who performed the checks. The procedure for performing these measurements and use of acceptance criteria is described in the SOP ADM-SEMC.

11.3 Water Purification System

The water purification system used at CAS is designed to produce deionized water of 18 megohms resistivity or better, meeting specifications for Type I water, as described in *Standard Methods for the Examination of Water and Wastewater (SM1080)*. The system is monitored continuously with an on-line meter, which is recorded daily in a bound record book. Deionizers are rotated and replaced when the first unit in the series produces water of 0.5 megohms, which is monitored by a light on the unit. The status of the deionizers is also checked (resistivity reading and light status) and recorded daily in a bound record book. Activated carbon filters are also in series with the demineralizers to produce "organic-free" water. Finally, the water is checked at a point downstream of the original source - typically a spigot in one of the laboratory operating units. This information is also recorded on a weekly basis.

11.4 Inductively Coupled Plasma-Atomic Emission Spectrograph (ICP-AES)

Each emission line on the ICP is calibrated daily against a blank and against standards. Analyses of calibration standards, initial and continuing calibration verification standards, and inter-element interference check samples are carried out as specified in the EPA CLP Statement of Work for Inorganic Analysis, SOW No ILM04.0.

11.5 Inductively Coupled Plasma-Mass Spectrometer (ICP-MS)

Each element of interest is calibrated for using a blank and a single standard. Prior to calibration, a short-term stability check is performed on the system. Following calibration, an independent check standard is analyzed, and a continuing calibration verification standard (CCV) is analyzed with every ten samples.

11.6 Atomic Absorption Spectrophotometers (AAS)

These instruments are calibrated daily using a minimum of four standards and a blank. Calibration is validated using reference standards, and is verified at a minimum frequency of once every ten samples. Initial calibration points cannot be "dropped" from the resulting calibration curve.

11.7 GC/MS Systems

All GC/MS instruments are calibrated at a minimum of five different concentration levels for the analytes of interest (unless specified otherwise) using procedures outlined in Standard Operating Procedures and/or appropriate USEPA method citations. All reference materials used for this function are vendor-certified standards. Calibration verification is performed at method-specified intervals following the procedures in the SOP and reference method. Compounds selected as system performance check compounds (SPCCs) must show a method-specified response factor in order for the calibration to be considered valid. Calibration check compounds (CCCs) must also meet method specifications for percent difference from the multipoint calibration. For isotope dilution procedures, the internal standard response(s) and labeled compound recovery must meet method criteria. Method-specific instrument tuning is regularly checked using bromofluorobenzene (BFB) for volatile organic chemical (VOC) analysis, or decafluorotriphenylphosphine (DFTPP) for semi-volatile analysis. Mass spectral peaks for the tuning compounds must conform both in mass numbers and in relative intensity criteria before analyses can proceed. Calibration policies for organics chormatographic analyses are described in the *SOP for Calibration of Instruments for Organics Chromatographic Analyses (SOP SOC-CAL).*

11.8 Gas Chromatographs and High Performance Liquid Chromatographs

Calibration and standardization follow SOP guidelines and/or appropriate USEPA method citations. All GC and HPLC instruments are calibrated at a minimum of five different concentration levels for the analytes of interest (unless specified otherwise). The lowest standard is equivalent to the method reporting limit; additional standards define the working range of the GC or LC detector. Results are used to establish response factors (or calibration curves) and retention-time windows for each analyte. Calibration is verified at a minimum frequency of once every ten samples, unless otherwise specified by the reference method. *SOP for Calibration of Instruments for Organics Chromatographic Analyses (SOP SOC-CAL).*

11.9 UV-Visible Spectrophotometer (manual colorimetric analyses)

Routine calibrations for colorimetric and turbidimetric analyses involve generating a 5-point calibration curve including a blank. Initial calibration points cannot be "dropped" from the resulting calibration curve. Correlation coefficients must meet method or SOP specifications before analysis can proceed. Independent calibration verification standards (ICVs) are analyzed with each batch of samples. Continuing calibration is verified at a minimum frequency of once every ten samples. Typical UV-Visible spectrophotometric methods at CAS include total phenolics, phosphates, surfactants and tannin-lignin.

11.10 Flow Injection Analyzer (automated colorimetric analysis)

A minimum of three standards and a blank are used to calibrate the instrument for cyanide analysis. A blank and (minimum of) five standards are used to calibrate the instrument for all other automated chemistries. Initial calibration points cannot be "dropped" from the resulting calibration curve. Standard CAS acceptance limits are used to evaluate the calibration curve prior to sample analysis.

11.11 Ion Chromatographs

Calibration of the ion chromatograph (IC) involves generating a 5-point calibration curve. Initial calibration points cannot be "dropped" from the resulting calibration curve. A correlation coefficient of $\geq$ 0.995 for the curve is required before analysis can proceed. Quality Control (QC) samples that are routinely analyzed include blanks and laboratory control samples. The target analytes typically determined by the IC include nitrate, nitrite, chloride, fluoride, sulfate and bromide. Calibration verification is performed at method-specified intervals following the procedures in the SOP and reference method.

11.12 Turbidimeter

Calibration of the turbidimeter requires analysis of three Nephelometric Turbidity Unit (NTU) formazin standards. Quality Control samples that are routinely analyzed include blanks, Analytical Products Group® QC samples (or equivalent) and duplicates.

11.13 Ion-selective electrode

Two standards are used to calibrate the electrodes before analysis. The slope of the curve must be within acceptance limits before analysis can proceed. Quality Control samples that are routinely analyzed include blanks, LCSs and duplicates.

11.14 Pipets

The calibration of pipets and autopipettors used to make critical-volume measurements is verified following the *SOP for Checking Pipet Calibration*. Both accuracy and precision verifications are performed, at intervals applicable to the pipet and use. The results of all calibration verifications are recorded in bound logbooks.

11.15 Other Instruments

Calibration for the total organic carbon (TOC), total organic halogen (TOX), and other instruments is performed following manufacturer's recommendations and applicable SOPs.

12.0 DATA REDUCTION, VALIDATION, AND REPORTING

CAS reports the analytical data produced in its laboratories to the client via the certified analytical report (CAR). This report includes a transmittal letter, a case narrative, client project information, specific test results, quality control data, chain of custody information, and any other project-specific support documentation. The following procedures describe our data reduction, validation and reporting procedures.

12.1 Data Reduction and Review

Results are generated by the analyst who performs the analysis and works up the data. All data is initially reviewed and processed by analysts using appropriate methods (e.g., chromatographic software, instrument printouts, hand calculation, etc.). Equations used for calculation of results are found in the applicable analytical SOPs. The resulting data set is either manually entered (e.g., titrimetric or microbiological data) into an electronic report form or is electronically transferred into the report from the software used to process the original data set (e.g., chromatographic software). Once the complete data set has been transferred into the proper electronic report form(s), it is then printed. The resulting hardcopy version of the electronic report is then reviewed by the analyst for accuracy. Once the primary analyst has checked the data for accuracy and acceptability, the hardcopy version of the data is forwarded to the supervisor or second qualified analyst, who reviews the data for errors. Where calculations are not performed a validated software system, the reviewer rechecks a minimum of 10% of the calculations. When the entire data set has been found to be acceptable, a final copy of the report is printed and signed by the laboratory supervisor, departmental manager or senior laboratory staff. The entire data package is then placed into the appropriate service request file, and an electronic copy of the final data package is forwarded to the appropriate personnel for archival. Data review procedures are described in the *SOP for Laboratory Data Review Process.*

Policies and procedures for manual editing of data are established. The analyst making the change must initial and date the edited data entry, without obliteration of the original entry. The policies and procedures are described in the *SOP for Making Entries Into Logbooks and Onto Benchsheets* (SOP ADM-DATANTRY).

Policies and procedures for electronic manual integration of chromatographic data are established. The analyst performing the integration must document the integration change by printing both the “before” and “after” integrations and including them in the raw data records. The policies and procedures are described in the *SOP for Manual Integration of Chromatographic Peaks* (SOP ADM-INT).

12.2 Confirmation Analysis

12.2.1 Gas Chromatographic and Liquid Chromatographic Analyses

For gas chromatographic (GC) and liquid chromatographic (LC) analyses, all positive results are confirmed by a second column, a second detector, a second wavelength (HPLC/UV), or by GC/MS analysis, unless exempted by one of the following situations:

- The analyte of interest produces a chromatogram containing multiple peaks exhibiting a characteristic pattern, which matches appropriate standards. This includes polychlorinated biphenyls and hydrocarbon fuels (e.g., gasoline and diesel).

- The sample is analyzed for benzene, toluene, ethylbenzene, xylenes, and naphthalene (BTEXN), and the sample is found, by a separate analysis, to contain gasoline. In a sample containing no gasoline, the presence of BTEXN compounds will be confirmed.

- The sample meets all of the following requirements:

    1. All samples (liquid or solid) come from the same source (e.g., groundwater samples from the same well) for continuous monitoring. Samples of the same matrix from the same site, but from different sources (e.g., different sampling locations) are not exempt.

    2. All analytes have been previously analyzed in sample(s) from the same source (within the last year), identified and confirmed by a second column or by GC/MS. The chromatogram is largely unchanged from the one for which confirmation was carried out. The documents indicating previous confirmation must be available for review.

12.2.2 Confirmation Data

Confirmation data will be provided as specified in the method. Identification criteria for GC, LC or GC/MS methods are summarized below:

- GC and LC Methods

    1. The analyte must fall within plus or minus three times the standard deviation (established for the analyte/column) of the retention time of the daily midpoint standard in order to be qualitatively identified. The retention-time windows will be established and documented, as specified in the appropriate Standard Operating Procedure (SOP).

2. When sample results are confirmed by two dissimilar columns or detectors, the agreement between quantitative results must be evaluated. The relative percent difference between the two results is calculated and evaluated against SOP and/or method criteria.

- GC/MS Methods - Two criteria are used to verify identification:

1. Elution of the analyte in the sample will occur at the same relative retention time (RRT) as that of the analyte in the standard.

2. The mass spectrum of the analyte in the sample must, in the opinion of a qualified analyst or the department manager, correspond to the spectrum of the analyte in the standard or the current GC/MS reference library.

12.3 Data Review and Validation

The integrity of the data generated in the laboratory is assessed through the evaluation of the results of the analysis of method blanks, laboratory control samples, sample duplicates, matrix spiked samples, QC samples, trip blanks, et al. The numerical criteria for evaluation of these QC samples are listed within each method-specific Standard Operating Procedure. These various QC sample analyses are evaluated using the flow diagrams found in Figures 12-1 through 12-9. Other validation measures of the data include a check of the linearity of the calibration curve, an accuracy check of the QC standards and a check of the system sensitivity. Data transcriptions and calculations are also reviewed.

12.4 Data Reporting

When an analyst determines that a data package has met the data quality objectives (and/or any client-specific data quality objectives) of the method and has qualified any anomalies in a clear, acceptable fashion, the data package is reviewed by a trained chemist. Prior to release of the report to the client, the project chemist reviews and approves the entire report for completeness and to ensure that any and all client-specified objectives were successfully achieved. The original raw data, along with a copy of the final report, is filed in project files by service request number for archiving. CAS maintains control of analytical results by adhering to standard operating procedures and by observing sample custody requirements. All data are calculated and reported in units consistent with project specifications, to enable easy comparison of data from report to report.

To the extent possible, samples shall be reported only if all quality control measures are acceptable. If a quality control measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s). The *SOP for Data Reporting and*

Report Generation addresses the flagging and qualification of data. The CAS-defined data qualifiers, state-specific data qualifiers, or project-defined data qualifiers are used depending on project requirements. A case narrative may be written by the project chemist to explain any unusual problems with a specific analysis or sample, etc.

For subcontracted analyses, the Project Chemist verifies that the report received from the subcontractor is complete. Verification includes checking that the correct analyses were performed, the analyses were performed for each sample as requested, a report is provided for each analysis, and the report is signed. The Project Chemist accepts the report if all verification items are complete. Acceptance is demonstrated by forwarding the report to the CAS client.

12.5 Documentation

CAS maintains a records system which ensures that all laboratory records of analysis data retained and available. Analysis data is retained for 5 years from the report date unless contractual terms specify a longer retention time. The archiving system is described in the *SOP for Data Archiving*.

12.5.1 Documentation and Archiving of Routine Analysis Data

The archiving system includes all of the following items for each set of analyses performed:

- Benchsheets describing sample preparation (if appropriate);
- Instrument parameters;
- Sample analysis sequence;
- Analysis benchsheets and instrument printouts;
- Chromatograms and peak integration reports for all samples, standards, blanks, spikes and reruns;
- Logbook ID number for the appropriate standards;
- Copies of report sheets submitted to the work request file; and
- Copies of Nonconformity and Corrective Action Reports, if necessary.

Individual sets of analyses are identified by analysis date and service request number. Since many analyses are performed with computer-based data systems, the final sample concentrations can be automatically calculated. If additional calculations are needed, they are written on the integration report or securely stapled to the chromatogram, if done on a separate sheet.

12.5.2 Documentation of QC and Data

To summarize the recovery data for surrogates and matrix spikes, a separate documentation system has been established. The results are segregated according to the sample matrix. Additional information is included, indicating

those results affected by matrix interferences, etc. Surrogate and matrix spike acceptance limits are listed in Appendix D. This system also includes results for the most recent calibration curves, as well as method validation results.

12.6 Deliverables

In order to meet individual project needs, CAS provides several levels of analytical reports. Basic specifications for each level of deliverable are described in Table 12-1. Variations may be provided based on client or project specifications. This includes (but is not limited to) to following specialized deliverables:

- ADEC – Alaska Department of Conservation specified data package
- ACOE/HTRW – Army Corps of Engineers HTRW specified data package and reporting requirements
- AFCEE – Air Force Center for Environmental Excellence project-specific reporting

When requested, CAS provides Electronic Data Deliverables (EDDs) in the format specified by client need or project specification. The EDD is prepared by report production staff using the electronic version of the laboratory report to minimize transcription errors. User guides and EDD specification outlines are used in preparing the EDD. The EDD is reviewed and compared to the hard-copy report for accuracy.

Figure 12-1
Evaluation of Method Calibration

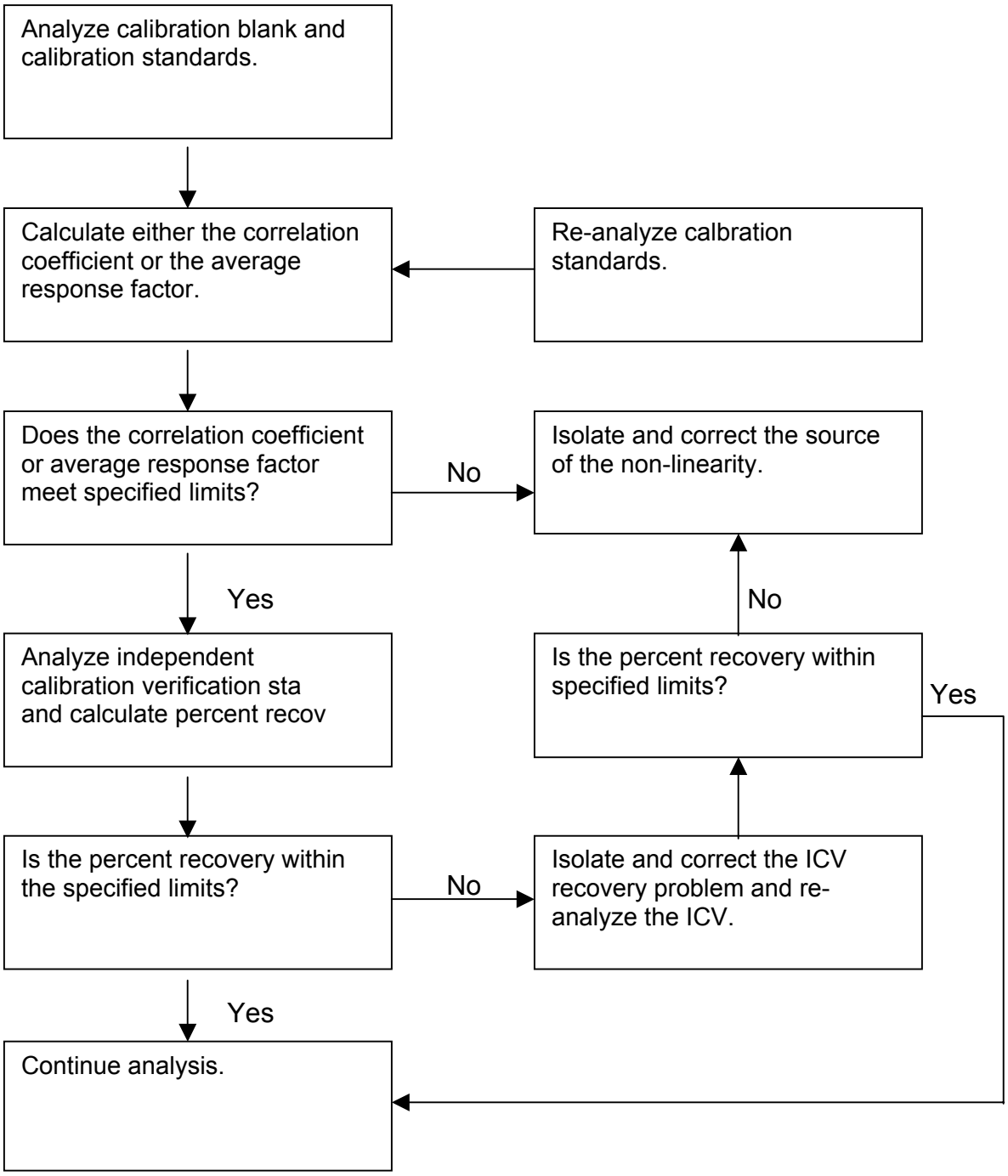


Figure 12-2
Evaluation of Continuing Calibration

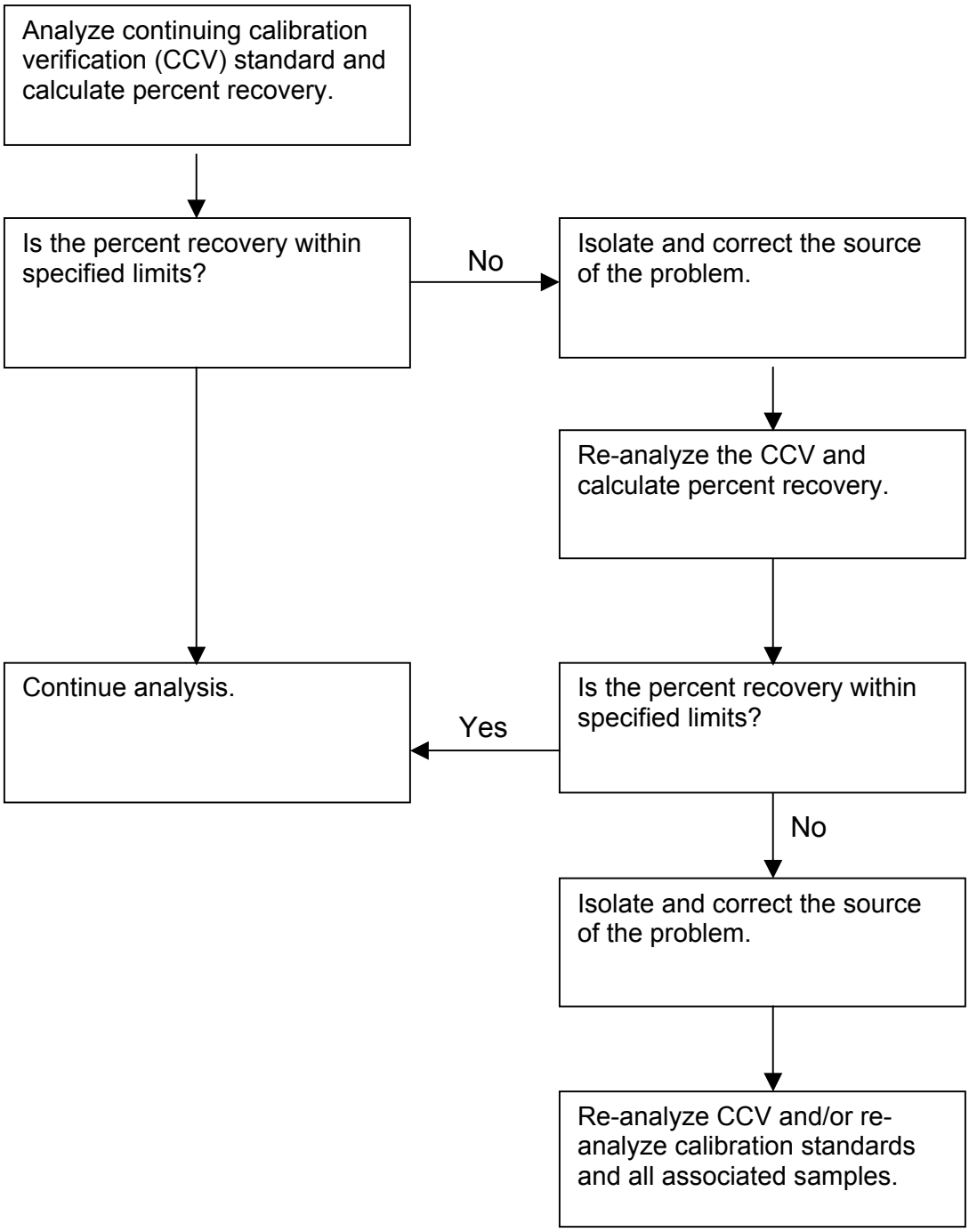


Figure 12-3
Evaluation of Method Blank and Instrument Blank Results

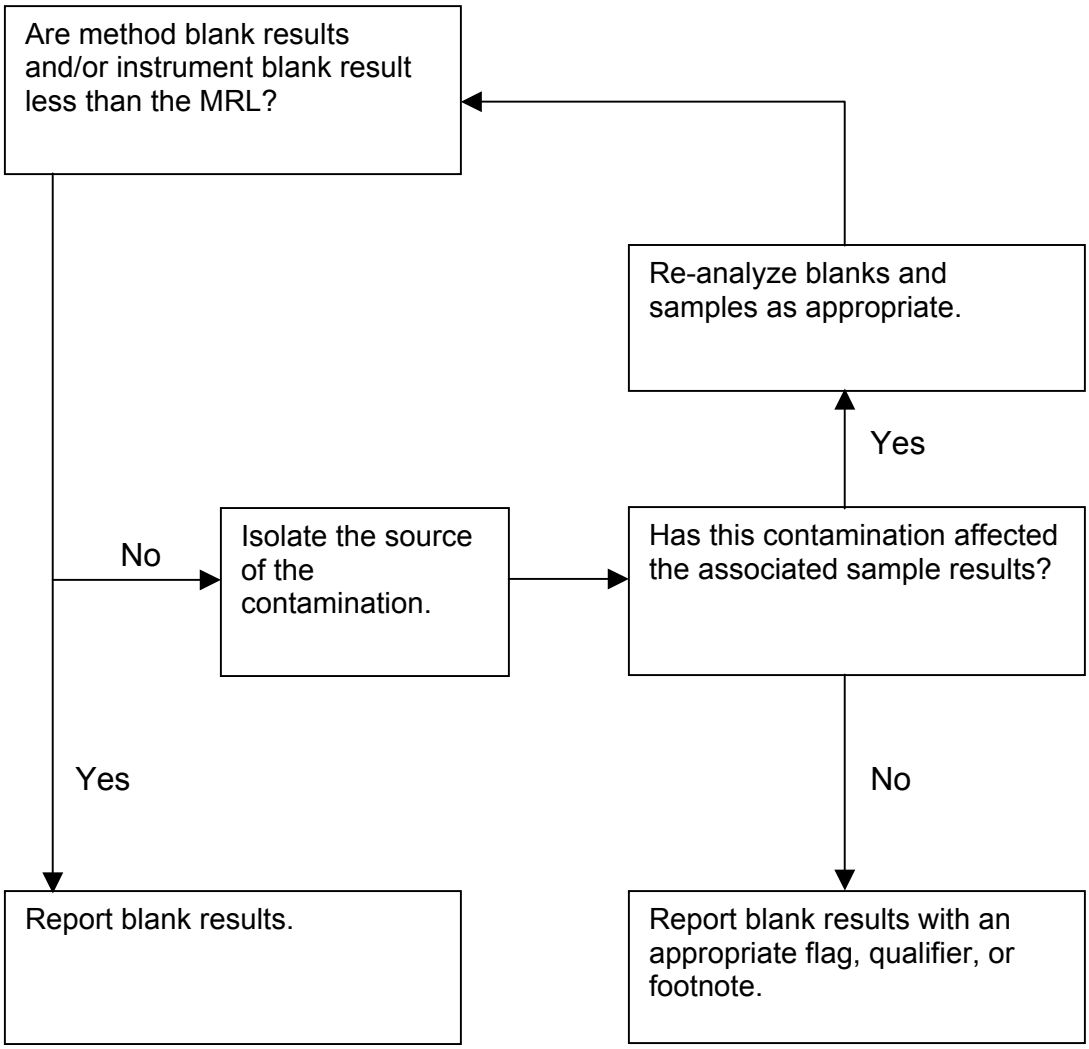


Figure 12-4
Evaluation of Sample Results for Inorganic Analyses

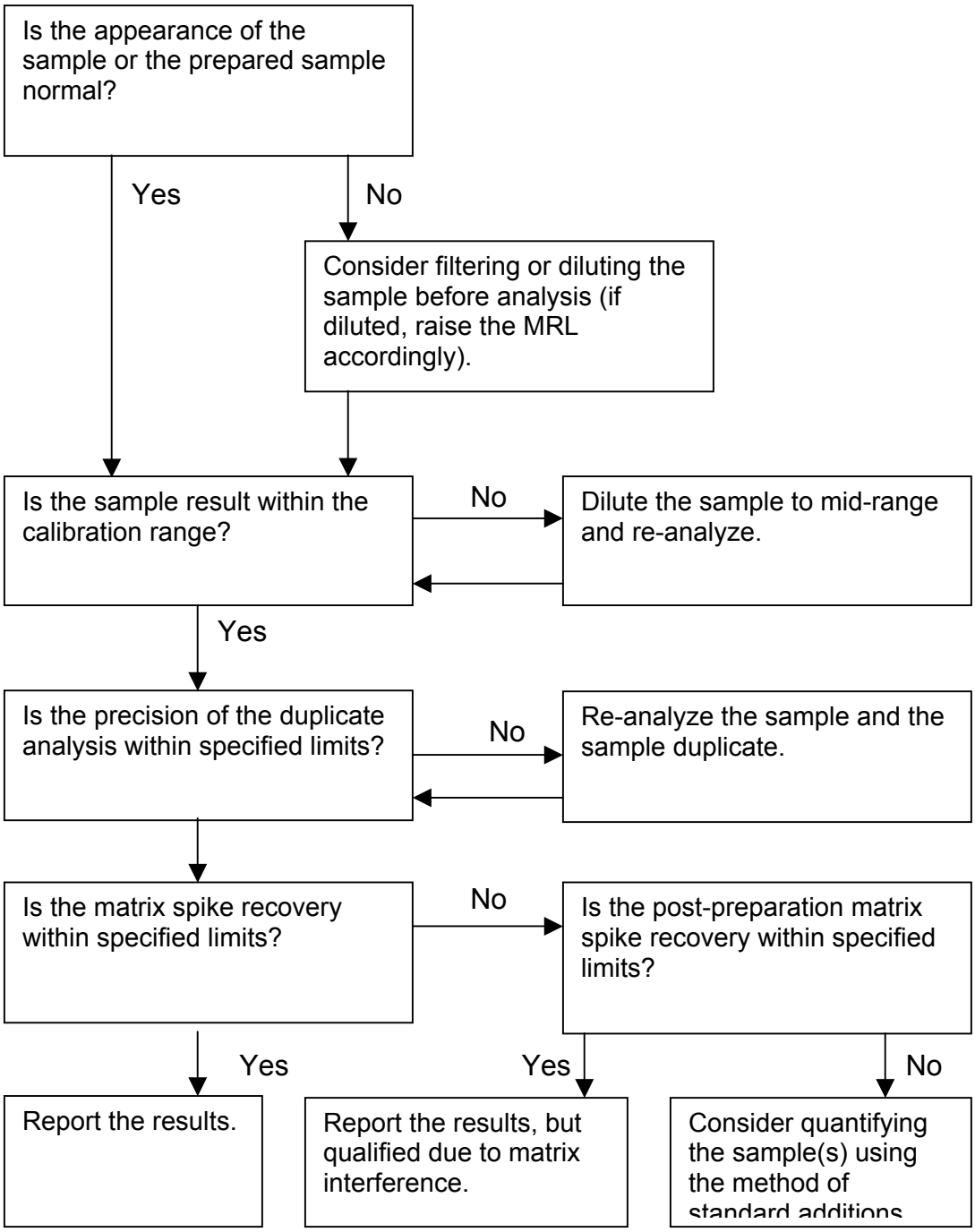


Figure 12-5
Evaluation of Sample Results for Organic Analyses

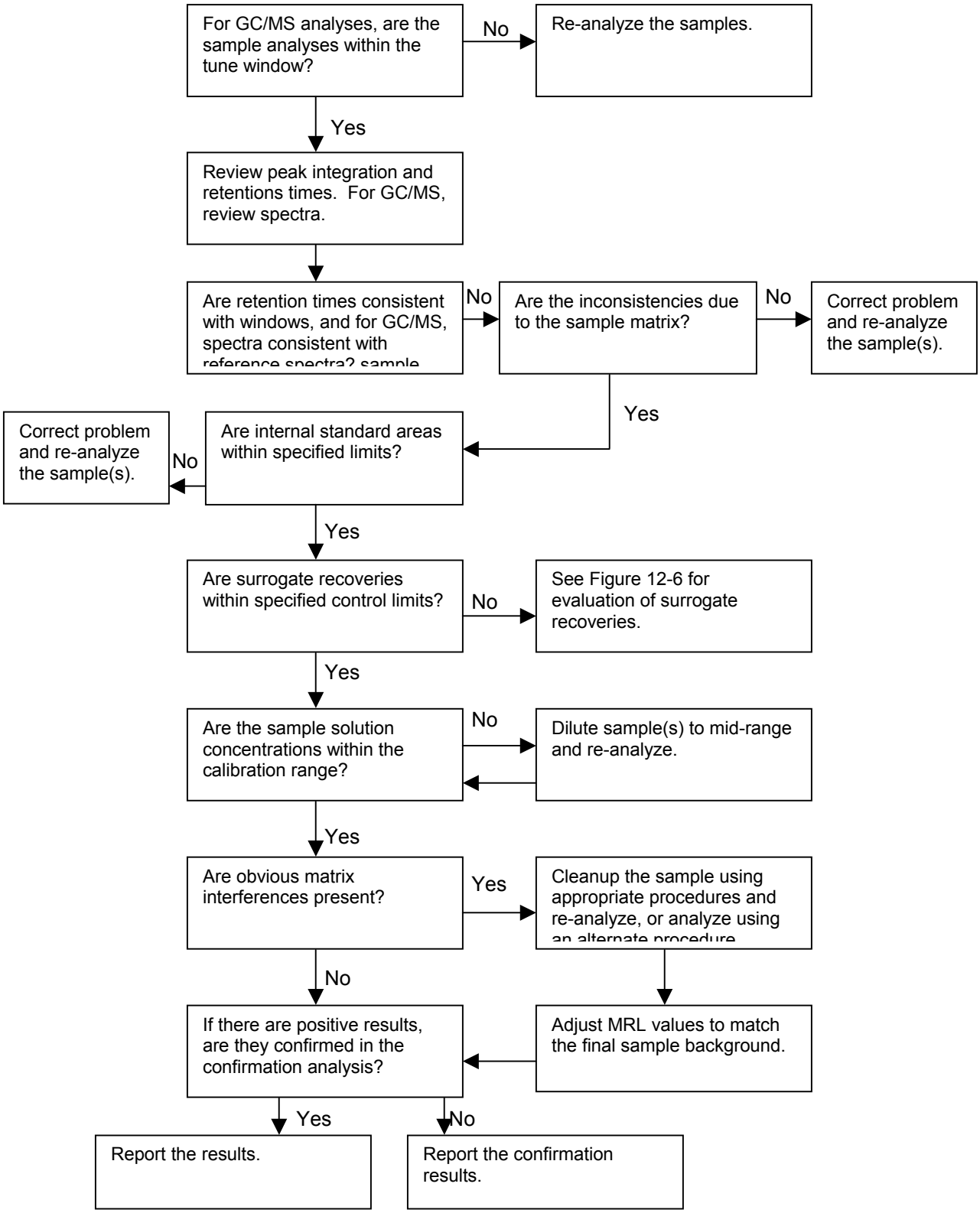


Figure 12-6
Evaluation of Surrogate Compound Recoveries

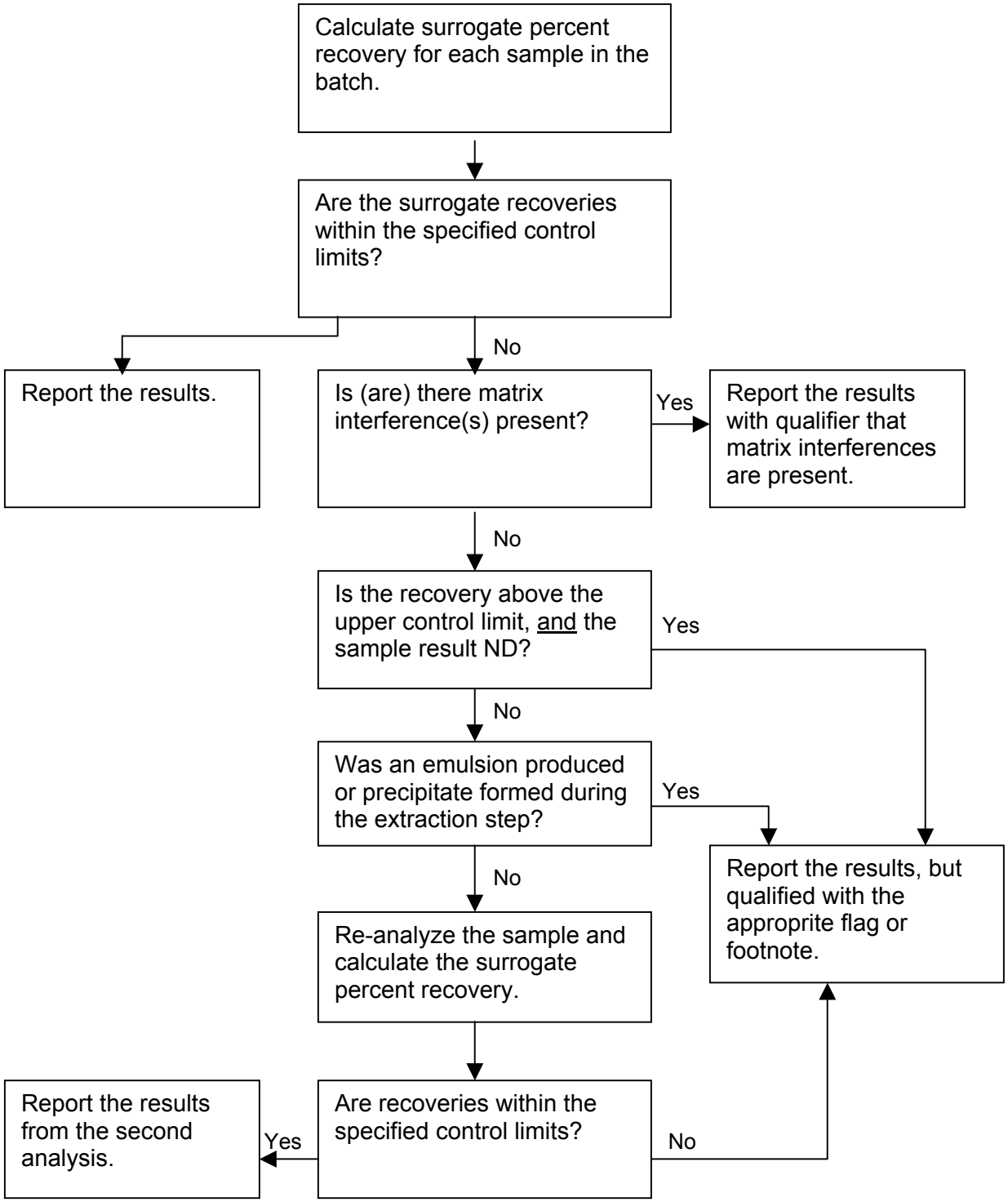


Figure 12-7
Evaluation of Duplicate Sample and/or Duplicate Matrix Spike Results

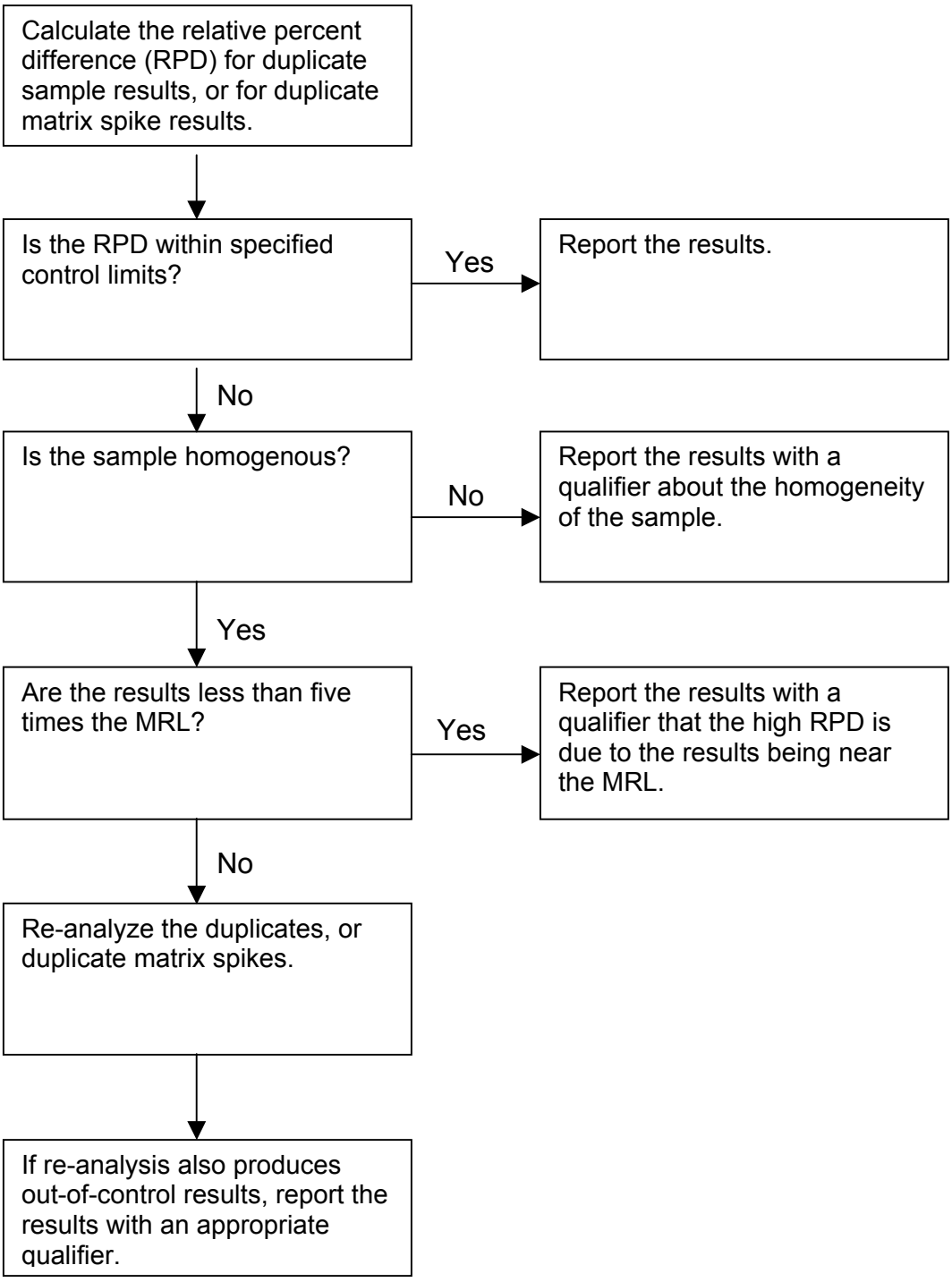


Figure 12-8
Evaluation of Matrix Spike Recoveries

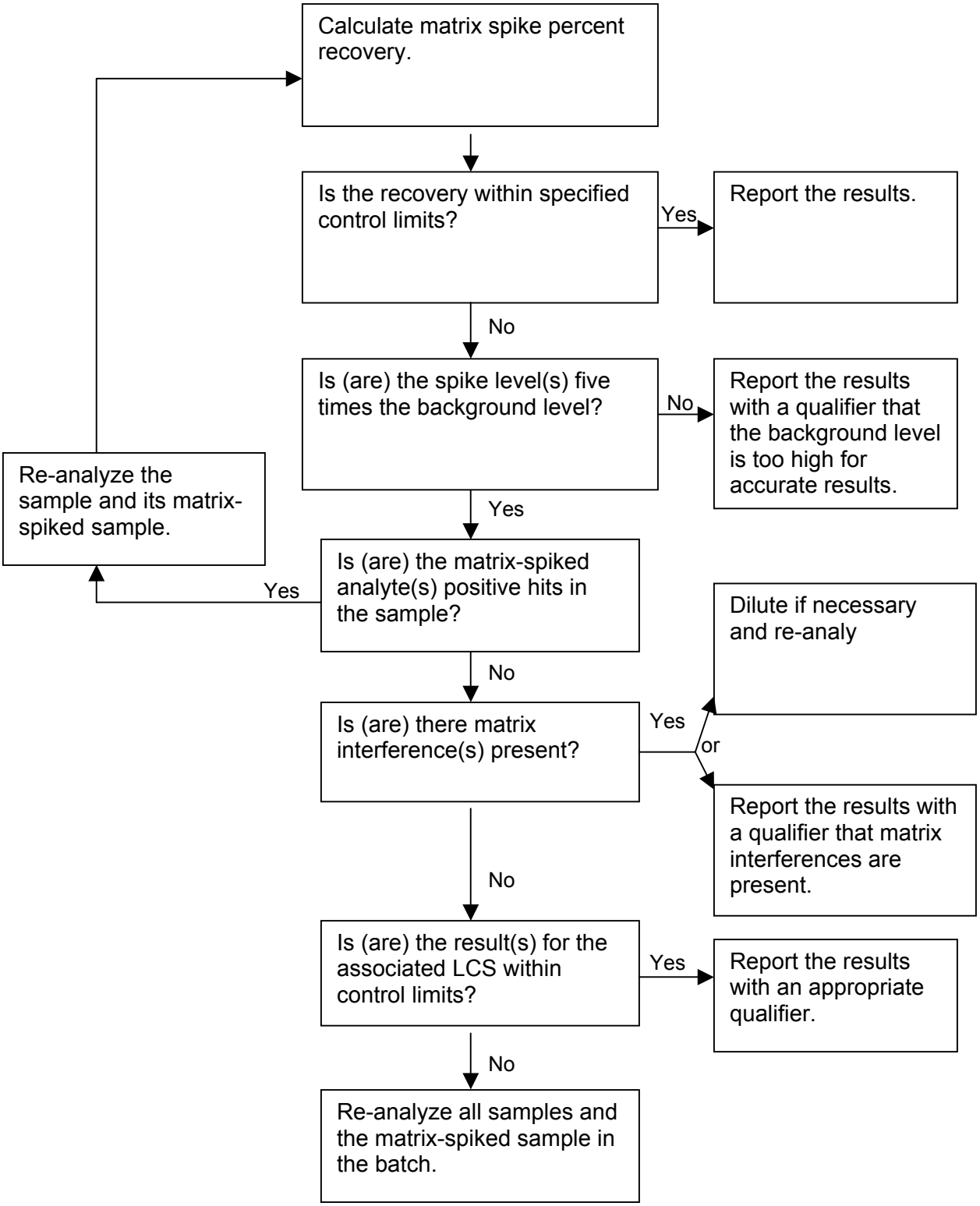


Figure 12-9
Evaluation of Laboratory Control Sample (LCS) Results

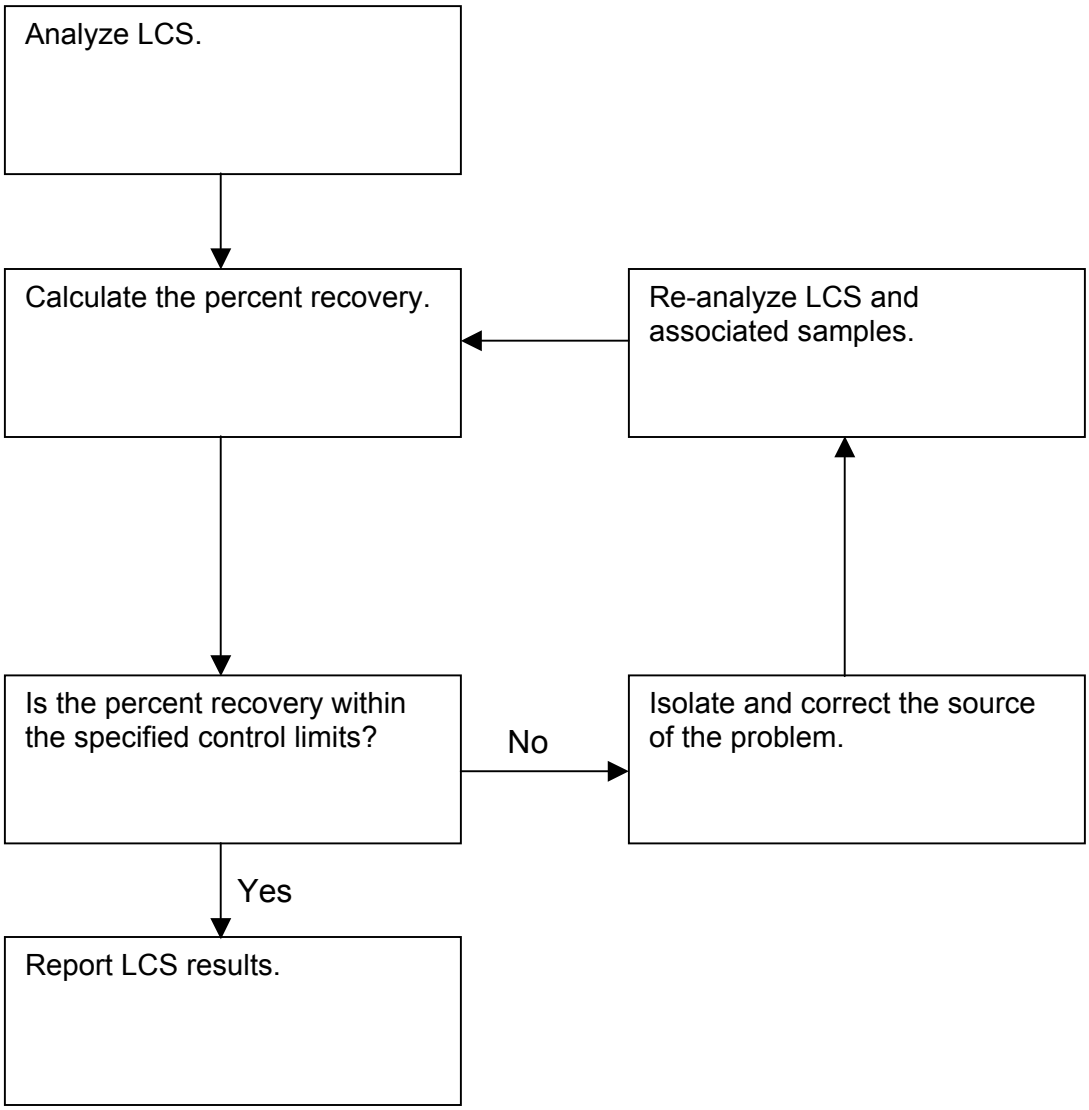


Table 12-1
Descriptions of CAS Data Deliverables

Tier I. Routine Certified Analytical Report (CAR) includes the following:

1. Transmittal letter
2. Sample analytical results
3. Method blank results
4. Surrogate recovery results and acceptance criteria for applicable organic methods
5. Chain of custody documents
6. Dates of sample preparation and analysis for all tests

Tier II and IIA. In addition to the Tier I Deliverables, this CAR includes the following:

1. Matrix spike result(s) with calculated recovery and including associated acceptance criteria
2. Duplicate or duplicate matrix spike result(s) (as appropriate to method), with calculated relative percent difference
3. Tier IIA also includes Laboratory Control Sample (LCS) result(s) with calculated recovery and including associated acceptance criteria

Tier III. Data Validation Package. In addition to the Tier II Deliverables, this CAR includes the following:

1. Case narrative
2. Calibration records and results of initial and continuing calibration verification standards, with calculated recoveries
3. Results of laboratory control sample (LCS) or Quality Control check sample, with calculated recovery and/or associated acceptance limit criteria
4. Results of calibration blanks or solvent blanks (as appropriate to method)
5. Summary forms for associated QC and calibration parameters
6. Copies of all raw data, including extraction/preparation bench sheets, chromatograms, and instrument printouts. For GC/MS, this includes tuning criteria and mass spectra of all positive hits. Results and spectra of TIC compounds will be included upon request.

Tier IV. CLP-Level Data Validation Package.

A complete Data Validation Package containing all sample results, quality control and calibration results, and raw data necessary to fulfill all deliverable requirements of an EPA Contract Laboratory Program (CLP) data package.

13.0 PERFORMANCE AND SYSTEM AUDITS

Quality audits are an essential part of CAS/Kelso's quality assurance program. There are two types of audits used at the facility: System Audits are conducted to qualitatively evaluate the operational details of the QA program, while Performance Audits are conducted by analyzing performance evaluation samples in order to quantitatively evaluate the outputs of the various measurement systems.

13.1 System Audits

The system audit examines the presence and appropriateness of laboratory systems. External system audits of CAS/Kelso are conducted regularly by various regulatory agencies and clients. Table 13-1 summarizes some of the major programs in which CAS/Kelso participates. Programs and certifications are added as required. Additionally, internal system audits of CAS/Kelso are conducted regularly by the Quality Assurance Manager and by the CAS Quality Assurance Director. The internal audit procedures are described in the *SOP for Internal Audits*. The internal audits are performed as follows:

- Comprehensive lab-wide system audit – performed annually by the QA Director.
- Focused systems audits – performed twice quarterly by the QA Manager.
- Hardcopy data audits – minimum of 3 per quarter.
- Electronic data audits – minimum of 3 per quarter.

The results of each audit are reported to the Laboratory Director for review and comment. All audit and review findings, and corrective actions are documented. Any deficiencies noted by the auditor are summarized in an audit report and corrective action is identified within a specified length of time to correct each deficiency. Should problems impacting data quality be found during an internal audit, any client whose data is adversely impacted will be given written notification if not already provided.

Electronic data audits may be performed in conjunction with hardcopy data audits. The electronic audits focus on organic chromatographic data and include an examination of audit trails, peak integrations, calibration practices and files, GCMS tuning data, peak response data, use of appropriate files, and other components of the analysis. The audit also verifies that the electronic data supports the hardcopy reported data.

13.2 Performance Audits

CAS/Kelso also participates in the analysis of interlaboratory proficiency testing (PT) samples. Participation in PT studies is performed on a regular basis and is designed to evaluate all analytical areas of the laboratory. CAS routinely participates in the following studies:

- Water Pollution (WP) and additional water parameters, 2 per year.
- Water Supply (WS) PT studies, 2 per year.
- Hazardous Waste/Soil PT studies, 2 per year.
- Underground Storage Tank PT studies, 2 per year.
- Microbiology (WS and WP) PT studies, 2 per year.
- Other studies as required for specific certifications, accreditations, or validations.

PT samples are processed by entering them into the LIMS system as samples (assigned Service Request, due date, testing requirements, etc.) and are processed the same as field samples. The laboratory sections handle samples the same as field samples, performing the analyses following method requirements and performing data review. The laboratory sections prepare an analytical report, which is forwarded to the QA Manager for subsequent reporting to the appropriate agencies or study coordinator. Results of the performance evaluation samples and audits are reviewed by the Quality Assurance Manager, Laboratory Director, the laboratory staff, and the CAS Quality Assurance Director. For any results outside acceptance criteria, the analysis data is reviewed to identify a possible cause for the deficiency, and corrective action is taken and documented.

Table 13-1
Current CAS Performance and System Audit Programs

Federal and National Programs

- Naval Facilities Engineering Service Center Validated
  Laboratory for Drinking Water, Wastewater and Hazardous Waste
- U.S. Air Force, Air Force Center for Environmental Excellence (AFCEE)
  Approved Laboratory for AFCEE Projects
- U.S. Army Corps of Engineers - MRD, HTRW Center of Expertise
  Validated for HTRW parameters
- National Environmental Laboratory Accreditation Conference (NELAC)

State and Local Programs

- State of Alaska, Department of Environmental Conservation
  UST Laboratory, Lab I.D. UST040
- State of Arkansas, Department of Environmental Quality
  Certified Environmental Laboratory
- State of Arizona, Department of Health Services
  License No. AZ0339
- State of California, Department of Health Services, Environmental Laboratory Accreditation Program
  Certification No. 2286
- State of Colorado, Department of Public Health and Environment
  Certified Drinking Water Laboratory
- State of Florida, Department of Health
  Primary NELAC Accreditation No. E87412
- State of Hawaii, Department of Health
  Certified Drinking Water Laboratory
- State of Idaho, Department of Health and Welfare
  Certified Drinking Water Laboratory
- State of Indiana, Department of Health
  Certified Drinking Water Laboratory
- State of Louisiana, Department of Environmental Quality
  Accredited Environmental Laboratory, Lab I.D. 3016
- State of Maine, Department of Human Services
  Certified Environmental Laboratory, Lab I.D. WA901
- State of Minnesota, Department of Health
  Certified Environmental Laboratory, Lab I.D. 053-999-368
- State of Montana, Department of Health and Environmental Sciences
  Certified Drinking Water Laboratory, Lab I.D. 0047
- State of New Jersey, Department of Environmental Protection
  Accredited Environmental Laboratory, Lab I.D. WA005
- State of New York, Department of Health
  Accredited Environmental Laboratory, Lab I.D. 11775
- State of Nebraska, Health and Human Services System
  Certified Drinking Water Laboratory
- State of North Carolina, Department of Environment and Natural Resources
  Certified Environmental Laboratory, Lab I.D. 605

Table 13-1 (continued)

State and Local Programs (continued)

- State of Oklahoma, Department of Environmental Quality
  General Water Quality/Sludge Testing, Lab I.D. 9801
- State of Oregon, ORELAP Laboratory Accreditation Program
  Accredited Environmental Laboratory, Lab I.D. WA200001
- State of South Carolina, Department of Health and Environmental Control
  Certified Environmental Laboratory, Lab I.D. 61002
- State of Utah, Department of Health, Division of Laboratory Services
  Accredited Environmental Laboratory
- State of Washington, Department of Ecology, Environmental Laboratory Accreditation Program
  Accreditation No. C001

14.0 PREVENTIVE MAINTENANCE

Preventive maintenance is a crucial element of Columbia Analytical Services Quality Assurance program. Instruments at CAS (e.g., ICP/MS and ICP systems, GC/MS systems, atomic absorption spectrometers, analytical balances, gas and liquid chromatographs, etc.) are maintained under commercial service contracts or by qualified, in-house personnel. All instruments are operated and maintained according to the instrument operating manuals. All routine and special maintenance activities pertaining to the instruments are recorded in instrument maintenance logbooks. The maintenance logbooks used at CAS contain extensive information about the instruments used at the laboratory.

An initial demonstration of analytical control is required on every instrument used at CAS before it maybe used for sample analysis. If an instrument is modified or repaired, a return to analytical control is required before subsequent sample analyses can occur. When an instrument is acquired at the laboratory, the following information is noted in a bound maintenance notebook specifically associated with the new equipment:

- The equipment's serial number;
- Date the equipment was received;
- Date the equipment was placed into service;
- Condition of equipment when received (new, used, reconditioned, etc.); and
- Prior history of damage, malfunction, modification or repair (if known).

Equipment records also include a copy of the manufacturer's manual(s) and dates and results of calibrations.

Preventive maintenance procedures, frequencies, etc. are available for each instrument used at CAS. They may be found in the various SOPs for routine methods performed on an instrument and may also be found in the operating or maintenance manuals provided with the equipment at the time of purchase.

Responsibility for ensuring that routine maintenance is performed lies with the section supervisor. The supervisor may perform the maintenance or assign the maintenance task to a qualified bench level analyst who routinely operates the equipment. In the case of non-routine repair of capital equipment, the section supervisor is responsible for providing the repair, either by performing the repair themselves with manufacturer guidance or by acquiring on-site manufacturer repair. Each laboratory section maintains a critical parts inventory. The parts inventories include the items needed to perform the preventive maintenance procedures listed in Appendix E.

This inventory or “parts list” also includes the items needed to perform any other routine maintenance and certain in-house non-routine repairs such as gas chromatography/mass spectrometry jet separators and electron multipliers and ICP/MS nebulizer. When performing maintenance on an instrument (whether preventive or corrective), additional information about the problem, attempted repairs, etc. is also recorded in the notebook. Typical logbook entries include the following information:

- Details and symptoms of the problem;
- Repairs and/or maintenance performed;
- Description and/or part number of replaced parts;
- Source(s) of the replaced parts;
- Analyst's signature and date; and
- Demonstration of return to analytical control.

See the table in Appendix E for a list of preventive maintenance activities and frequency for each instrument.

15.0 CORRECTIVE ACTION

To the extent possible, samples shall be reported only if all quality control measures are acceptable. If a quality control measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s). Failure to meet established analytical controls, such as the quality control objectives outlined in Section 9.0, prompts corrective action. In general, corrective action may take several forms and may involve a review of the calculations, a check of the instrument maintenance and operation, a review of analytical technique and methodology, and reanalysis of quality control and field samples. If a potential problem develops that cannot be solved directly by the responsible analyst, the supervisor, team leader, the department manager, and/or the Quality Assurance Manager may examine and pursue alternative solutions. In addition, the appropriate project chemist may be notified in order to ascertain if contact with the client is necessary.

Problems with analysis, as well as the corresponding corrective actions taken, are documented on Nonconformity and Corrective Action Reports (See Figure 15-1) following the requirements in the *SOP for Nonconformity and Corrective Action Documentation* (SOP No. ADM - NCAR). This form is utilized to document corrective actions in response to out-of-control situations. The Quality Assurance Manager reviews each problem, ensuring that appropriate corrective action has been taken by the appropriate personnel. The Nonconformity and Corrective Action Report (NCAR) is filed in the associated service request file and a copy is kept by the Quality Assurance Manager. The Quality Assurance Manager periodically reviews all NCARs looking for chronic, systematic problems that need more in-depth investigation and alternative corrective action consideration. In addition, the appropriate project chemist is promptly notified of any problems in order to inform the client and proceed with any action the client may want to initiate.

Corrective action due to a performance audit or a check sample problem is initiated by the Quality Assurance Manager; the affected laboratory laboratory supervisors and managers are promptly informed of performance audit results requiring corrective action.

Figure 15-1

Nonconformity and Corrective Action Report

SAMPLES/SYSTEM/JOB/CLIENT AFFECTED N&CA Report No. _____

NONCONFORMITY

Analysis/Event: _____

Instrument/System: _____ Date: _____

Detailed Description of Nonconformity:

Originator (name): _____ Date: _____

Supervisor Verification: _____ Date: _____

CORRECTIVE ACTION AND OUTCOME

Detailed Description: (Re-establishment of conformity must be demonstrated and documented. Describe the steps that were taken, or are planned to be taken, to correct the particular Nonconformity and prevent the reoccurrence of the Nonconformity.)

Is the data to be flagged in the Analytical Report with an appropriate qualifier? **No** **Yes**

Person Responsible: _____ Date: _____

Supervisor Verification: _____ Date: _____

NOTIFICATION - CUSTOMER/CLIENT - INTERNAL/EXTERNAL

Project Chemist Notified by: _____ Date: _____

Customer Notified? **No** **Yes** If Yes, Notifier: _____ Date: _____

Project Chemist/Customer Comments (Retain record, e.g. telephone record, e-mail) _____

ACCEPTANCE OF CORRECTIVE ACTION

Comments:

Corrective Action(s) have been implemented. QA Pgm Mgr: _____ Date: _____

Original: Client File Photocopies: Supervisor and QA Pgm Mgr N&CA_RPT.DOC 1/26/2001

16.0 QUALITY ASSURANCE REPORTS

Quality assurance requires an active, ongoing commitment by CAS personnel at all levels of the organization. Information flow and feedback mechanisms are designed so that analysts, supervisors and managers are aware of quality assurance issues in the laboratory.

Analysts performing routine tests in the laboratory are aware of the various method acceptance criteria and in-house control limits that must be met in order to generate acceptable results. The analysts are also responsible for generating a Data Quality Report (DQR), or similar, form with every analytical batch they process; this report contains explicit documentation of the various controls that must be met during the analysis. This report also allows the analyst to provide appropriate notes and/or a case narrative if problems were encountered with the analyses. A Non-Conformity and Corrective Action Report (NCAR) (see Section 15.0) may also be attached to the data prior to review. Supervisors or qualified analysts review all of the completed analytical batches to ensure that all QC criteria have been examined and any deficiencies noted and corrected if possible.

It is the responsibility of each laboratory unit to provide the project chemist with a final report of the data, accompanied by signature approval. Footnotes and/or narrative notes must also accompany any data package if problems were encountered that require further explanation to the client. Each data package is submitted to the appropriate project chemist, who in turn reviews the entire collection of analytical data for completeness. The project chemist must also review the entire body of data to ensure that any and all client-specified objectives were successfully achieved. A case narrative may be written by the project chemist to explain any unusual problems with a specific analysis or sample, etc.

The Quality Assurance Manager (QAM) provides overview support to the project chemists if required to do so (e.g., contractually specified, etc.). The QAM is also responsible for the oversight of all internal and external audits, for all proficiency testing sample and analysis programs, and for all laboratory certification/accreditation responsibilities.

The QAM also prepares quarterly reports for the Laboratory Director that summarizes the various QA/QC activities that have occurred during the previous quarter. The typical report will address such topics as the following:

- Status, schedule, and results of internal and external audits;
- Status, schedule, and results of internal and external proficiency testing studies;
- Status of certifications, accreditations, and approvals;
- Status of QA Manual and SOP review and revision;
- Status of MDLs studies;
- Discussion of QC problems in the laboratory;

- Discussion of corrective action program issues;
- Status of staff training and qualification; and
- Other topics as appropriate.

Any problems noted by the Laboratory Director are then discussed during the regularly scheduled senior staff operations meetings with all appropriate department managers. The Laboratory Director performs an annual documented review of the laboratory quality system to identify any necessary changes or improvements to the quality system.

17.0 PERSONNEL TRAINING

Technical position descriptions are available for all employees, regardless of position or level of seniority. These documents are maintained by the Human Resources personnel and are available for review. In order to assess the technical capabilities and qualifications of a potential employee, all candidates for employment at CAS are evaluated, in part, against the appropriate technical description.

Training begins the first day of employment at CAS when the company policies are presented and discussed. Safety and QA/QC requirements are integral parts of all technical SOPs and, consequently, are integral parts of all training processes at CAS. Safety training begins with the reading of the *Environmental Health and Safety Manual.* All employees are also required to attend safety meetings during which the safety program is discussed and safety training is presented by the Environmental, Health and Safety Officer. Each employee is responsible for complying with the requirements of the QA Manual and QA/QC requirements associated with their function(s).

CAS requires each employee to participate in Ethics training, which is part of the CAS Improper Practices Prevention Program. CAS also encourages its personnel to continue to learn and develop new skills that will enhance their performance and value to the Company. Ongoing training occurs for all employees through a variety of mechanisms. The "CAS University" education system, external and internal technical seminars and training courses, and laboratory-specific training exercises are all used to provide employees with professional growth opportunities.

17.1 Initial Demonstration of Proficiency

Training in analytical procedures typically begins with the reading of the Standard Operating Procedure (SOP) for the method. Hands-on training begins with the observation of an experienced analyst performing the method, followed by the trainee performing the method under close supervision, and culminating with independent performance of the method on quality control samples. Successful completion of the applicable Demonstration of Proficiency analysis qualifies the analyst to perform the method independently. Demonstration of Proficiency is performed by one of the following:

- Successful completion of a Initial Precision and Recovery (IPR) study (required where mandated by the method).

- Analysis of 4 consecutive Laboratory Fortified Blanks, with acceptable accuracy and precision.

- Where spiking is not possible but QC standards are used ("non-spiked" Laboratory Control Samples), analysis of 4 consecutive Laboratory Control Samples with acceptable accuracy and precision.

- Where one of the three above is not possible, special requirements are as follows:

    - Total Settleable Solids: Successful single-blind PT sample analysis and duplicate results with RPD<10%.
    - Color: Four consecutive prepared LCSs with acceptable accuracy and precision of <10% RSD.
    - Physical Tests (Grain size, Corrosivity to Steel, etc.): Supervisor acknowledgement of training and approval.

A flowchart identifying the Demonstration of Proficiency requirements is given in Figure 17-1. The flowchart identifies allowed approaches to assessing Demonstration of Capability when a 4-replicate study is not mandated by the method, when spiking is not an option, or when QC samples are not readily available.

17.2 Continuing Demonstration of Proficiency

A periodic demonstration of proficiency is required to maintain continuing qualification. Continuing Demonstration of Proficiency is required each year, and may be performed one of the following ways:

- Successful performance on external (independent) single-blind PT sample analyses using the test method, or a similar test method using the same technology.

- Performing Initial Demonstration of Proficiency as described above, with acceptable levels of precision and accuracy.

- Performing an acceptable Method Detection Limit study for the method.

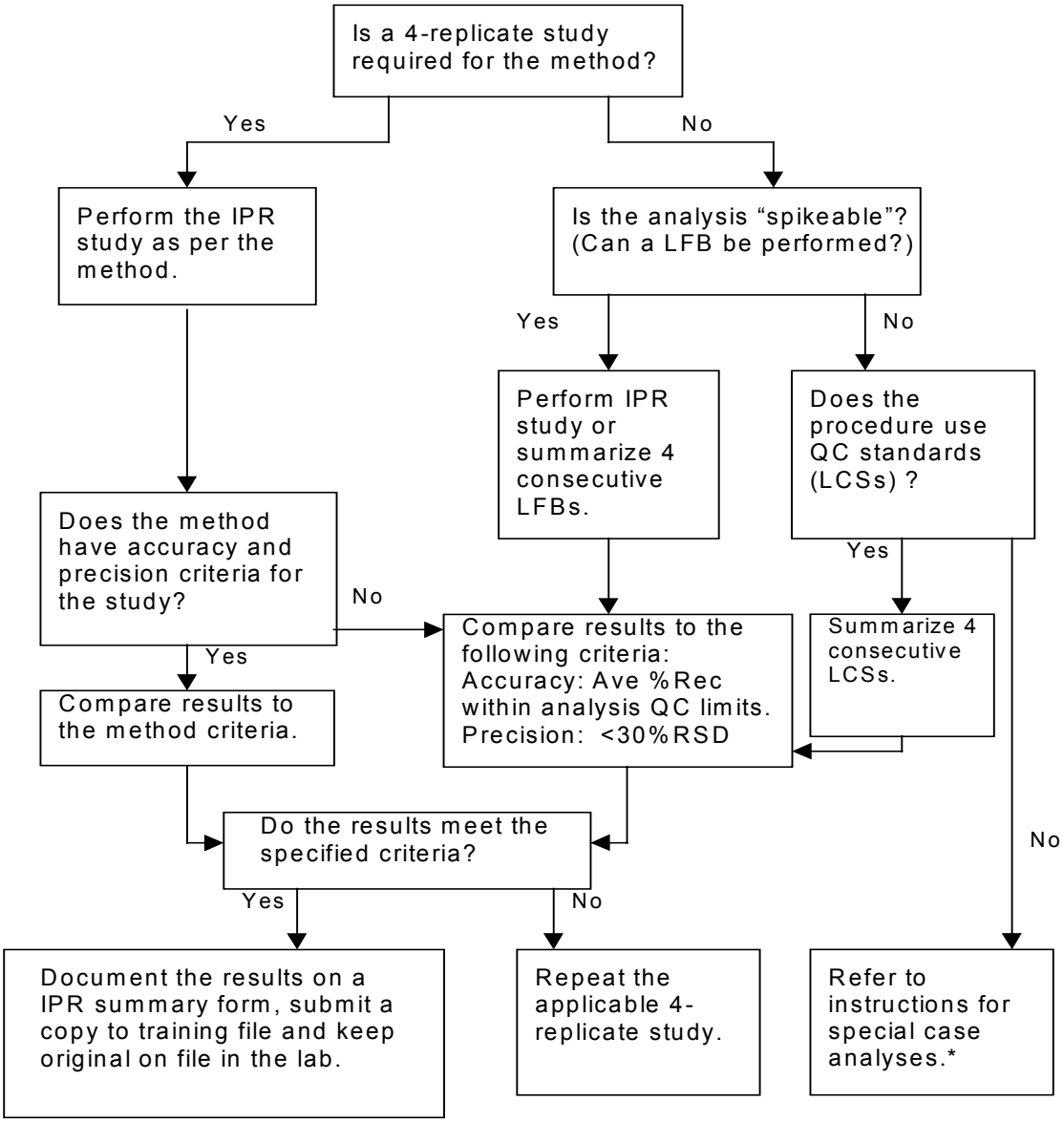
- For methods for which PT samples are not available and a spiked analysis (LFB, MDL, etc.) is not possible, analysis of field samples that have been analyzed by another analyst with statistically indistinguishable results.

17.3 Documentation of Training

Records are maintained to indicate the employee has the necessary training, education, and experience to perform their functions. Information of previously acquired skills and abilities for a new employee is maintained in Human Resources personnel files and CAS resumes.

A database is used to record the various technical skills and abilities acquired and maintained by an employee while employed by CAS. Information in the database includes the employee's name, a description of the skill including the appropriate method and SOP reference, the mechanism used to document proficiency, and the date the training was completed. General procedures for documenting technical training are described in the *SOP for Documentation of Training (SOP No. ADM-TRANDOC).*

Figure 17-1
Initial Demonstration of Proficiency Requirements



*Total Settleable Solids: Successful PT sample analysis and duplicate results with RPD<10%.
*Color: Four consecutive prepared LCSs with acceptable accuracy and precision of <10% RSD.
* Physical Tests (Grain size, Corrosivity to Steel, etc.): Supervisor acknowledgement of training and approval.

18.0 REFERENCES FOR ANALYTICAL PROCEDURES

The analytical methods used at CAS generally depend upon the end-use of the data. Since most of our work involves the analysis of environmental samples for regulatory purposes, specified federal and/or state testing methodologies are used and followed closely. Several factors are involved with the selection of analytical methods to be used in the laboratory. These include the method detection limit, the concentration of the analyte being measured, method selectivity, accuracy and precision of the method, the type of sample being analyzed, and the regulatory compliance objectives. Typical methods used at CAS are taken from the following references:

- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, (September 1986) and Updates I (July 1992), II (September 1994), IIA (August 1993), IIB (January 1995), III (December 1996), and Proposed Update IVA (January 1998). See Chapters 1, 2, 3, and 4.

- *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, (Revised March 1983).

- *Methods for the Determination of Inorganic Substances in Environmental Samples*, EPA/600/R-93/100 (August 1993).

- *Methods for the Determination of Metals in Environmental Samples*, EPA/600/4-91/010 (June 1991) and Supplements.

- *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*, EPA 600/4-82-057 (July 1982) and 40 CFR Part 136, Appendix A.

- *Methods for the Determination of Organic Compounds in Drinking Water*, EPA/600/4-88/039 (December 1988) and Supplements.

- *Standard Methods for the Examination of Water and Wastewater*, 16th Edition (1985); 17th Edition (1989); 18th Edition (1992); 19th Edition (1995). See Introduction in Part 1000.

- 40 CFR Part 136, Guidelines for Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act.

- 40 CFR Part 141, National Primary Drinking Water Regulations.

- *Analytical Methods for Petroleum Hydrocarbons*, ECY 97-602, Washington State Department of Ecology, June 1997.

- State-specific total petroleum hydrocarbon methods for the analysis of samples for gasoline, diesel, and other petroleum hydrocarbon products (Alaska, Arizona, California, Oregon, Washington, Wisconsin, etc.).

- Annual Book of ASTM Standards, Part 31, Water.

- EPA Contract Laboratory Program, Statement of Work for Organic Analysis, SOW Nos. OLM01.8, OLM02.0, OLM03.1, OLM03.2, OLM04.2, and OLM04.3.

- EPA Contract Laboratory Program, Statement of Work for Inorganic Analysis, SOW No. ILM04.0, ILM04.1, and ILM05.2.

- *U. S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA-540/R-94/012 (February 1993).

- *U. S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA-540/R-94/013 (February 1994).

- National Institute for Occupational Safety and Health (NIOSH) *Manual of Analytical Methods*, Third Edition (August 1987); Fourth Edition (August 1994).

- *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound*, for USEPA and USACE (March 1986), with revisions through April 1997.

- WDOE 83-13, *Chemical Testing Methods for Complying with the State of Washington Dangerous Waste Regulations* (March 1982) and as Revised (July 1983 and April 1991).

- *Identification and Listing of Hazardous Waste,* California Code of Regulations, Title 22, Division 4.5, Chapter 11.

- *Analytical Methods for the Determination of Pollutants in Pulp and Paper Industry Wastewater*, EPA 821-R-93-017 (October 1993).

- *Analytical Methods for the Determination of Pollutants in Pharmaceutical Manufacturing Industry Wastewaters*, EPA 821-B-98-016 (July 1998).

- National Council of the Pulp and Paper Industry for Air and Stream Improvement (NCASI).

- *Good Automated Laboratory Practices, Principles and Guidance to Regulations For Ensuring Data Integrity In Automated Laboratory Operations*, EPA 2185 (August 1995).

- *Manual for the Certification of Laboratories Analyzing Drinking Water*, 4th Edition, EPA 815-B-97-001 (March 1997).

- National Environmental Laboratory Accreditation Conference (NELAC), Quality Standards, 2001 and 2002.

APPENDIX A

LIST of QA PROGRAM DOCUMENTS

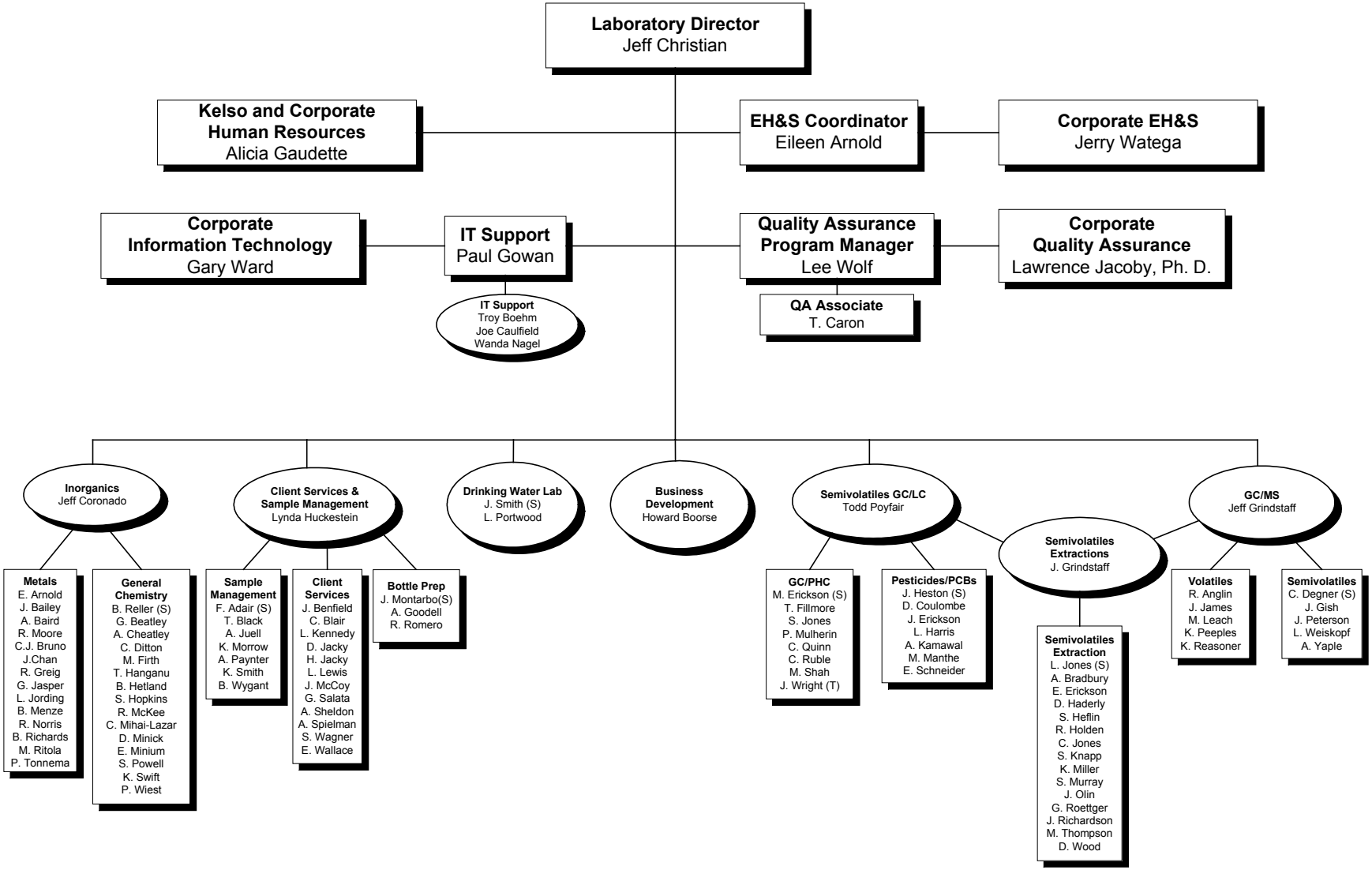
Quality Assurance Manual	10/3/03
Software Quality Assurance Plan	8/7/01
CAS-Kelso Certifications/Accreditations	Cert_kel.xls
Columbia Analytical Services MDL Tracking Spreadsheet	Mdl_list.xls
Technical Training Summary Database	TrainDat.mdb
Approved Signatories List	QA Dept. Files
Personnel resumes/qualifications	(all staff)
Personnel Job Descriptions	HR Department
Quality Control Acceptance Criteria	Qclimits.xls
Master Logbook of Laboratory Logbooks	Masterlog-001
TECHNICAL STANDARD OPERATING PROCEDURES	
SOP TABLE OF CONTENTS	SOPLIST.DOC
ADMINISTRATIVE STANDARD OPERATING PROCEDURES	
ADMINISTRATIVE - CORPORATE	**FILE NAME**
CHAIN OF CUSTODY FOR SAMPLE TRANSFER BETWEEN LABORATORIES	ADM-COC
CHECKING NEW LOTS OF CHEMICALS FOR CONTAMINATION	ADM-CTMN
CONTROL LIMITS	ADM-CTRL_LIM
DEALING WITH COMPLAINTS	ADM-CMPLT
DOCUMENT CONTROL	ADM-DOCCTRL
DOCUMENTATION OF TRAINING	ADM-TRANDOC
ELECTRONIC DATA AUDITING	ADM-E_DATAUDIT
MAKING ENTRIES INTO LOGBOOKS AND ONTO BENCHSHEETS	ADM-DATANTRY
MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS	ADM-INT
NONCONFORMITY AND CORRECTIVE ACTION	ADM-NCAR
PREPARATION OF STANDARD OPERATING PROCEDURES	ADM-SOP
PURCHASING THROUGH CAS PURCHASING AGENT	ADM-PUR
QUALIFICATION OF SUBCONTRACT LABORATORIES	ADM-SUBLAB
SAMPLE BATCHES	ADM-BATCH
SIGNIFICANT FIGURES	ADM-SIG.FIG
THE DETERMINATION OF METHOD DETECTION LIMITS	ADM-MDL

ADMINISTRATIVE – LOCAL LABORATORY	**FILE NAME**
CHECKING PIPET CALIBRATION	ADM-CPIP
CONTINGENCY PLAN FOR LABORATORY EQUIPMENT FAILURE	ADM-ECP
CONTROL CHARTING QUALITY CONTROL DATA	ADM-CHRT
DATA ARCHIVING	ADM-ARCH
DATA REPORTING AND REPORT GENERATION	ADM-RG
INTERNAL QUALITY ASSURANCE AUDITS	ADM-IAUD
LABORATORY DATA REVIEW PROCESS	ADM-DREV
METHOD DETECTION LIMIT DOCUMENTATION AND CONTROL	ADM-MDLC
PROJECT MANAGEMENT	ADM-PCM
REAGENT LOGIN AND TRACKING	ADM-RLT
SUPPORT EQUIPMENT MONITORING AND CALIBRATION	ADM-SEMC
THERMOMETER CALIBRATION	ADM-TCAL
SAMPLE MANAGEMENT SOPS	**FILE NAME**
BOTTLE ORDER PREPARATION AND SHIPPING	SMO-BORD
FOREIGN SOILS HANDLING TREATMENT	SMO-FSHT
SAMPLE DISPOSAL	SMO-SDIS
SAMPLE RECEIVING	SMO-GEN
SAMPLE TRACKING AND LABORATORY CHAIN OF CUSTODY	SMO-SCOC

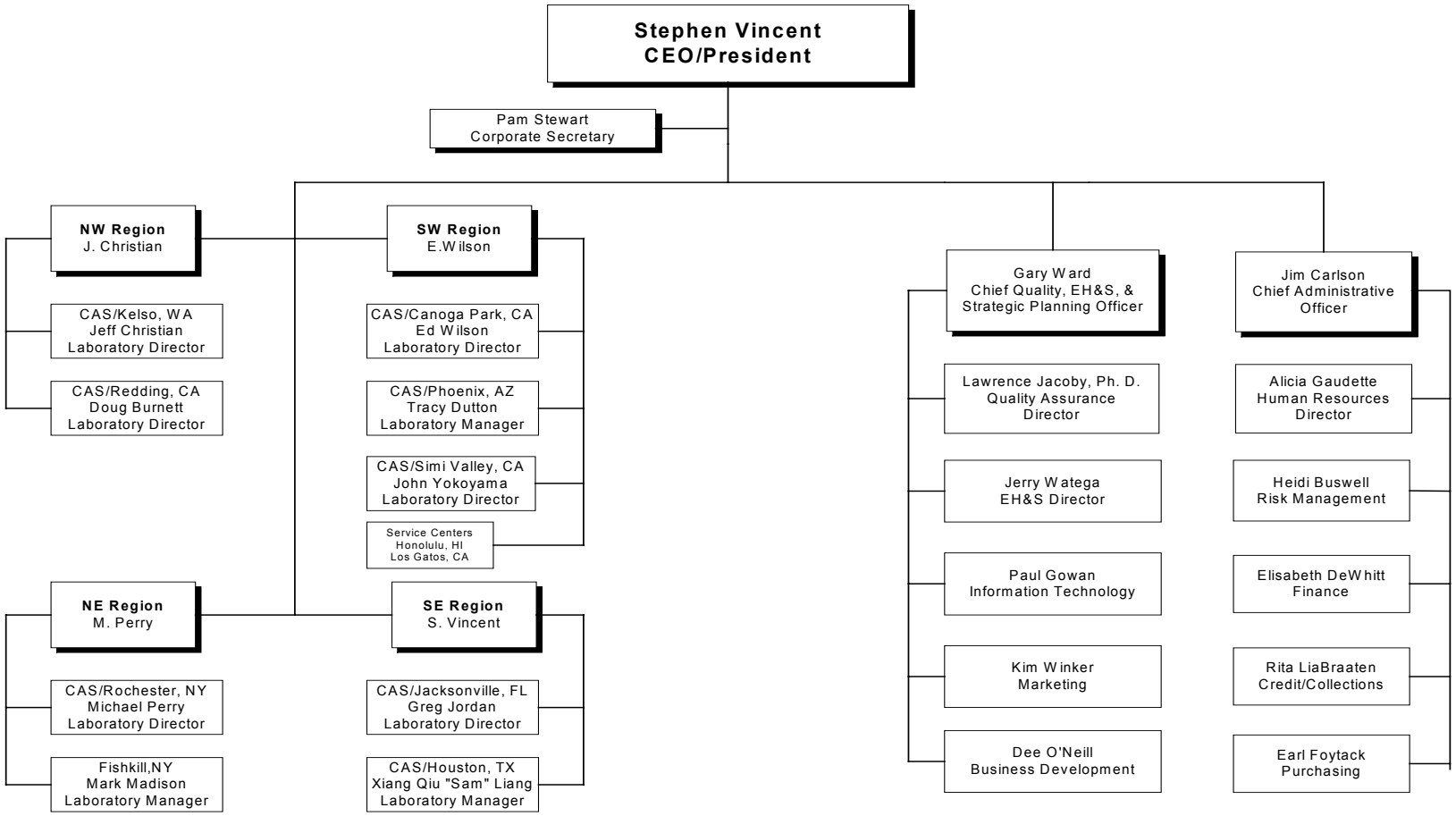
APPENDIX B

ORGANIZATIONAL CHARTS and RESUMES OF KEY PERSONNEL

Columbia Analytical Services, Inc.
Kelso, Washington Laboratory Organization



Columbia Analytical Services, Inc.
Laboratory Division Organization



Revised 8/1/03

JEFFREY D. CHRISTIAN

1989 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

VICE PRESIDENT/NW REGIONAL DIRECTOR – 1996 to Present

Responsibilities

Responsible for all phases of laboratory operations at the Kelso (WA) and Redding (CA) facilities, including project planning, budgeting, and quality assurance. Primary duties include the direct management of the Kelso laboratory (i.e. serves as the Kelso Laboratory Director, 1993-present). Also responsible for additional duties acquired as a member of the Columbia Analytical Services Holdings, Inc., Board of Directors.

Experience

Laboratory Director, Kelso Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1993-1995. Responsible for all phases of laboratory operations, including project planning, budgeting, and quality assurance.

Operations Manager, Kelso Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1992-1993. Responsibilities included directing the daily operation of the Kelso laboratory. Other responsibilities and duties included functioning as a technical consultant to clients, providing assistance in developing and planning analytical schemes to match client objectives, and writing and developing analytical procedures/methods. Also, served as Project Manager for State of Alaska Department of Environmental Conservation contract and Coordinator for EPA Special Analytical Services (SAS) contracts.

Project Chemist and Manager, Metals Analysis Laboratory, *Columbia Analytical Services, Kelso, Washington,* 1989-1992. Responsible for directing the daily operation of the Metals Laboratory, including the sample preparation, AAS, ICP-OES, and ICP-MS Laboratories.

Scientist, *Weyerhaeuser Technology Center, Federal Way, Washington,* 1986-1989. Responsibilities included supervising atomic spectroscopy laboratory which included flame and furnace AAS, ICP-OES, and sample preparation capabilities to handle a wide variety of sample types. Interfaced with internal and external clients to provide technical support. Wrote and developed analytical procedures/methods.

Lead Technician, Metals Lab, *Weyerhaeuser Technology Center, Federal Way, Washington*, 1981-1986. Responsibilities included primary ICP and AAS analyst for EPA-CLP contract work. Extensive experience in wide variety of environmental and product-related testing.

Research Assistant, *ITT Rayonier, Olympic Research Division, Shelton, Washington,* 1978-1981. Responsibilities included performing water quality tests, product-related analytical tests, corrosion tests (i.e., potentiometric polarization techniques), and operated pilot equipment specific to the pulp and paper industry.

Education

B.S., Chemistry, *Evergreen State College, Olympia, Washington,* 1993.
ICP/MS Training Course, *VG-Elemental,* 1992.
Coursework, *Pacific Lutheran University, Tacoma, Washington.* 1988-1989.
Coursework, *Tacoma Community College, Tacoma, Washington.* 1970-1971, 1988-1989.
Perkin-Elmer Advanced Furnace, *Norwalk, Connecticut,* 1986.
CERTIFICATION, Chemistry, *L.H. Bates Technical, Tacoma, Washington,* 1978.
Coursework, *Central Washington University, Ellensburg, Washington.* 1969-1970.

Publications/ Presentations

On request.

LEE E. WOLF

1988 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

TECHNICAL MANAGER IV, KELSO QUALITY ASSURANCE MANAGER – 2002 to Present

Responsibilities

Responsible for the overall coordination of the laboratory QA program, and for ensuring that established quality objectives are met. Responsible for Quality Assurance function, including the Quality Assurance Manual, certifications, documenting SOPs, and maintaining performance evaluation records. Oversee balance calibration and sample storage temperature control. Maintain certifications/accreditations for regulatory agencies and client certifications or approval programs. Act as primary point of contact during laboratory audits. Provides audit responses and initiates any changes in procedures resulting from an audit. Coordinate the analysis of performance evaluation samples required for certification/accreditation programs. Report and review results for these analyses. Conduct internal audits and make recommendations for corrective action.

Experience

Scientist IV, Kelso Quality Assurance Manager, *Columbia Analytical Services, Inc., Kelso, Washington,* 1996-2002. Duties primarily as listed above.

Project Chemist/Principal Organic Scientist, *Columbia Analytical Services, Inc., Kelso, Washington,* 1994-1996. Responsibilities included GC and GC/MS method development and special projects coordination. Acts as technical advisor to the GC and GC/MS laboratories and GC/MS interpretation specialist and CLP organics specialist. Also responsible for Project Chemist functions, including management and coordination of projects for clients, identifying client needs, and preparation of data reports.

Semi-VOA Department Manager, *Columbia Analytical Services*, 1988-1994. Responsibilities included overall management of the Semi-VOA department. Oversee the operation of Semi-VOA GC/MS, data review and reporting and related QA/QC function. Also responsible for supervision of staff, including training, scheduling, and other personnel issues. Beginning in 1992, increased responsibilities to include Project Chemist functions for organics EPA-SAS and other clients. This involved scheduling projects for clients, identifying client needs, and preparing data reports.

GC/MS Chemist, *U.S. Testing Co., Richland, Washington*, 1985-1988. Responsibilities included GC and GC/MS analysis of water and soil samples for volatiles and Semi-VOA by EPA protocol, including Methods 8240, 8270 and CLP. Coordinated extraction and GC-GC/MS areas to manage sample/data flow through the lab. Experience also with pesticide/PCB analysis by EPA Methods 8080 and CLP. Responsible for development of analysis methods for non-routine pesticides and herbicides and performed HPLC analysis.

Laboratory Assistant, *Eastern Washington University, Cheney, Washington,* 1985. Responsibilities included supervision and instruction of organic chemistry labs. Experience with GC and IR operation. Responsible for lab safety.

Chemist Assistant, *Spokane County Air Pollution Control Authority, Spokane, Washington*, 1984. Responsibilities included gathering and analyzing air samples for CO content using IR equipment.

Education

Documenting Your Quality System, *A2LA Short Course, Las Vegas, Nevada*, 1998.
Internal Laboratory Audits, *A2LA Short Course, Las Vegas, Nevada,* 1998.
Mass Spectra Interpretation, *ACS Short Course, Denver, Colorado*, 1992.
BS, Chemistry, Minor in Geology, *Eastern Washington University, Cheney, Washington,* 1985.

Publications/ Presentations

On Request.

Affiliations

American Chemical Society.

LYNDA A. HUCKESTEIN

1989 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

CLIENT SERVICES MANAGER IV – 1998 to Present

Responsibilities

Management of the Client Services Departments: Project Management, Electronic Data Deliverables and Report Generation, and Sample Management. Personally responsible for approximately 1.5 million dollars of client work annually performing technical project management and client service. Provides technical and regulatory interpretation assistance as-well-as project organization to work received by the laboratory.

Documentation of Demonstration of Capabilities is available for review.

Experience

Project Chemist, *Columbia Analytical Service, Inc., Kelso, Washington,* 1992-1998. Primary responsibilities included technical project management and client service in areas of pulp & paper, marine services, mining, and DOD. Also responsible for providing technical and regulatory interpretation assistance as-well-as project organization to work received by the laboratory

Project Chemist and Department Manager, General Chemistry Laboratory, *Columbia Analytical Services, Inc.,* 1989-1992. Responsible for management of the General Chemistry laboratory for routine wastewater, bioassay, and microbiological analyses. Also responsible for supervision of staff, data review, and reporting.

Analyst III, *Columbia Analytical Services, Inc., Kelso, Washington*, 1989. Primary responsibilities included coliform testing, total recoverable petroleum hydrocarbon extractions and analysis, BODs, ammonias, and TKN, in addition to miscellaneous wet chemistry analyses.

Microbiologist/Chemist, *Coffey Laboratories, Portland, Oregon,* 1983. Coliform analysis; water chemistry.

Laboratory Assistant, *Oregon State University, Corvallis, Oregon,* 1983. Wheat spike dissection and tissue culture.

Education

BS, Microbiology, *Oregon State University, Corvallis, Oregon,* 1983.

JEFFREY A. CORONADO

1989 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

TECHNICAL MANAGER IV, INORGANICS DEPARTMENT MANAGER – 2001 to Present

Responsibilities

Oversee the operation of the inorganic groups, which consists of two separate laboratories: Metals and General Chemistry. Responsible for the quality and timeliness of the inorganic laboratories analytical reports, departmental budgets, workload coordination, method development efforts, cost-effectiveness, and resource allocation.

Documentation of Demonstration of Capabilities is available for review.

Experience

Metals Department Manager, *Columbia Analytical Services, Inc., Kelso, Washington,* 1992-2001. Responsibilities included management of all aspects of the metal laboratory operation, including personnel training and evaluation, review of all metals data, and report generation. Also responsible for client service on a number of ongoing CAS accounts. Technical duties include primary analytical responsibility for trace level metals analysis by ICP/MS. Analyses range from routine water and soil analysis, to marine tissues, as well as industrial applications such as ultra-trace QA/QC work for various semiconductor clients. Also responsible for a number of specialized sample preparation techniques including trace metals in seawater by reductive precipitation, and arsenic and selenium speciation by ion-exchange chromatography. Developed methodology for performing mercury analysis at low part per trillion levels by cold vapor atomic fluorescence..

Supervisor, GFAA Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1989-1992. Responsibilities included supervision of metals analysis by graphite furnace atomic absorption following SW-846 and EPA CLP methodologies. Duties include workload scheduling, data review, instrument maintenance, personnel training and evaluation.

Education

Field Immunoassay Training Course, *EnSys Inc*., 1995.
Winter Conference on Plasma Spectrochemistry, *San Diego, California,* 1994.
ICP-MS Training Course, *VG-Elemental*, 1992.
BS, Chemistry, *Western Washington University, Bellingham, Washington,* 1988.
BA, Business Administration, *Western Washington University, Bellingham, Washington,* 1985.

JEFFREY A. GRINDSTAFF

1991 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

TECHNICAL MANAGER III, GC/MS VOA AND SEMI-VOA LABORATORIES – 1997 to Present

Responsibilities

Primary responsibilities include supervision of GC/MS VOA and Semi-VOA staff, method development, training, data review, tracking department workload, scheduling analyses, and general maintenance and troubleshooting of GC/MS systems.

Documentation of Demonstration of Capabilities is available for review.

Experience

Manager, GC/MS VOA Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1994-1997. Responsible for supervision of GC/MS VOA staff, method development, training, data review, tracking department workload, scheduling analyses, and general maintenance and troubleshooting of GC/MS systems.

Scientist III, GC/MS VOA Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1991-1994. Responsibilities included scheduling workload, data review, instrument maintenance and troubleshooting, and personnel training and evaluation. Also responsible for supervision of extraction personnel and instrument analysts. Additional supervisory duties included report generation and data review for GC analyses. Responsibilities also included project management and customer service.

Chemist, *Enseco-CRL, Ventura, California,* 1990-1991. Established GC/MS department including inventory maintenance, preparation of state certification data packages, method development, SOPs, and extended data programs. Performed daily maintenance and troubleshooting of GC and GC/MS instrumentation. Scheduled and performed routine and non-routine VOA analyses.

GC/MS Chemist, VOA Laboratory *Coast-to-Coast Analytical Service, San Luis Obispo, California,* 1990-1991. Responsible for standard preparation for VOA analyses and instrument calibration, tuning, and maintenance. Also implemented and further developed EPA methods for quantitative analysis of pesticides and priority pollutants..

Education

Mass Selective Detector Maintenance*, Hewlett-Packard Education Center,* 1993.
Interpretation of Mass Spectra I, *Hewlett-Packard Analytical Education Center,* 1992.
B.S., Chemistry, *California Polytechnic State University, San Luis Obispo, California,* 1989.
A.A., Liberal Arts, *Allan Hancock College, Santa Maria, California.* 1986

Publications/ Presentations

Alternate Method to Lower Detection Limits to Satisfy Regulatory Action Levels for Volatiles in Groundwater, with David Edelman, Kairas Parvez, and Paul Laymon. TAPPI National Meeting, Orlando, Florida. 1996

Affiliations

American Chemical Society. 1989

TODD N. POYFAIR

1991 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

TECHNICAL MANAGER III, SVG LABORATORIES – 2001 to Present

Responsibilities

Primary responsibilities include supervision of GC, HPLC, and fuels Semi-VOA laboratory staff. Also responsible for training oversight, data review, tracking department workload, and scheduling and performance of GC and HPLC analyses.

Documentation of Demonstration of Capabilities is available for review.

Experience

Supervisor/Manager, General Chemistry Department, *Columbia Analytical Services, Inc., Kelso, Washington,* 1995-2001. Responsibilities included supervision, management, and training of General Chemistry staff. Also responsible for workload coordination, data review, reporting, and instrument maintenance within the General Chemistry department.

Project Chemist, Client Services Group, *Columbia Analytical Services, Inc., Kelso, Washington*, 1993-1995. Responsibilities included technical project management and customer service. Responsible for meeting the clients' needs of timely and appropriate analyses, and to acted as liaison for all client-related activities within CAS.

Scientist II, General Chemistry Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington*, 1992-1993. Responsibilities included the review and summarization of pH, alkalinity, conductivity, turbidity, hardness, and CODs.

Scientist I, **General Chemistry Laboratory,** *Columbia Analytical Services, Inc., Kelso, Washington*, 1992. Responsibilities included analysis of Total Organic Halogens, Chemical Oxygen Demand, Sulfides, Ammonia, TKN, Nitrate/Nitrite by Lachat, and Cyanide.

Analyst III, **General Chemistry Laboratory,** *Columbia Analytical Services, Inc., Kelso, Washington,* 1991-1992. Responsibilities included analysis of pH, Conductivity, Alkalinity, Turbidity, and Oil and Grease.

Education

BS, Chemistry, *Portland State University, Portland, Oregon,* 1991.
BA, German, *Portland State University, Portland, Oregon,* 1990.
COURSEWORK, *Brigham Young University, Provo, Utah.* 1982-1983 & 1985-1986.

JAMES R. "JIM" SMITH

2001 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

TECHNICAL MANAGER I, DRINKING WATER LABORATORY SUPERVISOR – 2002 to Present

Responsibilities

Overall implementation of Organic Drinking Water Methods and method development. Project management of Drinking water accounts. Development of Standard Operating Procedures for Drinking Water methods. Operation of Varian GC/MS, Agilant GC/ECD and Agilant HPLC.

Documentation of Demonstration of Capabilities is available for review.

Experience

Project Manager III, *Columbia Analytical Services, Inc., Kelso, Washington,* 2001-2002. Responsible for technical project management, ensuring overall data quality and compliance with customer requirements, and providing technical support to clients regarding laboratory application to projects. Extensive technical experience with the various GC and GC/MS method allow for detailed technical review of organics projects. Also has extensive experience coordinating drinking water and sediment projects. Currently responsible for coordination of approximately $200,000 of analyses in the laboratory on a monthly basis. Current large clients include Bechtel (Navy work), which involves numerous groundwater-monitoring projects, the Port of Seattle and URS. Also responsible for various storm water studies for Bremerton Naval Shipyard.

Director, Trace Organics and Project Manager, *Amtest, Inc., Redmond, Washington,* 1987-2001. Responsible for project management, client contact, data review, and writing reports. Additional responsibilities pertained to supervision of the trace organics department and running the GC/MS system. Performed various methods by GC/MS for volatiles, semi-volatiles and by GC for pesticides, PCBs, herbicides, and fuels (LUST). Also performed hazardous waste characterization including completion of waste profile forms.

Education

BS, Chemistry, *Rochester Institute of Technology, Rochester, New York,* 1985.

EILEEN M. ARNOLD

1987 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

SCIENTIST IV, METALS LABORATORY, KELSO HEALTH AND SAFTEY OFFICER – 1994 to Present

Responsibilities

Duties include the operation and maintenance of the Inductively Coupled Argon Plasma (ICAP) Emission Spectrometer. This involves digestion, instrumental analysis, and report generation for environmental samples using approved EPA techniques. Health and Safety Officer responsibilities included development and implementation of the Kelso Health and Safety program, including accident investigation and incident review, maintenance of all safety related equipment and documents, and performance of monthly safety audits.

Documentation of Demonstration of Capabilities is available for review.

Experience

Project Chemist, Client Services Group, Kelso Health and Safety Officer, *Columbia Analytical Services, Inc., Kelso, Washington,* 1992-1994. Duties included technical project management and customer service. Responsible for meeting the clients' needs of timely and appropriate analyses, and to act as liaison for all client-related activities within Columbia Analytical Services, Inc. Health and Safety Officer responsibilities included development and implementation of the Kelso Health and Safety program, including accident investigation and incident review, maintenance of all safety related equipment and documents, and performance of monthly safety audits.

Scientist IV, Metals Laboratory, Health and Safety Officer, *Columbia Analytical Services, Inc., Kelso, Washington, 1987-1992.* Duties include the operation and maintenance of the Inductively Coupled Argon Plasma (ICAP) Emission Spectrometer. This involves digestion, instrumental analysis, and report generation for environmental samples using approved EPA techniques. Health and Safety Officer responsibilities included development and implementation of the Kelso Health and Safety program, including accident investigation and incident review, maintenance of all safety related equipment and documents, and performance of monthly safety audits.

Chemist, *Dow Corning Corporation, Springfield, Oregon,* 1986-1987. Responsibilities included ICP and atomic absorption work in silicon manufacturing. Methods development for ICP analysis of minor impurities found in silicon.

Chemist, *Ametek, Inc., Harleysville, Pennsylvania,* 1982-1985. Responsibilities included product research and development chemist involved in production of thin-film semiconductors for use as solar cells. Work involved AA and SEM techniques.

Chemist, *Janbridge, Inc., Philadelphia, Pennsylvania*, 1978-1982. Responsibilities included maintaining electroplating process lines through wet chemical analysis techniques, and performed Quality Assurance testing on printed circuit boards.

Education

BA, Chemistry, *Immaculata College, Immaculata, Pennsylvania,* 1977.

Affiliations

American Chemical Society, Member since 1987.

PAUL GOWAN

1994 TO PRESENT

CAS Holdings Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

IT MANAGER II, 2002 to Present

Responsibilities

Identify and plan IT requirements by interacting with management personnel to identify current and long-term user objectives. Assist in developing and tracking the IT computer capital budget. Provide electronic data deliverable (EDD) and LIMS system guidance to management personnel throughout the company. Ensure the effective utilization of computer systems. Train users as required. Establish IT policies, standards, practices, and specifications. Participate in the LIMS planning group.

Plan and supervise IT department staffing, organization, hardware and software acquisitions to meet requirements. Acquire, develop, and maintain a professional, skilled, and motivated staff through effective performance review and career development programs. Develop and maintain relationships with local and national vendors of computer hardware, software, and telephone equipment.

Experience

KELSO IT MANAGER, *Columbia Analytical Services, Inc., Kelso, Washington,* 1999-2002. Responsible for all IT efforts related to the CAS laboratory in Kelso, WA, including, but not excluded to computing equipment specification, purchasing and maintenance; network infrastructure; software development; strategic planning for future IT initiatives; budget preparation performance reviews, and career growth planning for IT staff.

TECHNICAL INFORMATION SPECIALIST, *CAS Holdings,Inc., Kelso, Washington,* 1994-1999. Primary responsibilities included support automation of HP chemstation and Enviroquant; support continued development of unified organic laboratories; support and development of project-specific data deliverables, technical assistance in Information Technology at Kelso to meet CAS IT objectives as related to LIMS.

Organics Section Manager, *Anametrix, Inc., San Jose, California,* 1992-1994. Responsibilities included managing the GC/MS and GC/Pesticide Departments, following protocols of the Department of Defense NEESA contracts (demanding stringent QA/QC and "Level D" data package submittals). Primary responsibilities included supervisor training and development, budget preparation and maintenance, performance reviews, data review, continuing research on environmental trends, SOP generation and updates, method development, capital equipment evaluation for laboratories, and project management.

GC/MS Program Manager, *Anametrix, Inc., San Jose, California,* 1988-1992. Responsibilities included supervision of five chemists, two Finnigan 4000 GC/MS Systems, and three HP 5971 GC/MS Systems. Primary responsibilities were to maintain high productivity and insure that the GC/MS department generated legally defensible data. Also responsible for sample scheduling and tracking, instrument maintenance and troubleshooting, analyst training and review, client interfacing, and purchasing.

GC/MS Analyst, *Anametrix, Inc., San Jose, California,* 1986-1988. Responsibilities included analyzing for VOA and Semi-VOA priority pollutants using EPA Methods 624/625 and 8240/8370.

Education

BA, Biochemistry, *San Jose State University, San Jose, California,* 1986.

LAWRENCE J. "LAWRY" JACOBY

1990 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

VICE PRESIDENT, QUALITY ASSURANCE DIRECTOR – 1992 to Present

Responsibilities

Responsible for the conduct of the quality assurance (QA) program and activities for CAS; for conducting systems and data audits at each CAS laboratory to ensure that the QA objectives established by management and by the various certifications, accreditations, project plans, and regulations under which CAS operates are satisfactorily met, to ensure that the QA programs are functioning as stated in QA Manuals, and to make appropriate recommendations for corrective actions and improvements; for management of performance evaluation and round-robin samples analyses programs; for evaluating data quality; for maintaining CAS-wide standard operating procedures; for preparing quarterly QA reports to management; for preparing, facilitating, and presenting quarterly ethics training; and for providing technical assistance and training to QA program managers at each CAS laboratory.

Experience

Quality Assurance Coordinator, *Columbia Analytical Services, Inc., Kelso, Washington,* 1990-1992. Responsible for CAS/Kelso's quality assurance program and projects, and for evaluating data quality.

Client Services Manager, *CH_2M Hill Laboratory, Redding, California,* 1989-1990. Management of client services and sample custody groups; customer service and maintenance; project management; proposal and quotation preparation; project-engineer/laboratory liaison.

Inorganic Division Manager, *CH_2M Hill Laboratory, Redding, California*, 1988-1989. Responsible for managing the operation of the inorganic analyses section including wet chemical, soil, and metals analyses; project management; customer service; proposal and quotation preparation.

Laboratory Manager, *CH_2M Hill Laboratory, Corvallis, Oregon,* 1986-1988. Responsible for managing the operation of the laboratory and coordinating the activities of project support staff; project management; quality assurance; proposal and quotation preparation; laboratory safety; engineering project consulting.

Analytical Chemist, *Teledyne Wah Chang, Albany, Oregon,* 1976-1986. Responsibilities included methods development; instrument maintenance; non-routine analyses; workload scheduling and coordination; and task force assignments.

Instructor, *Chemeketa Community College, Salem, Oregon,* 1971-1976. Taught college courses in general, organic and analytical chemistry.

Assistant Professor, *Portland State University, Portland, Oregon*, 1969-1971. Taught college courses in general and organic chemistry.

Education

PhD, Organic Chemistry, *Colorado State University, Ft. Collins, Colorado,* 1969.
BS, Chemistry, *Oregon State University, Corvallis, Oregon,* 1965.

Affiliations

American Society for Quality.
American Chemical Society.
AOAC International.

GARY K. WARD

2001 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

VICE PRESIDENT, CHIEF QUALITY, SAFETY, AND ETHICS OFFICER – 2001 to Present

Responsibilities

Responsibilities include directing and managing the overall corporate-wide quality systems, ethics and safety programs for all CAS facilities, as well as strategic planning, marketing, business development, and information technology. Responsible for all interaction and liaison with government entities involving quality, technical and operational issues.

Experience

Deputy Director, Laboratory Standards, *Intertek Testing Services, Houston, Texas,* 1998-2001. Responsibilities included professional standards/quality assurance for 240 laboratories in 93 countries, involving laboratory tests ranging from petroleum products and environmental samples to toys, textiles, and building products. Resolution of issues with a variety of governments, agiences, and companies with particular focus on interactions with the US EPA. Was previously responsible for all operations of over 100 labs in the Americas, ranging from Canada to South America, including duties to improve quality, raise profits and revenues, and implement a LIMS.

Director, Technical Operations, *Environmental Health Laboratories, South Bend, Indiana*, 1995-1998. Responsibilities included operations and quality assurance of the laboratory. Directed, administered and coordinated activities of the lab in accordance with goals and objectives of the company. Responsible for the R&D program, laboratory throughput and financial performance, and implementation of the new LIMS system.

Executive Scientist, *Quanterra (Enseco), Arvada, Colorado,* 1987-1995. Responsibilities included providing expertise and experience in laboratory analysis and operations to the entire laboratory system. Duties included implementation of network-wide LIMS as well as coordination of the Technology, QA, IS, and Operations groups. As Director of Technology and Quality Assurance was responsible for management of the R&D program, Quality Assurance program, and Environment, Health and Safety program throughout the Enseco lab system. Direct reports were all QA managers, safety managers, and chief scientists from each of the 13 laboratories.

Deputy Branch Chief, *U.S. Environmental Protection Agency*, 1983-1987. Responsibilities included providing expertise to entire Superfund program ranging from lab analytical services to sampling. Duties involved managing the CLP program as well as the Superfund R&D program. As CLP National Program Manager was responsible for development and implementation of CLP analytical protocols, administration of contracts for over 100 laboratories throughout the country, and liasion with contract divisions, other EPA programs, and enforcement. Responsible for development and implementation of disk deliverables, automated contract screening, as well as writing new protocols for specific methods such as ICP/MS and for EPA methods such as included in SW846, 3rd Edition. Duties also included coordination of the annual CLP conferences.

Education

MS, Chemical Oceanography, *RSMAS, University of Miami, Miami, Florida,* 1973.
BS, Chemistry, *Loyola University, Los Angeles, California,* 1970.

Publications, Presentations. And Affiliations

Mr. Ward has a number of publications and presentations, and is affiliated with several professional organizations. For a list of these, please contact CAS.

STEPHEN W. VINCENT

1986 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

PRESIDENT, CAS HOLDINGS INC. – 1986 to Present

Responsibilities

Responsible for the overall growth and profitability of the CAS laboratory network. This includes establishing and implementing long-range objectives, plans, and policies, and representing the company with its major customers, technical community, and the public.

Experience

Laboratory Manager, *Weyerhaeuser Company, Federal Way, Washington,* 1979-1986. Responsibilities involved all phases of technical and administrative management. This included management of organic, inorganic, and microbiological analyses and management of capital; an annual operating budget of approximately $2 million; management of thirty staff members; contract procurement, and project management. Projects included an EPA Inorganic CLP contract; an EPA acid rain deposition contract; a contract with the Fish and Wildlife Service to measure trace organic contaminants in animal tissues; and others.

Analytical Chemist, *Weyerhaeuser Company, Longview, Washington,* 1975-1979. Responsibilities: Method development, routine analysis and supervision for the Weyerhaeuser Multi-Region Support Lab. Responsible for setting up a company-wide laboratory audit, round robin, and quality assurance program.

Education

Market Strategy for Technology Based Companies, *Executives Program, Stanford University*. 1994.

Advanced Technical Management Program, *University of California at Los Angeles, Department of Business, Engineering and Management,* 1991.

Completion of Coursework for MS, Pulp and Paper Technology, *University of Washington, Seattle, Washington*, 1984.

Post Graduate Coursework, Engineering and Management, *University of California at Los Angeles, Graduate School of Engineering and Applied Science, Los Angeles, California,* 1981.

BS, Oceanography, *University of Washington, Seattle, Washington,* 1974.

Publications/ Presentations

Mr. Vincent has a number of publications and presentations. For a list of these publications and presentations, please contact CAS.

Affiliations

American Chemical Society.
Technical Association of the Pulp and Paper Industry.

APPENDIX C

MAJOR ANALYTICAL EQUIPMENT

GENERAL CHEMISTRY/WATER CHEMISTRY LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Analytical Balances (9):			
Precisa and Mettler models	1988-2000	MM	15
Autoclave - Market Forge Sterilmatic	1988	LM	5
Calorimeter - Parr 1241 EA Adiabatic	1987	LM	5
Centrifuge - Damon/IEC Model K	1992	LM	15
Colony Counter - Quebec Darkfield	1988	LM	5
Conductivity Meters (2):			
Amber Science Model 604	1987	LM	8
VWR	2001	LM	8
Digestion Systems (5):			
COD (4)	1987, 1989	LM	8
Kjeldahl, Lachat 46-place (1)	1999	LM	5
Dissolved Oxygen Meter - YSI Model 58 (3)	1987, 1988, 1991	LM	8
Distillation apparatus (Midi) - Easy Still (2)	1996, 2000	LM	7
Drying Ovens (11):			
Shel-Lab and VWR models	1988 - 2003	LM	15
Flash Point Testers:			
ERDCO Setaflash Tester (2)	1988, 1991	LM	5
Flow-Injection Analyzers (2):			
Lachat Quik-Chem AE	1990	LM	5
Bran-Leubbe	2002	LM	3
Ion Chromatographs (5)			
Dionex 2000i with Peaknet Data Systems (2)	1988	LM	5
Dionex DX-120 with Peaknet Data System	1998	LM	5
Dionex DX-100 with Peaknet Data System	2000	LM	3
Dionex ICS-2500 with Chromchem Data System	2002	LM	3
Ion Selective Electrode Meters (5)			
Fisher Scientific Accument Model 50	1997	LM	9
Fisher Scientific Accument Model 25	1993	LM	9
Fisher Scientific Accument Model 20	2000	LM	9
Orion Model 920A	1990	LM	9
Corning pH/ion Meter Model 135	1992	LM	9
Microscopes (3):			
Olympus BH-2	1987	LM	13
Bausch & Lomb	1988	LM	13
Swift	1988	LM	13
Muffle Furnaces- Sybron Thermolyne Model F-A1730	1991	LM	15

GENERAL CHEMISTRY/WATER CHEMISTRY LABORATORY (continued)			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
pH Meters (3):			
Beckman 34 (2)	1989	LM	9
Fisher Scientific Accument Model 20	1993	LM	9
Shatter Box - GP 1000	1989	LM	5
Sieve Shakers (2):			
CE Tyler - Portable RX 24	1990	LM	5
WS Tyler - RX 86	1991	LM	5
Thomas-Wiley Laboratory Mill, Model 4	1989	LM	7
Total Organic Carbon (TOC) Analyzers (3)			
O-I Corporation, Model 700	1993	LM	3
Coulemetrics Model 5012	1997	LM	5
O-I Corporation Model 1010	2002	LM	3
Total Organic Halogen (TOX) Analyzers (4):			
Mitsubishi (MCI) TOX-10	1986	LM	5
Mitsubishi TOX-Sigma	1995	LM	5
Mitsubishi TOX-100 (2)	2001	LM	4
Turbidimeter - Hach Model 2100N	1996	LM	8
UV-Visible Spectrophotometers (2):			
Hitachi 100-40 Single Beam	1986	LM	10
Milton Roy 1001 Plus	1991	LM	10
Vacuum Pumps (2):			
Welch Duo-Seal Model 1376	1990	LM	13
Busch R-5 Series Single Stage	1991	LM	13
Water Baths/Incubators (6):			
Hach Model 15320 Incubator	1986	LM	6
Precision Model L-6 (2)	1989, 1990	LM	6
VWR 1540	1991	LM	6
Fisher 11-680-626M Incubator	1992	LM	6
Fisher Isotemp Incubator	2001	LM	6

METALS LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Analytical Balance (6)			
Various Mettler AE 200 analytical balance	1990	MM	12
Various Mettler models (5)	1988	MM	12
Atomic Absorption Spectrophotometers (6):			
Varian SpectrAA 300 Zeeman AA and IBM Data Systems (2)	1989	LM	3
Varian SpectrAA Zeeman/220 AA w/Data Systems (2)	2000	LM	3
Varian SpectrAA 20 with Flame, Cold Vapor, and Hydride Systems	1988	LM	4
CETAC Mercury Analyzer	2000	LM	3
Atomic Fluorescence Spectrophotometer			
Brooks-Rand Model III	1996	LM	4
Centrifuge - IEC Model Clinical Centrifuge	1990	LM	12
Drying Oven - VWR Model 1370F	1990	LM	12
TCLP Extractors (3)	1989, 2002	LM	6
Freeze Dryers (2) - Labconco	1988, 1992	LM	5
Muffle Furnace - Thermolyne Furnatrol Model 53600	1991	LM	5
Shaker - Burrell Wrist Action Model 75	1990	LM	12

ICP LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Inductively Coupled Plasma Atomic Emission Spectrometer (ICP-AES) - Thermo Jarrell Ash Model 61E	1988	LM	5
Inductively Coupled Plasma Atomic Emission Spectrometer (ICP-AES): Thermo Jarrell Ash, Model IRIS	2000	MM	3
Inductively Coupled Plasma Mass Spectrometer (ICP-MS): VG PQ-S	1997	MM	4
Inductively Coupled Plasma Mass Spectrometer (ICP-MS): VG Excell	2001	MM	4

GC SEMIVOLATILE ORGANICS LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
SAMPLE PREPARATION			
Accelerated Solvent Extractor - Dionex ASE 200	1996	LM	5
Analytical Balance (2)			
Mettler BB240	1987	MM	7
Satorious B610	1999	MM	7
Aspirator pumps - Labconco Cole Parmer (1)	1994	LM	7
Centrifuges (2):			
Adams Model DYNAC	1986	LM	7
Sorvall Model GLC-1	1988	LM	7
Drying Oven - Fisher Model 655 G	1991	LM	7
Evaporators (6):			
Organomation N-Evap (3)	1989,1998, 2001	LM	7
Organomation S-Evap (3)	1989-1991	LM	7
Extractors: Lab-Line Multi-Unit Extraction Heaters (60)	1987-1992	LM	7
ABC GPC - single column (2)	1998, 1999	LM	4
Muffle Furnace - Parflow MIC 6000	1994	LM	7
Sonic Water Bath - Branson Model 8200	1991	LM	7
Vacuum Pump - Edwards	1992	LM	7
INSTRUMENTATION			
Analytical Balance - Mettler AT 250	1989	MM	8
Chromatography Data Systems (12)			
HP Enviroquant (8)	1994-2002	LM	4
Thruput Target (4)	1998-2000	LM	3
Gas Chromatographs (11):			
Hewlett-Packard 5890 GC with HP 7673 Autosampler and Dual ECD Detectors (7)	1990 – 1995	LM	7
Hewlett-Packard 5890 GC with HP 7673 Autosampler and Dual FPD Detectors	1991	LM	4
Agilent 6890 GC with Agilent 7683 Autosampler and Dual ECD Detectors (2)	2001	LM	4
Agilent 6890 GC with Agilent 7683 Autosampler and Dual FPD Detectors	2003	MM	4

PETROLEUM HYDROCARBONS GC LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
SAMPLE PREPARATION			
Analytical Balance (3)			
Mettler BB300	1991	MM	7
Mettler BB240	1994	MM	7
Mettler AE166	1994	MM	7
Aspirator pumps - Labconco Cole Parmer (1)	1994	LM	7
Drying Oven (2) - Fisher Models 630F & 655 G	1991	LM	7
Evaporators (2):			
Organomation N-Evap	1990	LM	6
Organomation S-Evap	1991	LM	6
Extractors (21):			
Lab-Line Multi-Unit Soxhlet Extraction Heaters (18)	1987-1992	LM	6
Sonic Horns (3): Branson, Ultrasonics, Fisher Models	1991-1994	LM	6
INSTRUMENTATION			
HP Enviroquant Chromatography Data Systems (10)	1994-2002	LM	6
Gas Chromatographs (10):			
Varian 3300 with PID/FID detectors	1989	LM	3
O-I 4460A Purge and Trap Concentrator	1989	LM	3
Dynatech PTA-30 Autosampler	1996	LM	3
Hewlett-Packard 5890 Series II with PID/	1991	LM	3
PID/FID det.	1991	LM	3
Tekmar LSC-2000 Purge and Trap Concentrator	1991	LM	3
Dynatech Archon 5100 Autosampler	1992	LM	3
Hewlett-Packard 5890 Series II with PID/FID det.	1988	LM	3
Tekmar LSC-2000 Purge and Trap Concentrator	2003	MM	3
ComBi-Pal Headspace Autosampler	1999	LM	3
Hewlett-Packard 5890 Series II with PID/PID/FID det.	1999	LM	3
O-I 4560A Purge and Trap Concentrator	1999	LM	3
Dynatech Archon 5100 Autosampler			
Hewlett-Packard 5890 GC with HP 7673	1990 - 1995	LM	5
Autosampler and Dual FID Detectors (3)			
Hewlett-Packard 5890 GC with HP 7673	1994	LM	5
Autosampler and FID/ECD Detectors			
Agilent 6890 with Agilent 7873	2001	LM	5
Autosampler and Dual FID Detectors			
Hewlett-Packard 5890 GC with HP 7673	2003	LM	2
Autosampler and Dual ECD Detectors			
High-Performance Liquid Chromatographs (2):			
HP 1090M Series II with HP 1046A Fluorescence Detector & Diode Array UV Detector (2)	1995, 1999	LM	3

GC/MS SEMIVOLATILE ORGANICS SAMPLE PREPARATION			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Analytical Balances			
Sartorius 610	2000	MM	6
Evaporators (4):			
Organomation N-Evap (2)	1989-1990, 2000	LM	5
Organomation S-Evap (2)	1990-1991	LM	5
Extractors (64):			
Continuous Liquid/Liquid Extractors (24)	1991	LM	5
Branson Model 450 Sonifier (2)	1991	LM	5
Tekmar Sonifier (2)	1994	LM	5
Soxhtherm (36)	2000	LM	3
GPC-ABC Model Autoprep 1000	1995	LM	4
Gas Chromatograph: Hewlett-Packard 5890 with HP 7673 autosampler and FID Detector	1994	LM	5

GC/MS SEMIVOLATILE ORGANICS INSTRUMENT LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
HP Enviroquant Chromatography Data Systems (9)	1994-2002	LM	8
Semivolatile GC/MS Systems (7):			
Hewlett-Packard 6890/5973 with HP 6890 Autosampler (2)	1997, 2001	MM	6
Hewlett-Packard 5890/5970 with HP 7673 Autosampler (2)	1990,1994	MM	6
Hewlett-Packard 5890/5972 with HP 7673 Autosampler (3)	1993, 1994, 1998	MM	6

VOLATILE ORGANICS LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Analytical Balance			
Mettler PE 160	1989	MM	8
Baxter Vortex Mixer	1989	LM	8
Extractors (10):			
Millipore TCLP Zero Headspace Extractors (10)	1987-1992	LM	2
TCLP Extractor - Tumbler (12 position)	1989	LM	2
HP Enviroquant Chromatography Data Systems (10)	1994-2002	LM	8
Drying Ovens (2):			
Narco 420	1989	LM	8
VWR 1305 U	1991	LM	8
Sonic Water Bath - Branson Model 2200	1989	LM	8
Volatile GC/MS Systems (5):			
Hewlett-Packard 5890/5970	1989	MM	6
Tekmar 3000 Purge and Trap Concentrator	1995	LM	6
Dynatech ARCHON 5100 Autosampler	1996	LM	6
Hewlett-Packard 5890/5970	1999	MM	6
EST Encon Purge and Trap Concentrator	2002	LM	6
Dynatech ARCHON 5100 Autosampler	1999	LM	6
Hewlett-Packard 5890/5971	1991	MM	6
Tekmar 3000 Purge and Trap Concentrator	2001	LM	6
Dynatech ARCHON 5100 Autosampler	1995	LM	6
Hewlett-Packard 5890/5972A	1993	MM	6
Tekmar 3000 Purge and Trap Concentrator	1995	LM	6
Dynatech ARCHON 5100 Autosampler	1996	LM	6
Hewlett-Packard 6890/5973	2001	MM	6
Tekmar 3100 Purge and Trap Concentrator	2001	LM	6
Varian Archon Autosampler	2001	LM	6

DRINKING WATER ORGANICS LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Analytical Balance - Mettler BB300	1991	MM	2
Extractors (5) – Horizon SPE-DEX Solid Phase Extractor	2003	LM	2
Aglinet Enviroquant Chromatography Data Systems (2)	2003	LM	2
Varian Saturn Chromatography Data System	2003	LM	2
Evaporator - Organomation N-Evap	2003	LM	2
Agilent 1100 HPLC w/post-column derivitization:	2003	LM	2
UV/Fluoescence detectors	2003	LM	2
Pickering PCX-5200 Post-column derivitization unit	2003	LM	2
Agilent 6890N GC/ECD system:	2003	LM	2
Dual micro-ECD detectors	2003	LM	2
Agilent autosampler	2003	LM	2
Varian Ion trap GC/MS:	2003	LM	2
Varian 3900 GC w/CP8400 autosampler	2003	LM	2
Varian Saturn 2100T mass spectrometer	2003	LM	2

AUTOMATED DATA PROCESSING EQUIPMENT			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
1-WAN: LIMs Sample Manager using ORACLE DBMS running on SEQUENT UNIX/DYNIX platform connected/linked on a frame relay WAN environment.	1994-1995	LM	NA
3- Network Servers Pentium/Pentium II class. 1 for Administration, 1 for Data Acquisition, and 1 for Applications. Network operating system: Microsoft Windows2000®. Data acquisition capacity at 28GB with redundant tape and disk arrays.	1994-2003	LM	NA
Appoximately 40+ HP class Laserjet printers (various types from IIIs to SI Ivs and 8150s) linked via LAN.	1991-2002	LM	NA
Approximately 115 HP/Gateway/Dell PC/Workstations on LAN hooked up with 10BT/100BT and TCP/IP for LIMs Terminal Emulation.	1993-2002	LM	NA
Microsoft Office Small Business Edition as the base application for all PC/Workstations.	1994-2000	LM	NA
E-Mail with link to SMTP for internal/external messaging. Web mail via Cobalt Qube interface. Microsoft Outlook® 98 and 2000.	1994-2001	LM	NA
Standard EXCEL® reporting platform application linked to LAN/WAN for data connectivity and EDD generation.	1994-1996	LM	NA
Facsimile Machines 9600-14400 Baud, 11 Pages/Minute (4)	1991-1998	LM	NA
Dot Matrix NLQ (3)	1991-1992	LM	NA
Thruput, MARRS, Stealth, Harold, and Blackbird reporting software systems.	1998-2003	LM	NA

NA: Not applicable. This equipment administered by IT staff but may be used by all staff.

APPENDIX D

DATA QUALITY CAPABILITIES

GENERAL CHEMISTRY/WATER CHEMISTRY ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision**[b] **(RPD)**	**Accuracy**[c] **(%REC)**
110.2	Color	Water	NA	NA	20	NA
120.1 / *SM* 2510B	Conductivity	Water	2 umhos/cm	0.2 umhos/cm	20	NA
130.2 / *SM* 2340C	Hardness as $CaCO_3$	Water	10 mg/L	3 mg/L	20	NA
150.1	pH	Water	NA	NA	NA	NA
160.1 / *SM* 2540C	Solids, Total Dissolved (Filterable)	Water	5 mg/L	5 mg/L	20	NA
160.2	Solids, Total Suspended (Nonfilterable)	Water	5 mg/L	5 mg/L	20	NA
160.3	Solids, Total	Soil Water	NA (%) 5 mg/L	NA (%) 5 mg/L	20 20	NA NA
160.4	Solids, Volatile	Soil Water	NA (%) 5 mg/L	NA (%) 5 mg/L	20 20	NA NA
160.5	Solids, Settleable	Water	0.1 ml/L	NA	20	NA
180.1	Turbidity	Water	0.1 NTU	0.05 NTU	20	NA
300.0 / 9056 Ion Chromatography (After Extraction)	Bromide	Soil	1 mg/Kg	0.3 mg/Kg	20	90-110[d]
	Chloride				20	90-110[d]
	Nitrate as Nitrogen				20	90-110[d]
	Nitrite as Nitrogen				20	90-110[d]
	Sulfate		2 mg/Kg	0.7 mg/Kg	20	90-110[d]
300.0 / 9056 Ion Chromatography	Bromide	Water	0.2 mg/L	0.02 mg/L	20	90-110[d]
	Chloride		0.2 mg/L	0.04 mg/L	20	90-110[d]
	Fluoride		0.2 mg/L	0.01 mg/L	20	90-110[d]
	Nitrate as Nitrogen		0.1 mg/L	0.008 mg/L	20	90-110[d]
	Nitrite as Nitrogen		0.1 mg/L	0.006 mg/L	20	90-110[d]
	Sulfate		0.2 mg/L	0.04 mg/L	20	90-110[d]
300.1 Ion Chromatography	Bromate	Water	6 ug/L	3 ug/L	20	90-110[d]
	Bromide		20 ug/L	6 ug/L	20	90-110[d]
	Chlorite		20 ug/L	5 ug/L	20	90-110[d]
305.2	Acidity as $CaCO_3$	Water	NA (mg/L)	NA (mg/L)	20	NA
310.1 / *SM* 2320B	Alkalinity as $CaCO_3$	Water	2 mg/L	1 mg/L	20	NA
325.3	Chloride, Titrimetric	Water	0.2 mg/L	0.2 mg/L	20	85-115
330.4	Chlorine, Total Residual	Water	0.1 mg/L	0.07 mg/L	20	85-115
335.1	Cyanides Amenable to Chlorination	Soil Water	0.2 mg/Kg 0.01 mg/L	 0.003 mg/L	20 20	85-115[b] 85-115[b]
335.2 / 335.4	Cyanide, Total	Soil Water	0.2 mg/Kg 0.01 mg/L	 0.004 mg/L	20 20	85-115[b] 85-115[b]
SM 4500-CN$^-$I	Cyanide, Weak Acid Dissociable	Soil Water	0.2 mg/Kg 0.01 mg/L	 0.003 mg/L	20 20	85-115[b] 85-115[b]
340.1	Fluoride, Bellack Distillation	Soil Water	1 mg/Kg 1.0 mg/L	 0.4 mg/L	20 20	85-115[b] 85-115[b]
340.2 / *SM* 4500-F$^-$C	Fluoride	Soil Water	2 mg/Kg 0.2 mg/L	 0.02 mg/L	20 20	85-115[b] 85-115[b]
350.3	Ammonia as Nitrogen	Soil Water	0.2 mg/Kg 0.05 mg/L	 0.03 mg/L	20 20	85-115[b] 85-115[b]

GENERAL CHEMISTRY/WATER CHEMISTRY ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
351.4	Nitrogen, Total Kjeldahl	Soil Water	20 mg/Kg 0.1 mg/L	6 mg/kg 0.07 mg/L	20 20	85-115[b] 85-115[b]
353.2	Nitrogen, Nitrate + Nitrite as Nitrogen	Soil Water	1 mg/Kg 0.2 mg/L	 0.02 mg/L	20 20	85-115[b] 85-115[b]
354.1	Nitrite as Nitrogen, Colorimetric	Water	0.01 mg/L	0.003 mg/L	20	85-115[b]
365.3	Orthophosphate as Phosphorus	Soil Water	(e) mg/Kg 0.01 mg/L	 0.003 mg/L	20 20	85-115[b] 85-115[b]
SM 4500-PF	Orthophosphate as Phosphorus	Water	0.01 mg/L	0.004 mg/L	20	85-115[b]
365.3M 365.3	Phosphorus, Total	Soil Water	0.2 mg/Kg 0.01 mg/L	 0.003 mg/L	20 20	85-115[b] 85-115[b]
376.1	Sulfide	Water	2 mg/L	0.5 mg/L	20	85-115[b]
377.1	Sulfite	Water	2 mg/L	0.3 mg/L	20	NA
SM 5550B	Tannin and Lignin	Water	0.2 mg/L	0.07 mg/L	20	85-115[b]
405.1	Biological Oxygen Demand	Water	4 mg/L	0.7 mg/L	20	NA
410.1 and 410.2	Chemical Oxygen Demand	Soil Water	50 mg/Kg 5 mg/L	 2 mg/L	20 20	85-115[b] 85-115[b]
ASTM D4129-82M 415.1	Total Organic Carbon	Soil Water	0.05% 0.5 mg/L	0.02% 0.2 mg/L	20 20	85-115[b] 85-115[b]
420.1	Phenolics, Total	Soil Water	0.5 mg/Kg 0.01 mg/L	 0.007 mg/L	20 20	85-115[b] 85-115[b]
425.1	Surfactants (MBAS)	Water	0.05 mg/L	0.02 mg/L	20	75-125[b]
ASTM D1498	Oxidation-Reduction Potential	Water	NA	NA	20	NA
1010	Flashpoint, Pensky-Marten	Soil Water	NA NA	NA NA	 20	 NA
1020	Flashpoint, Setaflash	Soil Water	NA NA	NA NA	 20	 NA
1110	Corrosivity	Liquid	NA	NA	20	NA
1650A/B/C	Absorbable Organic Halides	Water	10 ug/L	6 ug/L	20	71-116[d]
3060A/7196A 7196A	Hexavalent Chromium	Soil Water	0.5 mg/Kg 0.05 mg/L	0.2 mg/Kg 0.02 mg/L	20 20	85-115[b] 85-115[b]
9010A	Cyanide, Total and Amenable	Soil Water	0.2 mg/Kg 0.01 mg/L	 0.004 mg/L	20 20	85-115[b] 85-115[b]
9020	Total Organic Halides	Water	10 ug/L	2 ug/L	20	87-113
9030	Sulfides	Water	0.1 mg/L	0.06 mg/L	20	60-130[b]
9030M	Sulfides	Soil	0.5 mg/kg	0.2 mg/kg	20	60-130[b]
9040	Corrosivity (pH)	Water	NA	NA	20	NA
9045C	pH	Soil	NA	NA	20	NA
9050	Specific Conductance	Water	2 mg/L	0.2 mg/L	20	NA
9060A	Total Organic Carbon	Water	0.5 mg/L	0.2 mg/L	20	85-115[b]
9066	Phenolics, Total	Soil Water	0.5 mg/Kg 0.01 mg/L	 0.007 mg/L	20 20	85-115[b] 85-115[b]
9095	Paint Filter Test	Soil	NA	NA	NA	NA
9252	Chloride, Titrimetric	Water	0.2 mg/L	0.2 mg/L	20	85-115[b]

METALS ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
200.7 (ICP)	Aluminum	Soil	10 mg/Kg	8 mg/Kg	30	70-130[m]
	Antimony		10 mg/Kg	6 mg/Kg	30	70-130[m]
	Barium		1 mg/Kg	0.2 mg/Kg	30	70-130[m]
	Beryllium		1 mg/Kg	0.2 mg/Kg	30	70-130[m]
	Boron		20 mg/Kg	20 mg/Kg	30	70-130[m]
	Cadmium		1 mg/Kg	0.8 mg/Kg	30	70-130[m]
	Calcium		10 mg/Kg	3 mg/Kg	30	70-130[m]
	Chromium		2 mg/Kg	0.6 mg/Kg	30	70-130[m]
	Cobalt		2 mg/Kg	0.6 mg/Kg	30	70-130[m]
	Copper		2 mg/Kg	2 mg/Kg	30	70-130[m]
	Iron		4 mg/Kg	1 mg/Kg	30	70-130[m]
	Lead		20 mg/Kg	5 mg/Kg	30	70-130[m]
	Magnesium		4 mg/Kg	2 mg/Kg	30	70-130[m]
	Manganese		1 mg/Kg	0.2 mg/Kg	30	70-130[m]
	Molybdenum		2 mg/Kg	2 mg/Kg	30	70-130[m]
	Nickel		4 mg/Kg	2 mg/Kg	30	70-130[m]
	Potassium		400 mg/Kg	100 mg/Kg	30	70-130[m]
	Silver		2 mg/Kg	2 mg/Kg	30	70-130[m]
	Sodium		20 mg/Kg	20 mg/Kg	30	70-130[m]
	Tin		10 mg/Kg	4 mg/Kg	30	70-130[m]
	Vanadium		2 mg/Kg	2 mg/Kg	30	70-130[m]
	Zinc		2 mg/Kg	0.5 mg/Kg	30	70-130[m]
200.7 (ICP)	Aluminum	Water	50 ug/L	50 ug/L	20	85-115[d]
	Antimony		50 ug/L	40 ug/L	20	85-115[d]
	Barium		5 ug/L	2 ug/L	20	85-115[d]
	Beryllium		5 ug/L	1 ug/L	20	85-115[d]
	Boron		50 ug/L	40 ug/L	20	85-115[d]
	Cadmium		5 ug/L	3 ug/L	20	85-115[d]
	Calcium		50 ug/L	30 ug/L	20	85-115[d]
	Chromium		5 ug/L	3 ug/L	20	85-115[d]
	Cobalt		10 ug/L	5 ug/L	20	85-115[d]
	Copper		10 ug/L	8 ug/L	20	85-115[d]
	Iron		20 ug/L	6 ug/L	20	85-115[d]
	Magnesium		20 ug/L	20 ug/L	20	85-115[d]
	Manganese		5 ug/L	1 ug/L	20	85-115[d]
	Molybdenum		10 ug/L	4 ug/L	20	85-115[d]
	Nickel		20 ug/L	20 ug/L	20	85-115[d]
	Potassium		2000 ug/L	700 ug/L	20	85-115[d]
	Silver		10 ug/L	9 ug/L	20	85-115[d]
	Sodium		100 ug/L	70 ug/L	20	85-115[d]
	Tin		50 ug/L	20 ug/L	20	85-115[d]
	Vanadium		10 ug/L	4 ug/L	20	85-115[d]
	Zinc		10 ug/L	2 ug/L	20	85-115[d]

METALS ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
200.9 (GFAA)	Arsenic	Soil	1 mg/Kg	0.2 mg/Kg	30	70-130[m]
200.9 (GFAA)	Lead		1 mg/Kg	0.2 mg/Kg	30	70-130[m]
200.9 (GFAA)	Selenium	Soil	1 mg/Kg	0.2 mg/Kg	30	70-130[m]
200.9 (GFAA)	Thallium		1 mg/Kg	0.2 mg/Kg	30	70-130[m]
206.2/200.9[f] (GFAA)	Arsenic	Water	5 ug/L	1 ug/L	20	85-115[d]
239.2/200.9[f] (GFAA)	Lead		2 ug/L	1 ug/L	20	85-115[d]
245.1 (CVAA)	Mercury		0.2 ug/L	0.1 ug/L	20	85-115[d]
1631	Mercury		1 ng/L	0.06 ng/L	20	71-125[d]
270.2/200.9[f] (GFAA)	Selenium		5 ug/L	1 ug/L	20	85-115[d]
279.2/200.9[f] (GFAA)	Thallium		5 ug/L	1 ug/L	20	85-115[d]
200.8 (ICP/MS)	Aluminum	Soil	2.0 mg/kg	2 mg/kg	30	70-130[m]
	Antimony		0.05 mg/kg	0.02 mg/kg	30	70-130[m]
	Arsenic		0.5 mg/kg	0.2 mg/kg	30	70-130[m]
	Barium		0.05 mg/kg	0.02 mg/kg	30	70-130[m]
	Beryllium		0.02 mg/kg	0.007 mg/kg	30	70-130[m]
	Cadmium		0.05 mg/kg	0.03 mg/kg	30	70-130[m]
	Chromium		0.2 mg/kg	0.07 mg/kg	30	70-130[m]
	Cobalt		0.02 mg/kg	0.008 mg/kg	30	70-130[m]
	Copper		0.1 mg/kg	0.08 mg/kg	30	70-130[m]
	Lead		0.05 mg/kg	0.02 mg/kg	30	70-130[m]
	Manganese		0.05 mg/kg	0.03 mg/kg	30	70-130[m]
	Molybdenum		0.05 mg/kg	0.04 mg/kg	30	70-130[m]
	Nickel		0.2 mg/kg	0.07 mg/kg	30	70-130[m]
	Selenium		1.0 mg/kg	0.2 mg/kg	30	70-130[m]
	Silver		0.02 mg/kg	0.02 mg/kg	30	70-130[m]
	Thallium		0.02 mg/kg	0.006 mg/kg	30	70-130[m]
	Vanadium		0.2 mg/kg	0.06 mg/kg	30	70-130[m]
	Zinc		0.5 mg/kg	0.2 mg/kg	30	70-130[m]
200.8 (ICP/MS)	Aluminum	Water	2.0 ug/L	0.7 ug/L	20	85-115[d]
	Antimony		0.05 ug/L	0.02 ug/L	20	85-115[d]
	Arsenic		0.5 ug/L	0.2 ug/L	20	85-115[d]
	Barium		0.05 ug/L	0.02 ug/L	20	85-115[d]
	Beryllium		0.02 ug/L	0.02 ug/L	20	85-115[d]
	Cadmium		0.02 ug/L	0.01 ug/L	20	85-115[d]
	Chromium		0.2 ug/L	0.06 ug/L	20	85-115[d]
	Cobalt		0.02 ug/L	0.01 ug/L	20	85-115[d]
	Copper		0.1 ug/L	0.04 ug/L	20	85-115[d]
	Lead		0.02 ug/L	0.01 ug/L	20	85-115[d]
	Manganese		0.05 ug/L	0.03 ug/L	20	85-115[d]
	Molybdenum		0.05 ug/L	0.03 ug/L	20	85-115[d]
	Nickel		0.2 ug/L	0.04 ug/L	20	85-115[d]
	Selenium		1.0 ug/L	0.2 ug/L	20	85-115[d]
	Silver		0.02 ug/L	0.01 ug/L	20	85-115[d]
	Thallium		0.02 ug/L	0.005 ug/L	20	85-115[d]
	Vanadium		0.2 ug/L	0.07 ug/L	20	85-115[d]
	Zinc		0.5 ug/L	0.2 ug/L	20	85-115[d]

METALS ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
6010B (ICP)	Aluminum	Soil	10 mg/Kg	8 mg/Kg	30	75-125[dm]
	Antimony		10 mg/Kg	6 mg/Kg	30	48-152
	Barium		1 mg/Kg	0.2 mg/Kg	30	73-131
	Beryllium		1 mg/Kg	0.2 mg/Kg	30	89-119
	Boron		20 mg/Kg	20 mg/Kg	30	67-136
	Cadmium		1 mg/Kg	0.8 mg/Kg	30	58-147
	Calcium		10 mg/Kg	3 mg/Kg	30	75-125[dm]
	Chromium		2 mg/Kg	0.6 mg/Kg	30	54-149
	Cobalt		2 mg/Kg	0.6 mg/Kg	30	84-115
	Copper		2 mg/Kg	2 mg/Kg	30	62-145
	Iron		4 mg/Kg	1 mg/Kg	30	75-125[dm]
	Lead		20 mg/Kg	5 mg/Kg	30	55-150
	Magnesium		4 mg/Kg	2 mg/Kg	30	75-125[dm]
	Manganese		1 mg/Kg	0.2 mg/Kg	30	47-163
	Molybdenum		2 mg/Kg	2 mg/Kg	30	77-117
	Nickel		4 mg/Kg	2 mg/Kg	30	79-125
	Potassium		400 mg/Kg	100 mg/Kg	30	75-125[dm]
	Silver		2 mg/Kg	2 mg/Kg	30	28-150
	Sodium		20 mg/Kg	20 mg/Kg	30	75-125[dm]
	Tin		20 mg/Kg	4 mg/Kg	30	75-125[dm]
	Vanadium		2 mg/Kg	2 mg/Kg	30	80-125
	Zinc		2 mg/Kg	0.5 mg/Kg	30	52-150
7060A (GFAA)	Arsenic	Soil	1 mg/Kg	0.2 mg/Kg	30	45-128
7421 (GFAA)	Lead		1 mg/Kg	0.2 mg/Kg	30	46-139
7471A (CVAA)	Mercury		0.02 mg/Kg	0.01 mg/Kg	30	55-137
7740 (GFAA)	Selenium		1 mg/Kg	0.2 mg/Kg	30	45-122
7841 (GFAA)	Thallium		1 mg/Kg	0.2 mg/Kg	30	60-119
6010B (ICP)	Aluminum	Water	50 ug/L	50 ug/L	20	93-113
	Antimony		50 ug/L	40 ug/L	20	93-116
	Barium		5 ug/L	2 ug/L	20	81-130
	Beryllium		5 ug/L	1 ug/L	20	89-113
	Boron		50 ug/L	40 ug/L	20	88-122
	Cadmium		5 ug/L	3 ug/L	20	86-119
	Calcium		50 ug/L	30 ug/L	20	81-124
	Chromium		5 ug/L	3 ug/L	20	95-113
	Cobalt		10 ug/L	5 ug/L	20	95-114
	Copper		10 ug/L	8 ug/L	20	95-113
	Iron		20 ug/L	6 ug/L	20	95-111
	Magnesium		20 ug/L	20 ug/L	20	72-131
	Manganese		5 ug/L	1 ug/L	20	96-112
	Molybdenum		10 ug/L	4 ug/L	20	93-115
	Nickel		20 ug/L	20 ug/L	20	94-114
	Potassium		2000 ug/L	700 ug/L	20	91-117
	Silver		10 ug/L	9 ug/L	20	79-122
	Sodium		100 ug/L	70 ug/L	20	81-127
	Tin		50 ug/L	20 ug/L	20	85-115[d]

METALS ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
6010B (ICP)	Vanadium	Water	10 ug/L	4 ug/L	20	95-114
	Zinc		10 ug/L	2 ug/L	20	95-113
7060A (GFAA)	Arsenic	Water	5 ug/L	1 ug/L	20	77-116
7421 (GFAA)	Lead		2 ug/L	1 ug/L	20	75-122
7470A (CVAA)	Mercury		0.2 ug/L	0.1 ug/L	20	84-114
7740 (GFAA)	Selenium		5 ug/L	1 ug/L	20	78-114
7841 (GFAA)	Thallium		5 ug/L	1 ug/L	20	78-116
6020 (ICP/MS)	Aluminum	Soil	2.0 mg/kg	2 mg/kg	30	70-130[m]
	Antimony		0.05 mg/kg	0.02 mg/kg	30	70-130[m]
	Arsenic		0.5 mg/kg	0.2 mg/kg	30	70-130[m]
	Barium		0.05 mg/kg	0.02 mg/kg	30	70-130[m]
	Beryllium		0.02 mg/kg	0.007 mg/kg	30	70-130[m]
	Cadmium		0.05 mg/kg	0.03 mg/kg	30	70-130[m]
	Chromium		0.2 mg/kg	0.07 mg/kg	30	70-130[m]
	Cobalt		0.02 mg/kg	0.008 mg/kg	30	70-130[m]
	Copper		0.1 mg/kg	0.08 mg/kg	30	70-130[m]
	Lead		0.05 mg/kg	0.02 mg/kg	30	70-130[m]
	Manganese		0.05 mg/kg	0.03 mg/kg	30	70-130[m]
	Molybdenum		0.05 mg/kg	0.04 mg/kg	30	70-130[m]
	Nickel		0.2 mg/kg	0.07 mg/kg	30	70-130[m]
	Selenium		1.0 mg/kg	0.2 mg/kg	30	70-130[m]
	Silver		0.02 mg/kg	0.02 mg/kg	30	70-130[m]
	Thallium		0.02 mg/kg	0.006 mg/kg	30	70-130[m]
	Vanadium		0.2 mg/kg	0.06 mg/kg	30	70-130[m]
	Zinc		0.5 mg/kg	0.2 mg/kg	30	70-130[m]
6020 (ICP/MS)	Aluminum	Water	2.0 ug/L	0.7 ug/L	20	85-115[d]
	Antimony		0.05 ug/L	0.02 ug/L	20	85-115[d]
	Arsenic		0.5 ug/L	0.2 ug/L	20	85-115[d]
	Barium		0.05 ug/L	0.02 ug/L	20	85-115[d]
	Beryllium		0.02 ug/L	0.02 ug/L	20	85-115[d]
	Cadmium		0.02 ug/L	0.01 ug/L	20	85-115[d]
	Chromium		0.2 ug/L	0.06 ug/L	20	85-115[d]
	Cobalt		0.02 ug/L	0.01 ug/L	20	85-115[d]
	Copper		0.1 ug/L	0.04 ug/L	20	85-115[d]
	Lead		0.02 ug/L	0.01 ug/L	20	85-115[d]
	Manganese		0.05 ug/L	0.03 ug/L	20	85-115[d]
	Molybdenum		0.05 ug/L	0.03 ug/L	20	85-115[d]
	Nickel		0.2 ug/L	0.04 ug/L	20	85-115[d]
	Selenium		1.0 ug/L	0.2 ug/L	20	85-115[d]
	Silver		0.02 ug/L	0.01 ug/L	20	85-115[d]
	Thallium		0.02 ug/L	0.005 ug/L	20	85-115[d]
	Vanadium		0.2 ug/L	0.07 ug/L	20	85-115[d]
	Zinc		0.5 ug/L	0.2 ug/L	20	85-115[d]

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision** [b] **(RPD)**	**Accuracy** [c] **(%REC)**
1664	Hexane Extractable Material	Water	5 mg/L	0.8 mg/L	18	78-114[d]
1664	Hexane Extractable Material - SGT	Water	5 mg/L	1.2 mg/L	34	64-132[d]
9071A/1664	Hexane Extractable Material	Soil	100 mg/Kg	50 mg/Kg	40	78-114[d]
9071A/1664	Hexane Extractable Material - SGT	Soil	100 mg/Kg	40 mg/Kg	40	64-132[d]
600/4-81-045 PCBs	Aroclor 1016	Oil	1 mg/Kg		40	21-116
	Aroclor 1221		2 mg/Kg		40	
	Aroclor 1232		1 mg/Kg		40	
	Aroclor 1242		1 mg/Kg		40	
	Aroclor 1248		1 mg/Kg		40	
	Aroclor 1254		1 mg/Kg		40	
	Aroclor 1260		1 mg/Kg		40	39-129
	Decachlorobiphenyl[g]		NA	NA	NA	51-133
608 Chlorinated Pesticides and PCBs	alpha-BHC	Water	0.04 ug/L	0.001 ug/L	30	
	gamma-BHC (Lindane)		0.04 ug/L	0.002 ug/L	30	39-134
	beta-BHC		0.04 ug/L	0.002 ug/L	30	
	Heptachlor		0.04 ug/L	0.005 ug/L	30	39-126
	delta-BHC		0.04 ug/L	0.005 ug/L	30	
	Aldrin		0.04 ug/L	0.004 ug/L	30	28-126
	Heptachlor Epoxide		0.04 ug/L	0.005 ug/L	30	
	Endosulfan I		0.04 ug/L	0.002 ug/L	30	
	4,4'-DDE		0.04 ug/L	0.003 ug/L	30	
	Dieldrin		0.04 ug/L	0.002 ug/L	30	44-136
	Endrin		0.04 ug/L	0.004 ug/L	30	44-138
	4,4'-DDD		0.04 ug/L	0.002 ug/L	30	
	Endosulfan II		0.04 ug/L	0.002 ug/L	30	
	4,4'-DDT		0.04 ug/L	0.002 ug/L	30	52-138
	Endosulfan Sulfate		0.04 ug/L	0.001 ug/L	30	
	Toxaphene		1 ug/L	0.05 ug/L	30	
	Chlordane		1 ug/L	0.02 ug/L	30	
	Aroclor 1016		1 ug/L	0.04 ug/L	30	
	Aroclor 1221		1 ug/L	0.04 ug/L	30	
	Aroclor 1232		1 ug/L	0.04 ug/L	30	
	Aroclor 1242		1 ug/L	0.04 ug/L	30	
	Aroclor 1248		1 ug/L	0.04 ug/L	30	
	Aroclor 1254		1 ug/L	0.04 ug/L	30	
	Aroclor 1260		1 ug/L	0.04 ug/L	30	
	Tetrachloro-*m*-xylene[g]		NA	NA	NA	15-116
	Decachlorobiphenyl[g]		NA	NA	NA	10-153
625 Base Neutral Acid Extractables	*N*-Nitrosodimethylamine	Water	25 ug/L	0.50 ug/L	30	
	Bis(2-chloroethyl) Ether		10 ug/L	0.34 ug/L	30	
	1,2-Dichlorobenzene		10 ug/L	0.44 ug/L	30	
	1,3-Dichlorobenzene		10 ug/L	0.36 ug/L	30	
	1,4-Dichlorobenzene		10 ug/L	0.32 ug/L	30	55-91
	Bis(2-chloroisopropyl) Ether		10 ug/L	0.32 ug/L	30	
	N-Nitrosodi-*n*-propylamine		10 ug/L	0.50 ug/L	30	62-113
	Hexachloroethane		10 ug/L	0.29 ug/L	30	
	Nitrobenzene		10 ug/L	0.57 ug/L	30	
	Isophorone		10 ug/L	0.25 ug/L	30	
	Bis(2-chloroethoxy)methane		10 ug/L	0.28 ug/L	30	
	1,2,4-Trichlorobenzene		10 ug/L	0.36 ug/L	30	58-97

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
625 Base Neutral Acid Extractables	Naphthalene	Water	10 ug/L	0.37 ug/L	30	
	Hexachlorobutadiene		10 ug/L	0.30 ug/L	30	
	2-Chloronaphthalene		10 ug/L	0.29 ug/L	30	
	Dimethyl Phthalate		10 ug/L	0.26 ug/L	30	
	Acenaphthylene		10 ug/L	0.24 ug/L	30	
	Acenaphthene		10 ug/L	0.29 ug/L	30	70-104
	2,4-Dinitrotoluene		10 ug/L	0.28 ug/L	30	77-121
	2,6-Dinitrotoluene		10 ug/L	0.35 ug/L	30	
	Diethyl Phthalate		10 ug/L	0.29 ug/L	30	
	4-Chlorophenyl Phenyl Ether		10 ug/L	0.28 ug/L	30	
	Fluorene		10 ug/L	0.33 ug/L	30	
	4-Bromophenyl Phenyl Ether		10 ug/L	0.28 ug/L	30	
	Hexachlorobenzene		10 ug/L	0.63 ug/L	30	
	Phenanthrene		10 ug/L	0.50 ug/L	30	
	Anthracene		10 ug/L	0.62 ug/L	30	
	Di-*n*-butyl Phthalate		10 ug/L	0.37 ug/L	30	
	Fluoranthene		10 ug/L	0.66 ug/L	30	
	Benzidine		50 ug/L	8.8 ug/L	30	
	Pyrene		10 ug/L	0.74 ug/L	30	65-113
	Butyl Benzyl Phthalate		10 ug/L	0.47 ug/L	30	
	3,3'-Dichlorobenzidine		25 ug/L	0.27 ug/L	30	
	Benz(a)anthracene		10 ug/L	0.60 ug/L	30	
	Bis(2-ethylhexyl) Phthalate		10 ug/L	1.9 ug/L	30	
	Chrysene		10 ug/L	0.79 ug/L	30	
	Di-*n*-octyl Phthalate		10 ug/L	0.63 ug/L	30	
	Benzo(b)fluoranthene		10 ug/L	0.59 ug/L	30	
	Benzo(k)fluoranthene		10 ug/L	0.83 ug/L	30	
	Benzo(a)pyrene		10 ug/L	0.66 ug/L	30	
	Indeno(1,2,3-c,d)pyrene		10 ug/L	0.69 ug/L	30	
	Dibenz(a,h)anthracene		10 ug/L	0.76 ug/L	30	
	Benzo(g,h,i)perylene		10 ug/L	0.82 ug/L	30	
	Phenol		10 ug/L	0.33 ug/L	30	48-101
	2-Chlorophenol		10 ug/L	0.32 ug/L	30	60-100
	2-Nitrophenol		10 ug/L	0.38 ug/L	30	
	2,4-Dimethylphenol		10 ug/L	0.27 ug/L	30	
	2,4-Dichlorophenol		10 ug/L	0.30 ug/L	30	
	4-Chloro-3-methylphenol		10 ug/L	0.49 ug/L	30	50-120
	2,4,6-Trichlorophenol		10 ug/L	0.21 ug/L	30	
	2,4-Dinitrophenol		25 ug/L	2.3 ug/L	30	
	4-Nitrophenol		25 ug/L	2.0 ug/L	30	49-123
	2-Methyl-4,6-dinitrophenol		25 ug/L	2.2 ug/L	30	
	Pentachlorophenol		25 ug/L	2.5 ug/L	30	50-122
	2-Fluorophenol[g]		NA	NA	NA	27-107
	Phenol-D6[g]		NA	NA	NA	22-126
	2,4,6-Tribromophenol[g]		NA	NA	NA	42-127
	Nitrobenzene-D5[g]		NA	NA	NA	37-119
	2-Fluorobiphenyl[g]		NA	NA	NA	27-119
	Terphenyl-D14[g]		NA	NA	NA	10-174

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
1653 Chlorinated Phenolics	4-Chlorophenol	Water	1.25 ug/L	0.07 ug/L	NA	NA
	2,4-Dichlorophenol		2.5 ug/L	0.2 ug/L	NA	NA
	2,6-Dichlorophenol		2.5 ug/L	0.3 ug/L	NA	NA
	2,4,5-Trichlorophenol		2.5 ug/L	0.07 ug/L	NA	NA
	2,4,6-Trichlorophenol		2.5 ug/L	0.08 ug/L	NA	NA
	2,3,4,6-Tetrachlorophenol		2.5 ug/L	0.1 ug/L	NA	NA
	Pentachlorophenol		5 ug/L	0.3 ug/L	NA	NA
	4-Chloroguaiacol		1.25 ug/L	0.04 ug/L	NA	NA
	3,4-Dichloroguaiacol		2.5 ug/L	0.2 ug/L	NA	NA
	4,5-Dichloroguaiacol		2.5 ug/L	0.08 ug/L	NA	NA
	4,6-Dichloroguaiacol		2.5 ug/L	0.2 ug/L	NA	NA
	3,4,5-Trichloroguaiacol		2.5 ug/L	0.08 ug/L	NA	NA
	3,4,6-Trichloroguaiacol		2.5 ug/L	0.06 ug/L	NA	NA
	4,5,6-Trichloroguaiacol		2.5 ug/L	0.07 ug/L	NA	NA
	Tetrachloroguaiacol		5 ug/L	0.2 ug/L	NA	NA
	4-Chlorocatechol		1.25 ug/L	0.05 ug/L	NA	NA
	3,4-Dichlorocatechol		2.5 ug/L	0.08 ug/L	NA	NA
	3,6-Dichlorocatechol		2.5 ug/L	0.06 ug/L	NA	NA
	4,5-Dichlorocatechol		2.5 ug/L	0.09 ug/L	NA	NA
	3,4,5-Trichlorocatechol		5 ug/L	0.2 ug/L	NA	NA
	3,4,6-Trichlorocatechol		5 ug/L	0.2 ug/L	NA	NA
	Tetrachlorocatechol		5 ug/L	0.3 ug/L	NA	NA
	5-Chlorovanillin		2.5 ug/L	0.04 ug/L	NA	NA
	6-Chlorovanillin		2.5 ug/L	0.2 ug/L	NA	NA
	5,6-Dichlorovanillin		5 ug/L	0.2 ug/L	NA	NA
	2-Chlorosyringaldehyde		2.5 ug/L	0.3 ug/L	NA	NA
	2,6-Dichlorosyringaldehyde		5 ug/L	0.4 ug/L	NA	NA
	Trichlorosyringol		2.5 ug/L	0.1 ug/L	NA	NA
	2,4-Dichlorophenol-D3[e]		NA	NA	NA	27-143[d]
	4-Chloroguaiacol-$^{13}C_6$[g]		NA	NA	NA	43-168[d]
	3,4,5-Trichlorophenol[g]		NA	NA	NA	24-167[d]
	5-Chlorovanillin-$^{13}C_6$[g]		NA	NA	NA	32-254[d]
	4,5-Dichlorocatechol-$^{13}C_6$[g]		NA	NA	NA	D-190[d]
	4,5,6-Trichloroguaiacol-$^{13}C_6$[g]		NA	NA	NA	51-139[d]
	Pentachlorophenol-$^{13}C_6$[g]		NA	NA	NA	27-167[d]
	Tetrachloroguaiacol-$^{13}C_6$[g]		NA	NA	NA	27-161[d]
	Tetrachlorocatechol-$^{13}C_6$[g]		NA	NA	NA	D-184[d]
8015B	Ethylene Glycol	Water	5 mg/L	1.2 mg/L	30	45-148
	Propylene Glycol		5 mg/L	1.8 mg/L	30	49-147
	Isopropyl Ether		1.0 ug/L	0.32 ug/L	30	84-121
	Cyclohexanol[g]		NA	NA	NA	50-161
	2,3-Butylene Glycol[g]		NA	NA	NA	58-163
8081A Chlorinated Pesticides	alpha-BHC	Soil	5 ug/Kg	0.40 ug/Kg	40	
	gamma-BHC (Lindane)		5 ug/Kg	1.2 ug/Kg	40	63-137
	beta-BHC		5 ug/Kg	0.59 ug/Kg	40	
	Heptachlor		5 ug/Kg	0.88 ug/Kg	40	61-123
	delta-BHC		5 ug/Kg	0.45 ug/Kg	40	
	gamma-Chlordane		5 ug/Kg	0.44 ug/Kg	40	
	alpha-Chlordane		5 ug/Kg	0.33 ug/Kg	40	

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
8081A Chlorinated Pesticides	Aldrin	Soil	5 ug/Kg	0.69 ug/Kg	40	59-127
	Heptachlor Epoxide		5 ug/Kg	0.55 ug/Kg	40	
	Endosulfan I		5 ug/Kg	0.62 ug/Kg	40	
	4,4'-DDE		5 ug/Kg	0.63 ug/Kg	40	
	Dieldrin		5 ug/Kg	0.48 ug/Kg	40	68-131
	Endrin		5 ug/Kg	1.2 ug/Kg	40	72-133
	4,4'-DDD		5 ug/Kg	1.9 ug/Kg	40	
	Endosulfan II		5 ug/Kg	2.5 ug/Kg	40	
	4,4'-DDT		5 ug/Kg	0.67 ug/Kg	40	68-144
	Endrin Aldehyde		5 ug/Kg	0.46 ug/Kg	40	
	Endosulfan Sulfate		5 ug/Kg	0.93 ug/Kg	40	
	Methoxychlor		5 ug/Kg	0.19 ug/Kg	40	
	Toxaphene		250 ug/Kg	38 ug/Kg	40	
	Tetrachloro-*m* -xylene[g]		NA	NA	NA	39-129
	Decachlorobiphenyl[g]		NA	NA	NA	29-141
8081A Chlorinated Pesticides	alpha-BHC	Water	0.01 ug/L	0.003 ug/L	30	
	gamma-BHC (Lindane)		0.01 ug/L	0.003 ug/L	30	59-130
	beta-BHC		0.01 ug/L	0.003 ug/L	30	
	Heptachlor		0.01 ug/L	0.005 ug/L	30	39-120
	delta-BHC		0.01 ug/L	0.002 ug/L	30	
	gamma-Chlordane		0.01 ug/L	0.003 ug/L	30	
	alpha-Chlordane		0.01 ug/L	0.002 ug/L	30	
	Aldrin		0.01 ug/L	0.004 ug/L	30	38-121
	Heptachlor Epoxide		0.01 ug/L	0.005 ug/L	30	
	Endosulfan I		0.01 ug/L	0.002 ug/L	30	
	4,4'-DDE		0.01 ug/L	0.003 ug/L	30	
	Dieldrin		0.01 ug/L	0.004 ug/L	30	64-126
	Endrin		0.01 ug/L	0.003 ug/L	30	63-128
	4,4'-DDD		0.01 ug/L	0.004 ug/L	30	
	Endosulfan II		0.01 ug/L	0.003 ug/L	30	
	4,4'-DDT		0.01 ug/L	0.005 ug/L	30	47-157
	Endrin Aldehyde		0.01 ug/L	0.003 ug/L	30	
	Endosulfan Sulfate		0.01 ug/L	0.003 ug/L	30	
	Methoxychlor		0.01 ug/L	0.004 ug/L	30	
	Toxaphene		0.5 ug/L	0.05 ug/L	30	
	Tetrachloro-*m* -xylene[g]		NA	NA	NA	17-128
	Decachlorobiphenyl[g]		NA	NA	NA	10-136
8082 PCBs	Aroclor 1016	Soil	0.1 mg/Kg	0.04 mg/Kg	40	47-138
	Aroclor 1221		0.2 mg/Kg	0.01 mg/Kg	40	
	Aroclor 1232		0.1 mg/Kg	0.02 mg/Kg	40	
	Aroclor 1242		0.1 mg/Kg	0.01 mg/Kg	40	
	Aroclor 1248		0.1 mg/Kg	0.01 mg/Kg	40	
	Aroclor 1254		0.1 mg/Kg	0.01 mg/Kg	40	
	Aroclor 1260		0.1 mg/Kg	0.01 mg/Kg	40	48-149
	Decachlorobiphenyl[g]		NA	NA	NA	40-145
8082 PCBs	Aroclor 1016	Water	0.2 ug/L	0.10 ug/L	30	46-143
	Aroclor 1221		0.4 ug/L	0.05 ug/L	30	
	Aroclor 1232		0.2 ug/L	0.09 ug/L	30	
	Aroclor 1242		0.2 ug/L	0.06 ug/L	30	
	Aroclor 1248		0.2 ug/L	0.04 ug/L	30	
8082 PCBs	Aroclor 1254	Water	0.2 ug/L	0.03 ug/L	30	
	Aroclor 1260		0.2 ug/L	0.05 ug/L	30	50-139
	Decachlorobiphenyl[g]		NA	NA	NA	10-147

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
8082 PCB Congeners	2,4'-Dichlorobiphenyl (PCB 8)	Soil	0.5 ug/Kg	0.11 ug/Kg	40	35-146
	2,2',5-Trichlorobiphenyl (PCB 18)		0.5 ug/Kg	0.06 ug/Kg	40	
	2,4,4'-Trichlorobiphenyl (PCB 28)		0.5 ug/Kg	0.08 ug/Kg	40	34-151
	2,2',3,5'-Tetrachlorobiphenyl (PCB 44)		0.5 ug/Kg	0.06 ug/Kg	40	
	2,2',5,5'-Tetrachlorobiphenyl (PCB 52)		0.5 ug/Kg	0.11 ug/Kg	40	38-141
	2,3',4,4'-Tetrachlorobiphenyl (PCB 66)		0.5 ug/Kg	0.12 ug/Kg	40	39-136
	3,3',4,4'-Tetrachlorobiphenyl (PCB 77)		0.5 ug/Kg	0.05 ug/Kg	40	46-141
	2,2',3,4,5'-Pentachlorobiphenyl (PCB 87)		0.5 ug/Kg	0.08 ug/Kg	40	
	2,2',3,4',5-Pentachlorobiphenyl (PCB 90)		0.5 ug/Kg	0.08 ug/Kg	40	45-153
	2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)		0.5 ug/Kg	0.04 ug/Kg	40	
	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)		0.5 ug/Kg	0.10 ug/Kg	40	38-157
	2,3,4,4',5-Pentachlorobiphenyl (PCB 114)		0.5 ug/Kg	0.40 ug/Kg	40	
	2,3',4,4',5-Pentachlorobiphenyl (PCB 118)		0.5 ug/Kg	0.05 ug/Kg	40	
	2',3,4,4',5-Pentachlorobiphenyl (PCB 123)		0.5 ug/Kg	0.08 ug/Kg	40	
	3,3',4,4',5-Pentachlorobiphenyl (PCB 126)		0.5 ug/Kg	0.14 ug/Kg	40	
	2,2',3,3',4,4'-Hexachlorobiphenyl (PCB 128)		0.5 ug/Kg	0.29 ug/Kg	40	
	2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)		0.5 ug/Kg	0.05 ug/Kg	40	
	2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)		0.5 ug/Kg	0.11 ug/Kg	40	
	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)		0.5 ug/Kg	0.10 ug/Kg	40	38-159
	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)		0.5 ug/Kg	0.20 ug/Kg	40	
	2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)		0.5 ug/Kg	0.33 ug/Kg	40	
	3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)		0.5 ug/Kg	0.14 ug/Kg	40	
	2,2',3,3',4,4',5-Heptachlorobiphenyl (PCB 170)		0.5 ug/Kg	0.07 ug/Kg	40	
	2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)		0.5 ug/Kg	0.04 ug/Kg	40	39-158
	2,2',3,4,4',5',6-Heptachlorobiphenyl (PCB 183)		0.5 ug/Kg	0.09 ug/Kg	40	35-154
	2,2',3,4,4',6,6'-Heptachlorobiphenyl(PCB184)		0.5 ug/Kg	0.05 ug/Kg	40	27-174
	2,2',3,4',5,5',6-Heptachlorobiphenyl (PCB187)		0.5 ug/Kg	0.14 ug/Kg	40	
	2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB189)		0.5 ug/Kg	0.10 ug/Kg	40	39-159
	2,2',3,3',4,4',5,6-Octachlorobiphenyl (PCB195)		0.5 ug/Kg	0.14 ug/Kg	40	
	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (PCB206)		0.5 ug/Kg	0.10 ug/Kg	40	
	Decachlorobiphenyl (PCB 209)		0.5 ug/Kg	0.06 ug/Kg	40	36-151
	Tetrachloro-*m*-xylene[e]		NA	NA	NA	10-128
8082 PCB Congeners	2,4'-Dichlorobiphenyl (PCB 8)	Water	5 ng/L	1.4 ng/L	30	70-130[d]
	2,2',5-Trichlorobiphenyl (PCB 18)		5 ng/L	1.1 ng/L	30	
	2,4,4'-Trichlorobiphenyl (PCB 28)		5 ng/L	1.1 ng/L	30	70-130[d]
	2,2',3,5'-Tetrachlorobiphenyl (PCB 44)		5 ng/L	1.3 ng/L	30	
	2,2',5,5'-Tetrachlorobiphenyl (PCB 52)		5 ng/L	0.94 ng/L	30	70-130[d]
	2,3',4,4'-Tetrachlorobiphenyl (PCB 66)		5 ng/L	0.79 ng/L	30	70-130[d]
	3,3',4,4'-Tetrachlorobiphenyl (PCB 77)		5 ng/L	1.1 ng/L	30	70-130[d]
	2,2',3,4,5'-Pentachlorobiphenyl (PCB 87)		5 ng/L	1.2 ng/L	30	
	2,2',3,4',5-Pentachlorobiphenyl (PCB 90)		5 ng/L	0.74 ng/L	30	70-130[d]
	2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)		5 ng/L	0.67 ng/L	30	
	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)		5 ng/L	1.1 ng/L	30	70-130[d]
	2,3,4,4',5-Pentachlorobiphenyl (PCB 114)		5 ng/L	0.59 ng/L	30	
	2,3',4,4',5-Pentachlorobiphenyl (PCB 118)		5 ng/L	0.84 ng/L	30	

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
8082 PCB Congeners	2',3,4,4',5-Pentachlorobiphenyl (PCB 123)	Water	5 ng/L	0.62 ng/L	30	
	3,3',4,4',5-Pentachlorobiphenyl (PCB 126)		5 ng/L	0.95 ng/L	30	
	2,2',3,3',4,4'-Hexachlorobiphenyl (PCB 128)		5 ng/L	1.3 ng/L	30	
	2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)		5 ng/L	0.66 ng/L	30	
	2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)		5 ng/L	0.47 ng/L	30	
	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)		5 ng/L	0.90 ng/L	30	70-130[d]
	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)		5 ng/L	1.0 ng/L	30	
	2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)		5 ng/L	1.1 ng/L	30	
	3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)		5 ng/L	1.1 ng/L	30	
	2,2',3,3',4,4',5-Heptachlorobiphenyl (PCB 170)		5 ng/L	0.81 ng/L	30	
	2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)		5 ng/L	0.56 ng/L	30	70-130[d]
	2,2',3,4,4',5',6-Heptachlorobiphenyl (PCB 183)		5 ng/L	0.65 ng/L	30	70-130[d]
	2,2',3,4,4',6,6'-Heptachlorobiphenyl (PCB 184)		5 ng/L	0.54 ng/L	30	70-130[d]
	2,2',3,4',5,5',6-Heptachlorobiphenyl (PCB 187)		5 ng/L	0.51 ng/L	30	
	2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)		5 ng/L	0.63 ng/L	30	70-130[d]
	2,2',3,3',4,4',5,6-Octachlorobiphenyl (PCB 195)		5 ng/L	0.63 ng/L	30	
	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (PCB 206)		5 ng/L	0.58 ng/L	30	
	Decachlorobiphenyl (PCB 209)		5 ng/L	0.41 ng/L	30	70-130[d]
	Tetrachloro-*m*-xylene[g]		NA	NA	NA	10-125
8141A Organo-phosphorus Pesticides	Azinphos Methyl	Soil	0.05 mg/Kg	0.01 mg/Kg	40	
	Bolstar		0.05 mg/Kg	0.01 mg/Kg	40	35-131
	Chlorpyrifos		0.05 mg/Kg	0.01 mg/Kg	40	47-120
	Coumaphos		0.1 mg/Kg	0.01 mg/Kg	40	
	Demeton-O and Demeton-S[h]		0.1 mg/Kg	0.02 mg/Kg	40	
	Diazinon		0.05 mg/Kg	0.01 mg/Kg	40	
	Dichlorvos		0.05 mg/Kg	0.02 mg/Kg	40	
	Dimethoate		0.05 mg/Kg	0.01 mg/Kg	40	
	Disulfoton		0.05 mg/Kg	0.01 mg/Kg	40	10-129
	EPN		0.05 mg/Kg	0.01 mg/Kg	40	
	Ethoprop		0.05 mg/Kg	0.02 mg/Kg	40	
	Ethyl Parathion		0.05 mg/Kg	0.01 mg/Kg	40	
	Fensulfothion		0.05 mg/Kg	0.02 mg/Kg	40	44-149
	Fenthion		0.05 mg/Kg	0.01 mg/Kg	40	
	Merphos		0.05 mg/Kg	0.01 mg/Kg	40	
	Mevinphos		0.05 mg/Kg	0.02 mg/Kg	40	
	Parathion Methyl		0.05 mg/Kg	0.01 mg/Kg	40	43-125
	Phorate		0.05 mg/Kg	0.01 mg/Kg	40	
	Ronnel		0.05 mg/Kg	0.01 mg/Kg	40	42-119
	Stirophos		0.05 mg/Kg	0.01 mg/Kg	40	
	Sulfotepp		0.05 mg/Kg	0.01 mg/Kg	40	
	Tokuthion (Prothiofos)		0.05 mg/Kg	0.01 mg/Kg	40	
	Trichloronate		0.05 mg/Kg	0.01 mg/Kg	40	
	Malathion		0.05 mg/Kg	0.01 mg/Kg	40	
	Triphenyl Phosphate[g]		NA	NA	NA	35-122
8141A Organo-phosphorus Pesticides	Azinphos Methyl	Water	1 ug/L	0.05 ug/L	30	
	Bolstar		0.5 ug/L	0.15 ug/L	30	10-154
	Chlorpyrifos		0.2 ug/L	0.06 ug/L	30	53-117
	Coumaphos		1 ug/L	0.05 ug/L	30	
	Demeton-O and Demeton-S[h]		2 ug/L	1.75 ug/L	30	

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision[b] (RPD)**	**Accuracy[c] (%REC)**
8141A Organo-phosphorus Pesticides	Diazinon	Water	0.2 ug/L	0.04 ug/L	30	
	Dichlorvos		0.5 ug/L	0.07 ug/L	30	
	Dimethoate		0.5 ug/L	0.06 ug/L	40	
	Disulfoton		1 ug/L	0.23 ug/L	30	10-121
	EPN		0.2 ug/L	0.04 ug/L	40	
	Ethoprop		0.2 ug/L	0.08 ug/L	30	
	Ethyl Parathion		0.5 ug/L	0.04 ug/L	40	
	Fensulfothion		0.5 ug/L	0.05 ug/L	30	46-152
	Fenthion		0.5 ug/L	0.14 ug/L	30	
	Merphos		0.2 ug/L	0.05 ug/L	30	
	Mevinphos		0.5 ug/L	0.05 ug/L	30	
	Parathion Methyl		0.5 ug/L	0.05 ug/L	30	60-118
	Phorate		0.5 ug/L	0.12 ug/L	30	
	Ronnel		0.2 ug/L	0.04 ug/L	30	62-110
	Stirophos		0.2 ug/L	0.06 ug/L	30	
	Sulfotepp		0.2 ug/L	0.04 ug/L	40	
	Tokuthion (Prothiofos)		0.2 ug/L	0.04 ug/L	30	
	Trichloronate		0.2 ug/L	0.06 ug/L	30	
	Malathion		0.2 ug/L	0.05 ug/L	30	
	Triphenyl Phosphate[g]		NA	NA	NA	23-139
8151A Chlorinated Herbicides	Dalapon	Soil	50 ug/Kg	7.0 ug/Kg	40	
	Dicamba		50 ug/Kg	5.4 ug/Kg	40	
	MCPA		10 mg/Kg	0.52 mg/Kg	40	
	MCPP		10 mg/Kg	0.53 mg/Kg	40	
	Dichloroprop		50 ug/Kg	9.5 ug/Kg	40	
	2,4-D		50 ug/Kg	8.0 ug/Kg	40	30-148
	2,4,5-TP (Silvex)		50 ug/Kg	3.9 ug/Kg	40	36-150
	2,4,5-T		50 ug/Kg	5.9 ug/Kg	40	38-161
	2,4-DB		50 ug/Kg	9.7 ug/Kg	40	
	Dinoseb		50 ug/Kg	3.5 ug/Kg	40	
	2,4-Dichlorophenylacetic Acid[g]		NA	NA	NA	19-151
8151A Chlorinated Herbicides	Dalapon	Water	0.4 ug/L	0.06 ug/L	30	
	Dicamba		0.4 ug/L	0.08 ug/L	30	
	MCPA		100 ug/L	24 ug/L	30	
	MCPP		100 ug/L	23 ug/L	30	
	Dichloroprop		0.4 ug/L	0.07 ug/L	30	
	2,4-D		0.4 ug/L	0.08 ug/L	30	24-139
	2,4,5-TP (Silvex)		0.2 ug/L	0.09 ug/L	30	17-139
	2,4,5-T		0.2 ug/L	0.17 ug/L	30	14-118
	2,4-DB		0.4 ug/L	0.13 ug/L	30	
	Dinoseb		0.2 ug/L	0.10 ug/L	30	
	2,4-Dichlorophenylacetic Acid[g]		NA	NA	NA	15-126
8151M Chlorinated Phenols	2,4,6-Trichlorophenol	Soil	5 ug/Kg	0.7 ug/Kg	40	48-93
	2,3,4,5 -Tetrachlorophenol		10 ug/Kg	3 ug/Kg	40	50-111
	2,3,5,6 -Tetrachlorophenol		10 ug/Kg	4 ug/Kg	40	57-115
	Pentachlorophenol		5 ug/Kg	2 ug/Kg	40	55-110
	4-Bromo-2,6-dichlorophenol[g]		NA	NA	NA	21-145

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision** [b] **(RPD)**	**Accuracy** [c] **(%REC)**
8151M Chlorinated Phenols	2,4,6-Trichlorophenol	Water	0.5 ug/L	0.03 ug/L	30	27-87
	2,3,4,5 -Tetrachlorophenol		0.5 ug/L	0.2 ug/L	30	34-107
	2,3,5,6 -Tetrachlorophenol		0.5 ug/L	0.2 ug/L	30	43-102
	Pentachlorophenol		0.5 ug/L	0.06 ug/L	30	43-107
	4-Bromo-2,6-dichlorophenol[g]		NA	NA	NA	32-124
8270C Base Neutral Acid Extractables	*N*-Nitrosodimethylamine	Soil	2 mg/Kg	0.03 mg/Kg	40	
	Aniline		1 mg/Kg	0.03 mg/Kg	40	
	Bis(2-chloroethyl) Ether		0.33 mg/Kg	0.02 mg/Kg	40	
	1,2-Dichlorobenzene		0.33 mg/Kg	0.02 mg/Kg	40	
	1,3-Dichlorobenzene		0.33 mg/Kg	0.02 mg/Kg	40	
	1,4-Dichlorobenzene		0.33 mg/Kg	0.02 mg/Kg	40	43-91
	Bis(2-chloroisopropyl) Ether		0.33 mg/Kg	0.02 mg/Kg	40	
	N-Nitrosodi-*n* -propylamine		0.33 mg/Kg	0.02 mg/Kg	40	46-104
	Hexachloroethane		0.33 mg/Kg	0.03 mg/Kg	40	
	Nitrobenzene		0.33 mg/Kg	0.03 mg/Kg	40	
	Isophorone		0.33 mg/Kg	0.02 mg/Kg	40	
	Bis(2-chloroethoxy)methane		0.33 mg/Kg	0.02 mg/Kg	40	
	1,2,4-Trichlorobenzene		0.33 mg/Kg	0.02 mg/Kg	40	48-93
	Naphthalene		0.33 mg/Kg	0.02 mg/Kg	40	
	4-Chloroaniline		0.33 mg/Kg	0.02 mg/Kg	40	
	Hexachlorobutadiene		0.33 mg/Kg	0.02 mg/Kg	40	
	2-Methylnaphthalene		0.33 mg/Kg	0.02 mg/Kg	40	
	Hexachlorocyclopentadiene		0.33 mg/Kg	0.02 mg/Kg	40	
	2-Chloronaphthalene		0.33 mg/Kg	0.01 mg/Kg	40	
	2-Nitroaniline		2 mg/Kg	0.02 mg/Kg	40	
	Dimethyl Phthalate		0.33 mg/Kg	0.02 mg/Kg	40	
	Acenaphthylene		0.33 mg/Kg	0.02 mg/Kg	40	
	3-Nitroaniline		2 mg/Kg	0.18 mg/Kg	40	
	Acenaphthene		0.33 mg/Kg	0.02 mg/Kg	40	54-97
	Dibenzofuran		0.33 mg/Kg	0.02 mg/Kg	40	
	2,4-Dinitrotoluene		0.33 mg/Kg	0.02 mg/Kg	40	60-120
	2,6-Dinitrotoluene		0.33 mg/Kg	0.02 mg/Kg	40	
	Diethyl Phthalate		0.33 mg/Kg	0.02 mg/Kg	40	
	4-Chlorophenyl Phenyl Ether		0.33 mg/Kg	0.02 mg/Kg	40	
	Fluorene		0.33 mg/Kg	0.02 mg/Kg	40	
	4-Nitroaniline		2 mg/Kg	0.18 mg/Kg	40	
	N-Nitrosodiphenylamine		0.33 mg/Kg	0.02 mg/Kg	40	
	4-Bromophenyl Phenyl Ether		0.33 mg/Kg	0.02 mg/Kg	40	
	Hexachlorobenzene		0.33 mg/Kg	0.02 mg/Kg	40	
	Phenanthrene		0.33 mg/Kg	0.01 mg/Kg	40	
	Anthracene		0.33 mg/Kg	0.02 mg/Kg	40	
	Di-*n* -butyl Phthalate		0.33 mg/Kg	0.02 mg/Kg	40	
	Fluoranthene		0.33 mg/Kg	0.02 mg/Kg	40	
	Pyrene		0.33 mg/Kg	0.02 mg/Kg	40	54-103
	Butyl Benzyl Phthalate		0.33 mg/Kg	0.02 mg/Kg	40	
	3,3'-Dichlorobenzidine		2 mg/Kg	0.03 mg/Kg	40	
	Benz(a)anthracene		0.33 mg/Kg	0.02 mg/Kg	40	
	Bis(2-ethylhexyl) Phthalate		0.33 mg/Kg	0.02 mg/Kg	40	
	Chrysene		0.33 mg/Kg	0.02 mg/Kg	40	
	Di-*n* -octyl Phthalate		0.33 mg/Kg	0.03 mg/Kg	40	

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
8270C Base Neutral Acid Extractables	Benzo(b)fluoranthene	Soil	0.33 mg/Kg	0.02 mg/Kg	40	
	Benzo(k)fluoranthene		0.33 mg/Kg	0.02 mg/Kg	40	
	Benzo(a)pyrene		0.33 mg/Kg	0.02 mg/Kg	40	
	Indeno(1,2,3-cd)pyrene		0.33 mg/Kg	0.04 mg/Kg	40	
	Dibenz(a,h)anthracene		0.33 mg/Kg	0.03 mg/Kg	40	
	Benzo(g,h,i)perylene		0.33 mg/Kg	0.03 mg/Kg	40	
	Phenol		0.33 mg/Kg	0.02 mg/Kg	40	45-90
	2-Chlorophenol		0.33 mg/Kg	0.01 mg/Kg	40	44-93
	Benzyl Alcohol		0.33 mg/Kg	0.02 mg/Kg	40	
	2-Methylphenol		0.33 mg/Kg	0.02 mg/Kg	40	
	3- and 4-Methylphenol[6]		0.33 mg/Kg	0.02 mg/Kg	40	
	2-Nitrophenol		0.33 mg/Kg	0.02 mg/Kg	40	
	2,4-Dimethylphenol		0.33 mg/Kg	0.02 mg/Kg	40	
	Benzoic Acid		2 mg/Kg	0.14 mg/Kg	40	
	2,4-Dichlorophenol		0.33 mg/Kg	0.02 mg/Kg	40	
	4-Chloro-3-methylphenol		0.33 mg/Kg	0.02 mg/Kg	40	52-102
	2,4,6-Trichlorophenol		0.33 mg/Kg	0.02 mg/Kg	40	
	2,4,5-Trichlorophenol		0.33 mg/Kg	0.02 mg/Kg	40	
	2,4-Dinitrophenol		2 mg/Kg	0.12 mg/Kg	40	
	4-Nitrophenol		2 mg/Kg	0.15 mg/Kg	40	42-107
	2-Methyl-4,6-dinitrophenol		2 mg/Kg	0.15 mg/Kg	40	
	Pentachlorophenol		2 mg/Kg	0.13 mg/Kg	40	46-112
Additional Non-routine Analytes (Appendix I, II, IX, Etc.)						
8270C Base Neutral Acid Extractables	2-Picoline	Soil	0.67 mg/Kg			
	N-Nitrosodiethylamine		0.33 mg/Kg			
	Methyl Methanesulfonate		0.33 mg/Kg			
	N-Nitrosomethylethylamine		0.33 mg/Kg			
	Pentachloroethane		1 mg/Kg			
	Acetophenone		0.33 mg/Kg	0.02 mg/Kg		
	N-Nitrosopyrrolidine		0.33 mg/Kg			
	N-Nitrosomorpholine		0.33 mg/Kg			
	N-Nitrosopiperidine		0.33 mg/Kg			
	O,O,O-Triethyl Phosphorothioate		0.33 mg/Kg			
	2,6-Dichlorophenol		0.33 mg/Kg			
	Hexachloropropene		0.33 mg/Kg			
	N-Nitrosodi-n-butylamine		0.33 mg/Kg			
	p-Phenylenediamine		2 mg/Kg	1.2 mg/Kg		
	Safrole		0.33 mg/Kg			
	1,2,4,5-Tetrachlorobenzene		0.33 mg/Kg			
	Isosafrole		0.67 mg/Kg			
	1,3-Dinitrobenzene		0.33 mg/Kg			
	Pentachlorobenzene		0.33 mg/Kg			
	1-Naphthylamine		0.33 mg/Kg			
	2-Naphthylamine		0.33 mg/Kg			
	2,3,4,6-Tetrachlorophenol		2 mg/Kg	0.04 mg/Kg		
	Diphenylamine		0.33 mg/Kg			
	1,3,5-Trinitrobenzene		0.67 mg/Kg	0.05 mg/Kg		
	Phenacetin		2 mg/Kg			
	4-Aminobiphenyl		0.33 mg/Kg			
	4-Nitroquinoline N-Oxide		3 mg/Kg	0.04 mg/Kg		

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
8270C Base Neutral Acid Extractables	Aramite, Total	Soil	2 mg/Kg	0.04 mg/Kg		
	3,3'-Dimethylbenzidine		2 mg/Kg	1.1 mg/Kg		
	7,12-Dimethylbenz(a)anthracene		0.33 mg/Kg			
	Hexachlorophene		5 mg/Kg	2.8 mg/Kg		
	3-Methylcholanthrene		0.33 mg/Kg			
	a,a-Dimethylphenethylamine		1 mg/Kg			
	2-Acetylaminofluorene		4 mg/Kg			
	o-Toluidine		0.33 mg/Kg			
	Ethyl methanesulfonate		0.33 mg/Kg			
	1,4-Naphthoquinone		0.33 mg/Kg			
	5-Nitro-o-toluidine		0.33 mg/Kg			
	p-Dimethylaminoazobenzene		0.33 mg/Kg			
	Pentachloronitrobenzene		2 mg/Kg			
	Methapyrilene		1 mg/Kg			
	Chlorobenzilate		0.33 mg/Kg			
	1,2-Diphenylhydrazine		0.33 mg/Kg			
	1,4-Dichlorobutane		0.33 mg/Kg			
	1-Chloronaphthalen		0.33 mg/Kg			
	1-Methylnaphthalene		0.33 mg/Kg			
	Biphenyl		0.33 mg/Kg	0.01 mg/Kg		
	Atrazine		0.33 mg/Kg	0.02 mg/Kg		
	Benzidine		2 mg/Kg	0.34 mg/Kg		
	Carbazole		0.33 mg/Kg	0.02 mg/Kg		
	Diallate		0.33 mg/Kg			
	Dicyclopentadiene		0.33 mg/Kg	0.2 mg/Kg		
	Dimethoate		0.33 mg/Kg			
	Dinoseb		0.33 mg/Kg	0.07 mg/Kg		
	Disulfoton		0.33 mg/Kg			
	Famphur		4 mg/Kg	0.05 mg/Kg		
	Isodrin		0.33 mg/Kg			
	Kepone		4 mg/Kg	0.41 mg/Kg		
	Malathion		1 mg/Kg			
	Methyl Parathion		0.33 mg/Kg			
	Parathion		0.33 mg/Kg			
	Phorate		0.33 mg/Kg			
	Pronamide		0.33 mg/Kg	0.01 mg/Kg		
	Pyridine		0.33 mg/Kg	0.04 mg/Kg		
	Sulfotepp		0.33 mg/Kg	0.02 mg/Kg		
	Thionazin		2 mg/Kg			
	2-Fluorophenol[g]		NA	NA	NA	26-86
	Phenol-D6[g]		NA	NA	NA	29-100
	2,4,6-Tribromophenol[g]		NA	NA	NA	33-106
	Nitrobenzene-D5[g]		NA	NA	NA	31-102
	2-Fluorobiphenyl[g]		NA	NA	NA	26-104
	Terphenyl-D14[g]		NA	NA	NA	46-135
8270C Base Neutral Acid Extractables	*N*-Nitrosodimethylamine	Water	25 ug/L	0.48 ug/L	30	
	Pyridine		25 ug/L	0.83 ug/L	30	
	Aniline		25 ug/L	0.49 ug/L	30	
	Bis(2-chloroethyl) Ether		10 ug/L	0.34 ug/L	30	

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
8270C Base Neutral Acid Extractables	1,2-Dichlorobenzene	Water	10 ug/L	0.44 ug/L	30	
	1,3-Dichlorobenzene		10 ug/L	0.36 ug/L	30	
	1,4-Dichlorobenzene		10 ug/L	0.32 ug/L	30	45-92
	Bis(2-chloroisopropyl) Ether		10 ug/L	0.32 ug/L	30	
	N-Nitrosodi-*n*-propylamine		10 ug/L	0.50 ug/L	30	61-106
	Hexachloroethane		10 ug/L	0.29 ug/L	30	
	Nitrobenzene		10 ug/L	0.57 ug/L	30	
	Isophorone		10 ug/L	0.25 ug/L	30	
	Bis(2-chloroethoxy)methane		10 ug/L	0.28 ug/L	30	
	1,2,4-Trichlorobenzene		10 ug/L	0.36 ug/L	30	53-91
	Naphthalene		10 ug/L	0.37 ug/L	30	
	4-Chloroaniline		10 ug/L	0.38 ug/L	30	
	Hexachlorobutadiene		10 ug/L	0.29 ug/L	30	
	2-Methylnaphthalene		10 ug/L	0.24 ug/L	30	
	Hexachlorocyclopentadiene		10 ug/L	1.3 ug/L	30	
	2-Chloronaphthalene		10 ug/L	0.29 ug/L	30	
	2-Nitroaniline		25 ug/L	0.34 ug/L	30	
	Dimethyl Phthalate		10 ug/L	0.26 ug/L	30	
	Acenaphthylene		10 ug/L	0.24 ug/L	30	
	3-Nitroaniline		25 ug/L	3.3 ug/L	30	
	Acenaphthene		10 ug/L	0.29 ug/L	30	55-106
	Dibenzofuran		10 ug/L	0.33 ug/L	30	
	2,4-Dinitrotoluene		10 ug/L	0.28 ug/L	30	76-125
	2,6-Dinitrotoluene		10 ug/L	0.35 ug/L	30	
	Diethyl Phthalate		10 ug/L	0.29 ug/L	30	
	4-Chlorophenyl Phenyl Ether		10 ug/L	0.28 ug/L	30	
	Fluorene		10 ug/L	0.33 ug/L	30	
	4-Nitroaniline		25 ug/L	4.1 ug/L	30	
	N-Nitrosodiphenylamine		10 ug/L	0.48 ug/L	30	
	4-Bromophenyl Phenyl Ether		10 ug/L	0.28 ug/L	30	
	Hexachlorobenzene		10 ug/L	0.63 ug/L	30	
	Phenanthrene		10 ug/L	0.49 ug/L	30	
	Anthracene		10 ug/L	0.62 ug/L	30	
	Carbazole		10 ug/L	0.53 ug/L	30	
	Di-*n*-butyl Phthalate		10 ug/L	0.37 ug/L	30	
	Fluoranthene		10 ug/L	0.66 ug/L	30	
	Pyrene		10 ug/L	0.74 ug/L	30	53-112
	Butyl Benzyl Phthalate		10 ug/L	0.47 ug/L	30	
	3,3'-Dichlorobenzidine		25 ug/L	0.27 ug/L	30	
	Benz(a)anthracene		10 ug/L	0.60 ug/L	30	
	Bis(2-ethylhexyl) Phthalate		10 ug/L	1.9 ug/L	30	
	Chrysene		10 ug/L	0.79 ug/L	30	
	Di-*n*-octyl Phthalate		10 ug/L	0.63 ug/L	30	
	Benzo(b)fluoranthene		10 ug/L	0.59 ug/L	30	
	Benzo(k)fluoranthene		10 ug/L	0.83 ug/L	30	
	Benzo(a)pyrene		10 ug/L	0.66 ug/L	30	
	Indeno(1,2,3-cd)pyrene		10 ug/L	0.69 ug/L	30	
	Dibenz(a,h)anthracene		10 ug/L	0.76 ug/L	30	
	Benzo(g,h,i)perylene		10 ug/L	0.82 ug/L	30	
	Phenol		10 ug/L	0.33 ug/L	30	53-94

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision[b] (RPD)**	**Accuracy[c] (%REC)**
8270C Base Neutral Acid Extractables	2-Chlorophenol	Water	10 ug/L	0.32 ug/L	30	53-97
	Benzyl Alcohol		10 ug/L	0.38 ug/L	30	
	2-Methylphenol		10 ug/L	0.33 ug/L	30	
	3- and 4-Methylphenol[h]		10 ug/L	0.48 ug/L	30	
	2-Nitrophenol		10 ug/L	0.38 ug/L	30	
	2,4-Dimethylphenol		10 ug/L	0.27 ug/L	30	
	Benzoic Acid		25 ug/L	5.9 ug/L	30	
	2,4-Dichlorophenol		10 ug/L	0.30 ug/L	30	
	4-Chloro-3-methylphenol		10 ug/L	0.49 ug/L	30	71-102
	2,4,6-Trichlorophenol		10 ug/L	0.21 ug/L	30	
	2,4,5-Trichlorophenol		10 ug/L	0.39 ug/L	30	
	2,4-Dinitrophenol		25 ug/L	2.3 ug/L	30	
	4-Nitrophenol		25 ug/L	2.0 ug/L	30	56-115
	2-Methyl-4,6-dinitrophenol		25 ug/L	2.2 ug/L	30	
	Pentachlorophenol		25 ug/L	2.5 ug/L	30	65-112
Additional Non-routine Analytes (Appendix I, II, IX, Etc.)						
8270C Base Neutral Acid Extractables	2-Picoline	Water	20 ug/L	4.2 ug/L		
	N-Nitrosodiethylamine		10 ug/L			
	Methyl Methanesulfonate		10 ug/L			
	N-Nitrosomethylethylamine		10 ug/L			
	Pentachloroethane		25 ug/L			
	Acetophenone		10 ug/L	0.58 ug/L		
	N-Nitrosopyrrolidine		10 ug/L			
	N-Nitrosomorpholine		10 ug/L			
	N-Nitrosopiperidine		10 ug/L			
	O,O,O-Triethyl Phosphorothioate		10 ug/L			
	2,6-Dichlorophenol		10 ug/L			
	Hexachloropropene		10 ug/L			
	N-Nitrosodi-n-butylamine		10 ug/L			
	p-Phenylenediamine		100 ug/L			
	Safrole		10 ug/L			
	1,2,4,5-Tetrachlorobenzene		10 ug/L			
	Isosafrole		10 ug/L			
	1,3-Dinitrobenzene		10 ug/L			
	Pentachlorobenzene		10 ug/L			
	1-Naphthylamine		10 ug/L			
	2-Naphthylamine		10 ug/L			
	2,3,4,6-Tetrachlorophenol		10 ug/L			
	Diphenylamine		10 ug/L			
	1,3,5-Trinitrobenzene		25 ug/L	1.4 ug/L		
	Phenacetin		50 ug/L			
	4-Aminobiphenyl		10 ug/L			
	4-Nitroquinoline N-Oxide		100 ug/L	1.6 ug/L		
	Aramite, Total		50 ug/L	1.1 ug/L		
	3,3'-Dimethylbenzidine		10 ug/L	2.8 ug/L		
	7,12-Dimethylbenz(a)anthracene		10 ug/L			
	Hexachlorophene		150 ug/L			
	3-Methylcholanthrene		10 ug/L			
	a,a-Dimethylphenethylamine		25 ug/L			

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
8270C Base Neutral Acid Extractables	2-Acetylaminofluorene	Water	100 ug/L			
	o-Toluidine		10 ug/L			
	Ethyl methanesulfonate		10 ug/L			
	1,4-Naphthoquinone		10 ug/L			
	5-Nitro-o-toluidine		10 ug/L			
	p-Dimethylaminoazobenzene		10 ug/L			
	Pentachloronitrobenzene		50 ug/L			
	Methapyrilene		100 ug/L	15 ug/L		
	Chlorobenzilate		10 ug/L			
	1,2-Diphenylhydrazine		10 ug/L			
	1,4-Dichlorobutane		10 ug/L			
	1-Chloronaphthalen		10 ug/L			
	1-Methylnaphthalene		10 ug/L			
	Biphenyl		10 ug/L	0.4 ug/L		
	Atrazine		10 ug/L	0.5 ug/L		
	Benzidine		50 ug/L	8.8 ug/L		
	Carbazole		10 ug/L			
	Diallate		10 ug/L			
	Dicyclopentadiene		10 ug/L			
	Dimethoate		10 ug/L			
	Dinoseb		10 ug/L	1.8 ug/L		
	Disulfoton		10 ug/L			
	Famphur		10 ug/L	1.2 ug/L		
	Isodrin		10 ug/L			
	Kepone		10 ug/L	3.6 ug/L		
	Malathion		25 ug/L			
	Methyl Parathion		10 ug/L			
	Parathion		10 ug/L			
	Phorate		10 ug/L			
	Pronamide		10 ug/L	0.44 ug/L		
	Pyridine		25 ug/L			
	Sulfotepp		10 ug/L	0.51 ug/L		
	Thionazin		25 ug/L			
	2-Fluorophenol[g]		NA	NA	NA	45-97
	Phenol-D6[g]		NA	NA	NA	45-108
	2,4,6-Tribromophenol[g]		NA	NA	NA	56-116
	Nitrobenzene-D5[g]		NA	NA	NA	47-112
	2-Fluorobiphenyl[g]		NA	NA	NA	48-103
	Terphenyl-D14[g]		NA	NA	NA	33-158
8310 Polynuclear Aromatic Hydrocarbons	Naphthalene	Soil	0.1 mg/Kg	0.020 mg/Kg	40	
	Acenaphthene		0.1 mg/Kg	0.013 mg/Kg	40	46-91
	Acenaphthylene		0.1 mg/Kg	0.026 mg/Kg	40	
	Fluorene		0.02 mg/Kg	0.014 mg/Kg	40	
	Phenanthrene		0.01 mg/Kg	0.001 mg/Kg	40	
	Anthracene		0.01 mg/Kg	0.001 mg/Kg	40	
	Fluoranthene		0.02 mg/Kg	0.001 mg/Kg	40	47-119
	Pyrene		0.02 mg/Kg	0.002 mg/Kg	40	
	Benz(a)anthracene		0.01 mg/Kg	0.002 mg/Kg	40	
	Chrysene		0.01 mg/Kg	0.001 mg/Kg	40	
	Benzo(b)fluoranthene		0.02 mg/Kg	0.001 mg/Kg	40	

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision**[b] **(RPD)**	**Accuracy**[c] **(%REC)**
8310 Polynuclear Aromatic Hydrocarbons	Benzo(k)fluoranthene	Soil	0.01 mg/Kg	0.001 mg/Kg	40	
	Benzo(a)pyrene		0.01 mg/Kg	0.001 mg/Kg	40	13-144
	Dibenz(a,h)anthracene		0.02 mg/Kg	0.004 mg/Kg	40	
	Benzo(g,h,i)perylene		0.02 mg/Kg	0.003 mg/Kg	40	
	Indeno(1,2,3-cd)pyrene		0.01 mg/Kg	0.002 mg/Kg	40	
	p-Terphenyl[g]		NA	NA	NA	39-142
8310 Polynuclear Aromatic Hydrocarbons	Naphthalene	Water	1 ug/L	0.23 ug/L	30	
	Acenaphthene		1 ug/L	0.21 ug/L	30	50-100
	Acenaphthylene		1 ug/L	0.22 ug/L	30	
	Fluorene		0.2 ug/L	0.014 ug/L	30	
	Phenanthrene		0.1 ug/L	0.010 ug/L	30	
	Anthracene		0.1 ug/L	0.012 ug/L	30	
	Fluoranthene		0.2 ug/L	0.019 ug/L	30	65-102
	Pyrene		0.2 ug/L	0.024 ug/L	30	
	Benz(a)anthracene		0.1 ug/L	0.023 ug/L	30	
	Chrysene		0.1 ug/L	0.037 ug/L	30	
	Benzo(b)fluoranthene		0.2 ug/L	0.020 ug/L	30	
	Benzo(k)fluoranthene		0.1 ug/L	0.017 ug/L	30	
	Benzo(a)pyrene		0.1 ug/L	0.017 ug/L	30	63-109
	Dibenz(a,h)anthracene		0.2 ug/L	0.051 ug/L	30	
	Benzo(g,h,i)perylene		0.2 ug/L	0.054 ug/L	30	
	Indeno(1,2,3-cd)pyrene		0.1 ug/L	0.034 ug/L	30	
	p-Terphenyl[g]		NA	NA	NA	48-126
8315	Formaldehyde	Soil	2 mg/Kg	0.42 mg/Kg	40	39-153[d]
8315	Formaldehyde	Water	100 ug/L	14 ug/L	30	39-153[d]
8330 Explosives	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	Soil	2 mg/Kg	0.050 mg/Kg	40	
	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)		2 mg/Kg	0.098 mg/Kg	40	
	1,3,5-Trinitrobenzene		2 mg/Kg	0.061 mg/Kg	40	
	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)		2 mg/Kg	0.120 mg/Kg	40	
	1,3-Dinitrobenzene		2 mg/Kg	0.053 mg/Kg	40	
	2,4,6-Trinitrotoluene		2 mg/Kg	0.056 mg/Kg	40	70-123
	Nitrobenzene		2 mg/Kg	0.062 mg/Kg	40	72-118
	4-Amino-2,6-dinitrotoluene		2 mg/Kg	0.066 mg/Kg	40	
	2-Amino-4,6-dinitrotoluene		2 mg/Kg	0.072 mg/Kg	40	
	2,6-Dinitrotoluene		2 mg/Kg	0.082 mg/Kg	40	
	2,4-Dinitrotoluene		2 mg/Kg	0.067 mg/Kg	40	71-122
	2-Nitrotoluene		2 mg/Kg	0.080 mg/Kg	40	
	4-Nitrotoluene		2 mg/Kg	0.110 mg/Kg	40	
	3-Nitrotoluene		2 mg/Kg	0.069 mg/Kg	40	
	1-Chloro-3-nitrobenzene[g]		NA	NA	NA	63-118
8330 Explosives	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	Water	2 ug/L	0.31 ug/L	30	
	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)		2 ug/L	0.19 ug/L	30	
	1,3,5-Trinitrobenzene		2 ug/L	0.23 ug/L	30	
	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)		2 ug/L	0.26 ug/L	30	
	1,3-Dinitrobenzene		2 ug/L	0.14 ug/L	30	
	2,4,6-Trinitrotoluene		2 ug/L	0.15 ug/L	30	71-129
	Nitrobenzene		2 ug/L	0.17 ug/L	30	56-121
	4-Amino-2,6-dinitrotoluene		2 ug/L	0.13 ug/L	30	

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision[b] (RPD)**	**Accuracy[c] (%REC)**
8330 Explosives	2-Amino-4,6-dinitrotoluene	Water	2 ug/L	0.17 ug/L	30	
	2,6-Dinitrotoluene		2 ug/L	0.24 ug/L	30	
	2,4-Dinitrotoluene		2 ug/L	0.12 ug/L	30	74-127
	2-Nitrotoluene		2 ug/L	0.41 ug/L	30	
	4-Nitrotoluene		2 ug/L	0.47 ug/L	30	
	3-Nitrotoluene		2 ug/L	0.30 ug/L	30	
	1-Chloro-3-nitrobenzene[g]		NA	NA	NA	47-134
8332 Explosives	Nitroglycerin	Soil	2 mg/Kg	0.90 mg/Kg	40	70-130[d]
	PETN		2 mg/Kg	0.92 mg/Kg	40	70-130[d]
	1-Chloro-3-nitrobenzene[g]		NA	NA	NA	49-123
8332 Explosives	Nitroglycerin	Water	2 ug/L	0.94 ug/L	30	70-130[d]
	PETN		2 ug/L	0.87 ug/L	30	70-130[d]
	1-Chloro-3-nitrobenzene[g]		NA	NA	NA	47-114
GC/MS-SIM Polynuclear Aromatic Hydrocarbons	Naphthalene	Soil	5 ug/Kg	0.21 ug/Kg	40	
	1-Methylnaphthalene		5 ug/Kg	0.14 ug/Kg	40	
	2-Methylnaphthalene		5 ug/Kg	0.21 ug/Kg	40	
	Biphenyl		5 ug/Kg	0.18 ug/Kg	40	
	2,6-Dimethylnaphthalene		5 ug/Kg	0.09 ug/Kg	40	
	Acenaphthylene		5 ug/Kg	0.16 ug/kg	40	
	Dibenzofuran		5 ug/Kg	0.20 ug/Kg	40	
	Acenaphthene		5 ug/Kg	0.21 ug/kg	40	50-105
	2,3,5-Trimethylnaphthalene		5 ug/Kg	0.10 ug/kg	40	
	Fluorene		5 ug/Kg	0.17 ug/kg	40	
	Phenanthrene		5 ug/Kg	0.15 ug/kg	40	
	Anthracene		5 ug/Kg	0.19 ug/kg	40	
	1-Methylphenanthrene		5 ug/Kg	0.19 ug/kg	40	
	Fluoranthene		5 ug/Kg	0.17 ug/kg	40	
	Pyrene		5 ug/Kg	0.11 ug/kg	40	59-121
	Benz(a)anthracene		5 ug/Kg	0.13 ug/kg	40	
	Chrysene		5 ug/Kg	0.15 ug/kg	40	
	Benzo(b)fluoranthene		5 ug/Kg	0.14 ug/kg	40	
	Benzo(k)fluoranthene		5 ug/Kg	0.15 ug/kg	40	
	Benzo(a)pyrene		5 ug/Kg	0.14 ug/kg	40	58-128
	Benzo(e)pyrene		5 ug/Kg	0.15 ug/kg	40	
	Indeno(1,2,3-cd)pyrene		5 ug/Kg	0.15 ug/kg	40	
	Dibenz(a,h)anthracene		5 ug/Kg	0.18 ug/kg	40	
	Benzo(g,h,i)perylene		5 ug/Kg	0.10 ug/kg	40	
	Fluorene-d10[f]		NA	NA	NA	27-110
	Fluoranthene-d10[g]		NA	NA	NA	34-122
	Terphenyl-d14[g]		NA	NA	NA	50-132
GC/MS-SIM Polynuclear Aromatic Hydrocarbons	Naphthalene	Water	0.02 ug/L	0.004 ug/L	30	
	1-Methylnaphthalene		0.02 ug/L	0.004 ug/L	30	
	2-Methylnaphthalene		0.02 ug/L	0.003 ug/L	30	
	Biphenyl		0.02 ug/L	0.005 ug/L	30	
	2,6-Dimethylnaphthalene		0.02 ug/L	0.004 ug/L	30	
	Acenaphthylene		0.02 ug/L	0.002 ug/L	30	
	Dibenzofuran		0.02 ug/L	0.008 ug/L	30	
	Acenaphthene		0.02 ug/L	0.002 ug/L	30	48-107
	2,3,5-Trimethylnaphthalene		0.02 ug/L	0.004 ug/L	30	

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision[b] (RPD)**	**Accuracy[c] (%REC)**
GC/MS-SIM Polynuclear Aromatic Hydrocarbons	Fluorene	Water	0.02 ug/L	0.003 ug/L	30	
	Phenanthrene		0.02 ug/L	0.004 ug/L	30	
	Anthracene		0.02 ug/L	0.002 ug/L	30	
	1-Methylphenanthrene		0.02 ug/L	0.004 ug/L	30	
	Fluoranthene		0.02 ug/L	0.003 ug/L	30	
	Pyrene		0.02 ug/L	0.003 ug/L	30	53-123
	Benz(a)anthracene		0.02 ug/L	0.003 ug/L	30	
	Chrysene		0.02 ug/L	0.002 ug/L	30	
	Benzo(b)fluoranthene		0.02 ug/L	0.002 ug/L	30	
	Benzo(k)fluoranthene		0.02 ug/L	0.002 ug/L	30	
	Benzo(a)pyrene		0.02 ug/L	0.002 ug/L	30	38-142
	Benzo(e)pyrene		0.02 ug/L	0.003 ug/L	30	
	Indeno(1,2,3-cd)pyrene		0.02 ug/L	0.003 ug/L	30	
	Dibenz(a,h)anthracene		0.02 ug/L	0.002 ug/L	30	
	Benzo(g,h,i)perylene		0.02 ug/L	0.004 ug/L	30	
	Fluorene-d10[g]		NA	NA	NA	37-107
	Fluoranthene-d10[g]		NA	NA	NA	18-137
	Terphenyl-d14[g]		NA	NA	NA	18-153
AK 102	Diesel Range Petroleum Hydrocarbons	Soil	10 mg/Kg	5.8 mg/Kg	40	75-125[d]
8015B			10 mg/Kg	7.1 mg/Kg	40	74-150
NWTPH-Dx			25 mg/Kg	7.1 mg/Kg	40	74-150
AK 102	o-Terphenyl[g]		NA	NA	NA	50-150[d]
8015B	o-Terphenyl[g]		NA	NA	NA	31-151
NWTPH-Dx	o-Terphenyl[g]		NA	NA	NA	50-150[d]
AK 102	Diesel Range Petroleum Hydrocarbons	Water	100 ug/L	31 ug/L	30	75-125[d]
8015B			250 ug/L	36 ug/L	30	71-146
NWTPH-Dx			250 ug/L	36 ug/L	30	71-146
AK 102	o-Terphenyl[g]		NA	NA	NA	50-150[d]
8015B	o-Terphenyl[g]		NA	NA	NA	37-141
NWTPH-Dx	o-Terphenyl[g]		NA	NA	NA	50-150[d]
AK 103	Residual Range Petroleum Hydrocarbons	Soil	100 mg/Kg	4.6 mg/Kg	40	60-120[d]
	n-Triacontane[g]		NA	NA	NA	50-150[d]

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
602	Benzene	Water	0.5 ug/L	0.059 ug/L	30	39-150[d]
	Toluene		1 ug/L	0.070 ug/L	30	46-148[d]
	Ethylbenzene		1 ug/L	0.092 ug/L	30	32-160[d]
	m&p-Xylenes		1 ug/L	0.19 ug/L	30	32-160[d]
	o-Xylene		1 ug/L	0.13 ug/L	30	32-160[d]
	1,4-Difluorobenzene[g]		NA	NA	NA	77-117
624	Chloromethane	Water	5 ug/L	0.34 ug/L	30	D-273[d]
	Vinyl Chloride		5 ug/L	0.40 ug/L	30	D-251[d]
	Bromomethane		5 ug/L	0.81 ug/L	30	D-242[d]
	Chloroethane		5 ug/L	0.38 ug/L	30	14-230[d]
	Trichlorofluoromethane (CFC 11)		5 ug/L	0.46 ug/L	30	17-181[d]
	1,1-Dichloroethene		5 ug/L	0.39 ug/L	30	D-234[d]
	Methylene Chloride		5 ug/L	0.25 ug/L	30	D-221[d]
	trans-1,2-Dichloroethene		5 ug/L	0.37 ug/L	30	54-156[d]
	1,1-Dichloroethane		5 ug/L	0.11 ug/L	30	59-155[d]
	Chloroform		5 ug/L	0.29 ug/L	30	51-138[d]
	1,1,1-Trichloroethane (TCA)		5 ug/L	0.37 ug/L	30	52-162[d]
	Carbon Tetrachloride		5 ug/L	0.36 ug/L	30	70-140[d]
	Benzene		5 ug/L	0.28 ug/L	30	37-151[d]
	1,2-Dichloroethane		5 ug/L	0.23 ug/L	30	49-155[d]
	Trichloroethene (TCE)		5 ug/L	0.39 ug/L	30	71-157[d]
	1,2-Dichloropropane		5 ug/L	0.20 ug/L	30	D-210[d]
	Bromodichloromethane		5 ug/L	0.25 ug/L	30	35-155[d]
	2-Chloroethyl Vinyl Ether		10 ug/L	0.36 ug/L	30	D-305[d]
	trans-1,3-Dichloropropene		5 ug/L	0.18 ug/L	30	17-183[d]
	Toluene		5 ug/L	0.31 ug/L	30	47-150[d]
	cis-1,3-Dichloropropene		5 ug/L	0.17 ug/L	30	D-227[d]
	1,1,2-Trichloroethane		5 ug/L	0.20 ug/L	30	52-150[d]
	Tetrachloroethene (PCE)		5 ug/L	0.41 ug/L	30	64-148[d]
	Dibromochloromethane		5 ug/L	0.23 ug/L	30	53-149[d]
	Chlorobenzene		5 ug/L	0.27 ug/L	30	37-160[d]
	Ethylbenzene		5 ug/L	0.37 ug/L	30	37-162[d]
	Bromoform		5 ug/L	0.25 ug/L	30	45-169[d]
	1,1,2,2-Tetrachloroethane		5 ug/L	0.15 ug/L	30	46-157[d]
	1,3-Dichlorobenzene		5 ug/L	0.16 ug/L	30	59-156[d]
	1,4-Dichlorobenzene		5 ug/L	0.19 ug/L	30	18-190[d]
	1,2-Dichlorobenzene		5 ug/L	0.13 ug/L	30	18-190[d]
	Acrolein		50 ug/L	4.0 ug/L	31	18-190[d]
	Acrylonitrile		10 ug/L	0.45 ug/L	32	18-190[d]
	Dibromofluoromethane[g]		NA	NA	NA	69-123
	Toluene-D8[g]		NA	NA	NA	84-116
	4-Bromofluorobenzene[g]		NA	NA	NA	75-117
8021B BTEX (Mid Level)	Benzene	Soil	0.05 mg/Kg	0.009 mg/Kg	40	45-150
	Toluene		0.1 mg/Kg	0.009 mg/Kg	40	44-153
	Ethylbenzene		0.1 mg/Kg	0.008 mg/Kg	40	47-151
	m&p-Xylenes		0.1 mg/Kg	0.017 mg/Kg	40	49-155
	o-Xylene		0.1 mg/Kg	0.010 mg/Kg	40	46-148
	4-Bromofluorobenzene[g]		NA	NA	NA	31-154

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision** [b] **(RPD)**	**Accuracy** [c] **(%REC)**
8021B BTEX	Benzene	Water	0.5 ug/L	0.059 ug/L	30	81-120
	Toluene		1 ug/L	0.070 ug/L	30	61-138
	Ethylbenzene		1 ug/L	0.092 ug/L	30	83-122
	m&p-Xylenes		1 ug/L	0.19 ug/L	30	86-123
	o-Xylene		1 ug/L	0.13 ug/L	30	82-120
	1,4-Difluorobenzene[g]		NA	NA	NA	75-121
8260B Volatile Organics	Dichlorodifluoromethane (CFC 12)	Soil	5 ug/Kg	0.77 ug/Kg	40	
	Chloromethane		5 ug/Kg	1.3 ug/Kg	40	
	Vinyl Chloride		5 ug/Kg	0.72 ug/Kg	40	
	Bromomethane		5 ug/Kg	0.88 ug/Kg	40	
	Chloroethane		5 ug/Kg	0.74 ug/Kg	40	
	Trichlorofluoromethane (CFC 11)		5 ug/Kg	0.93 ug/Kg	40	
	Trichlorotrifluoromethane (CFC 113)		5 ug/Kg	1.4 ug/Kg	40	
	Acetone		50 ug/Kg	3.6 ug/Kg	40	
	1,1-Dichloroethene		5 ug/Kg	0.74 ug/Kg	40	71-127
	Carbon Disulfide		5 ug/Kg	0.71 ug/Kg	40	
	Methylene Chloride		10 ug/Kg	0.83 ug/Kg	40	
	trans -1,2-Dichloroethene		5 ug/Kg	0.94 ug/Kg	40	
	1,1-Dichloroethane		5 ug/Kg	0.68 ug/Kg	40	
	Methyl tert-butyl ether		5 ug/Kg	2.1 ug/Kg	40	
	2-Butanone (MEK)		20 ug/Kg	3.6 ug/Kg	40	
	2,2-Dichloropropane		5 ug/Kg	0.76 ug/Kg	40	
	cis-1,2-Dichloroethene		5 ug/Kg	0.52 ug/Kg	40	
	Chloroform		5 ug/Kg	0.62 ug/Kg	40	
	Bromochloromethane		5 ug/Kg	0.81 ug/Kg	40	
	1,1,1-Trichloroethane (TCA)		5 ug/Kg	0.82 ug/Kg	40	
	1,1-Dichloropropene		5 ug/Kg	0.68 ug/Kg	40	
	Carbon Tetrachloride		5 ug/Kg	0.73 ug/Kg	40	
	1,2-Dichloroethane		5 ug/Kg	0.59 ug/Kg	40	
	Benzene		5 ug/Kg	0.52 ug/Kg	40	78-124
	Trichloroethene (TCE)		5 ug/Kg	0.88 ug/Kg	40	69-128
	1,2-Dichloropropane		5 ug/Kg	0.61 ug/Kg	40	
	Bromodichloromethane		5 ug/Kg	0.67 ug/Kg	40	
	Dibromomethane		5 ug/Kg	0.71 ug/Kg	40	
	2-Hexanone		20 ug/Kg	1.7 ug/Kg	40	
	cis -1,3-Dichloropropene		5 ug/Kg	0.78 ug/Kg	40	
	Toluene		5 ug/Kg	1.1 ug/Kg	40	75-128
	trans -1,3-Dichloropropene		5 ug/Kg	0.51 ug/Kg	40	
	1,1,2-Trichloroethane		5 ug/Kg	0.54 ug/Kg	40	
	4-Methyl-2-pentanone (MIBK)		20 ug/Kg	2.6 ug/Kg	40	
	1,3-Dichloropropane		5 ug/Kg	0.56 ug/Kg	40	
	Tetrachloroethene (PCE)		5 ug/Kg	0.85 ug/Kg	40	
	Dibromochloromethane		5 ug/Kg	0.31 ug/Kg	40	
	1,2-Dibromoethane (EDB)		20 ug/Kg	0.21 ug/Kg	40	
	Chlorobenzene		5 ug/Kg	0.63 ug/Kg	40	76-119
	1,1,1,2-Tetrachloroethane		5 ug/Kg	0.47 ug/Kg	40	
	Ethylbenzene		5 ug/Kg	0.73 ug/Kg	40	
	m&p-Xylenes		5 ug/Kg	1.9 ug/Kg	40	
	o-Xylene		5 ug/Kg	0.71 ug/Kg	40	
	Styrene		5 ug/Kg	0.62 ug/Kg	40	

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision [b] (RPD)**	**Accuracy [c] (%REC)**
8260B Volatile Organics	Bromoform	Soil	5 ug/Kg	0.34 ug/Kg	40	
	Isopropylbenzene		20 ug/Kg	0.88 ug/Kg	40	
	1,1,2,2-Tetrachloroethane		5 ug/Kg	0.64 ug/Kg	40	
	1,2,3-Trichloropropane		5 ug/Kg	0.77 ug/Kg	40	
	Bromobenzene		5 ug/Kg	0.56 ug/Kg	40	
	n-Propylbenzene		20 ug/Kg	0.88 ug/Kg	40	
	2-Chlorotoluene		20 ug/Kg	0.76 ug/Kg	40	
	4-Chlorotoluene		20 ug/Kg	0.98 ug/Kg	40	
	1,3,5-Trimethylbenzene		20 ug/Kg	0.83 ug/Kg	40	
	tert-Butylbenzene		20 ug/Kg	1.0 ug/Kg	40	
	1,2,4-Trimethylbenzene		20 ug/Kg	0.96 ug/Kg	40	
	sec-Butylbenzene		20 ug/Kg	1.1 ug/Kg	40	
	1,3-Dichlorobenzene		5 ug/Kg	0.95 ug/Kg	40	
	4-Isopropyltoluene		20 ug/Kg	1.0 ug/Kg	40	
	1,4-Dichlorobenzene		5 ug/Kg	0.94 ug/Kg	40	
	n-Butylbenzene		20 ug/Kg	1.1 ug/Kg	40	
	1,2-Dichlorobenzene		5 ug/Kg	0.92 ug/Kg	40	73-123
	1,2-Dibromo-3-chloropropane (DBCP)		20 ug/Kg	0.89 ug/Kg	40	
	1,2,4-Trichlorobenzene		20 ug/Kg	1.1 ug/Kg	40	
	1,2,3-Trichlorobenzene		20 ug/Kg	0.97 ug/Kg	40	
	Naphthalene		20 ug/Kg	1.0 ug/Kg	40	69-134
	Hexachlorobutadiene		20 ug/Kg	1.0 ug/Kg	40	
Additional Non-routine Analytes (Gasoline Additives, Appendix I, II, IX, Etc.)						
8260B Volatile Organics	Tert-Butyl Alcohol (TBA)	Soil	50 ug/Kg	10 ug/Kg		
	Diisopropyl ether (DIPE)		10 ug/Kg	5 ug/Kg		
	Tert-amyl Methyl Ether (TAME)		10 ug/Kg	5 ug/Kg		
	Allyl Chloride		20 ug/Kg			
	Acrolein		100 ug/Kg			
	Iodomethane		20 ug/Kg			
	Acetonitrile		20 ug/Kg			
	3-Chloro-1-propene		5 ug/Kg			
	n-Hexane		5 ug/Kg			
	Chloroprene		20 ug/Kg			
	Acrylonitrile		20 ug/Kg	1.2 ug/Kg		
	Vinyl Acetate		20 ug/Kg	1.8 ug/Kg		
	Propionitrile		20 ug/Kg			
	Ethyl Acetate		5 ug/Kg			
	Methacrylonitrile		20 ug/Kg			
	Isobutyl Alcohol		100 ug/Kg			
	1-Chlorohexane		5 ug/Kg	0.47 ug/Kg		
	Methylmethacrylate		20 ug/Kg			
	1,4-Dioxane		250 ug/Kg	20 ug/Kg		
	2-Nitropropane		5 ug/Kg			
	Ethylmethacrylate		20 ug/Kg			
	cis-1,4-dichloro-2-butene		20 ug/Kg			
	trans-1,4-dichloro-2-butene		20 ug/Kg			
	Ethyl Ether		5 ug/Kg			
	1,3,5-Trichlorobenzene		5 ug/Kg	0.5 ug/Kg		
	2-Chloroethyl Vinyl Ether		10 ug/Kg	1.3 ug/Kg		

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
8260B Volatile Organics	Toluene-D8[g]	Soil	NA	NA	NA	77-131
	4-Bromofluorobenzene[g]		NA	NA	NA	74-116
	Dibromofluoromethane[g]		NA	NA	NA	81-120
	Toluene-D8[g]	Soil-mid	NA	NA	NA	35-153
	4-Bromofluorobenzene[g]		NA	NA	NA	35-144
	Dibromofluoromethane[g]		NA	NA	NA	36-148
8260B Volatile Organics	Dichlorodifluoromethane (CFC 12)	Water	0.5 ug/L	0.12 ug/L	30	
	Chloromethane		0.5 ug/L	0.14 ug/L	30	
	Vinyl Chloride		0.5 ug/L	0.11 ug/L	30	
	Bromomethane		0.5 ug/L	0.17 ug/L	30	
	Chloroethane		0.5 ug/L	0.20 ug/L	30	
	Trichlorofluoromethane (CFC 11)		0.5 ug/L	0.13 ug/L	30	
	Trichlorotrifluoromethane (CFC 113)		0.5 ug/L	0.13 ug/L	30	
	Acetone		20 ug/L	1.8 ug/L	30	
	1,1-Dichloroethene		0.5 ug/L	0.14 ug/L	30	76-128
	Methyl tert-butyl ether		0.5 ug/L	0.09 ug/L	30	
	Carbon Disulfide		0.5 ug/L	0.12 ug/L	30	
	Methylene Chloride		2 ug/L	0.10 ug/L	30	
	trans -1,2-Dichloroethene		0.5 ug/L	0.10 ug/L	30	
	1,1-Dichloroethane		0.5 ug/L	0.10 ug/L	30	
	2-Butanone (MEK)		20 ug/L	1.6 ug/L	30	
	2,2-Dichloropropane		0.5 ug/L	0.10 ug/L	30	
	cis -1,2-Dichloroethene		0.5 ug/L	0.10 ug/L	30	
	Chloroform		0.5 ug/L	0.10 ug/L	30	
	Bromochloromethane		0.5 ug/L	0.12 ug/L	30	
	1,1,1-Trichloroethane (TCA)		0.5 ug/L	0.14 ug/L	30	
	1,1-Dichloropropene		0.5 ug/L	0.12 ug/L	30	
	Carbon Tetrachloride		0.5 ug/L	0.14 ug/L	30	
	1,2-Dichloroethane		0.5 ug/L	0.09 ug/L	30	
	Benzene		0.5 ug/L	0.11 ug/L	30	87-122
	Trichloroethene (TCE)		0.5 ug/L	0.11 ug/L	30	82-124
	1,2-Dichloropropane		0.5 ug/L	0.10 ug/L	30	
	Bromodichloromethane		0.5 ug/L	0.08 ug/L	30	
	Dibromomethane		0.5 ug/L	0.09 ug/L	30	
	2-Hexanone		20 ug/L	2.1 ug/L	30	
	cis -1,3-Dichloropropene		0.5 ug/L	0.08 ug/L	30	
	Toluene		0.5 ug/L	0.10 ug/L	30	84-120
	trans -1,3-Dichloropropene		0.5 ug/L	0.07 ug/L	30	
	1,1,2-Trichloroethane		0.5 ug/L	0.08 ug/L	30	
	4-Methyl-2-pentanone (MIBK)		20 ug/L	2.6 ug/L	30	
	1,3-Dichloropropane		0.5 ug/L	0.09 ug/L	30	
	Tetrachloroethene (PCE)		0.5 ug/L	0.11 ug/L	30	
	Dibromochloromethane		0.5 ug/L	0.06 ug/L	30	
	1,2-Dibromoethane (EDB)		2 ug/L	0.10 ug/L	30	
	Chlorobenzene		0.5 ug/L	0.09 ug/L	30	85-114
	1,1,1,2-Tetrachloroethane		0.5 ug/L	0.10 ug/L	30	
	Ethylbenzene		0.5 ug/L	0.12 ug/L	30	
	m&p-Xylenes		0.5 ug/L	0.24 ug/L	30	
	o-Xylene		0.5 ug/L	0.10 ug/L	30	
	Styrene		0.5 ug/L	0.10 ug/L	30	

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
8260B Volatile Organics	Bromoform	Water	0.5 ug/L	0.09 ug/L	30	
	Isopropylbenzene		2 ug/L	0.12 ug/L	30	
	1,1,2,2-Tetrachloroethane		0.5 ug/L	0.13 ug/L	30	
	1,2,3-Trichloropropane		0.5 ug/L	0.28 ug/L	30	
	Bromobenzene		2 ug/L	0.14 ug/L	30	
	n-Propylbenzene		2 ug/L	0.15 ug/L	30	
	2-Chlorotoluene		2 ug/L	0.13 ug/L	30	
	4-Chlorotoluene		2 ug/L	0.13 ug/L	30	
	1,3,5-Trimethylbenzene		2 ug/L	0.11 ug/L	30	
	tert-Butylbenzene		2 ug/L	0.15 ug/L	30	
	1,2,4-Trimethylbenzene		2 ug/L	0.12 ug/L	30	
	sec-Butylbenzene		2 ug/L	0.17 ug/L	30	
	1,3-Dichlorobenzene		0.5 ug/L	0.11 ug/L	30	
	4-Isopropyltoluene		2 ug/L	0.14 ug/L	30	
	1,4-Dichlorobenzene		0.5 ug/L	0.09 ug/L	30	
	n-Butylbenzene		2 ug/L	0.13 ug/L	30	
	1,2-Dichlorobenzene		0.5 ug/L	0.09 ug/L	30	82-117
	1,2-Dibromo-3-chloropropane (DBCP)		2 ug/L	0.39 ug/L	30	
	1,2,4-Trichlorobenzene		2 ug/L	0.09 ug/L	30	
	1,2,3-Trichlorobenzene		2 ug/L	0.12 ug/L	30	
	Naphthalene		2 ug/L	0.14 ug/L	30	64-145
	Hexachlorobutadiene		2 ug/L	0.28 ug/L	30	
Additional Non-routine Analytes (Gasoline Additives, Appendix I, II, IX, Etc.)						
8260B Volatile Organics	Tert-Butyl Alcohol (TBA)	Water	20 ug/L	1.7 ug/L		
	Diisopropyl ether (DIPE)		2 ug/L	0.12 ug/L		
	Tert-amyl Methyl Ether (TAME)		2 ug/L	0.10 ug/L		
	Allyl Chloride		0.5 ug/L			
	Acrolein		20 ug/L	2.0 ug/L		
	Iodomethane		5 ug/L	0.32 ug/L		
	Acetonitrile		50 ug/L	2.2 ug/L		
	3-Chloro-1-propene		5 ug/L	0.08 ug/L		
	n-Hexane		0.5 ug/L	0.10 ug/L		
	Chloroprene		10 ug/L	0.11 ug/L		
	Acrylonitrile		5 ug/L	0.30 ug/L		
	Vinyl Acetate		5 ug/L	0.90 ug/L		
	Propionitrile		5 ug/L	1.2 ug/L		
	Ethyl Acetate		5 ug/L	0.90 ug/L		
	Methacrylonitrile		5 ug/L	0.25 ug/L		
	Isobutyl Alcohol		100 ug/L	5.8 ug/L		
	1-Chlorohexane		0.5 ug/L	0.11 ug/L		
	Methylmethacrylate		0.5 ug/L	0.30 ug/L		
	1,4-Dioxane		100 ug/L	9 ug/L		
	2-Nitropropane		5 ug/L	0.44 ug/L		
	Ethylmethacrylate		5 ug/L	0.07 ug/L		
	cis-1,4-dichloro-2-butene		10 ug/L	0.36 ug/L		
	trans-1,4-dichloro-2-butene		10 ug/L	0.26 ug/L		
	Ethyl Ether		1 ug/L	0.07 ug/L		
	1,3,5-Trichlorobenzene		5 ug/L	0.1 ug/L		
	2-Chloroethyl Vinyl Ether		5 ug/L	0.34 ug/L		

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision** [b] **(RPD)**	**Accuracy** [c] **(%REC)**
8260B	Toluene-D8[g]	Water	NA	NA	NA	93-109
Volatile	4-Bromofluorobenzene[g]		NA	NA	NA	78-114
Organics	Dibromofluoromethane[g]		NA	NA	NA	85-112
AK 101	Gasoline Range Petroleum Hydrocarbons	Soil	5 mg/Kg	0.76 mg/Kg	40	60-120[d]
CA-TPH-G			10 mg/Kg	3.2 mg/Kg	40	72-129
NWTPH-Gx			10 mg/Kg	3.2 mg/Kg	40	72-129
AK 101	4-Bromofluorobenzene[g]		NA	NA	NA	60-120[d]
CA-TPH-G	4-Bromofluorobenzene[g]		NA	NA	NA	41-136
NWTPH-Gx	4-Bromofluorobenzene[g]		NA	NA	NA	50-150[d]
AK 101	Gasoline Range Petroleum Hydrocarbons	Water	50 ug/L	13 ug/L	30	60-120[d]
CA-TPH-G			50 ug/L	12 ug/L	30	65-133
NWTPH-Gx			50 ug/L	12 ug/L	30	65-133
AK 101	1,4-Difluorobenzene[g]		NA	NA	NA	60-120[d]
CA-TPH-G	1,4-Difluorobenzene[g]		NA	NA	NA	70-122
NWTPH-Gx	1,4-Difluorobenzene[g]		NA	NA	NA	50-150[d]

ORGANIC COMPOUNDS IN DRINKING WATER ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision [b] (RPD)	Accuracy [c] (%REC)
504.1	1,2,3-Trichloropropane	Drinking Water	0.5 ug/L	0.02 ug/L	30	70-130[d]
	1,2-Dibromo-3-chloropropane (DBCP)		0.01 ug/L	0.003 ug/L	30	70-130[d]
	Ethylene Dibromide (EDB)		0.01 ug/L	0.003 ug/L	30	70-130[d]
508.1 Pesticides and PCBs	Aldrin	Drinking Water	0.005 ug/L	0.003 ug/L	30	70-130[d]
	Alpha-BHC		0.005 ug/L	0.003 ug/L	30	70-130[d]
	Alpha-Chlordane		0.007 ug/L	0.004 ug/L	30	70-130[d]
	Beta-BHC		0.007 ug/L	0.004 ug/L	30	70-130[d]
	Chlordane		0.10 ug/L	0.007 ug/L	30	70-130[d]
	4,4`-DDD		0.005 ug/L	0.003 ug/L	30	70-130[d]
	4,4`-DDE		0.005 ug/L	0.003 ug/L	30	70-130[d]
	4,4`-DDT		0.008 ug/L	0.004 ug/L	30	70-130[d]
	Delta-BHC		0.005 ug/L	0.003 ug/L	30	70-130[d]
	Dieldrin		0.005 ug/L	0.003 ug/L	30	70-130[d]
	Endosulfan I		0.005 ug/L	0.003 ug/L	30	70-130[d]
	Endosulfan II		0.007 ug/L	0.004 ug/L	30	70-130[d]
	Endosulfan Sulfate		0.006 ug/L	0.003 ug/L	30	70-130[d]
	Endrin		0.006 ug/L	0.003 ug/L	30	70-130[d]
	Endrin Aldehyde		0.008 ug/L	0.004 ug/L	30	70-130[d]
	Gamma-BHC(Lindane)		0.005 ug/L	0.003 ug/L	30	70-130[d]
	Gamma-Chlordane		0.006 ug/L	0.003 ug/L	30	70-130[d]
	Heptachlor		0.006 ug/L	0.003 ug/L	30	70-130[d]
	Heptachlor Epoxide		0.006 ug/L	0.003 ug/L	30	70-130[d]
	Heptachlor Epoxide (isomer A)		0.006 ug/L	0.003 ug/L	30	70-130[d]
	Methoxychlor		0.007 ug/L	0.004 ug/L	30	70-130[d]
	Toxaphene		0.10 ug/L	0.025 ug/L	30	70-130[d]
	Aroclor 1016		0.080 ug/L	0.024 ug/L	30	70-130[d]
	Aroclor 1221		0.10 ug/L	0.017 ug/L	30	70-130[d]
	Aroclor 1232		0.10 ug/L	0.056 ug/L	30	70-130[d]
	Aroclor 1242		0.10 ug/L	0.031 ug/L	30	70-130[d]
	Aroclor 1248		0.10 ug/L	0.013 ug/L	30	70-130[d]
	Aroclor 1254		0.10 ug/L	0.018 ug/L	30	70-130[d]
	Aroclor 1260		0.10 ug/L	0.015 ug/L	30	70-130[d]
	4,4'-Dibromooctafluorobiphenyl[e]		NA	NA	NA	70-130[d]
515.4 Herbicides	Aciflurofen	Drinking Water	0.20 ug/L	0.026 ug/L	30	70-130[d]
	Bentazon		0.40 ug/L	0.097 ug/L	30	70-130[d]
	Chloramben		0.20 ug/L	0.037 ug/L	30	70-130[d]
	2,4-D		0.20 ug/L	0.042 ug/L	30	70-130[d]
	Dalapon		0.54 ug/L	0.18 ug/L	30	70-130[d]
	2,4-DB		0.40 ug/L	0.020 ug/L	30	70-130[d]
	Dacthal Diacid		0.10 ug/L	0.019 ug/L	30	70-130[d]
	Dicamba		0.20 ug/L	0.015 ug/L	30	70-130[d]
	3,5-Dichlorobenzoic acid		0.20 ug/L	0.023 ug/L	30	70-130[d]
	Dichlorprop		0.40 ug/L	0.033 ug/L	30	70-130[d]
	Dinoseb		0.40 ug/L	0.091 ug/L	30	70-130[d]
	Pentachlorophenol		0.04 ug/L	0.004 ug/L	30	70-130[d]
	Picloram		0.20 ug/L	0.018 ug/L	30	70-130[d]
	2,4,5-T		0.20 ug/L	0.022 ug/L	30	70-130[d]
	2,4,5-TP (Silvex)		0.05 ug/L	0.012 ug/L	30	70-130[d]
	4-Nitrophenol		0.40 ug/L	0.080 ug/L	30	70-130[d]
	2,4-Dichlorophenylacetic acid [e]		NA	NA	NA	70-130[d]

ORGANIC COMPOUNDS IN DRINKING WATER ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision [b] (RPD)	Accuracy [c] (%REC)
524.2 Volatile Organics	Dichlorodifluoromethane (CFC 12)	Drinking Water	0.5 ug/L	0.14 ug/L	NA	70-130[d]
	Chloromethane		0.5 ug/L	0.07 ug/L	NA	70-130[d]
	Vinyl Chloride		0.5 ug/L	0.12 ug/L	NA	70-130[d]
	Bromomethane		0.5 ug/L	0.30 ug/L	NA	70-130[d]
	Chloroethane		0.5 ug/L	0.16 ug/L	NA	70-130[d]
	Trichlorofluoromethane (CFC 11)		0.5 ug/L	0.14 ug/L	NA	70-130[d]
	1,1-Dichloroethene		0.5 ug/L	0.16 ug/L	NA	70-130[d]
	Methylene Chloride		0.5 ug/L	0.09 ug/L	NA	70-130[d]
	trans-1,2-Dichloroethene		0.5 ug/L	0.13 ug/L	NA	70-130[d]
	2,2-Dichloropropane		0.5 ug/L	0.13 ug/L	NA	70-130[d]
	cis-1,2-Dichloroethene		0.5 ug/L	0.07 ug/L	NA	70-130[d]
	1,1-Dichloroethane		0.5 ug/L	0.07 ug/L	NA	70-130[d]
	Chloroform		0.5 ug/L	0.07 ug/L	NA	70-130[d]
	Bromochloromethane		0.5 ug/L	0.10 ug/L	NA	70-130[d]
	1,1,1-Trichloroethane (TCA)		0.5 ug/L	0.11 ug/L	NA	70-130[d]
	1,1-Dichloropropene		0.5 ug/L	0.14 ug/L	NA	70-130[d]
	Carbon Tetrachloride		0.5 ug/L	0.17 ug/L	NA	70-130[d]
	Benzene		0.5 ug/L	0.08 ug/L	NA	70-130[d]
	1,2-Dichloroethane		0.5 ug/L	0.09 ug/L	NA	70-130[d]
	Trichloroethene (TCE)		0.5 ug/L	0.08 ug/L	NA	70-130[d]
	1,2-Dichloropropane		0.5 ug/L	0.08 ug/L	NA	70-130[d]
	Bromodichloromethane		0.5 ug/L	0.05 ug/L	NA	70-130[d]
	Dibromomethane		0.5 ug/L	0.12 ug/L	NA	70-130[d]
	cis-1,3-Dichloropropene		0.5 ug/L	0.07 ug/L	NA	70-130[d]
	Toluene		0.5 ug/L	0.09 ug/L	NA	70-130[d]
	trans-1,3-Dichloropropene		0.5 ug/L	0.10 ug/L	NA	70-130[d]
	1,1,2-Trichloroethane		0.5 ug/L	0.11 ug/L	NA	70-130[d]
	Tetrachloroethene (PCE)		0.5 ug/L	0.14 ug/L	NA	70-130[d]
	1,3-Dichloropropane		0.5 ug/L	0.11 ug/L	NA	70-130[d]
	1,2,3-Trichlorobenzene		0.5 ug/L	0.19 ug/L	NA	70-130[d]
	Dibromochloromethane		0.5 ug/L	0.07 ug/L	NA	70-130[d]
	1,2-Dibromoethane (EDB)		0.5 ug/L	0.10 ug/L	NA	70-130[d]
	Chlorobenzene		0.5 ug/L	0.06 ug/L	NA	70-130[d]
	Ethylbenzene		0.5 ug/L	0.15 ug/L	NA	70-130[d]
	1,1,1,2-Tetrachloroethane		0.5 ug/L	0.06 ug/L	NA	70-130[d]
	Styrene		0.5 ug/L	0.20 ug/L	NA	70-130[d]
	m&p Xylenes		0.5 ug/L	0.42 ug/L	NA	70-130[d]
	o-Xylene		0.5 ug/L	0.22 ug/L	NA	70-130[d]
	Bromoform		0.5 ug/L	0.10 ug/L	NA	70-130[d]
	Isopropylbenzene		0.5 ug/L	0.24 ug/L	NA	70-130[d]
	1,1,2,2-Tetrachloroethane		0.5 ug/L	0.10 ug/L	NA	70-130[d]
	1,2,3-Trichloropropane		0.5 ug/L	0.25 ug/L	NA	70-130[d]
	Bromobenzene		0.5 ug/L	0.12 ug/L	NA	70-130[d]
	n-Propylbenzene		0.5 ug/L	0.18 ug/L	NA	70-130[d]
	1,3,5-Trimethylbenzene		0.5 ug/L	0.09 ug/L	NA	70-130[d]
	2-Chlorotoluene		0.5 ug/L	0.15 ug/L	NA	70-130[d]
	4-Chlorotoluene		0.5 ug/L	0.11 ug/L	NA	70-130[d]

ORGANIC COMPOUNDS IN DRINKING WATER ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision [b] (RPD)	Accuracy [c] (%REC)
524.2	tert-Butylbenzene	Drinking Water	0.5 ug/L	0.18 ug/L	NA	70-130[d]
	1,2,4-Trimethylbenzene		0.5 ug/L	0.10 ug/L	NA	70-130[d]
	sec-Butylbenzene		0.5 ug/L	0.16 ug/L	NA	70-130[d]
	4-Isopropyltoluene		0.5 ug/L	0.12 ug/L	NA	70-130[d]
	1,3-Dichlorobenzene		0.5 ug/L	0.11 ug/L	NA	70-130[d]
	1,4-Dichlorobenzene		0.5 ug/L	0.11 ug/L	NA	70-130[d]
	n-Butylbenzene		0.5 ug/L	0.16 ug/L	NA	70-130[d]
	1,2-Dichlorobenzene		0.5 ug/L	0.12 ug/L	NA	70-130[d]
	1,2-Dibromo-3-chloropropane (DBCP)		0.5 ug/L	0.23 ug/L	NA	70-130[d]
	1,2,4-Trichlorobenzene		0.5 ug/L	0.12 ug/L	NA	70-130[d]
	Hexachlorobutadiene		0.5 ug/L	0.13 ug/L	NA	70-130[d]
	Naphthalene		0.5 ug/L	0.15 ug/L	NA	70-130[d]
	Ethyl-tert-Butyl Ether (ETBE)		0.5 ug/L	0.31 ug/L	NA	70-130[d]
	Methyl tert-Butyl Ether (MTBE)		0.5 ug/L	0.31 ug/L	NA	70-130[d]
	tert-Amyl Methyl Ether		0.5 ug/L	0.30 ug/L	NA	70-130[d]
	tert-Butyl Alcohol		20 ug/L	1.1 ug/L	NA	70-130[d]
	1,2-Dichlorobenzene-D4[g]		NA	NA	NA	73-120
	4-Bromofluorobenzene[g]		NA	NA	NA	82-106
525.2 SOCs	2,4-Dinitrotoluene	Drinking Water	0.10 ug/L	0.037 ug/L	30	70-130[d]
	2,6-Dinitrotoluene		0.10 ug/L	0.031 ug/L	30	70-130[d]
	4,4'-DDD		0.05 ug/L	0.024 ug/L	30	70-130[d]
	4,4'-DDE		0.03 ug/L	0.017 ug/L	30	70-130[d]
	4,4'-DDT		0.05 ug/L	0.025 ug/L	30	70-130[d]
	Acenaphthene		0.05 ug/L	0.026 ug/L	30	70-130[d]
	Acenaphthylene		0.05 ug/L	0.027 ug/L	30	70-130[d]
	Acetochlor		0.06 ug/L	0.03 ug/L	30	70-130[d]
	Alachlor		0.07 ug/L	0.036 ug/L	30	70-130[d]
	Aldrin		0.09 ug/L	0.047 ug/L	30	70-130[d]
	alpha-BHC		0.05 ug/L	0.021 ug/L	30	70-130[d]
	Ametryn		0.05 ug/L	0.019 ug/L	30	70-130[d]
	Anthracene		0.07 ug/L	0.034 ug/L	30	70-130[d]
	Atrazine		0.10 ug/L	0.05 ug/L	30	70-130[d]
	Benz(a)anthracene		0.10 ug/L	0.024 ug/L	30	70-130[d]
	Benzo(a)pyrene		0.04 ug/L	0.036 ug/L	30	70-130[d]
	Benzo(b)fluoranthene		0.10 ug/L	0.023 ug/L	30	70-130[d]
	Benzo(g,h,i)perylene		0.10 ug/L	0.03 ug/L	30	70-130[d]
	Benzo(k)fluoranthene		0.10 ug/L	0.017 ug/L	30	70-130[d]
	Benzyl butyl phthalate		0.05 ug/L	0.021 ug/L	30	70-130[d]
	Beta-BHC		0.05 ug/L	0.027 ug/L	30	70-130[d]
	Bis(2-ethylhexyl)adipate		0.50 ug/L	0.091 ug/L	30	70-130[d]
	Bis(2-ethylhexyl)phthalate		0.50 ug/L	0.12 ug/L	30	70-130[d]
	Bromacil		0.10 ug/L	0.024 ug/L	30	70-130[d]
	Butachlor		0.05 ug/L	0.026 ug/L	30	70-130[d]
	Butylate		0.03 ug/L	0.015 ug/L	30	70-130[d]
	Caffeine		0.10 ug/L	0.041 ug/L	30	70-130[d]
	Chlorobenzilate		0.04 ug/L	0.02 ug/L	30	70-130[d]
	Chloroneb		0.11 ug/L	0.055 ug/L	30	70-130[d]
	Chlorothalonil		0.10 ug/L	0.025 ug/L	30	70-130[d]
	Chlorpropham		0.07 ug/L	0.035 ug/L	30	70-130[d]
	Chorpyrifos		0.06 ug/L	0.031 ug/L	30	70-130[d]

ORGANIC COMPOUNDS IN DRINKING WATER ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision [b] (RPD)	Accuracy [c] (%REC)
525.2 SOCs	Chrysene	Drinking Water	0.05 ug/L	0.016 ug/L	30	70-130[d]
	alpha-Chlordane		0.08 ug/L	0.04 ug/L	30	70-130[d]
	cis-Permethrin		0.06 ug/L	0.028 ug/L	30	70-130[d]
	Cyanazine		0.09 ug/L	0.046 ug/L	30	70-130[d]
	Cycloate		0.07 ug/L	0.037 ug/L	30	70-130[d]
	Dacthal		0.04 ug/L	0.021 ug/L	30	70-130[d]
	delta-BHC		0.05 ug/L	0.025 ug/L	30	70-130[d]
	Diazinon		0.05 ug/L	0.026 ug/L	30	70-130[d]
	Dibenz(a,h)anthracene		0.11 ug/L	0.053 ug/L	30	70-130[d]
	Dibutyl phthalate		0.50 ug/L	0.055 ug/L	30	70-130[d]
	Dichlorvos		0.05 ug/L	0.017 ug/L	30	70-130[d]
	Dieldrin		0.20 ug/L	0.13 ug/L	30	70-130[d]
	Diethyl Phthalate		0.50 ug/L	0.029 ug/L	30	70-130[d]
	Dimethoate		0.12 ug/L	0.06 ug/L	30	70-130[d]
	Dimethyl phthalate		0.50 ug/L	0.02 ug/L	30	70-130[d]
	Di-n-octyl phthalate		0.10 ug/L	0.036 ug/L	30	70-130[d]
	Diphenamide		0.05 ug/L	0.027 ug/L	30	70-130[d]
	Endosulfan I		0.08 ug/L	0.04 ug/L	30	70-130[d]
	Endosulfan II		0.08 ug/L	0.042 ug/L	30	70-130[d]
	Endosulfan Sulfate		0.08 ug/L	0.038 ug/L	30	70-130[d]
	Endrin		0.05 ug/L	0.027 ug/L	30	70-130[d]
	Endrin Aldehyde		0.11 ug/L	0.054 ug/L	30	70-130[d]
	EPTC		0.05 ug/L	0.026 ug/L	30	70-130[d]
	Ethoprophos		0.04 ug/L	0.02 ug/L	30	70-130[d]
	Fluoranthene		0.10 ug/L	0.016 ug/L	30	70-130[d]
	Fluorene		0.07 ug/L	0.033 ug/L	30	70-130[d]
	Heptachlor		0.08 ug/L	0.041 ug/L	30	70-130[d]
	Heptachlor Epoxide		0.04 ug/L	0.037 ug/L	30	70-130[d]
	Hexachlorobenzene		0.06 ug/L	0.028 ug/L	30	70-130[d]
	Hexachlorocyclopentadiene		0.07 ug/L	0.034 ug/L	30	70-130[d]
	Indeno(1,2,3-cd)pyrene		0.20 ug/L	0.16 ug/L	30	70-130[d]
	Isophorone		0.05 ug/L	0.024 ug/L	30	70-130[d]
	Lindane (gamma-BHC)		0.04 ug/L	0.022 ug/L	30	70-130[d]
	Malathion		0.10 ug/L	0.051 ug/L	30	70-130[d]
	Methoxychlor		0.04 ug/L	0.02 ug/L	30	70-130[d]
	Metolachlor		0.09 ug/L	0.045 ug/L	30	70-130[d]
	Metribuzin		0.08 ug/L	0.038 ug/L	30	70-130[d]
	Mevinphos		0.05 ug/L	0.014 ug/L	30	70-130[d]
	Molinate		0.05 ug/L	0.021 ug/L	30	70-130[d]
	Parathion		0.16 ug/L	0.079 ug/L	30	70-130[d]
	Pebulate		0.05 ug/L	0.024 ug/L	30	70-130[d]
	Phenanthrene		0.03 ug/L	0.011 ug/L	30	70-130[d]
	Prometon		0.05 ug/L	0.015 ug/L	30	70-130[d]
	Prometryn		0.10 ug/L	0.03 ug/L	30	70-130[d]
	Propachlor		0.08 ug/L	0.038 ug/L	30	70-130[d]
	Propazine		0.05 ug/L	0.02 ug/L	30	70-130[d]
	Propyzamide (Pronamide)		0.06 ug/L	0.032 ug/L	30	70-130[d]
	Pyrene		0.03 ug/L	0.012 ug/L	30	70-130[d]
	Simazine		0.10 ug/L	0.042 ug/L	30	70-130[d]
	Simetryn		0.10 ug/L	0.041 ug/L	30	70-130[d]

ORGANIC COMPOUNDS IN DRINKING WATER ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision [b] (RPD)	Accuracy [c] (%REC)
525.2 SOCs	Terbutryn	Drinking Water	0.05 ug/L	0.02 ug/L	30	70-130[d]
	Terbacil		0.10 ug/L	0.021 ug/L	30	70-130[d]
	Terbufos		0.10 ug/L	0.013 ug/L	30	70-130[d]
	Tetrachlorvinphos		0.07 ug/L	0.033 ug/L	30	70-130[d]
	Thiobencarb		0.05 ug/L	0.018 ug/L	30	70-130[d]
	gamma-Chlordane		0.04 ug/L	0.022 ug/L	30	70-130[d]
	trans-Nonachlor		0.09 ug/L	0.045 ug/L	30	70-130[d]
	trans-Permethrin		0.07 ug/L	0.033 ug/L	30	70-130[d]
	Triadimefon		0.03 ug/L	0.016 ug/L	30	70-130[d]
	Trifluralin		0.05 ug/L	0.027 ug/L	30	70-130[d]
	Vernolate		0.05 ug/L	0.027 ug/L	30	70-130[d]
	1,3-dimethyl-2-nitrobenzene [g]		NA	NA	NA	70-130[d]
	Perylene-D12 [g]		NA	NA	NA	70-130[d]
	Triphenylphosphate [g]		NA	NA	NA	70-130[d]
531.1 Carbamates	Aldicarb	Drinking Water	0.5 ug/L	0.11 ug/L	30	80-120[d]
	Aldicarb Sulfone		0.5 ug/L	0.13 ug/L	30	80-120[d]
	Aldicarb Sulfoxide		0.5 ug/L	0.11 ug/L	30	80-120[d]
	Baygon(Propoxur)		0.5 ug/L	0.14 ug/L	30	80-120[d]
	Carbaryl		0.5 ug/L	0.17 ug/L	30	80-120[d]
	Carbofuran		0.5 ug/L	0.13 ug/L	30	80-120[d]
	3-Hydroxycarbofuran		0.5 ug/L	0.12 ug/L	30	80-120[d]
	Methiocarb		0.5 ug/L	0.21 ug/L	30	80-120[d]
	Methomyl		0.5 ug/L	0.09 ug/L	30	80-120[d]
	Oxamyl		0.5 ug/L	0.16 ug/L	30	80-120[d]
547	Glyphosate	DW	6 ug/L	1.9 ug/L	30	70-130[d]
548.1	Endothall	DW	2 ug/L	0.78 ug/L	30	80-120[d]
549.2	Diquat	DW	0.4 ug/L	0.14 ug/L	30	70-130[d]
	Paraquat		1.6 ug/L	0.20 ug/L	30	70-130[d]
552.2 Haloacetic Acids	Bromochloroacetic Acid	Drinking Water	0.40 ug/L	0.17 ug/L	30	70-130[d]
	Bromodichloroacetic Acid		1.6 ug/L	0.23 ug/L	30	70-130[d]
	Chlorodibromoacetic Acid		2.0 ug/L	0.74 ug/L	30	70-130[d]
	Dibromoacetic Acid		0.2 ug/L	0.10 ug/L	30	70-130[d]
	Dichloroacetic Acid		0.6 ug/L	0.15 ug/L	30	70-130[d]
	Monobromoacetic Acid		0.4 ug/L	0.15 ug/L	30	70-130[d]
	Monochloroacetic Acid		1.2 ug/L	0.22 ug/L	30	70-130[d]
	Trichloroacetic Acid		0.40 ug/L	0.11 ug/L	30	70-130[d]
	2,3-Dibromopropionic acid [g]		NA	NA	NA	70-130[d]

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method[a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision[b] (RPD)**	**Accuracy[c] (%REC)**
ASTM D4129-82M	Total Organic Carbon	Sediment	0.05%	0.02%	20	85-115[b]
9030M	Sulfides	Sediment	0.1 mg/kg	0.05 mg/kg	20	60-130[b]
PSEP	Particle Size	Sediment		NA	NA	NA
6010B - ICP	Cadmium	Sediment	0.2 mg/kg		30	75-125
AVS-SEM	Copper		0.4 mg/kg		30	75-125
	Lead		3 mg/kg		30	75-125
	Nickel		0.5 mg/kg		30	75-125
	Zinc		0.4 mg/kg		30	75-125
7470A	Mercury		0.01 mg/kg		30	75-125
200.8 - ICP/MS	Aluminum	Tissue	2 mg/kg	0.4 mg/kg	30	70-130[m]
200.8 - ICP/MS	Antimony		0.05 mg/kg	0.02 mg/kg	30	70-130[m]
200.8 - ICP/MS	Arsenic		0.5 mg/kg	0.05 mg/kg	30	70-130[m]
200.8 - ICP/MS	Barium		0.05 mg/kg	0.006 mg/kg	30	70-130[m]
200.8 - ICP/MS	Beryllium		0.02 mg/kg	0.006 mg/kg	30	70-130[m]
200.8 - ICP/MS	Cadmium		0.02 mg/kg	0.01 mg/kg	30	70-130[m]
6010B - ICP	Chromium		0.5 mg/kg	0.5 mg/kg	30	75-125[m]
200.8 - ICP/MS	Cobalt		0.02 mg/kg	0.005 mg/kg	30	70-130[m]
200.8 - ICP/MS	Copper		0.1 mg/kg	0.06 mg/kg	30	70-130[m]
200.8 - ICP/MS	Lead		0.02 mg/kg	0.004 mg/kg	30	70-130[m]
200.8 - ICP/MS	Manganese		0.05 mg/kg	0.01 mg/kg	30	70-130[m]
7174A- CVAA	Mercury		0.02 mg/kg	0.01 mg/kg	30	60-130[m]
200.8 - ICP/MS	Molybdenum		0.05 mg/kg	0.009 mg/kg	30	70-130[m]
200.8 - ICP/MS	Nickel		0.2 mg/kg	0.03 mg/kg	30	70-130[m]
7740 - GFAA	Selenium		1 mg/kg	1 mg/kg	30	60-130[m]
200.8 - ICP/MS	Silver		0.02 mg/kg	0.004 mg/kg	30	70-130[m]
200.8 - ICP/MS	Thallium		0.02 mg/kg	0.002 mg/kg	30	70-130[m]
200.8 - ICP/MS	Vanadium		0.2 mg/kg	0.05 mg/kg	30	75-125[m]
200.8 - ICP/MS	Zinc		0.5 mg/kg	0.2 mg/kg	30	70-130[m]
200.8 - ICP/MS	Arsenic	Seawater	0.5 ug/L	0.2 ug/L	20	56-99
Reductive	Beryllium		0.02 ug/L	0.003 ug/L	20	70-130
Precipitation	Cadmium		0.02 ug/L	0.007 ug/L	20	80-106
	Chromium		0.2 ug/L	0.2 ug/L	20	62-115
	Cobalt		0.02 ug/L	0.005 ug/L	20	70-130
	Copper		0.1 ug/L	0.02 ug/L	20	77-113
	Lead		0.02 ug/L	0.02 ug/L	20	82-116
	Nickel		0.2 ug/L	0.04 ug/L	20	77-114
	Silver		0.02 ug/L	0.008 ug/L	20	74-109
	Thallium		0.02 ug/L	0.004 ug/L	20	70-130
	Zinc		0.5 ug/L	0.2 ug/L	20	75-129
7742 - BRAA	Selenium	Seawater	1 ug/L	0.7 ug/L	20	75-125

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision [b] (RPD)	Accuracy [c] (%REC)
8081A Chlorinated Pesticides	alpha-BHC	Sediment	5 ug/Kg	0.40 ug/Kg	40	64-135
	gamma-BHC (Lindane)		5 ug/Kg	1.2 ug/Kg	40	63-137
	beta-BHC		5 ug/Kg	0.59 ug/Kg	40	49-145
	Heptachlor		5 ug/Kg	0.88 ug/Kg	40	61-123
	delta-BHC		5 ug/Kg	0.45 ug/Kg	40	68-144
	gamma-Chlordane		5 ug/Kg	0.44 ug/Kg	40	63-127
	alpha-Chlordane		5 ug/Kg	0.33 ug/Kg	40	63-125
8081A Chlorinated Pesticides	Aldrin	Sediment	5 ug/Kg	0.69 ug/Kg	40	59-127
	Heptachlor Epoxide		5 ug/Kg	0.55 ug/Kg	40	64-124
	Endosulfan I		5 ug/Kg	0.62 ug/Kg	40	55-124
	4,4'-DDE		5 ug/Kg	0.63 ug/Kg	40	67-133
	Dieldrin		5 ug/Kg	0.48 ug/Kg	40	68-131
	Endrin		5 ug/Kg	1.2 ug/Kg	40	72-133
	4,4'-DDD		5 ug/Kg	1.9 ug/Kg	40	67-139
	Endosulfan II		5 ug/Kg	2.5 ug/Kg	40	62-126
	4,4'-DDT		5 ug/Kg	0.67 ug/Kg	40	68-144
	Endrin Aldehyde		5 ug/Kg	0.46 ug/Kg	40	48-120
	Endosulfan Sulfate		5 ug/Kg	0.93 ug/Kg	40	62-131
	Methoxychlor		5 ug/Kg	0.19 ug/Kg	40	65-140
	Toxaphene		250 ug/Kg	38 ug/Kg	40	
	Tetrachloro-*m*-xylene[d]		NA	NA	NA	39-129
	Decachlorobiphenyl[d]		NA	NA	NA	29-141
8081A Chlorinated Pesticides	alpha-BHC	Tissue	5 ug/Kg	0.40 ug/Kg	40	54-128
	gamma-BHC (Lindane)		5 ug/Kg	1.2 ug/Kg	40	58-125
	beta-BHC		5 ug/Kg	0.59 ug/Kg	40	54-119
	Heptachlor		5 ug/Kg	0.88 ug/Kg	40	48-117
	delta-BHC		5 ug/Kg	0.45 ug/Kg	40	61-131
	gamma-Chlordane		5 ug/Kg	0.44 ug/Kg	40	60-117
	alpha-Chlordane		5 ug/Kg	0.33 ug/Kg	40	60-114
	Aldrin		5 ug/Kg	0.69 ug/Kg	40	56-120
	Heptachlor Epoxide		5 ug/Kg	0.55 ug/Kg	40	60-118
	Endosulfan I		5 ug/Kg	0.62 ug/Kg	40	55-114
	4,4'-DDE		5 ug/Kg	0.63 ug/Kg	40	58-131
	Dieldrin		5 ug/Kg	0.48 ug/Kg	40	61-122
	Endrin		5 ug/Kg	1.2 ug/Kg	40	62-129
	4,4'-DDD		5 ug/Kg	1.9 ug/Kg	40	47-141
	Endosulfan II		5 ug/Kg	2.5 ug/Kg	40	55-115
	4,4'-DDT		5 ug/Kg	0.67 ug/Kg	40	52-143
	Endrin Aldehyde		5 ug/Kg	0.46 ug/Kg	40	10-109
	Endosulfan Sulfate		5 ug/Kg	0.93 ug/Kg	40	57-121
	Methoxychlor		5 ug/Kg	0.19 ug/Kg	40	60-128
	Toxaphene		250 ug/Kg	38 ug/Kg	40	
	Tetrachloro-*m*-xylene[d]		NA	NA	NA	10-171
	Decachlorobiphenyl[d]		NA	NA	NA	38-167

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
8082 PCBs	Aroclor 1016	Sediment	0.1 mg/Kg	0.04 mg/Kg	40	47-138
	Aroclor 1221		0.2 mg/Kg	0.01 mg/Kg	40	
	Aroclor 1232		0.1 mg/Kg	0.02 mg/Kg	40	
	Aroclor 1242		0.1 mg/Kg	0.01 mg/Kg	40	
	Aroclor 1248		0.1 mg/Kg	0.01 mg/Kg	40	
	Aroclor 1254		0.1 mg/Kg	0.01 mg/Kg	40	
	Aroclor 1260		0.1 mg/Kg	0.01 mg/Kg	40	48-149
	Decachlorobiphenyl[f]		NA	NA	NA	40-145
8082 PCBs	Aroclor 1016	Tissue	0.1 mg/Kg	0.04 mg/Kg	40	38-150
	Aroclor 1221		0.2 mg/Kg	0.01 mg/Kg	40	
	Aroclor 1232		0.1 mg/Kg	0.02 mg/Kg	40	
	Aroclor 1242		0.1 mg/Kg	0.01 mg/Kg	40	
	Aroclor 1248		0.1 mg/Kg	0.01 mg/Kg	40	
8082 PCBs	Aroclor 1254	Tissue	0.1 mg/Kg	0.01 mg/Kg	40	
	Aroclor 1260		0.1 mg/Kg	0.01 mg/Kg	40	30-149
	Decachlorobiphenyl[f]		NA	NA	NA	22-172
8082 PCB Congeners	2,4'-Dichlorobiphenyl (8)	Sediment	0.5 ug/Kg	0.11 ug/Kg	40	35-146
	2,2',5-Trichlorobiphenyl (18)		0.5 ug/Kg	0.06 ug/Kg	40	
	2,4,4'-Trichlorobiphenyl (28)		0.5 ug/Kg	0.08 ug/Kg	40	34-151
	2,2',3,5'-Tetrachlorobiphenyl (44)		0.5 ug/Kg	0.06 ug/Kg	40	
	2,2',5,5'-Tetrachlorobiphenyl (52)		0.5 ug/Kg	0.11 ug/Kg	40	38-141
	2,3',4,4'-Tetrachlorobiphenyl (66)		0.5 ug/Kg	0.12 ug/Kg	40	39-136
	3,3',4,4'-Tetrachlorobiphenyl (77)		0.5 ug/Kg	0.05 ug/Kg	40	46-141
	2,2',3,4,5'-Pentachlorobiphenyl (87)		0.5 ug/Kg	0.08 ug/Kg	40	
	2,2',3,4',5-Pentachlorobiphenyl (90)		0.5 ug/Kg	0.08 ug/Kg	40	45-153
	2,2',4,5,5'-Pentachlorobiphenyl (101)		0.5 ug/Kg	0.04 ug/Kg	40	
	2,3,3',4,4'-Pentachlorobiphenyl (105)		0.5 ug/Kg	0.10 ug/Kg	40	38-157
	2,3,4,4',5-Pentachlorobiphenyl (114)		0.5 ug/Kg	0.40 ug/Kg	40	
	2,3',4,4',5-Pentachlorobiphenyl (118)		0.5 ug/Kg	0.05 ug/Kg	40	
	2',3,4,4',5-Pentachlorobiphenyl (123)		0.5 ug/Kg	0.08 ug/Kg	40	
	3,3',4,4',5-Pentachlorobiphenyl (126)		0.5 ug/Kg	0.14 ug/Kg	40	
	2,2',3,3',4,4'-Hexachlorobiphenyl (128)		0.5 ug/Kg	0.29 ug/Kg	40	
	2,2',3,4,4',5'-Hexachlorobiphenyl (138)		0.5 ug/Kg	0.05 ug/Kg	40	
	2,2',4,4',5,5'-Hexachlorobiphenyl (153)		0.5 ug/Kg	0.11 ug/Kg	40	
	2,3,3',4,4',5-Hexachlorobiphenyl (156)		0.5 ug/Kg	0.10 ug/Kg	40	38-159
	2,3,3',4,4',5-Hexachlorobiphenyl (157)		0.5 ug/Kg	0.20 ug/Kg	40	
	2,3',4,4',5,5'-Hexachlorobiphenyl (167)		0.5 ug/Kg	0.33 ug/Kg	40	
	3,3',4,4',5,5'-Hexachlorobiphenyl (169)		0.5 ug/Kg	0.14 ug/Kg	40	
	2,2',3,3',4,4',5-Heptachlorobiphenyl (170)		0.5 ug/Kg	0.07 ug/Kg	40	
	2,2',3,4,4',5,5'-Heptachlorobiphenyl (180)		0.5 ug/Kg	0.04 ug/Kg	40	39-158
	2,2',3,4,4',5',6-Heptachlorobiphenyl (183)		0.5 ug/Kg	0.09 ug/Kg	40	35-154
	2,2',3,4,4',6,6'-Heptachlorobiphenyl(184)		0.5 ug/Kg	0.05 ug/Kg	40	27-174
	2,2',3,4',5,5',6-Heptachlorobiphenyl (187)		0.5 ug/Kg	0.14 ug/Kg	40	
	2,3,3',4,4',5,5'-Heptachlorobiphenyl (189)		0.5 ug/Kg	0.10 ug/Kg	40	39-159
	2,2',3,3',4,4',5,6-Octachlorobiphenyl (195)		0.5 ug/Kg	0.14 ug/Kg	40	
	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (206)		0.5 ug/Kg	0.10 ug/Kg	40	
	Decachlorobiphenyl (209)		0.5 ug/Kg	0.06 ug/Kg	40	36-151
	Tetrachloro-*m*-xylene[g]		NA	NA	NA	10-128

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
8082 PCB Congeners	2,4'-Dichlorobiphenyl (8)	Tissue	0.5 ug/Kg	0.14 ug/Kg	40	25-152
	2,2',5-Trichlorobiphenyl (18)		0.5 ug/Kg	0.11 ug/Kg	40	
	2,4,4'-Trichlorobiphenyl (28)		0.5 ug/Kg	0.031 ug/Kg	40	13-167
	2,2',3,5'-Tetrachlorobiphenyl (44)		0.5 ug/Kg	0.063 ug/Kg	40	
	2,2',5,5'-Tetrachlorobiphenyl (52)		0.5 ug/Kg	0.08 ug/Kg	40	32-136
	2,3',4,4'-Tetrachlorobiphenyl (66)		0.5 ug/Kg	0.073 ug/Kg	40	23-140
	3,3',4,4'-Tetrachlorobiphenyl (77)		0.5 ug/Kg	0.092 ug/Kg	40	14-174
	2,2',3,4,5'-Pentachlorobiphenyl (87)		0.5 ug/Kg	0.23 ug/Kg	40	
	2,2',3,4',5-Pentachlorobiphenyl (90)		0.5 ug/Kg	0.11 ug/Kg	40	18-164
	2,2',4,5,5'-Pentachlorobiphenyl (101)		0.5 ug/Kg	0.065 ug/Kg	40	
	2,3,3',4,4'-Pentachlorobiphenyl (105)		0.5 ug/Kg	0.21 ug/Kg	40	14-165
	2,3,4,4',5-Pentachlorobiphenyl (114)		0.7 ug/Kg	0.32 ug/Kg	40	
	2,3',4,4',5-Pentachlorobiphenyl (118)		0.5 ug/Kg	0.10 ug/Kg	40	
	2',3,4,4',5-Pentachlorobiphenyl (123)		0.5 ug/Kg	0.11 ug/Kg	40	
	3,3',4,4',5-Pentachlorobiphenyl (126)		0.5 ug/Kg	0.12 ug/Kg	40	
8082 PCB Congeners	2,2',3,3',4,4'-Hexachlorobiphenyl (128)	Tissue	0.5 ug/Kg	0.091 ug/Kg	40	
	2,2',3,4,4',5'-Hexachlorobiphenyl (138)		0.5 ug/Kg	0.23 ug/Kg	40	
	2,2',4,4',5,5'-Hexachlorobiphenyl (153)		0.5 ug/Kg	0.15 ug/Kg	40	
	2,3,3',4,4',5-Hexachlorobiphenyl (156)		0.5 ug/Kg	0.13 ug/Kg	40	29-155
	2,3,3',4,4',5-Hexachlorobiphenyl (157)		0.5 ug/Kg	0.082 ug/Kg	40	
	2,3',4,4',5,5'-Hexachlorobiphenyl (167)		0.5 ug/Kg	0.22 ug/Kg	40	
	3,3',4,4',5,5'-Hexachlorobiphenyl (169)		0.5 ug/Kg	0.085 ug/Kg	40	
	2,2',3,3',4,4',5-Heptachlorobiphenyl (170)		0.5 ug/Kg	0.08 ug/Kg	40	
	2,2',3,4,4',5,5'-Heptachlorobiphenyl (180)		0.5 ug/Kg	0.11 ug/Kg	40	28-148
	2,2',3,4,4',5',6-Heptachlorobiphenyl (183)		0.5 ug/Kg	0.18 ug/Kg	40	31-145
	2,2',3,4,4',6,6'-Heptachlorobiphenyl(184)		0.5 ug/Kg	0.082 ug/Kg	40	20-169
	2,2',3,4',5,5',6-Heptachlorobiphenyl (187)		0.5 ug/Kg	0.18 ug/Kg	40	
	2,3,3',4,4',5,5'-Heptachlorobiphenyl (189)		0.5 ug/Kg	0.089 ug/Kg	40	32-150
	2,2',3,3',4,4',5,6-Octachlorobiphenyl (195)		0.5 ug/Kg	0.095 ug/Kg	40	
	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (206)		0.5 ug/Kg	0.077 ug/Kg	40	
	Decachlorobiphenyl (209)		0.5 ug/Kg	0.095 ug/Kg	40	31-143
	Tetrachloro-*m*-xylene[c]		NA	NA	NA	34-97

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method[a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
GC/MS-SIM Polynuclear Aromatic Hydrocarbons	Naphthalene	Sediment	5 ug/Kg	0.21 ug/Kg	40	43-102
	1-Methylnaphthalene		5 ug/Kg	0.14 ug/Kg	40	44-108
	2-Methylnaphthalene		5 ug/Kg	0.21 ug/Kg	40	44-105
	Biphenyl		5 ug/Kg	0.18 ug/Kg	40	49-105
	2,6-Dimethylnaphthalene		5 ug/Kg	0.09 ug/Kg	40	43-112
	Acenaphthylene		5 ug/Kg	0.16 ug/kg	40	51-107
	Dibenzofuran		5 ug/Kg	0.20 ug/Kg	40	50-106
	Acenaphthene		5 ug/Kg	0.21 ug/kg	40	50-105
	2,3,5-Trimethylnaphthalene		5 ug/Kg	0.10 ug/kg	40	49-112
	Fluorene		5 ug/Kg	0.17 ug/kg	40	54-108
	Phenanthrene		5 ug/Kg	0.15 ug/kg	40	58-106
	Anthracene		5 ug/Kg	0.19 ug/kg	40	61-113
	1-Methylphenanthrene		5 ug/Kg	0.19 ug/kg	40	61-115
	Fluoranthene		5 ug/Kg	0.17 ug/kg	40	63-117
	Pyrene		5 ug/Kg	0.11 ug/kg	40	59-121
	Benz(a)anthracene		5 ug/Kg	0.13 ug/kg	40	57-120
	Chrysene		5 ug/Kg	0.15 ug/kg	40	64-116
	Benzo(b)fluoranthene		5 ug/Kg	0.14 ug/kg	40	58-126
	Benzo(k)fluoranthene		5 ug/Kg	0.15 ug/kg	40	61-122
	Benzo(a)pyrene		5 ug/Kg	0.14 ug/kg	40	58-128
	Benzo(e)pyrene		5 ug/Kg	0.15 ug/kg	40	61-121
	Indeno(1,2,3-cd)pyrene		5 ug/Kg	0.15 ug/kg	40	46-133
	Dibenz(a,h)anthracene		5 ug/Kg	0.18 ug/kg	40	50-128
	Benzo(g,h,i)perylene		5 ug/Kg	0.10 ug/kg	40	52-125
	Fluorene-d10[f]		NA	NA	NA	27-110
	Fluoranthene-d10[f]		NA	NA	NA	34-122
	Terphenyl-d14[g]		NA	NA	NA	50-132
GC/MS-SIM Polynuclear Aromatic Hydrocarbons	Naphthalene	Tissue	5 ug/Kg	0.21 ug/Kg	40	53-103
	1-Methylnaphthalene		5 ug/Kg	0.14 ug/Kg	40	28-141
	2-Methylnaphthalene		5 ug/Kg	0.21 ug/Kg	40	27-138
	Biphenyl		5 ug/Kg	0.18 ug/Kg	40	56-107
	2,6-Dimethylnaphthalene		5 ug/Kg	0.09 ug/Kg	40	53-109
	Acenaphthylene		5 ug/Kg	0.16 ug/kg	40	56-111
GC/MS-SIM Polynuclear Aromatic Hydrocarbons	Dibenzofuran	Tissue	5 ug/Kg	0.20 ug/Kg	40	27-160
	Acenaphthene		5 ug/Kg	0.21 ug/kg	40	57-108
	2,3,5-Trimethylnaphthalene		5 ug/Kg	0.10 ug/kg	40	53-114
	Fluorene		5 ug/Kg	0.17 ug/kg	40	57-114
	Phenanthrene		5 ug/Kg	0.15 ug/kg	40	56-112
	Anthracene		5 ug/Kg	0.19 ug/kg	40	61-116
	1-Methylphenanthrene		5 ug/Kg	0.19 ug/kg	40	57-126
	Fluoranthene		5 ug/Kg	0.17 ug/kg	40	59-127
	Pyrene		5 ug/Kg	0.11 ug/kg	40	48-121
	Benz(a)anthracene		5 ug/Kg	0.13 ug/kg	40	43-127
	Chrysene		5 ug/Kg	0.15 ug/kg	40	50-127
	Benzo(b)fluoranthene		5 ug/Kg	0.14 ug/kg	40	59-132
	Benzo(k)fluoranthene		5 ug/Kg	0.15 ug/kg	40	57-141
	Benzo(a)pyrene		5 ug/Kg	0.14 ug/kg	40	55-139
	Benzo(e)pyrene		5 ug/Kg	0.15 ug/kg	40	56-131
	Indeno(1,2,3-cd)pyrene		5 ug/Kg	0.15 ug/kg	40	48-142
	Dibenz(a,h)anthracene		5 ug/Kg	0.18 ug/kg	40	49-144
	Benzo(g,h,i)perylene		5 ug/Kg	0.10 ug/kg	40	53-130
	Fluorene-d10[f]		NA	NA	NA	53-103
	Fluoranthene-d10[f]		NA	NA	NA	56-109
	Terphenyl-d14[g]		NA	NA	NA	50-124

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method [a]	Analyte	Matrix	Method Reporting Limit	Method Detection Limit	Precision[b] (RPD)	Accuracy[c] (%REC)
GC/MS-SIM Polynuclear Aromatic Hydrocarbons	Naphthalene	Water	0.02 ug/L	0.004 ug/L	30	44-101
	1-Methylnaphthalene		0.02 ug/L	0.004 ug/L	30	37-110
	2-Methylnaphthalene		0.02 ug/L	0.003 ug/L	30	36-106
	Biphenyl		0.02 ug/L	0.005 ug/L	30	36-113
	2,6-Dimethylnaphthalene		0.02 ug/L	0.004 ug/L	30	33-113
	Acenaphthylene		0.02 ug/L	0.002 ug/L	30	49-114
	Dibenzofuran		0.02 ug/L	0.008 ug/L	30	40-115
	Acenaphthene		0.02 ug/L	0.002 ug/L	30	48-107
	2,3,5-Trimethylnaphthalene		0.02 ug/L	0.004 ug/L	30	39-118
	Fluorene		0.02 ug/L	0.003 ug/L	30	55-111
	Phenanthrene		0.02 ug/L	0.004 ug/L	30	56-108
	Anthracene		0.02 ug/L	0.002 ug/L	30	42-117
	1-Methylphenanthrene		0.02 ug/L	0.004 ug/L	30	47-131
	Fluoranthene		0.02 ug/L	0.003 ug/L	30	61-123
	Pyrene		0.02 ug/L	0.003 ug/L	30	53-123
	Benz(a)anthracene		0.02 ug/L	0.003 ug/L	30	53-123
	Chrysene		0.02 ug/L	0.002 ug/L	30	57-118
	Benzo(b)fluoranthene		0.02 ug/L	0.002 ug/L	30	57-132
	Benzo(k)fluoranthene		0.02 ug/L	0.002 ug/L	30	54-126
	Benzo(a)pyrene		0.02 ug/L	0.002 ug/L	30	38-142
	Benzo(e)pyrene		0.02 ug/L	0.003 ug/L	30	46-133
	Indeno(1,2,3-cd)pyrene		0.02 ug/L	0.003 ug/L	30	49-139
	Dibenz(a,h)anthracene		0.02 ug/L	0.002 ug/L	30	47-138
	Benzo(g,h,i)perylene		0.02 ug/L	0.004 ug/L	30	50-125
	Fluorene-d10[f]		NA	NA	NA	37-107
	Fluoranthene-d10[f]		NA	NA	NA	18-137
	Terphenyl-d14[f]		NA	NA	NA	18-153
GC/FPD Organotin Compounds	Tributyltin	Sediment	1 ug/Kg	0.33 ug/Kg	40	10-144
	Dibutyltin		1 ug/Kg	0.35 ug/Kg	40	10-150
	Monobutyltin		1 ug/Kg	0.38 ug/Kg	40	10-137
	Tetrabutyltin		1 ug/Kg	0.38 ug/Kg	40	10-128
	Tripropyltin[g]		NA	NA	NA	10-132
GC/FPD Organotin Compounds	Tributyltin	Tissue	1 ug/Kg	0.37 ug/Kg	40	37-141
	Dibutyltin		1 ug/Kg	0.24 ug/Kg	40	43-136
	Monobutyltin		1 ug/Kg	0.39 ug/Kg	40	29-120
	Tetrabutyltin		1 ug/Kg	0.34 ug/Kg	40	32-131
	Tripropyltin[g]		NA	NA	NA	25-161
GC/FPD Organotin Compounds	Tributyltin	Water	0.02 ug/L	0.004 ug/L	30	11-145
	Dibutyltin		0.05 ug/L	0.008 ug/L	30	10-128
	Monobutyltin		0.05 ug/L	0.005 ug/L	30	13-167
	Tetrabutyltin		0.05 ug/L	0.010 ug/L	30	10-112
	Tripropyltin[g]		NA	NA	NA	19-146

MICROBIOLOGICAL ANALYSES						
Method [a]	**Analyte**	**Matrix**	**Method Reporting Limit**	**Method Detection Limit**	**Precision**[b] **(RPD)**	**Accuracy**[c] **(%REC)**
SM 9215B	Heterotrophic Plate Count (Pour)	Water	1 CFU/mL	NA	NA	NA
SM 9215C	Heterotrophic Plate Count (Spread)		1 CFU/mL	NA	NA	NA
SM 9221B	Coliform, Total (MPN)		2 MPN/100mL[i]	NA	NA	NA
SM 9221E	Coliform, Fecal (MPN)		2 MPN/100mL[i]	NA	NA	NA
SM 9223B	Coliform (Colilert)		Presence/100mL	NA	NA	NA
SM 9230B	Enterococcus		2 MPN/100mL	NA	NA	NA
SM 9230B	Fecal Streptococcus		2 MPN/100mL	NA	NA	NA
SM 10200H	Chlorophyll A		0.8 mg/L	0.2 mg/L	20	NA

Legend: NA = Not Applicable PCBs = Polychlorinated Biphenyls

a See Section 18 for list of references. Unless noted, the listed methods are EPA methods:
SM = Standard Methods for the Examination of Water and Wastewater;
ASTM = American Society for Testing and Materials.
Microbiology methods are *Standard Methods for the Examination of Water and Wastewater*, 18th edition.

b In-house limits, unless footnoted.

c Statistically derived Laboratory Control Sample (LCS) limits, unless footnoted.

d Method specified control limits.

e Method MRLs and matrix spike percent recovery data vary according to the method of extraction.

f Either method may be used, depending on project requirements.

g Surrogate compound

h These compounds coelute; therefore, results are reported as the combined concentration.

i MRL is 1.1 MPN/100mL for drinking water samples (10 tube method).

m Matrix spike control limits.

APPENDIX E

PREVENTIVE MAINTENANCE PROCEDURES

Instrument	Activity	Frequency
Refrigerators and Coolers	Record temperatures Clean coils Check coolant	Daily Annually Annually or if temperature outside limits
Vacuum Pumps	Clean and change pump oil	Every month or as needed
Fume Hoods	Face velocity measured Sash operation Change filters Inspect fan belts	Quarterly As needed Annually Annually
Ovens	Clean Record temperatures	As needed or if temperature outside lim. Daily, when in use
Incubators	Record temperatures	Daily, morning and evening
Water Baths	Record temperatures Wash with disinfectant solution	Daily, morning and evening When water is murky, dirty, or growth appears
Autoclave	Check sterility Check temperature Clean	Every month Every month When mold or growth appears
Analytical Balances	Check alignment Check calibration Clean pans and compartment	Before every use Daily After every use
Dissolved Oxygen Meter	Change membrane	When fluctuations occur
pH probes	Condition probe	When fluctuations occur
Fluoride ISE	Store in storage solution	Between uses
Ammonia ISE	Store in storage solution	Between uses
UV-visible Spectrophotometer	Wavelength check	Annually
Total Organic Carbon Analyzers	Check IR zero Check digestion/condensation vessels Clean digestion chamber Clean permeation tube Clean six-port valves Clean sample pump Clean carbon scrubber Clean IR cell	Weekly Each use Every 2000 hours, or as needed Every 2000 hours, or as needed Every 200 - 2000 hours, or as needed Every 200 - 2000 hours, or as needed Every 200 - 2000 hours, or as needed Every 2000 - 4000 hours, or as needed

Instrument	Activity	Frequency
Total Organic Halogen Analyzers	Change cell electrolyte	Daily
	Change electrode fluids	Daily
	Change pyrolysis tube	As needed
	Change inlet and outlet tubes	As needed
	Change electrodes	As needed
Flow Injection Analyzer	Check valve flares	Each use
	Check valve ports	Each use
	Check pump tubing	Each use
	Check light counts	Each use
	Check flow cell flares	Quarterly
	Change bulb	As needed
	Check manifold tubing	Each use
	Check T's and connectors	Each use
Ion Chromatographs	Change column	Every six months or as needed
	Change valve port face & hex nut	Every six months or as needed
	Clean valve slider	Every six months or as needed
	Change tubing	Annually or as needed
	Eluent pump	Annually
Atomic Absorption Spectro-photometers - FAA and CVAA	Check gases	Daily
	Clean burner head	Daily
	Check aspiration tubing	Daily
	Clean optics	Every three months
	Empty waste container	Weekly
Atomic Absorption Spectro-photometers - GFAA	Check gases	Daily
	Check argon dewar	Daily
	Change graphite tube	Daily, as needed
	Clean furnace windows	Monthly
ICP - AES	Check argon dewar	Daily
	Replace peristaltic pump tubing	Daily
	Empty waste container	Weekly
	Clean nebulizer, spray chamber, and torch	Every two weeks
	Replace water filter	Quarterly
	Replace vacuum air filters	Monthly

Instrument	Activity	Frequency
ICP - MS	Check argon dewar	Daily
	Check water level in chiller	Daily
	Complete instrument log	Daily
	Replace peristaltic pump tubing	Daily
	Clean sample and skimmer cones	As needed
	Clean RF contact strip	As needed
	Inspect nebulizer, spray chamber, and torch	Clean as needed
	Clean lens stack/extraction lens	As needed
	Check rotary pump oil	Monthly
	Change rotary pump oil	Every six months
Gel-Permeation Chromatographs	Clean and repack column	As needed
	Backflush valves	As needed
High Pressure Liquid Chromatographs	Backflush guard column	As needed
	Backflush column	As needed
	Change guard column	As needed when back pressure to high
	Change column	Annually or as needed
	Change in-line filters	As needed
	Leak check	After column maintenance
	Change pump seals	As needed
	Change pump diaphragm	Annually
	Clean flow cell	As needed
	Fluorescence detector check	Daily
	Diode array absorbance check	Daily
Gas Chromatographs, Semivolatiles	Check gas supplies	Daily, replace when pressure reaches 50 psi
	Change in-line filters	Quarterly or after 30 tanks of gas
	Change septum	Daily
	Change injection port liner	Weekly or as needed
	Clip first 6-12" of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Check system for gas leaks	After changing columns and after any power failure
	Clean FID	Weekly or as needed
	Clean ECD	Quarterly or as needed
	Leak test ECD	Annually

Instrument	Activity	Frequency
Gas Chromatograph/Mass Spectrometers, Semivolatiles	Check gas supplies	Daily, replace when pressure reaches 50 psi
	Change in-line filters	Annually or as needed
	Change septum	Daily, when in use
	Change injection port liner	Weekly or as needed
	Clip first 6-12" of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Clean source	As needed when tuning problems
	Change pump oil	As specified by service specifications
Purge and Trap Concentrators	Change trap	Every four months or as needed
	Change transfer lines	Every six months or as needed
	Clean purge vessel	Daily
Gas Chromatographs, Volatiles	Check gas supplies	Daily, replace when pressure reaches 50 psi
	Change in-line filters	Quarterly or after 30 tanks of gas
	Change septum	Daily
	Clip first 6-12" of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Check system for gas leaks	After changing columns and after any power failure
	Clean PID lamp	As needed
	Clean FID	As needed
	Change ion exchange resin	Every 60 days
	Replace nickel tubing	Quarterly or as needed
Gas Chromatograph/Mass Spectrometers, Volatiles	Check gas supplies	Daily, replace when pressure reaches 50 psi
	Change in-line filters	Annually or as needed
	Change septum	Daily
	Clip first foot of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Clean jet separator	As needed
	Clean source	As needed when tuning problems
	Change pump oil	As specified by service specifications

APPENDIX F

ADDITIONAL AGENCY-SPECIFIC DOCUMENTS