Appendix B

CD-ROM Including: Laboratory Quality Assurance Manuals

Legend Technical Services, St. Paul, MN
Braun Intertec, Minneapolis, MN
TestAmerica, West Sacramento, CA

LABORATORY QUALITY ASSURANCE MANUAL

Volume 22

Book #308

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MISSION STATEMENT

Legend Technical Services, Inc. (LEGEND) is dedicated to promoting public health and supporting the environment by providing reliable, legally defensible analytical and consulting services to a wide variety of clientele in an efficient, timely manner.

LEGEND'S primary goal is to maintain extensive experience and flexibility in order to provide a diverse range of services to our clients, giving them the best analytical and consulting services value. LEGEND is committed to continuous improvement in the quality and scope of services provided.

LEGEND TECHNICAL SERVICES, INC.
QUALITY ASSURANCE MANUAL
May 2008 – Volume 22

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SECTION 1

SCOPE

1 Scope

The objective of the Legend Technical Services, Inc. (LEGEND) Quality Assurance Program and its systems is to verify that the laboratory data including field observations and analytical data for the client are of good quality generated by using good laboratory practices, and meet all applicable regulatory requirements. The quality assurance manual covers the quality management system consistent with the ISO 9001:2000 standard for the analysis, data collection and reporting of results on samples initiated within LEGEND.

Design is excluded from the ISO scope because LEGEND does not have design responsibilities. Any design decisions are driven by the client and would fall under customer oriented processes.

SECTION 2

REFERENCES

2 References

The quality systems and procedures described in this manual are based on the requirements of ISO 9001:2000, state agencies, federal programs, and AIHA/NVLAP policies employing the principles of ISO/IEC 17025:2005 (E).

SECTION 3

TERMS AND DEFINITIONS

3 Terms and Definitions

This quality assurance manual applies the terms and definitions given in ISO 9001:2000. The term "organization" refers to LEGEND to which the ISO 9001:2000 standard applies.

In this quality manual, the term "product" refers to product and services LEGEND delivers to the market place. Internal services for internal customers are treated as interim steps to satisfying the end-user. Therefore, customer service support and product design information are internal products driving the deployment of the final product to the end-user.

Appendix A lists definitions for common terms and abbreviations.

SECTION 4

QUALITY MANAGEMENT SYSTEM

4 Quality Management System

4.1 General Requirements

The quality assurance manual specifies requirements for a quality management system that helps guide LEGEND to demonstrate its ability to consistently provide service that meet customer needs as well as applicable regulatory requirements and enhance customer satisfaction through continual improvement of services.

4.1.1 Quality Management System Model

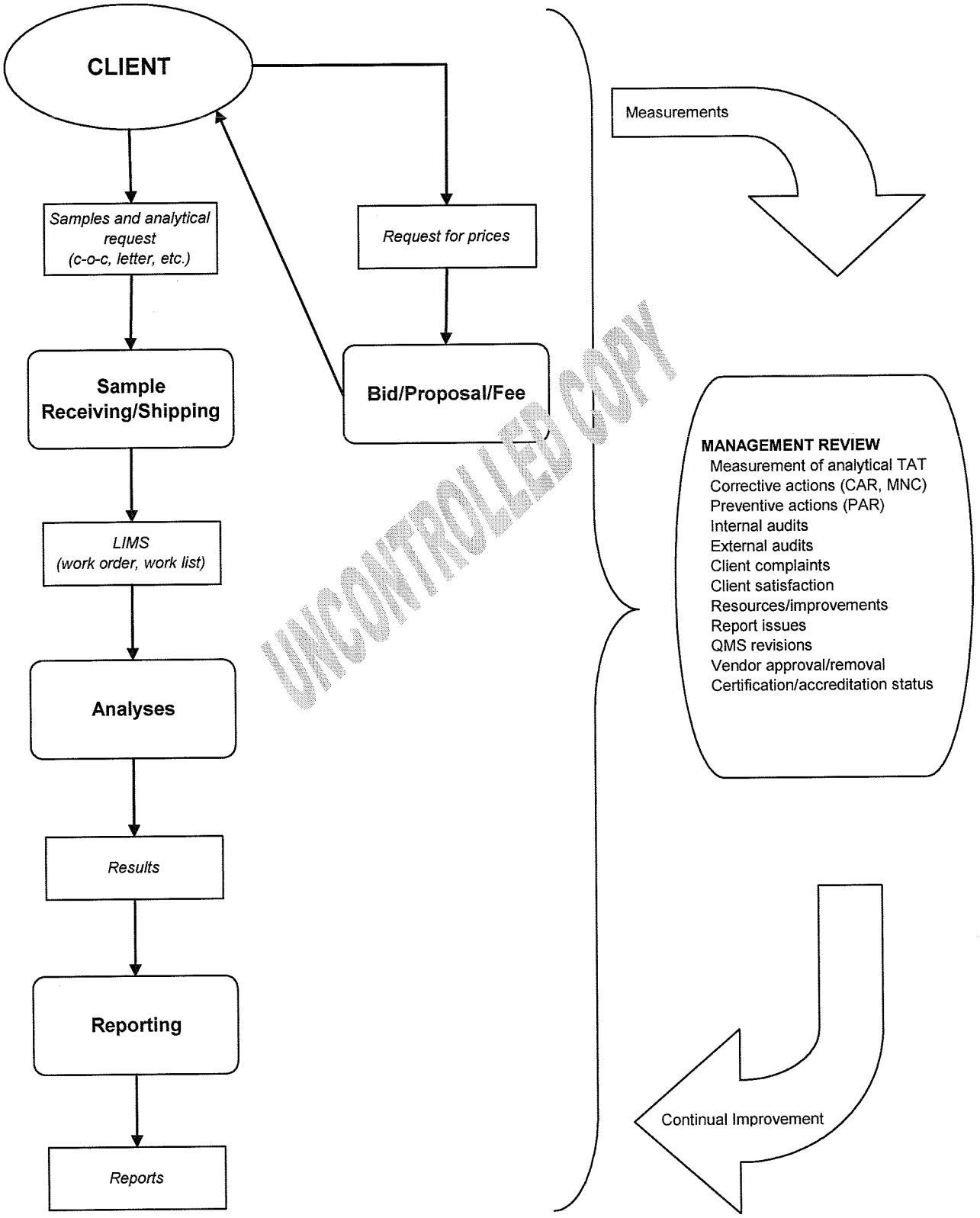
A. Determines criteria and methods needed to ensure that both the operation and control of these processes are effective.

B. Ensures the availability of resources and information necessary to support the operation and monitoring of these processes.

C. Ensures the monitoring, measuring and analysis of these processes.

D. Ensures the implementation of actions necessary to achieve planned results and continual improvement of these processes.

Quality Management System (QMS) Model



4.2 Documentation Requirements

4.2.1 General

The quality management system documentation consists of the following: Quality Assurance (QA) Manual, Standard Operating Procedures, Work Instructions, and Quality Records.

4.2.2 Quality Manual

The QA Manual provides the overall policy for the laboratory. It follows ISO guidelines and is reviewed annually. The QA Manual includes:

A. The scope of the quality management system (Section 1).

B. The documented procedures established for the quality management system, or reference to them.

C. A description of the interaction between the processes of the quality management system (Section 4.1).

D. The quality policy (Section 5.3).

The QA Manual shall require the approval of the President before changes are issued. The QA Manual is numbered and a distribution list maintained.

4.2.3 Control of Documents

This QA Manual and other referenced supporting documents are controlled per the requirements of ISO 9001:2000. The documentation of the quality management system for the most part is electronically controlled. Any employee using a printed document is required to verify that the version is current. The main documents are Standard Operating Procedures (SOP), Work Instructions (WI), and Forms.

A. Quality Assurance Manual (QAM)

The QA/QC Coordinator shall review and update the QAM on an annual basis. The QAM shall require the approval of the President before changes are issued. The QAM is numbered and a distribution list maintained.

B. Standard Operating Procedures (SOP)

SOPs shall be developed and implemented for all routine, standardized, and/or special/critical operations. The procedure for preparation of an SOP can be found under SOP 'Preparation of Departmental SOPs'.

SOPs have been divided into four groups, to reflect the different operations as outlined below:

1. General Operations Standard Operating Procedures

This group contains the SOPs required for daily operation of office and business functions, including QA activities.

2. Equipment Standard Operating Procedures

   This group contains the SOPs required for use of field and laboratory equipment.

3. Laboratory Operations Standard Operating Procedures

   This group contains the SOPs required for all facets of lab operations including calibration and specific procedures. It is divided further into environmental (LABENV), industrial hygiene (LABIH), and industrial chemistry (LABIND).

4. Field Operations Standard Operating Procedures

   This group contains the SOPs required for all facets of field operations including calibration and specific procedures.

The current revision of each SOP is stored on-line in the laboratory's network. Paper copies are allowed within the individual departments as long as the revision being followed has been checked against the current revision on-line.

All SOPs (except LABENV) are updated and reissued as needed and are re-evaluated approximately every two years or more frequently when changes have been made to references or the procedure to determine suitability for continued use.

SOPs that are revised shall retain their original number with an additional number after a decimal point to indicate the revision number, i.e., first revision of an environmental SOP LABENV-001 would be designated SOP LABENV-001.1. Copies of all SOP revisions are kept in the QA department.

New SOPs shall be reviewed by a technical reviewer, approved by the QA/QC Coordinator and authorized by the President.

C. Work Instructions (WI)

Work Instructions (WI) are brief, detailed instructions outlining a specific, routine task. A copy of the Work Instruction is usually located where the task is performed. The procedure for preparation of a WI can be found under SOP 'Preparation of Work Instructions'.

WIs that are revised will retain their original number with an additional number after a decimal point to indicate the revision number, i.e., first revision of WI-001 would be designated WI-001.1. Copies of all WI revisions are kept in the QA department.

D. Forms

Forms are developed to aid in the documentation process and may be accompanied by an SOP. Forms have been divided into the following categories:

1. General (GEN)

   This group contains forms that may be used by everyone in the company.

2. Asbestos (ASB)

   This group contains forms related to asbestos field and laboratory work.

3. Equipment (EQUIP)

   This group contains forms related to equipment use.

4. Field (FLD)

   This group contains forms related to fieldwork.

5. Laboratory (LAB)

   This group contains forms related to laboratory work.

Each form is assigned a unique number under its specific group and an issue date. When a form is reviewed and changes are made, the date changes to reflect the date of change. Forms are revised on an as needed basis. An index of forms maintains a record of each form, its revision date, and its title. Copies of all current 'LAB' forms are kept by the QA department.

E. Quality Assurance Project Plans (QAPP)

QAPPs are project specific plans that may be prepared where a project requires unique or different quality assurance requirements or when they are required by regulatory agencies. They require the approval of the Client Manager and/or QA/QC Coordinator and are signed and dated before issuance.

All obsolete documents, excluding forms, are retained for either legal or knowledge preservation purposes and become part of the records system. These documents will be marked to indicate they are no longer current. Quality system documents generated by the laboratory will be uniquely identified, including date of issue and/or revision date, and page numbers with the total number of pages in the document (if applicable). The issuing authorities are defined as follows:

QA Plan:	QA/QC Coordinator
Form:	QA/QC Coordinator/IH Administrative Assistant
SOP:	QA/QC Coordinator
WI:	QA/QC Coordinator

4.2.4 Control of Records

All information recorded in support of technical or quality activities are records. All records are maintained in good order by the responsible department. Records are stored in temperature and humidity controlled environments with all employees having access. Records are retained for a minimum of five years with the following exceptions: ELLAP laboratory records – maintained for a period of at least ten years, Material Safety Data Sheets (MSDS) – one version for the life of the chemical and Certificates of Analysis (C of A) – indefinitely. Records are disposed of by recycling and/or as general trash. A spreadsheet listing the indexing, ISO reference number, and storage of records is found on the next page.

Control of Records

Record	ISO Ref. #	Indexing	Storage
QA Manual (archived)	4.2.2	Date	QA Department
SOPs (archived)	4.2.3	Date	QA Department
Final Reports	4.2.4	Project/Work Order #	File room and archive area
External Audits	4.2.4	Type, date	QA Department
Material Safety Data Sheets	4.2.4	Alphabetical	Laboratory
Certificates of Analysis	4.2.4	Manufacturer, unique ID	QA Department
Management Reviews	5.6.1	Date	QA Department
Training	6.2.2	Date	Current – analyst Archive – personnel file
Job Descriptions / Resumes	6.2.2	Alphabetic	Listing – computer Signed – personnel file
Proposals / Quotes / Contracts	7.2.1	Project/Work Order #	Single project – project file Multiple projects – client specific file
Review of requirements	7.2.2	Project/Work Order #	Project file
Subcontractor / Vendor Evaluations	7.4.1	Alphabetical	QA Dept. / Accounting Dept.
Raw Data (runs, chromatographs, etc.)	7.5.1	Date	Current – analytical department Archive – archive area
Instrument Run Logs	7.5.2	Log #	Current – analytical department Archive – archive area
Daily Files	7.5.2	Date	Current – analytical department Archive – archive area
Proficiency Testing	7.5.2	Project/Work Order #	QA Department
Control Charts	7.5.2	Date, department	QA Department
Client Information (samples, project, etc.)	7.5.3, 7.5.4	Project/Work Order #	Project file / LIMS
Instrument Calibration/ Maintenance Logs	7.6	Log #	Specific department, QA Dept. or archive area
Computer Software Validation	7.6	Date	QA Department
Internal Audits	8.2.2	Audit #	QA Department
Release of product	8.2.4	Project/Work Order #	Daily and/or project file
Corrective Action Report (CAR)	8.3 / 8.5.2	CAR #	QA Department
Preventive Action Report (PAR)	8.5.3	PAR #	QA Department

A. Project Files

1. Project files are maintained in accordance with LEGEND's Project File Maintenance SOP. Separate record packages are maintained for each project and are filed according to project number. Project files are maintained in a controlled area. Working files may be established by test during sample analysis and data reduction. The designated client manager is responsible for set-up and organization of his/her project files.

2. Completed files may consist of raw data sheets (i.e. chromatograms and bench sheets), correspondence with the client, chain of custody forms, etc.

3. All records of review, including any significant changes, shall be maintained and noted on the chain-of-custody or in the case narrative. All observations, data, and calculations shall be recorded at the time they are made. The laboratory management does have the authority for permitting departures from documented policies and procedures or from standard specifications. This deviation is documented in the project file along with management's approval. The client may be consulted and/or informed if the deviation impacts the data.

4. The records will indicate if the laboratory subcontracted any of the work.

   a) For projects requiring specific accreditation, the client shall be informed of subcontracted work in writing. When appropriate, the client will approve the work, preferably in writing.

   b) LEGEND is responsible to the client for the timeliness that the work is coordinated with the subcontractor and the completeness of the resulting data in the final report. LEGEND is not responsible to the client if the client or a regulatory authority indicates which subcontractor is to be used.

5. The client shall be informed if any deviations occurred from the original request.

6. Completed and closed files are transferred to a secured file storage area where laboratory personnel may access them.

B. Laboratory Records

1. All records on original observations, calculations, derived data, and calibrations are recorded. The laboratory maintains a copy of the test report. Each record for each test shall contain sufficient information to permit their reconstruction at a future date. The records will include the person involved in sampling (if available), sample preparation, and sample testing, where appropriate.

2. When mistakes occur in the records, each mistake shall be crossed out with a single line, the correct entry made, and the correction initialed and dated by the individual making the change in ink.

3. Laboratory records fall into two major categories:

   a) Documents that reflect overall laboratory operation such as instrument log books and control charts.

b) Documents specific to a group of samples such as chain-of- custody and raw analytical data.

4. Raw data is defined as the record of observations on a project including laboratory/field notebooks, bench sheets, memoranda, printouts, strip charts, photographs, magnetic media (tape and disc) and any other methods used to capture and record original data.

5. All data recording sheets, calculation sheets, chromatograms, bench sheets etc., shall be dated and signed by the analyst. (Multiple page chromatograms may have the top sheet only, signed & dated.)

6. Any additions to the raw data shall include the original data indicating the reason for change, the date changed, and who was responsible for making the change. If a correction needs to be made to the data, a single-line crossing out the error will be made through the incorrect information. Beside the correct information, record the initials of the person who made the change and the date when the change was made.

7. All laboratory records from time of sample receipt through data reporting and sample disposal shall be available if requested by clients, an authorized regulatory agency, or court. No other outside person or persons shall have access to the laboratory files without written /verbal permission from the client. Records are maintained in the project and daily files.

C. General Laboratory Operation Records

The laboratory department heads and/or QA/QC Coordinator shall maintain the following records:

1. Instrument Calibration and Maintenance Logs

A separate log shall be maintained for each instrument listing all maintenance and calibration performed in-house or by outside groups. These logs shall be maintained in the laboratory during use and then archived within the individual department. This maintenance log shall store all calibration reports performed by outside sources.

2. Proficiency Testing Records

The QA/QC Coordinator shall maintain a record.

3. Certification Program Records

Records shall be maintained by the QA/QC Coordinator of all correspondence, analytical data, agency results and certification of performance from all certification programs.

4. Control Charts

Charts shall be filed chronologically. Current charts shall be maintained in the laboratory and old charts archived for a minimum of five years.

5. Audit Records

   Formal audit reports of internal and external performance audits shall be filed with the QA/QC Coordinator.

6. Computer Software Verification

   Laboratory data systems are validated on an annual basis.

7. Training Records

   Resumes, external training, and in-house training records shall be maintained in the employee file.

8. Master Corrective Action Log

   The QA/QC Coordinator shall maintain a copy of all Corrective Action Reports (CAR).

9. Master Preventive Action Log

   The QA/QC Coordinator shall maintain a copy of all Preventive Action Reports (PAR).

10. Instrument Run Log

    A list of samples run on each instrument shall be recorded in logbooks and maintained by the analysts.

11. Standard Operating Procedures / Work Instructions

    A file of historical laboratory SOPs and WIs with issue dates shall be maintained by the QA/QC Coordinator.

12. Subcontractor QA Sample Records

    The QA/QC Coordinator shall maintain results of any QC samples submitted to subcontractors.

13. Vendor Evaluations

    The Accounting Department shall maintain completed vendor evaluations.

14. Reports

    The results of each test, or series of tests, shall be reported accurately, clearly, unambiguously, and objectively, in accordance with any instructions in the test method. The results should be reported in a test report and should include all the information necessary for the understanding of the test results. If a statement of compliance with a specification is made, the clauses of the specifications that are met or not met shall be made. When statements of compliance are made, the uncertainty of measurement shall be taken into account.

15. Proposals/Quotes/Contracts

All requests, tenders, and contracts will be reviewed to ensure:

a) The requirements, including the methods to be used, are adequately defined, documented, and understood.

b) The laboratory has the capability and resources to meet the requirements.

c) The appropriate tests and/or methods are selected and capable of meeting the client's requirements.

d) If a contract needs to be amended after work has commenced, the same contract review process shall be repeated and any amendments shall be communicated to all affected personnel.

The items listed above are further described under SOP 'Preparation of Proposals and Use of General Conditions and Sub-Contract Agreements'

SECTION 5

MANAGEMENT RESPONSIBILITY

5 Management Responsibility

5.1 Management Commitment

A. LEGEND is committed to the development, implementation, and continual improvement of its quality management system. This is accomplished by:

1. Communicating to the organization the importance of meeting customer as well as statutory and regulatory requirements
2. Maintaining the quality policy
3. Ensuring that quality objectives are established
4. Conducting regular management reviews
5. Ensuring the availability of resources

B. Management's mission is to foster, through teamwork, the development of a proactive quality program. It is management's responsibility to ensure that LEGEND's processes, documentation, and service is of the type and quality expected by the customer. Senior management's responsibilities in this endeavor include, but are not limited to:

1. Defining the functional responsibilities of management and staff.
2. Establishing levels of accountability and authority.
3. Creating and supporting the need for communication for planning, implementing, and assessing our programs and services.
4. Providing adequate resources to implement the QA program.
5. Performing an annual assessment of the quality process.
6. Using the internal assessments and those of outside auditors to determine what response/actions are appropriate and implement them.
7. Taking the initiative to remove any barriers that hinder the organization from meeting quality objectives.
8. Ensuring the quality program is reviewed and updated to reflect organizational or policy changes.
9. Ensuring the adequacy of resources and personnel that has the necessary education, training, technical knowledge and experience for their assigned functions to achieve and assure quality in all activities.
10. Formulating the goals with respect to the education training and skills of the laboratory personnel.
11. Ensuring management and personnel are free from any undue internal and external commercial, financial or other pressures and influences that may adversely affect the quality of their work.

12. Ensuring the protection of the customers' confidential information and proprietary rights, including procedures for protecting the electronic storage and transmission of results.

5.2 Customer focus

Customer satisfaction is critical for the success of LEGEND. Customer interaction is a key to understanding customer needs and is accomplished through multiple means including direct sales/marketing contacts, client managers' interactions, management interactions, and specific performance measurements provided by several customers.

5.3 Quality Policy

LEGEND is committed to meet customer requirements. We are focused on meeting our customer's quality expectations through continual improvement and uncompromising business ethics. This policy is communicated to the organization and reviewed for continuing suitability.

5.4 Planning

5.4.1 Quality Objectives

Quality objectives are documented in the Management Review Summaries.

5.4.2 Quality Management System Planning

The planning of the quality management system is carried out to ensure the integrity of the model as stated in section 4.1 and to meet the quality objectives, quality plan, and strategic plan.

5.5 Responsibility, Authority and Communication

5.5.1 Responsibility and Authority

LEGEND's management team manages the quality management system. A copy of the organizational chart is on the following page.

A. Technical Director

1. Report to President.
2. Responsible for developing procedures, bringing equipment on-line, and maintaining current with regulatory requirements, state-of-the-art technologies, and certification requirements.
3. Assist the QA/QC Coordinator in obtaining laboratory certification.
4. Directly manages supervisors.
5. Monitors expenses including justification of capitol expenditures.
6. Assists supervisors in employee reviews including changes in compensation.

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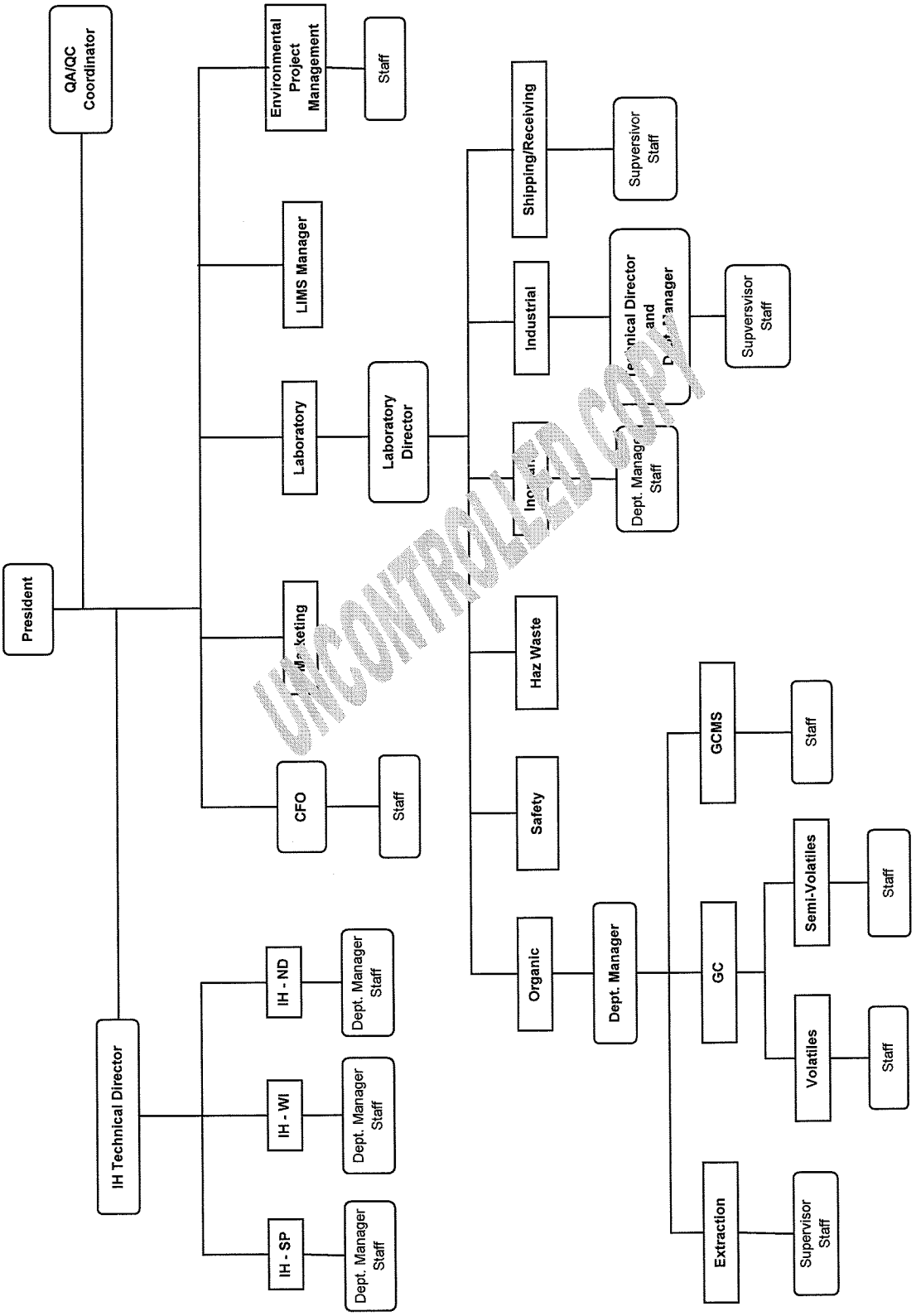


B. Department Manager

1. Reports to the President.
2. Reviews data generated by their staff.
3. Responsible for instrument performance, calibration, and preventive maintenance.
4. Takes an active role in cross training.
5. Reports out-of-control situations to the QA/QC Coordinator by completing Corrective Action Reports.
6. Maintains adequate and appropriate quantities of laboratory supplies.
7. Is responsible for training and continuing compliance of analysts with methods, SOPs, and quality assurance requirements.

C. Sample Preparation/Analysis Personnel

1. Perform methods, data recording, and data validation using prescribed methods.
2. Report out-of-control situations and nonconformances to the Department Manager.

5.5.2 Quality Assurance/Quality Control Coordinator - ISO Management Representative

The QA/QC Coordinator is the designated quality management representative. The responsibilities include assuring that processes needed for the quality management system are established, implemented, and maintained, reporting to top management on the performance of the quality management system and any need for improvement, and ensuring the promotion of awareness of customer requirements throughout the organization.

A. Performs statistical analysis on quality control data.

B. Reviews statistical data from laboratory quality control samples.

C. Maintains the quality manual.

D. Maintains records and archives of quality assurance data.

E. Responsible for assuring documentation and resolution of nonconformances.

F. Stops production of laboratory data when quality control data demonstrates significant trend problems.

G. Coordinates laboratory certification/accreditation.

H. Coordinates laboratory quality assurance audits.

I. Reports to the President, Technical Directors, and Department Managers on the

status of quality control program and audit results.

J. Recommends methods, standard operating procedures, and quality control procedures to the appropriate personnel.

K. When absent, the applicable Technical Director assumes the responsibility.

L. Authorizes resumption of the production of laboratory data when corrective actions have been implemented and proven effective.

5.5.3 Internal Communication

The top management conducts quarterly management review meetings to discuss LEGEND's performance results including quality and customer service indices.

5.6 Management Review

5.6.1 General

The purpose of the review is to evaluate the overall performance of the quality management system and identify improvement opportunities. Reviews are held on a quarterly basis. Meetings are rescheduled if the President, Industrial Chemistry Technical Director or the QA/QC Coordinator can not be there or if 50% of the following can not attend: department managers, supervisors, or marketing. Records of these reviews are documented and maintained for future reference.

5.6.2 Review Input

Inputs to the quality management system review will include the following:

A. Customer satisfaction

B. Results of audits

C. Product conformity

D. Status of preventive and corrective actions

E. Changes affecting the quality management system (e.g. quality policy, documents, regulatory standards, certifications, vendor approval/removal)

F. Recommendations for improvement/resources identified

G. Report of proficiency testing results

H. Supervisory/managerial reports

Follow-up actions from previous management reviews are addressed within each section. Management will retain and exercise the responsibility for defining and implementing an effective quality assurance program for the organization.

5.6.3 Review Output

The output of the management review summarizes the decisions made and actions assigned for improvement of the quality management system and processes, customer satisfaction improvement, and any resource needs.

SECTION 6

RESOURCE MANAGEMENT

6 Resource Management

6.1 Provision of Resources

Resource needs are identified and allocated to implement and maintain the quality management system and continually improve its effectiveness, and to enhance customer satisfaction by meeting customer expectations.

6.2 Human Resources

6.2.1 General

The selection process and on-going training of individuals performing work affecting product quality is designed to match individuals with appropriate education, training, skills, and experience to the job.

6.2.2 Competence, Awareness, and Training

Job descriptions contain all appropriate requirements for job openings and are used to review and select the right candidates for the job. The job qualifications and requirements help in the selection of the individual with the best set of skills and experience. Appropriate records of education, training, skills and experience are maintained for all employees by the Human Resources Director.

Training at LEGEND is primarily accomplished through on-the-job training. If the task has an SOP or Work Instruction, the trainee must read the document before initiating training. The trainee and supervisor/trainer must sign off acknowledging the reading of the SOP. This record is maintained with the trainee until completely filled and then it is placed in their personnel file. Trainees will observe the job as performed by qualified personnel and may participate in phases of the task at the supervisor/trainer's discretion. A trainee may not perform the task alone until the supervisor/trainer has signed off on the task. Some of the tasks will also require a completion of an Initial Demonstration of Capability (IDC) to show effectiveness of the training. The IDC information is listed in each applicable SOP. Where appropriate or required, training procedures are written. Training procedures should include trainer qualifications, training content, training duration, an IDC procedure and documented authorization to perform the specific tasks.

Public and private personnel files are maintained for each employee (SOP 'Personnel File Maintenance'). Items that may be contained in each are listed below. Public files are open for review by any employee or outside agency. Private files are available only to the Human Resources Director. Any record placed in the public file may not contain the employee's Social Security Number.

A. Public File

1. Resume: current resume for each employee is maintained and updated by the employee.

2. Job Description(s): a signed copy of each applicable job description is maintained.

3. Training: a training log outlining all training activities including on-the-job-

training are kept up-to-date and maintained by each employee. Completed logs are archived in the personnel file. Copies of all course completion certificates for external training are also included.

4. Initial Demonstration of Capability (IDC): shall be performed by the analyst initially and when there is a significant change in instrumentation or published test method. Completed IDCs are archived in the personnel file.

5. Medical Surveillance: for those employees required to wear respiratory protection during job activities, personnel file documentation includes doctor sign-off that the individual can wear a respirator and respirator fit test records.

B. Private File

1. Formal Reviews/Salary Actions: should be initiated annually by the employee completing an 'Employee Self-Evaluation' form for each of their job descriptions. The completed form(s) are submitted to their supervisor. The written review requires input from both the staff and their supervisor and is designed to positively direct each individual's career and to implement growth and change from within the organization. The review shall also identify training needs and how these needs are to be completed. Salary actions are initiated as needed by the review or as required due to a change in status. These changes are documented on an employee status change form.

2. Tax Forms: each employee's W-4 form, W-4 form, etc. are maintained.

3. Employee Application: each employee's job application form is maintained.

4. Medical/Life/401K Benefits: employee's insurance and 401K information are maintained.

5. New Hire Form.

Where contracted and additional technical and key personnel are used, the laboratory shall ensure that such personnel are supervised and competent, and that they work in accordance with the laboratory's quality system.

6.3 Infrastructure

A. LEGEND has an infrastructure designed to support the company needs to achieve conformity to service and product requirements. The infrastructure includes but is not limited to buildings and associated facilities, instrumentation including hardware and software, and supporting services such as transport and communication.

B. LEGEND's St. Paul, Minnesota operations are housed in a 30,000-ft^2, one-story commercial building located at 88 Empire Drive. The building is air-conditioned and has sufficient three-phase power and water to meet our equipment's requirements. Backup power, backup air-conditioning, and a 24 hour security system are also provided. A floor plan and key for the laboratory layout are on pages 26-29.

C. The deionized water is produced using a Barnstead E-pure organic free deionizer system with resistivity >16.3 megaohm/cm. The water purity level is checked and recorded each day of use.

D. Major equipment is classified as calibration (C), reference (R) or hood (H).

1. Calibration equipment is defined as a monitoring or measuring device that yields a value used within an analysis. 'CP' refers to periodic calibration (e.g. balances, thermometers, weights, etc.) and 'CO' refers to operational calibrations (e.g. GC, spectrophotometer, sampling pump). Section 7.6 further defines calibration requirements.

2. Reference equipment is typically used in techniques to prepare the sample (e.g. pellet press, ASE, steam bath).

3. Hoods are located throughout the individual laboratories to limit exposure to hazardous chemical fumes, remove instrument exhaust and/or asbestos.

E. On the following pages are a list of the major equipment indexed by 'C', 'R' or 'H' and a unique number. The record includes the manufacturer, instrument name, location, model #, serial #, and operating manual location. Thermometers are indexed separately. The list is subject to change but the information is updated annually.

EQUIPMENT INFORMATION

New #	Old #	Manufacturer and Instrument Name	Location	Model #	Serial #	Operating Manual Location
CO-1	17	HP GC-PID1/FID 1	Organic	5890	3140A38930	By equip
CO-2	15	HP GC-PID2/FID 2	Organic	5890	3140A39036	By equip
CO-3	51	HP GC-PID3/FID 3	Organic	5890	3336A59628	By equip
CO-4	18	HP GC-PID4/ELCD (not in service)	Organic	5890	3140A38454	By equip
CO-5	16	HP GC-FID 4	Organic	5890	3203A40004	By equip
CO-6	102	HP GC FID 5	Organic	5890E	3336A51432	By equip
CO-7	54	HP GC-FID 6	Organic	5890	3336A61999	By equip
CO-8	33	HP GC-NPD/FID	Organic	5890	3235A45161	By equip
CO-9	19	HP GC-TCD/FPD	Organic	5890	3140A39817	By equip
CO-10	77	Agilent GC-Dual ECD #1 (Det. 1&2)	Organic	6890 Plus	US00037991	By equip
CO-11	14	HP GC-Dual ECD #2 (Det. 1&2)	Organic	5890	3140A39816	By equip
CO-12	35	HP GC/MS 1	Organic	5890E	3336A50197	By equip
CO-13	38	HP GC/MS 2	Organic	5890E	3336A52565	By equip
CO-14	50	HP GC 3	Organic	5890	3310A48568	By equip
CO-15	---	Agilent GC/MS 4	Organic	6890N	CN10429072	By equip, CD
CO-16	79	Varian Ion Trap	Organic	2000 CX	22505	By equip
CO-17	22	Orion Ion Analyzer	Inorganic	EA940	TX41A	By equip
CO-18	39	O.I. TOC Analyzer	Inorganic	700	I408700175	By equip
CO-19	69	Varian Flame AA	Inorganic	220	EL97073198	Software
CO-20	70	Cetac Mercury Analyzer	Inorganic	M6000A	069801 MAS	By equip
CO-21	72	Varian ICP	Inorganic	VISTA AX	EL99103583	Software
CO-22	74	CARY-50 UV-VIS	Inorganic	Cary 50 Bio	EL98113374	By equip
CO-24	76	Milestone Mercury Analyzer	Inorganic	DMA 80	1050029	By equip
CO-25	---	HACH Turbidimeter	Inorganic	2100N	000500006172	By equip
CO-26	85	Site Lab UV Fluorometer	Inorganic	UVF-3100	7-1272-CE	By equip
CO-27	32,45	Waters® HPLC	Industrial	60F	MX5JM0229M	By equip
CO-28	96	HP 1090	Industrial	1090	2516A00563	By equip
CO-29	34	Fisher-Johns Melting Point	Industrial	Cat# 12-144	30200010	IR lab
CO-30	43	PE DSC 7	Industrial	DSC-7	519N5022401	By equip
CO-31	44	PE TGA 7	Industrial	TGA-7	519N5030201	By equip
CO-32	56	PE DMA7e	Industrial	DMA7e	539N6082807	By equip
CO-33	93	Thermo-Nicolet FTIR (scope)	Industrial	912A0429	680C	By equip
CO-34	94	Thermo-Nicolet FTIR (bench)	Industrial	470	AEP0200731	By equip
CO-35	---	Dr. Steeg Reuter Polarimeter	Industrial	SRG 5314	-----	-----
CO-36	---	Accumet pH Meter	Industrial	925	160	By equip
CO-37	---	HP Series II 1090 HPLC	Industrial	1090	3338A04348	By equip
CO-38	---	Varian ICP-MS	Inorganic	800 Series	EL04043768	By equip
CO-39	---	Thermo GC/MS	Organic	Focus GC/4660	D650466367P	By equip
CO-40	---	Leeman Mercury Analyzer	Inorganic	HydraAA	HA-7008	By equip
CO-41	---	Entech TO-15 Precon/Autosampler	Organic	7100A/7032AQ-L	1420/1083	By equip
CP-1	4	Olympus PCM	IH	BH-2 (BHT)	238874	Equip file

EQUIPMENT INFORMATION

New #	Old #	Manufacturer and Instrument Name	Location	Model #	Serial #	Operating Manual Location
CP-2	5	Olympus PLM	PLM Lab	BH-2 (BHSP)	201447	Equip file
CP-3	6	Zeiss Stereo Microscope	PLM Lab	SV8	P40355	Equip file
CP-4	27	Olympus PCM	IH	CH-2 (CHS)	OE0113	Equip file
CP-5	89	Olympus PCM	PCM Lab	BX40	4H06849	By equip
CP-6	90	Olympus PCM	PCM Lab	CH30	8F12499	Equip file
CP-7	95	Olympus PCM	Industrial	BH2	706007	Equip file
CP-8	105	Olympus PCM	IH	CX40	6J13360	Equip file
CP-9	11	Ohaus Top Load Balance	Organic	CT-200-S	14916	QA Dept.
CP-10	12	Sartorius Analytical Balance	PCM Lab	RC 210 D	10405995	By equip
CP-11	47	Ohaus Triple Beam Balance	Industrial	700/800	----------	-----
CP-12	60	Ohaus Top Load Balance	Inorganic	CT200	CD05067	QA Dept.
CP-13	61	Ohaus Top Load Balance	Log-in	CT200	CD05068	QA Dept.
CP-14	83	AND Analytical Balance	Inorganic	HM - 3[illegible]	13506172	By equip
CP-15	84	AND Analytical Balance	Industrial	HM [illegible]	13506078	By equip
CP-16	100	Ohaus Top Load Balance	Extraction	[illegible]ven [illegible]	H188 1203090461 P	By equip
CP-17	---	Fisher Isotemp Drying Oven	Log-in	6. 5G	108N0165	By equip
CP-18	86	Fisher Drying Oven	Inorganic	[illegible]-G	106N0214	Dept. Man.
CP-19	91	Blue M Drying Oven	Inor[illegible]	[illegible]-17TA-1	SW-1848	Not available
CP-20	98	Lab-Line Drying Oven	[illegible]tria	3510	0891-0541	IR lab
CP-21	104	Blue M Drying Oven	In[illegible]tri	OV-490A-2	OV3-926	IR lab
CP-22	---	VWR Oven	[illegible]dustrial	1310	0400391	IR lab
CP-23	---	Equatherm Vacuum Ove	Industrial	299-751	295-0023	IR lab
CP-24	97	Thermolyne Muffle [illegible]ve	Inorganic	114300	1206030615824	By equip
CP-25	101	Thermolyne Mu[illegible]	Extraction	F30420C	1262030932011	By equip
CP-27	---	Isotemp Digital Dry Ba[illegible]	Extraction	145D	504N0085	By equip
CP-28	67	Ohaus Top Load Ba[illegible]ce	Log-in	LS200	No unique ID#	By equip
CP-29	---	Block Digester - ICP	Inorganic	SC154	2484VAR1327	By equip
CP-30	---	Block Digester - ICP MS	Inorganic	SC154	4298CEC2068	By equip
CP-31	---	Olympus PLM	PLM Lab	BH-2	OH8294	Equip file
CP-32	---	Bioscience COD Reactor	Inorganic	163-466T	COD-T348	Dept. Man.
CP-33	---	Fisher Scientific Digital Timer	Industrial	14-649-15	72572201	QA/QC office
CP-34	---	Fisher Scientific Digital Timer	Industrial	14-649-15	72572185	QA/QC office
R-1	58	Olympus Microtome	Industrial	CUT4055	550539	By equip
R-2	82	Dionex ASE 200 #1	Extraction	200	00120383	By equip
R-3	99	Dionex ASE 200 #2	Extraction	200	00120381	By equip
R-4	31	Pensky-Martens Flashpoint	Inorganic	K-16200	5021	Dept. Man.
R-6	103	Barnstead E-Pure DI System	Inorganic	D4641	10900031044121	Inorg. DM
R-7	---	Precision Scientific Steam Bath	Extraction	120	SN0026	By equip
R-8	---	TurboVap II Evaporator	Extraction	TurboVap II	TV9425N4108	By equip
R-9	---	Organomation N-Evap (not in service)	Extraction	111	66500K	By equip
R-10	---	Carver Hydraulic Press	Industrial	C	36000-310	By IR
R-11	---	Haake Chiller	Extraction	K20	194017764004	IR lab

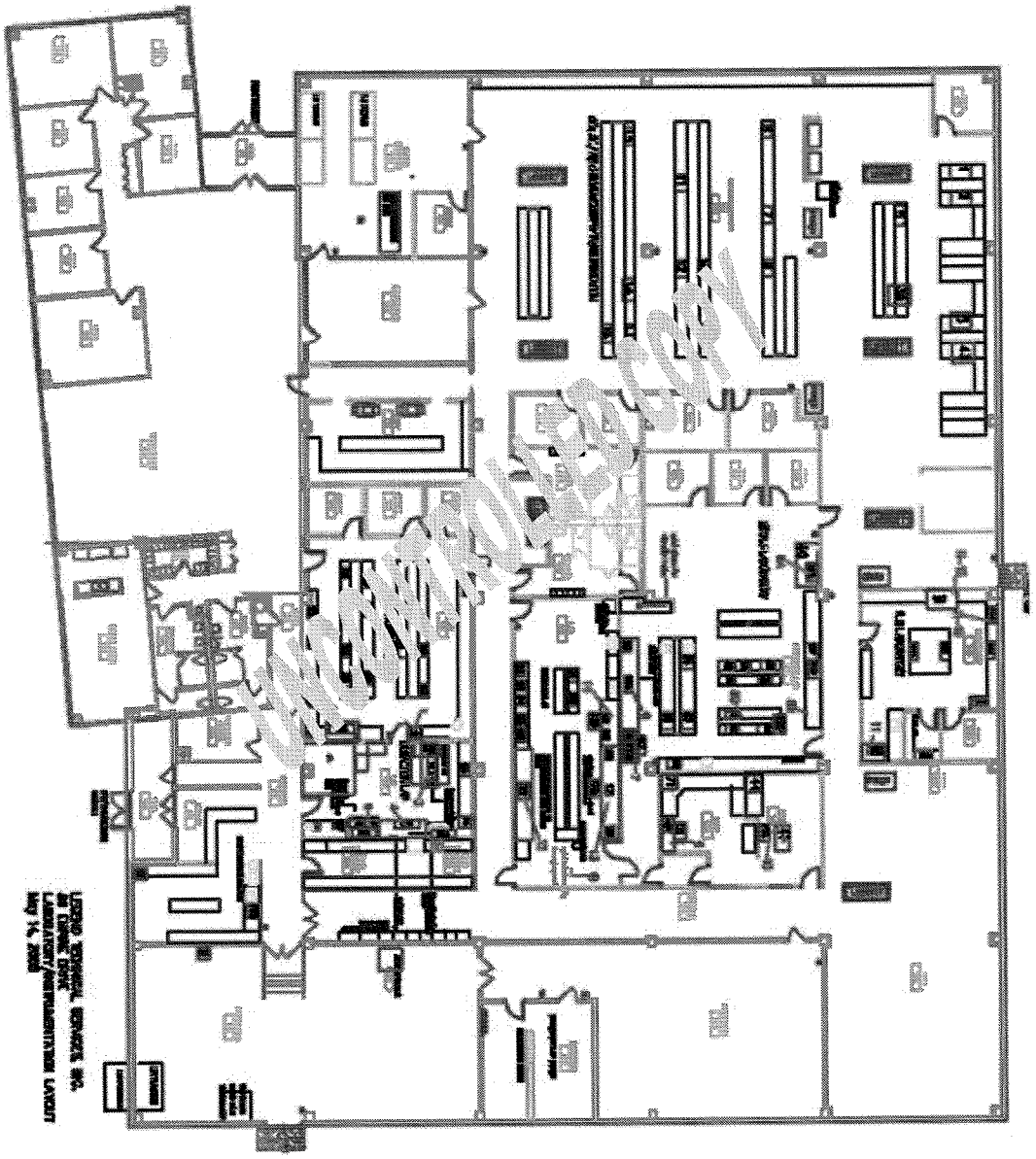
EQUIPMENT INFORMATION

New #	Old #	Manufacturer and Instrument Name	Location	Model #	Serial #	Operating Manual Location
R-12	---	Haake Chiller	Industrial	K20	195001521001	IR lab
R-13	---	Lab-Line Shaker Bath	Industrial	3540	01970088	Not available
R-14	---	Branson Sonicator	Extraction	8210	8210R-MT	By equip
R-15	---	Labconco Rotary Evaporator	Extraction	421-1655	119109013	By equip
R-16	---	Equatherm Orbital Shaker	Extraction	3508	0196-0067	By equip
R-17	---	Thomas-Wiley Mill	Industrial	3383-L10	-----	By equip
R-18	---	Fisher Mini Vortexer	Industrial	128101	2159	By equip
R-19	---	Equatherm Ultrasonic Cleaner	Industrial	9313	695-0004	IR lab
R-20	---	Leica Stereoscope	Industrial	Wild M3Z	059	-----
R-21	---	Rheology International Viscometer	Industrial	RI:1:H_1	6092	Industrial
R-22	---	Boekel Steam Bath	Industrial	1494	042403121	Industrial
R-23	---	ThermoNeslab Chiller	Industrial	M25	10224902	By equip
R-24	---	TurboVap II Evaporator	Extraction	TurboVa	TV9717N7461	By equip
R-25	---	Steambath #1	Extraction	- -	-----	-----
R-26	---	Steambath #2	Extraction	----	-----	-----
R-27	---	Barnstead Nano Pure DI System	Inorganic	D[illegible]193[illegible]	1193031256882	Inorganic
R-28	---	Organomation N-EVAP	Extraction	[illegible]85	15322	-----
R-29	---	Fisher Scientific Water Bath	Inor[illegible]	228	904N0084	-----
R-30	---	Labnet Centrifuge	[illegible]ustria	Z 300	47980075	By equip
H-1	---	Dedicated Ashing Hood	In[illegible]tri	-----	-----	-----
H-2	---	Labconco Chemical Fume H[illegible]od	[illegible]dustrial	7280100	050739918G	CHP
H-3	---	Dedicated Soxlet Extrac[illegible]Hoo[illegible]	Industrial	-----	-----	-----
H-4	---	Labconco Chemical [illegible]ume Hood	Industrial	9683000	050739922K	CHP
H-5	---	Labconco Chem[illegible]a[illegible]d	Industrial	7280100	050739919G	CHP
H-6	---	Labconco Chemic[illegible]Fume Hood	Inorganic	9700400	050739911F	CHP
H-7	---	Labconco Open Hood	Inorganic	-----	-----	-----
H-8A	---	Vista ICP-AES Exhaust Hood	Inorganic	-----	-----	-----
H-8B	---	Varian Spectra-AA Exhaust Hood	Inorganic	-----	-----	-----
H-8C	---	Cetac M6000 Exhaust Hood – not connected	Inorganic	-----	-----	-----
H-9	---	Labconco Chemical Fume Hood	Inorganic	7280100	050739920G	CHP
H-10	---	ICP-MS Exhaust Hood	Inorganic	-----	-----	-----
H-11	---	Classic Modular Systems, Inc Fume Hood	PLM Lab	-----	-----	-----
H-12	---	Labconco Chemical Fume Hood	Extraction	9700400	050739940F	CHP
H-13	---	Labconco Chemical Fume Hood	Extraction	9700400	050739921F	CHP
H-14	---	Labconco Chemical Fume Hood	Extraction	9683000	050739923K	CHP
H-15	---	NuAire	PLM Lab	NU-425-400	23946WY	-----
H-16	---	PLM Macroscope Hood	PLM Lab	-----	-----	-----

CHP=Chemical Hygiene Plan

THERMOMETER INFORMATION

Number	Location	Serial Number	Range	Increments
#3	Investigative Chemistry	No unique ID #	-2.5 to 101.5 C	0.5
#9	QA Dept.	K96-516	20 to 230 F	1.0
#13	QA Dept.	No unique ID #	0 - 40 C	0.2
#17	QA Dept.	No unique ID #	0 to 300 F	2
#19	PLM Lab	93-16001	-1 to 51 C	0.1
#22	Water Bath – Inorganic Lab	No unique ID #	-20 to 50 C	1.0
#25	Flashpoint – Inorganic Lab	716PG	20 to 230 F	1.0
#26	QA Dept.	758PG	20 to 230 F	1.0
#27	QA Dept.	6967	-5 to 15 C	0.5
#28	Water Bath – Extraction Lab	360724	-5 to 5 & 20 to 130 C	1.0
#29	Volatiles Cooler	8882	-5 to 15 C	0.5
#33	Frigidaire Freezer (white)	9052	-30 to 0 C	0.5
#34	Freezer – Extraction Lab Standards	10477	-30 to 0 C	0.5
#35	Freezer – Investigative Chemistry	10521	-30 to 0 C	0.5
#36	Refrigerator – Inorganic Lab	12565	-5 to 15 C	0.5
#38	Refrigerator – Mobile Lab	5485	-5 to 15 C	0.5
#39	Refrigerator – Investigative Chemistry	10811	-5 to 15 C	0.5
#40	QA Dept.	89[illegible]	20 to 760 F	5.0
#41	SVOC Cooler	[illegible]09	-5 to 15 C	0.5
#45	QA Dept.	[illegible]37	-5 to 15 C	0.5
#46	QA Dept.	12[illegible]	-5 to 15 C	0.5
#47	Log-in Cooler	[illegible]76	-5 to 15 C	0.5
#48	SVOC Cooler	[illegible]3338	-5 to 15 C	0.5
#50	Inorganic Lab Drawer (digital)	21115640	-50 to 150 C	0.1
#53	Investigative Chemistry (thermocouple)	240117969/240173926	-40 to 1200 C	1
#54	QA Dept.	240222209	-50 to 250 C	0.1
#55	Mobile Lab Oven – Inorganic La	14-983-17D	-10 to 260 C	1.0
#56	Blue M Oven – Inorganic Lab	13-246	30 to 230 C	1.0
#61	Log-in Cooler	T 7589	-5 to 15 C	0.5
#64	QA Dept.	1065	-5 to 15 C	0.5
#65	QA Dept.	T 63969	15 to 50 C	0.5
#66	QA Dept.	T 42390	15 to 50 C	0.5
#67	QA Dept.	F 48863	15 to 50 C	0.5
#68	QA Dept.	6269	20 to 50 C	0.5
#69	QA Dept.	307059	0 to 100 C	1.0
#71	Investigative Chemistry	61066-104	-20 to 110 C	1.0
#72	Moisture Oven – Log-in	T 2008-2	-20 to 110 C	1.0
#73	QA Dept.	No unique ID #	-30 to 150 C	1.0
#75	QA Dept.	4473	80 to 130 C	0.5
#76	QA Dept.	1196	35 to 200 C	1.0
#77	QA Dept.	HB 177484	20 to 130 C	1.0
#78	QA Dept.	T 8777	15 to 50 C	0.5
#79	QA Dept.	T 8445	15 to 50 C	0.5
#80	QA Dept.	T 42473	15 to 50 C	0.5
#81	QA Dept.	No unique ID #	-10 to 60 C	1.0
#82	QA Dept.	No unique ID #	35 to 230 C	1.0
#83	Nitrogen Blowdown – Extraction Lab	No unique ID #	0 to 100 C	1.0
#85	Log-in	72047290	-50 to 250 C	0.1
#86	Freezer – Extraction Lab Extracts	5937	-30 to 0 C	0.5
#87	Inorganic Lab – COD Reactor	No unique ID #	90 to 160 C	1.0



Floor Plan Key

Floor Plan #	LTS #	Manufacturer and Instrument Name
1	CO-3	HP GC-PID 3/FID 3
2	CO-2	HP GC-PID 2/FID 2
3	CO-13	HP GC/MS 2
5	CO-1	HP GC-PID 1/FID 1
6	CO-16	Varian Ion Trap
7	CO-12	HP GC/MS 1
8	CO-15	Agilent GC/MS 4
9	CO-5	HP GC-FID 4
10	CO-7	HP GC-FID 6
11	CO-10	Agilent GC-Dual ECD #1
12	CO-11	HP GC-Dual ECD #2
13	CO-6	HP GC-FID 5
14	CO-8	HP GC-NPD/FID
15	CO-14	HP GC 3
16	CO-9	HP GC-[illegible]/FID
17	R-28	Orga[illegible] N-[illegible]ap
18	R-8	[illegible]aporator
19	R-24	[illegible] Evaporator
20	R-3	[illegible] ASE 200 #2
21	R-2	[illegible]onex ASE 200 #1
22	R-14	Branson Sonicator
23	R-[illegible]	Equatherm Orbital Shaker
24	CP-[illegible]5	Thermolyne Muffle Furnace
25	[illegible]1	Haake Chiller
26	R-[illegible]	Labconco Rotary Evaporator
27	[illegible]-19	Varian Flame AA
28	CO-18	O.I. TOC Analyzer
29	CO-20	Cetac Mercury Analyzer
30	CO-22	CARY-50 UV-VIS
31	CO-24	Miestone Mercury Analyzer
32	R-6	Barnstead E-Pure DI System
33	CP-14	AND Analytical Balance
34	CO-17	Orion Ion Analyzer
35	CP-12	Ohaus Top Load Blanace
36	CP-24	Thermolyne Muffle Furnace
37	R-4	Pensky-Martens Flashpoint
38	CP-29	Varian Block Digester
39	CP-19	Blue M Drying Oven
40	CO-21	Varian ICP
41	CO-38	Varian ICP-MS
42	CO-40	Leeman Mercury Analyzer
43	CO-39	Thermo GC/MS
44		Leeman Low-level Mercury Analyzer

Floor Plan #	LTS #	Manufacturer and Instrument Name
45	CP-30	Block Digester - ICP MS
46	CP-18	Fisher Drying Oven
47	CP-32	Bioscience COD Reactor
48	R-29	Fisher Scientific Water Bath
50	CO-30	PE DSC 7
51	CO-31	PE TGA 7
52	CO-32	PE DMA7e
53	CP-15	AND Analytical Base
54	R-17	Thomas-Wiley Mill
55	CO-33/CO-34	Thermo-Nicolet FTIR (scope/bench)
56	R-20	Leica Stereoscope
57	R-10	Carver Hydraulic Press
58	CP-7	Olympus PCM
59	CO-27	Waters® HPLC
60	CO-28	HP 1090
61	R-23	ThermoNeslab Chiller
62	R-13	Lab-Line Shaker Bath
63	CP-22	VWR Oven
64	CP-23	Equatherm Vacuum Oven
65	R-22	Shaker Steam Bath
66	CP-20	Labline Drying Oven
67	CP-21	Blue M Drying Oven
68	CO-37	HP Series II 1090 HPLC
69	R-[illegible]	Steambath # 1
70	R-[illegible]	Steambath # 2
71	[illegible]	Barnstead Nano Pure DI System
72	R-[illegible]0	Labnet Centrifuge
73	R-21	Rheology International Viscometer
74	R-12	Haake Chiller
100	CP-5	Olympus PCM
101	CP-2	Olympus PCM
102	CP-3	Zeiss Stereo Microscope
103	CP-31	Olympus PLM
104	CP-10	Sartorius Analytical Balance
105	CP-13	Ohaus Top Load Balance
106	CP-17	Fisher Isotemp Drying Oven
111	H-1	Dedicated Ashing Hood
112	H-2	Labconco Chemical Fume Hood
113	H-3	Dedicated Soxlet Extractor Hood
114	H-4	Labconco Chemical Fume Hood
115	H-5	Labconco Chemical Fume Hood
116	H-6	Labconco Chemical Fume Hood
117	H-7	Labconco Open Hood
118	H-8A	Vista ICP-AES Exhaust Hood

Floor Plan #	LTS #	Manufacturer and Instrument Name
119	H-8B	Varian Spectra-AA Exhaust Hood
120	H-8C	Cetac M6000A Exhaust Hood- Not connected
121	H-9	Labconco Chemical Fume Hume
122	H-10	ICP-MS Exhaust Hood
123	H-11	Classic Modular Systems, Inc. Fume Hood
124	H-12	Labconco Chemical Fume Hood
125	H-13	Labconco Chemical Fume Hood
126	H-14	Labconco Chemical Fume Hood
127	H-15	NuAire
128	H-16	PLM Macroscope Hood
129		US Filter DI System

6.4 Work Environment

LEGEND has a safe work environment to support the division's needs to achieve conformity to service and product requirements.

A. Laboratory accommodation, test areas, energy sources, lighting, heating, and ventilation shall be appropriate to allow proper performance of tests.

B. The environment in which these activities are undertaken shall not invalidate the results or adversely affect the required accuracy of measurement.

C. The laboratory shall provide facilities for the effective monitoring, control, and recording of environmental conditions as appropriate.

D. There shall be effective separation between neighboring areas where the activities therein are incompatible.

E. Health and safety programs are listed below. Program documentation, requirements, and designated administrators are included with each program.

1. Medical Surveillance Program: defines medical monitoring requirements
2. Chemical Hygiene Program: defines general laboratory health and safety
3. Respiratory Protection Program: defines when respirators are used and the medical monitoring and fit testing requirements
4. Personnel Exposure Monitoring Program: defines air and wipe sampling to be performed in the laboratory to assess employee exposures
5. Waste Contingency Plan: defines waste generation, handling, and disposal
6. Bloodborne Pathogens Program: defines special requirements for clean-up and disposal of body fluids during first aid procedures

SECTION 7

PRODUCT REALIZATION

7 Product Realization

7.1 Planning of Product Realization

This process identifies action needed to plan product realization, including:

A. Quality objectives and requirements for the product

B. The need to establish processes, documents, and provide resources specific to the product

C. Required verification, validation, monitoring, inspection, and test activities specific to the product and the criteria for product/service acceptance

D. Records needed to provide evidence that the realization processes and resulting product/service meet requirements

7.2 Customer Related Processes

7.2.1 Determination of Requirements Related to the Product/Service

The testing and analyzing process includes activities that determine the following:

A. Requirements specified by the customer, including the requirements for delivery and post-delivery activities

B. Requirements not stated by the customer but necessary for specified or intended use, where known

C. Statutory and regulatory requirements related to the product

Once received and logged in, the samples are delivered to the appropriate department. The client manager reviews the analytical request. If a method has not been specified by the client, a person with the appropriate technical expertise will select the most current method that has been published in international or national standards, published by reputable technical organizations or in relevant scientific texts or journals.

Employing methods that have not been established as standard shall only be done after receiving client approval. The method must be fully documented and validated, and be available to the client.

7.2.2 Review of Requirements Related to the Product/Service

For new orders that require testing and analysis, a process is used to ensure that product/service requirements are defined, differing order or contract requirements are resolved, and the organization has the ability to meet the defined requirements before committing to supply the product to the customer.

Records of the results of the reviews and actions arising from them are maintained (e.g. work orders and proposals within project files).

Project personnel shall be notified immediately of any discrepancies, and the samples segregated and held until the problem is resolved. The laboratory shall not be responsible for meeting holding times on these samples. A Corrective Action Report may be used to document actions taken to resolve problems with incoming samples.

7.2.3 Customer Communication

LEGEND's sales and client managers are responsible for direct communication with the customer relating to:

A. Product information

B. Inquiries, contracts or order handling, including amendments

C. Customer feedback - customer complaints are processed through LEGEND's complaint process in the SOP 'Client Complaint Resolution'.

7.3 Design and Development – Excluded from LEGEND's ISO 9001:2000 Certification

7.4 Purchasing

7.4.1 Purchasing Process

The specifications and control methods for purchased materials are determined as part of the procurement process for specific products/services. Vendors are selected and managed by the process described in the SOP 'Purchasing and Receiving Procedure'.

7.4.2 Purchasing Information

Appropriate purchasing information is contained in raw material specifications, component drawings, and purchase orders delivered to the vendor. Appropriate technical and purchasing personnel verify the adequacy of the information before it is communicated to the vendor. LEGEND does not procure externally purchased materials and services.

7.4.3 Verification of Purchased Product

The requesting individual verifies product purchased per SOP 'Purchasing and Receiving Procedure'.

7.5 Production and Service Provision

7.5.1 Control of Production and Service Provisions

The product design and development, testing and analysis, and related activities for LEGEND are carried out under controlled conditions (i.e. internal audits and reviews).

Suitable monitoring and measuring equipment is used and controlled as appropriate.

7.5.2 Validation of Processes for Production and Service Provision

A. LEGEND validates each piece of testing equipment prior to installation. The review of the processes may lead to:

1. Redefining for criteria for review and approval of the process
2. Providing approval of equipment and qualification of personnel
3. Assuring the use of specific new methods and procedures

4. Reassessment requirements for records keeping accessing

5. Revalidation or amendment of certain requirements

B. Data may be manually computed, input into a computer for processing or calculation, or directly acquired from a computer.

1. If the analyst manually processes data, all steps in the computation shall be provided including equations used and the source of input parameters such as response factors, dilution factors, and calibration constants. These shall be performed on the data sheet or on a LEGEND form that shall be initialed and dated by the analyst and attached to the data sheets.

2. For data entered and processed in a computer, the analyst shall indicate on a copy of the input the sample(s) or project number, sign and date the copy, and attach it to the data sheets.

3. Where computers or automated equipment are used for capture, processing, recording, reporting, storage or retrieval of test data, all applicable requirements of the software will be complied with, the computer software is documented and adequate for use, and the computer and automated equipment is maintained to ensure proper functioning and provided with environmental and operating conditions necessary to maintain the integrity of test data.

4. For data acquired directly from the computer, the analyst shall verify that all parameters (project/sample numbers, response factors, units, detection limits, etc.) are correct. The analyst shall sign and date the output.

C. Review of Data Processing

1. One hundred (100%) percent of all data shall be reviewed by a second analyst, Department Manager, or his/her designee. Reviewed data shall be initialed and dated by the technical reviewer.

2. If the reviewer disagrees with a number or qualifier, the reviewer shall bring it to the attention of the analyst. Upon agreement between the analyst and the reviewer, the data will be revised by crossing out the incorrect number/qualifier with a single line and recording the revised number/qualifier next to it. All changes need to be initialed and dated. If there is a question on whether a change should be made, the department manager will make the final decision. If the reviewer believes it is a systematic error vs. an isolated error, a Corrective Action Report (CAR) should be initiated.

D. Review of Laboratory Reports

1. The Client Manager shall review all laboratory reports. Then, the laboratory report shall be reviewed and signed by a report reviewer.

2. If the reviewer finds an error, it is noted and given back to the Client Manager for correction. It is at the Client Manager's discretion if the change is made. If the reviewer believes it is a systematic error vs. an isolated error, a Corrective Action Report (CAR) should be initiated.

E. Verification of Software

Computer software (ChemStation, Target) shall be verified by running sample calculations and comparing the values to hand calculations. Only one example calculation need be verified for an individual data acquisition system. Software shall be verified on an annual basis or whenever it is modified. The analyst shall document this procedure by signing and dating both the computer output and the hand calculations. The data and work sheets will be archived in the QA/QC department for future reference.

Where forms developed in-house are used to generate data (using Excel spreadsheets with equations), the calculations are verified by running sample calculations and comparing the values to hand calculations. Equations shall be verified on an annual basis or whenever modified.

F. Laboratory Data System Archival

1. The results directory of the central computer system is backed up onto computer tapes every month.

2. The method files are archived onto tapes every month with the result files. The tapes are archived for a minimum of two years.

3. The back up result and method files are deleted off the central computer after the back up.

3. The [illegible] backed up and archived every month.

G. Data Reports

1. The format and content of the laboratory data report will vary depending on project or client needs, contract and regulatory requirements, and the need for explanatory text.

2. Each page shall list client, project number (if applicable), and field identification. Data shall be presented in a tabular format whenever possible.

3. Data listed on the report shall include parameters analyzed, reported values, reporting limit (RL), and units of measurement.

4. Results less than the RL shall be indicated by a "less than" sign (<) or appropriate qualifiers. Qualifiers may also include standard Contract Laboratory Program (CLP) "flags" on actual data values or use of footnotes on data tables to qualify or clarify results. If necessary, case narrative text shall be included in the report or in a separate letter of transmittal.

5. All reports shall be signed by two personnel, usually the client manager and primary chemist, QA/QC Coordinator, or Technical Director. Any analytical results communicated verbally shall be considered preliminary until data are sent in hard copy.

H. Proficiency Testing Programs

Specific LEGEND laboratory sections participate in formal inter-laboratory proficiency testing programs (American Industrial Hygiene Association (AIHA) Proficiency Testing Program, state certifications, etc.) depending on their particular area of analysis and the individual program's scope. The QA/QC Coordinator reviews performance as information is received from the specific program agency.

Any deviations from acceptable performance are documented on a Corrective Action Report and a corrective plan of action immediately implemented. Subsequent performance is monitored to assure corrective plan has resulted in acceptable performance.

I. Blind Standard Samples

For AIHA fields of testing not covered by PT programs, a minimum of four independently prepared blind spikes at varying levels are analyzed twice annually by trained personnel. Acceptance criteria are calculated from 20 QC data points as the average ± 3s, and are applied to the blind spike recoveries. The QA/QC Coordinator reviews performance after the results from the blind spikes are technically reviewed. Any deviations from acceptable performance are documented on a Corrective Action Report and a corrective plan of action immediately implemented. Subsequent performance is monitored to assure corrective plan has resulted in acceptable performance.

J. Exchange Of Samples With Other Laboratories

Periodically samples are exchanged with one or more laboratories and the results compiled as a comparison. This is done both formally through the use of inter-laboratory Round Robin programs and informally through the submission of previously analyzed samples to another laboratory for comparison.

K. Certification Programs

LEGEND participates in laboratory accreditation/certification programs such as the American Industrial Hygiene Association (AIHA) accreditation program, the National Voluntary Laboratory Accreditation Program (NVLAP), and various state certification programs.

These programs require an annual performance of laboratory analytical testing and periodic review (external audit) of laboratory facilities and personnel.

Current certificates are found in the QA Department.

L. External Audits

The QA/QC Coordinator is responsible for coordinating outside agency audits of the laboratory facility. Manufacturers and agencies regularly audit LEGEND. Specific

items to be addressed are reviewed by the QA/QC Coordinator including schedule, audit agenda, specific personnel to be involved in the audit. These items are then communicated to the appropriate personnel. Client confidentiality is taken into consideration when producing specific items during the audit. The QC Coordinator prepares a follow-up report after receiving the results of the audit that summarizes the findings and any corrective actions needed. Results of these audits are available for review.

7.5.3 Identification and Traceability

The process for identification and traceability from order entry to the end of the process for products/service is in place.

A. Sample Receipt and Log-In

1. Samples shall be logged in as soon as possible after receipt. If samples arrive during non-business hours, they shall be held in a cooler at 4 ± 2 °C (where applicable) and logged in the next business day.

2. Follow the protocol outlined in LEGEND SOP 'Sample Receiving, Handling, Log-In, Storage Control, and Holding Times'.

3. Where there is any doubt as to the item's suitability for testing, where the item does not conform to the description provided, or where the test required is not fully specified, the client shall be contacted for further instructions before proceeding.

B. The Department Managers and/or Technical Director shall be responsible for prioritizing work to assure that holding times and project commitments are met.

7.5.4 Customer Property

Care is exercised with all customer property while it is under LEGEND's control. Customer property is identified, verified, and safeguarded for use in the output of LEGEND's operations. Items found to be unsuitable for use or that are lost or damaged are reported to the customer and records are maintained. Typical customer property would be samples for analysis, raw data of the analysis and a final report. All information received and released to clients is strictly confidential. No information may be released to another party without the written approval of the client.

7.5.5 Preservation of Product

Client samples and data collected in the analysis are stored.

A. Client Samples

1. Care is taken in preservation that includes identification, handling, storage, and protection (see SOP 'Sample Receiving, Handling, Log-in, Storage Control, and Holding Times').

2. Analytical samples shall be stored for at least 30 days after submittal of the laboratory report to the client before disposal.

3. It is at the lab's discretion to return samples to the client. (Examples: samples that have been defined as hazardous waste or samples with high levels of oil.) Client managers arrange for the return of these samples.

4. Samples are stored in the laboratory and are accessible by LEGEND employees only. Visitors in the laboratory are required to sign in and wear a 'Visitor Badge'. Access is limited to the area of concern.

5. Samples may be completely consumed during analysis, returned to the client or sampling location, stored under required environmental conditions (if re-analysis is anticipated) or under ambient conditions (if re-analysis is not likely), or disposed by the laboratory. Samples and extracts shall usually be disposed in thirty days unless otherwise specified. Disposition is indicated in the report.

6. Department Managers and/or the Hazardous Waste Coordinator shall determine the method and time for disposal if not specified by the client manager.

7. Some waste may be disposed of in a sanitary sewer as permitted by 40 CFR 261.3(a)(2)(iv). Some samples may be hazardous because of their general characteristics or because they are listed in 40 CFR Part 261. Shipping of these materials is addressed in 40 CFR 172.02, 172.03, 172.04, 172.300, and 172.400.

8. Laboratory waste disposal is addressed in the Waste Contingency and Emergency Response Plan.

B. Data Storage

Data storage is addressed in Section 4.2.4 'Control of Records'.

7.6 Control of Monitoring and Measuring Devices

A. Various monitoring and measuring devices that are utilized in the testing and analysis of samples are calibrated according to calibration procedures.

B. Development and implementation of calibration procedures shall be the responsibility of the Department Managers. At a minimum, each manager must address the following key points for the applicable instruments in their areas of responsibility.

1. Recognized procedures (USEPA, ASTM, NIOSH, manufacturer's instructions etc.) shall be used when available. Written calibration procedures may include the reference materials to be used, calibration technique, acceptable performance limits, frequency, and documentation.

2. Calibration frequency shall be determined by manufacturer's recommendations, agency requirements, equipment type, instrument stability, method requirements and prior experience.

3. Physical standards (weights, certified thermometers) shall be traceable to nationally recognized standards (e.g. NIST). Chemical reference standards shall be those provided by the National Institute of Standards and Technology, Standard Reference Materials (SRMs) and/or vendor certified materials traceable to these standards.

Where this is not possible, the laboratory should provide satisfactory evidence of correlation of results. They shall be used for calibration only and for no other purpose, unless it can be demonstrated that their performance as reference standards has not been invalidated.

4. Operationally calibrated equipment that fails calibration shall be removed from service or tagged to indicate that it is out of calibration. The equipment shall be repaired and re-calibrated before re-use. A record of all such occurrences shall be maintained with the instrument maintenance and calibration log and/or instrument run logs.

5. If a periodically calibrated piece of equipment is found to be out of tolerance by either the calibration vendor or LEGEND personnel, the calibration results will be reviewed by the QA/QC Coordinator and the impact on the affected data will be assessed and documented. Corrective action will be taken by the appropriate laboratory personnel as required.

C. Calibration is required to demonstrate that instruments are operating properly and to ensure traceability of measurements. Calibration records shall be maintained for each piece of equipment that requires calibration. The analyst will eliminate, or minimize, the source of errors by proper selection of method, equipment, solvents and/or gases. There are two types of calibrations: periodic and operational.

1. Periodic calibrations are performed at prescribed intervals. Balances, weights, microscopes, and thermometers are calibrated annually. Balances are checked, prior to each day of use, with weights bracketing the mass being measured.

2. Operational calibrations are performed or verified prior to instrument usage. Specific calibration requirements are contained in the SOPs applicable to each instrument or analytical method. Examples of equipment using operational calibration are: GC, GC/MS, HPLC, and ICP. Examples of operational calibrations are calibration curves, calibration verification standards, and flow checks.

3. If calibration curve information is not listed, the following guidelines should be used:

   a) A method blank should be prepared with each batch of twenty or fewer samples by following the procedure step-by-step, including the addition of all solvents and reagents in the quantities specified by the method. If this cumulative blank interferes with the determination, steps should be taken to reduce or eliminate the interferences. If this cannot be done, the magnitude of the interference should be considered when calculating the concentration of a compound.

   b) A standard calibration curve should be prepared from the preparation and analysis of at least three standard solutions, unless the method dictates differently (e.g. ICP), by mixing the species to be analyzed with the appropriate diluent that is used to introduce the species into the instrument. The concentrations of the standard solutions should cover the working range of the instrument and sample measurements should be made within this range if the data is to be acceptable.

   c) The calibration curve should be prepared by plotting instrument response versus concentration of the species analyzed so that sample concentrations can be determined.

d) If an average response factor calibration is used, the Relative Standard Deviation (%RSD) must be ≤ 20%. If the %RSD is greater than 20%, a linear calibration curve is constructed. The correlation coefficient (r) of a first order or linear calibration curve must be 0.99 or greater. Some analytes do not respond linearly and would require a second order or quadratic fit. The weighted coefficient of determination (COD) must be 0.99 or greater.

e) Records of calibrations should be kept in a logbook with each instrument. This logbook, maintained by the analyst, should contain the instrument name and number, manufacturer, model #, serial #, location, and a brief record of all calibrations and samples analyzed.

f) When intermediate checks are needed to maintain confidence in the calibration status of the equipment, these checks should be within ± 15%.

D. When an instrument for calibration has been adjusted or repaired, the calibration results before and after adjustment or repair will be made available to the client upon their request.

E. The laboratory will notify clients promptly, in writing, if any event such as the identification of defective measuring or test equipment, casts doubt on the validity of results given in any test report or amendment to a report.

F. In the event that the laboratory needs to obtain equipment on a temporary basis, the equipment will be calibrated to ensure all relevant requirements are met.

G. When, for whatever reason, equipment goes outside the direct control of the laboratory, the laboratory should ensure that the functions and calibration status of the equipment are checked and shown to be satisfactory before the equipment is returned to service.

H. New equipment is validated prior to use within the laboratory. The form 'Initial Qualification of New Equipment' is filled out by the operator, reviewed, and filed with the QA department.

SECTION 8

MEASUREMENT, ANALYSIS, AND IMPROVEMENT

8 Measurement, Analysis, and Improvement

8.1 General

LEGEND monitors, measures, analyzes, and implements improvements to the processes and quality management system.

8.2 Monitoring and Measurement

8.2.1 Customer Satisfaction

A. On-going measures of customer satisfaction are monitored by periodic surveys of clients and direct client feedback. These records are archived with the QA department.

B. Customer complaints are processed through LEGEND's complaint process in the SOP 'Client Complaint Resolution'.

1. A record shall be maintained when a complaint or any other circumstances arise concerning the laboratory's compliance with policies or procedures. Those areas specific to the complaint will be audited and the corrective action taken will be reported to the individual(s) who raised the doubt and recorded in the complaint log maintained by the QA/QC Coordinator.

2. The QA/QC Coordinator will close the complaint by calling the affected party and asking if they are satisfied with the resolution. If further action is required, the action is recorded on the complaint form and the complaint is given back to the complaint initiator to continue the process. If no further action is required, the complaint is signed and dated by the QA/QC Coordinator.

C. Information acquired from these measures is used as inputs for improving products, processes, and service to the customer.

8.2.2 Internal Audits

The internal audit process used to monitor and maintain the quality management system and analyses are documented in the SOP 'Internal Auditing'. LEGEND's Internal Auditors are responsible for planning and conducting the audits, and for reporting results. Internal audits are archived with the QA department.

8.2.3 Monitoring and Measurement of Processes

The quality management system processes are monitored and measured using various means. Corrective action is taken when planned results are not achieved. They include:

A. Internal and external audits

B. Management reviews

C. Customer inputs

D. Preventive and corrective actions

8.2.4 Monitoring and Measurement of Product

LEGEND's processes specify requirements to be met before release of product/service to the customer.

The following criteria may not be 100% applicable to all applications.

A. Calibration Curves

1. Average Response Factor Calibration

a) Calculate response factors (RFs) for each compound at each level.

$$RF = \frac{(A_X)}{(C_X)}$$

A_x = Area of the characteristic ion for the compound being measured
C_x = Concentration of the compound being measured

b) If internal standards are used, calculate response factors (RFs) for each compound at each level relative to the preceding internal standard.

$$RF = \frac{(A_x)(C_{is})}{(A_{is})(C_x)}$$

A_{is} = Area of the characteristic ion for the specific internal standard
C_{is} = Concentration of the specific internal standard

c) The average response factor, standard deviation, and percent relative standard deviation (%RSD) should be calculated for each compound. The %RSD should be less than the method criteria.

$$\%RSD = \frac{SD}{RF_m}(100)$$

RSD = relative standard deviation
SD = standard deviation of RFs for a compound
RF_m = mean of RFs for a compound

NOTE: 'By response' must be used for Target applications so that the calculation is performed correctly. The graph will depict response on the 'x-axis'.

2. Linear Regression Calibration

a) A regression equation that does not pass through the origin, where the instrument response is treated as the dependent variable (y) and the concentration is treated as the independent variable (x). Results are calculated as follows:

$y = ax + b_y$ Is rearranged to solve for concentration: $x = \frac{\left(y - b_y\right)}{a}$

y = Instrument response (peak area)
a = Slope of the line
b_y = The 'y' intercept
x = Concentration of the calibration standard

b) If internal standards are used, the y-axis is the instrument response divided by the internal standard response and the x-axis is the concentration divided by the internal standard concentration.

$$C_s = \frac{\left[\frac{A_s}{A_{is}} - b\right]}{a}(C_{is})$$

A_s = Area of the peak for the target analyte
A_{is} = Area of the peak for the specific internal standard
C_s = Concentration of the target analyte
C_{is} = Concentration of the specific internal standard

c) To display the concentration intercept on the x-axis, software may perform the following reciprocal equation:

$$x = \left(\frac{1}{a}\right)(\ldots) - b_x$$

b_x = The 'x' intercept

d) If internal standards are used, the equation becomes:

$$x = \left[\left(\frac{1}{a}\right)\left(\frac{A_s}{A_{is}}\right) + b_x\right](C_{is})$$

NOTE: 'By Amount' must be used for Target applications so that concentration is on the 'x-axis'. Target will perform the reciprocal equation above to display the 'x-axis' intercept.

3. Non-linear (Polynomial) Calibration

a) Quadratic (second order) calibrations are only used when historical information or analyst experience shows that the instrument response does not follow a linear model. It is not used for those compounds that have previously shown to exhibit linear calibration or to compensate for poor instrument performance. Quadratic calibrations require a minimum of six points for environmental applications and three points for other applications. Results are calculated as followed:

$y = ax^2 + bx + c$ Is rearranged to solve for concentration:

$$x = \left[\frac{\sqrt{b^2 - (4)(a)(c-y)} - b}{(2)(a)} \right] [C_{IS}]$$

NOTE: 'By Amount' must be used for Target applications so that concentration is on the 'x-axis'.

b) Third order calibrations are used in rare cases and require a minimum of seven points for environmental applications and four points for other applications. If used, the calibration curve is verified by a second method and the information is stored with the data.

$$y = ax^3 + bx^2 + cx + d$$

B. Precision and Accuracy

1. Precision: measure of the degree of agreement among replicate analysis of a sample. Precision is calculated as

$$\text{Relative Percent Difference (\%RPD)} = \left| \frac{Result1 - Result2}{Average\ of\ Result1\ \&\ Result2} \right| (100)$$

2. Accuracy: combination of bias and precision of an analytical procedure, which reflects the closeness of a measured value to a true value. Accuracy is calculated as

$$\%\ Recovery = \left(\frac{Matrix\ Spike - Sample}{Spike\ Amount} \right) (100)$$

3. Representativeness: the typical sample matrix of a group of samples.

4. Completeness: meeting all of the data quality objectives.

C. Frequency and Acceptance Criteria

1. Matrix spike and matrix spike duplicate samples (if applicable) will be prepared and analyzed with each sample batch in a 12-hour shift or with every twenty samples if not otherwise specified in the SOP used. When spiking solutions are not practical or applicable, sample duplicates will be prepared and analyzed daily or after a minimum of twenty samples.

2. Acceptance criteria for spike recoveries are determined by one of the following methods.

a) Laboratory determined control limits
b) Reference method requirements
c) Interim limits (dependent on analysis) if no method limit exists and laboratory determined control limits have not been set

3. Acceptance criteria for %RPD are determined by one of the following methods:

   a) Laboratory determined control limits
   b) Reference method requirements
   c) Interim limits of ≤ 20% if no method limit exists and laboratory determined control limits have not been set

4. Each SOP states specific requirements for accuracy and precision, where applicable.

D. Processing of Quality Control Data

Individual Standard Operating Procedures provide criteria for each analysis, and may supersede the information contained below.

1. Reagent Blank Evaluation: If high blank values are observed (greater than the reporting limit), laboratory glassware and reagents shall be checked for contamination. Any affected data is reran if sufficient sample is available. If sufficient sample is not available, the data is flagged.

2. Field Blank Evaluation: If high values are found, the procedures for sample collection, shipment and laboratory analysis shall be reviewed. If both the reagent/method blank and the field blank contain significant contamination, the source is probably within the laboratory. High field blank readings may be due to contaminated sample bottles or cross-contamination due to poorly sealed containers.

3. Initial Calibration Evaluation: The initial calibration curve shall be prepared by a minimum of three points (unless method dictates differently – i.e. ICP). Correlation coefficient should be 0.99 or greater or a %RSD within method requirements.

4. Continuing Calibration Evaluation: A mid-level standard should be analyzed daily and after twenty samples (or 12 hours per method) to evaluate the calibration curve. Recovery is evaluated against method or certification code criteria. If acceptance criteria are not listed, ± 20 % of the initial curve is used.

5. Duplicate Sample Evaluation: The duplicate results shall be used to calculate the precision for the sample matrix as defined by the RPD. If the precision value exceeds the control limit, the reason for the nonconformance shall be determined and documented. Actions may include re-analysis or flagging data.

6. Matrix and Blank Spike Evaluations: The observed recovery of the matrix spike versus the theoretical spike recovery shall be used to calculate accuracy as defined by the percent recovery. If the accuracy value is outside the control limits, the reason for the nonconformance shall be determined and documented. Actions may include re-analysis for the parameter in questions. Re-testing of a retained item may be used for quality control purposes.

   If interferences are present in the sample matrix spiked, a blank spike may be used to demonstrate that the laboratory technique is in control.

7. Check Standard Evaluation: The results of check standard analysis shall be

compared with the original calibration curve, and the percent recovery of the check standard shall be calculated to determine if the calibration system is in control. A secondary reference material should be used.

If correction is required, the check standard shall be re-analyzed to demonstrate that the corrective action has been successful.

8. Surrogate Standard Evaluation: The results of surrogate standard determinations shall be compared with the true values spiked into the sample matrix prior to extraction and analysis and the percent recoveries of the surrogate standards shall be determined. Percent recoveries attained shall be in accordance with current EPA recommendations/requirements or laboratory generated control limits. Samples may be re-extracted or re-analyzed, if possible; otherwise the data will be flagged.

9. Breakthrough: Breakthrough may result when the quantity of analyte sampled exceeds the capacity of the sampling device or because of atmospheric conditions (i.e. high relative humidity). Breakthrough is determined by analyzing the front and back sections of sorbent media separately. In general, if the quantity of analyte in the backup section exceeds 25% of the amount in the front section, breakthrough has occurred and resampling may be necessary.

10. Data Correlation: Analytical results within the same sample are reviewed for sensibility.

E. Control Charts

Control charts for precision and accuracy shall be established for all major parameters. A minimum of 20 data points should be used to establish control limits. Warning limits of two standard deviations and control limits of three standard deviations shall be used in most cases. If specific method limits are available, they are used to determine compliance. If fewer than 20 data points are collected within a year, the laboratory will set the limits. Control limits are updated on a semiannual basis. Control limits are unique and specific for each 'field of testing' (analysis, analyte, and matrix).

F. Measure of Uncertainty

Accuracy limits are used to measure the uncertainty of a test. If the accuracy limits are 70.0 – 130%, the measure of uncertainty is considered 30%.

G. Detection and Reporting Limits

1. Instrument Detection Limit (IDL)

Specific to metals analysis, this is the lowest concentration that an analyte can be detected on the instrument using a particular methodology. The value is obtained by calculating three times the standard deviation of a reagent blank analyzed 10 times at the same wavelength. The IDL is calculated before any samples are analyzed and when there has been a significant change with the instrument.

2. Method Detection Limit (MDL)

   Defined as the minimum concentration that can be reported for a specific substance with 99% confidence, it is determined by analyzing a minimum of seven samples at a concentration between one and five times the estimated detection limit. The policy at LEGEND is to run a minimum of eight samples so an outlier test may be performed. The MDL is calculated as MDL = T(s) where s is the standard deviation of the analysis, and T is the student's T-value associated with a 99% confidence level and a standard deviation estimate with N-1 degrees of freedom. The MDL study is determined annually or when a significant change in either the method or instrumentation has occurred.

3. Practical Quantitation Limit (PQL)

   The PQL is determined by multiplying the standard deviation calculated in the MDL by ten.

4. Reporting Limit (RL)

   Defined as a value that is set by the laboratory for reporting purposes. The RL should be above the calculated PQL but must be above the MDL.

   Results below the reporting limit are reported as less than the value of the RL. Sample results below the RL but above the MDL are flagged at the client's request.

H. Trend Analysis

Major parameters shall be monitored in applicable analyses against established control charts for data trends. If a trend is identified, corrective action must be taken. Below is a list of the rules that should be used to identify trends.

1. Eight consecutive points above average + 2 σ
2. Eight consecutive points below average - 2 σ

8.3 Control of Nonconforming Product

There are three areas defined as internal nonconforming product at LEGEND: method error, analytical data error, and report error.

A. Method errors are documented through method nonconformances (MNC) as described in Work Instruction 'Method Nonconformance (MNC) Documentation'.

B. Analytical data errors (systematic) are documented through Corrective Action Reports (CAR) as described in 7.5.2, C.

C. Report errors (systematic) are documented through Corrective Action Reports (CAR) as described in 7.5.2, D.

8.4 Analysis of Data

Data is collected and analyzed to determine the effectiveness of the quality management system and identify areas for improvement. This data analysis includes information relating to:

A. Customer satisfaction as described in 8.2.1

B. Conformity to product requirements collected during the testing and analysis process

C. Customer complaints as described in 8.2.1

D. Processes as described in 8.2.3

E. Vendors from the vendor management process described in 7.4.1.

8.5 Improvement

8.5.1 Continual Improvement

Continual improvement is an on-going expectation. Continual improvement is achieved through the use of quality objectives, audit results, analysis of data, corrective and preventive actions, and management review processes.

8.5.2 Corrective Action

A. Corrective action is taken to prevent recurrence of a nonconformance. All employees shall be responsible for reporting any nonconformance that they observe or identify to their supervisor, department manager, technical director, and/or QA/QC department. The appropriate supervisor is responsible for assuring that the corrective actions are taken. It is the responsibility of the QA/QC department to monitor all corrective actions taken.

B. Nonconformances may include (but are not limited to) results from the following:

1. External and internal audits
2. Client complaints
3. Management reviews
4. Chronic QC data outside of limits (i.e. blanks, duplicates, spikes, etc.)
5. Proficiency testing (PT) samples outside limits
6. Nonconforming equipment/materials
7. Nonconforming product (laboratory error examples)
    a) Chronic exceedances of sample holding time
    b) Incorrect sample preparation
    c) Wrong analysis procedure
    d) Improper sample storage
    e) Mixing up samples during analysis
    f) Reporting wrong data

C. Corrective action is divided into two sections:

1. Remedial action – dealing with the immediate problem (i.e. recalibrating, updating training records, responding to an audit finding, etc.)

2. Cause analysis – searching for the underlying problem or root cause (the most basic reason, which if eliminated, would prevent recurrence)

D. Corrective actions are required in writing and must be completed within an agreeable timeframe. A 'Corrective Action Report (CAR)' is filled out as follows:

1. Assign responsibility for taking the corrective action

2. Identify and describe the problem

3. Determine if the nonconformance impacts the client

4. Document the remedial action taken

5. Investigate the possible cause(s) looking for the root cause

6. Determine the action to be taken

7. Implement any new preventive action (fill out 'Preventive Action Report')

E. There may be times when the remedial action is sufficient to eliminate the problem. In this case, it is acceptable to record 'Not applicable' in the root cause section of the form. The corrective action should be appropriate to the magnitude and risk of the nonconformance.

F. The area where the nonconformance occurred should be revisited (internal audit) at a later stage to determine the efficiency of the corrective action. All records generated should be kept in the QA department.

8.5.3 Preventive Action

A. Preventive action is taken to prevent occurrence of a nonconformance. It is a pro-active process to identify opportunities for improvement rather than a reaction to problems or complaints. Preventive actions may result from the following areas:

1. Corrective actions

2. Suggestions from staff members (employees are encouraged to identify possible improvements to the quality system or test procedures)

3. Suggestions from clients

4. External and internal audits

5. Management reviews

6. Meetings of professional organizations

7. Literature

8. Routine maintenance

B. Preventive action is divided into two sections:

1. Risk assessment – assessing areas where failures may occur and have procedures in place to prevent them (i.e. staff training, servicing equipment, monitoring equipment, validating methods, etc.)

2. Continuous improvement – identifying and addressing improvements in the system and potential sources of nonconformances

C. One of the largest areas of preventive action is preventive maintenance of equipment. The initial determination of a specific preventive maintenance item is considered a preventive action. Preventive maintenance maintains proper instrument and equipment performance and prevents instruments and equipment from failing during use. It considers instruments, equipment and parts that are subject to wear, deterioration or other changes in operational characteristics; spare parts that should be available to minimize downtime; and the frequency which maintenance is required. See equipment SOPs for specific information.

D. When a preventive action is initiated a review of the current procedure is performed to develop an action plan to determine what action will be taken. A 'Preventive Action Report (PAR)' should be filled out as follows:

1. Identify the potential issue

2. Evaluate the need for the action

3. Specify the action to be taken

4. Assign personnel to perform the preventive action

5. Determine if the action was effective and if it should be implemented throughout the company (if applicable)

SECTION 9

SPECIAL QUALITY ASSURANCE

9 SPECIAL QUALITY ASSURANCE

Specific analyses may require a cert program that does not apply to general lab analyses. This section applies to these specific analyses. LEGEND will comply with the requirement in the NIST Handbook 150.

9.1 Bulk Asbestos Quality Assurance

A. Bulk Analysis Procedure

LEGEND uses a quality assurance procedure entitled, "BULK SAMPLE IDENTIFICATION USING POLARIZED LIGHT MICROSCOPY," for its in-house analysis program. The procedure is based on the Environmental Protection Agency (EPA), "Interim Method for the Determination of Asbestos in Bulk Building Materials," 1993 (EPA-600/R-93/116). The procedure describes the process used in identifying the presence of asbestos, prepping samples, and estimating the percent composition of asbestos in bulk samples.

B. Data Reporting

1. Use of NVLAP Logo

Reports that contain results covered by NVLAP accreditation must indicate in the report and in the records and all results that are not covered by the NVLAP accreditation. A statement must be made in the report referencing the data not covered by NVLAP accreditation and the NVLAP logo may only be used on the page(s) that NVLAP accreditation applies. For marketing materials, websites, or other company literature, the NVLAP logo must indicate the facility where the accreditation is held. For all applications where the NVLAP logo is used, it must be accompanied by the NVLAP Lab Code.

2. Layered Samples

When layers are present in the sample, each layer is analyzed and reported separately unless a composite is requested by the client, and must indicate so on the report.

3. Approved Signatures

Approved signatures for reports referencing data covered by NVLAP accreditation are limited to currently approved personnel.

C. Quality Assurance/Quality Control (QA/QC)

LEGEND's QA Manual is used as the guiding document for all company operations. Procedures, training records, and equipment calibration are all dictated through this document. All documents and analysis sheets shall be completed, signed, and dated before a second analyst reviews them.

The Microscopy Supervisor has overall responsibility for the technical operations of the PLM laboratory.

D. Inter-Laboratory Quality Control Program

LEGEND participates in a tri-annual Interlaboratory Round Robin Quality Control Program for bulk sample analysis that includes analysis of three to four bulk samples. The program is sponsored by the Twin City Asbestos Round Robin Program and includes approximately six laboratories. A designated laboratory collects the data and provides the analytical statistics for the program.

LEGEND participates in the NIST National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos proficiency analysis. Proficiency samples are analyzed twice a year. Analyses are not contracted out to another laboratory. All analysts will participate and analyze the samples separately. One single result will be submitted to NVLAP by the laboratory.

The samples will be kept for in-house use in interanalyst comparisons. Problems observed from the test results will be discussed and resolved by the analysts and the Microscopy Supervisor.

E. Intra-Laboratory Quality Control Program

1. 10% of the samples will be set up in duplicate by the same analyst. The results of these samples will be recorded on the 'Bulk Asbestos Chart Table' form. The acceptable ranges are calculated on each appropriate form (1-10% and >10%).

2. If two different analysts read the same slide, the acceptable ranges are:

   a) $\leq$ 10% asbestos – within 5% units
   b) 10% to 75% asbestos – within 20% units
   c) $\geq$ 75% asbestos – within 10% units

3. NIST standard bulk asbestos reference materials are set up as needed and used to crosscheck samples analyzed for clients.

F. Instrument Calibration/Maintenance/Contamination Control

Appropriately trained in-house personnel will service all polarizing microscopes used in bulk analysis annually.

All polarizing microscopes used in bulk analysis will be calibrated by checking the alignment of the central stop. Ensure that the polarizer and analyzer are orientated at 90 degrees to one another, center the objectives, and check that the substage condenser and iris diaphragm are centered. Standard reference materials from NIST (SRM 1866 and 1867) are used as analysis reference materials.

Refractive index liquids will be calibrated with an accuracy of $\pm$ 0.004 once a month, or as needed to verify accuracy, with Cargill R.I. glass beads and recorded in a notebook. Approximately once a day, when used, slides, cover slips, and regularly used refractive index oils will be checked for contamination and a blank sample (non-asbestos containing) will be analyzed and recorded in a notebook.

To ensure a contamination free workspace, the hood, sample boards, tools, and counters will be wiped down with wet wipes after sample analysis. Phase contrast microscopy (PCM) samples will be run in the asbestos laboratory area, analyzed, and recorded on a bi-annual basis.

G. Measure of Uncertainty

In estimating the measure of uncertainty, some test procedures preclude an actual calculation. The components of uncertainty would be defined as follows:

1. Homogeneity of the sample
2. Analyst accuracy and precision
3. Preparation procedures
4. Calibration of the microscope
5. Calibration of the refractive index liquids
6. Cleanliness of the facility
7. Quality of the standard reference materials

9.2 Collection and Analysis of Asbestos Fiber Air Samples Quality Assurance Program

A. Objective

The objective of the program is to ensure consistent and accurate fiber count data is generated both in the field and the laboratory and comply with OSHA 29 CFR 1926.58, Appendix A requirements.

B. Sampling and Analytical Procedure

1. Sampling

The sampling medium for air samples shall be mixed cellulose ester filter membranes manufactured so as to be suitable for asbestos fiber determination. The standard medium for phase contrast microscopy (PCM) shall be a 25 mm, 0.8-micron pore size MCE filter in an open-faced 50-mm electrically conductive extension cowled cassette. The standard medium for transmission electron microscopy (TEM) shall be a 25-mm 0.45 micron pore size MCE filter followed by a 0.5 micron pore size MCE filter in an open faced 50-mm electrically conductive extension cowled cassette shipped loaded from the manufacturer.

Samples will be collected using both high and low flow vacuum pumps. The sampling pumps shall be calibrated each day prior to use with a primary standard calibrator or a rotameter which is calibrated every 3 months against a primary standard. Personal and area enclosure samples shall be collected using low flow pumps at a flow rate of 0.5 to 2.5 liters per minute (LPM). Exterior area enclosure and final clearance air samples shall be collected using high flow pumps at a flow rate of from 5 to 16 LPM.

Personal samples shall be collected in the breathing zone of the employee being monitored.

2. Air Volume

Where possible, a sufficient volume for each air sample shall be collected to yield between 100 and 1,200 fibers per square millimeter on the membrane filter. A quantifiable limit will be calculated for each sample based on sample air volume.

3. Field Blanks

Each set of samples taken will include 10 percent (10%) blanks or a minimum of 2 blanks. The blank results shall be analyzed with the samples and an average of the results subtracted from the sample counts.

Any filter media having blanks that when analyzed yield 5 or more fibers per 100 fields, shall be discarded. Any samples collected with that media shall be voided and re-sampling conducted. For situations where more than 40 samples are collected using the same media on the same day, the air sampling professional will analyze 4 blanks initially. If the results of the 4 blanks are less than 5 fibers per 100 fields and the counts are within 2 fibers of each other, no further blanks will be collected for that set of samples.

4. Phase Contrast Microscopy (PCM)

Air sample analysis shall be in accordance with NIOSH 7400A Method. Sample data shall be reported on the appropriate LEGEND TECHNICAL SERVICES, INC. (LEGEND) data sheets. Field analysis shall be conducted under the most dust free conditions obtainable at the site.

The analyst shall observe the NIOSH 7400A counting rules and count enough graticule fields to yield 100 fibers or count a minimum of 20 fields.

Blind recounts by the analyst shall be conducted at the rate of 10 percent. Upon completion of a project, the analyst returns his/her samples and count sheets to the designated quality assurance (QA) person. The QA person randomly selects 10 percent of the samples, relabels the samples, and resubmits them to the original analyst for blind recount. The blind recount results are then submitted back to the QA person for compilation and determination of acceptability. Results of the blind recheck are included in the client's reports.

At completion of a project, samples are stored and disposed of in accordance with LEGEND policies.

5. Microscope Maintenance

The microscopes used by LEGEND personnel shall be aligned at the beginning of each day that the microscope is used and at any time the analyst observes deterioration in the image. It shall be done according to written protocols and shall include but is not limited to alignment of the microscopic optics.

The analyst shall run the HSE/HPL test slide on the microscope, according to the written procedure, to ascertain whether its performance is within the established guidelines.

The analyst shall then measure the projected diameter of the Walton-Beckett graticule to assure that it is within established guidelines.

Any microscope not meeting the established criteria shall not be used for asbestos fiber counting.

C. Personnel Requirements

All analysts performing asbestos fiber counting analysis must have successfully completed an in-house training course for the evaluation of fibrous materials that is equivalent to the NIOSH 582 course or have completed the NIOSH 582 course.

1. Precision

Ten percent (10%) of the samples analyzed by each analyst shall be randomly selected, re-numbered, and submitted to the analyst for blind re-check. The results of the re-check will be compared to the results of the original analysis. Results will be considered acceptable if the difference between the two results is less than 2.77 $(F)S_r$, where F is the average of the two fiber counts and S_r is the relative standard deviation which is derived from historical in-house data. If deficiencies are noted, the analyst will be required to perform further review and a review of the microscope and analyst performance will be made by supervisory personnel until deficiencies are corrected.

2. Accuracy

a) Intra-laboratory

Reference slides are analyzed per SOP 'Asbestos Fiber Counting NIOSH 7400 Method'.

b) Inter-laboratory

LEGEND will participate in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program for asbestos fiber counting. PAT samples will also be analyzed by a number of analysts to assess variation in technique.

3. Identification of Analytical Bias Process

Analytical bias will be identified through the following sources:

a) Blind re-count analyses
b) Repetitive counts on the same filter
c) Intra-laboratory quarterly analyses
d) Inter-laboratory Round Robin and AIHA PAT analyses

If the analyses from the above sample analyses are not within acceptable limits for their respective quality control (QC) parameters, then analysis bias will be suspected. The designated QC supervisor will evaluate each outlier and determine what corrective action shall be taken.

9.3 Collection and Analysis of Industrial Hygiene Samples

A. Objective

The objective of the program is to ensure consistent and accurate industrial hygiene sample data is generated both in the field and in the laboratory. Industrial Hygiene samples are performed within LEGEND's laboratory that also performs environmental and industrial sample analysis.

B. Applicability

This section is applicable to airborne analysis of:

1. Solvent
2. Free silica
3. Metals
4. Gravimetric dust
5. Other specialty IH parameters

C. Sampling Procedure

1. Sampling Media

Sample in accordance with established OSHA/NIOSH procedures and LEGEND SOP's utilizing the media recommended in the procedures.

Media typically used includes the following:

a) Solvent vapor - charcoal, silica gel, or passive organic vapor monitor
b) Free silica - 37mm 0.8 micron mixed cellulose ester filters or PVC filters
c) Metals - 37mm 0.8 micron mixed cellulose ester filters
d) Gravimetric dust - 37mm 0.8 micron PVC filters
e) Other specialty IH parameter - per method requirements

2. Sample Collection

Samples are collected using both high and low flow vacuum pumps. The sampling pumps shall be calibrated each day prior to use with a primary standard calibrator or a rotameter which is calibrated every 3 months against a primary standard. Air sampling duration and flow rate depend on the method and expected level of concentration.

A sufficient volume of air shall be collected on the appropriate sampling media to provide a lower limit of detection within the applicable OSHA PEL or ACGIH TLV at the laboratory lower detectable limit for the compound of interest.

3. Field Blanks

Each set of samples taken will include a minimum of one blank. Additional blanks may be required where the sampling media is known to be contaminated with a low baseline level of the compound of interest. Specific compounds requiring multiple field blanks to assess level of media contamination include potassium, sodium, and gravimetric dust.

4. Replicate Samples

Where sampling conditions allow, collect and submit blind replicates to the laboratory for verification of sampling and analysis precision. Report the results of blind replicate sampling with sampling results.

5. Spikes Samples

Submit sampling media spiked with the target compound(s) at expected levels to the laboratory with each batch of laboratory samples collected for solvents or metals analysis. Report the results of the spiked samples with sampling results.

6. Sample Submission

Samples shall be submitted to the laboratory with a completed chain-of-custody.

D. Personnel Requirements

1. Field Sampling

Personnel performing the field sampling are under the direction of the field supervisor and have received training specific to sample collection and analysis.

2. Laboratory Analysts

Laboratory analysts performing the industrial hygiene analysis have received either in-house or outside training in their specific area of expertise including chromatography, atomic absorption, infrared spectroscopy, etc.

Training is documented in the employee individual training manuals.

E. Laboratory Analysis

1. Standard Operating Procedures

Standard operating procedures shall be written for each routine industrial hygiene analysis performed in the laboratory. Standard operating procedures are written and updated in accordance with SOP 'Preparation of Department Standard Operating Procedures'. Where methods exist, SOPs are based on established EPA, OSHA, and NIOSH methods.

2. Analytes Not Routinely Performed by the Laboratory

Where an analysis is requested and a written LEGEND SOP does not exist, the analyst must first consult the current OSHA and NIOSH Air Sampling Method Books

to identify existing published methods for the analyte of interest. Consult with the IH Technical Director before committing resources to method development. Verify that LEGEND has the proper equipment, materials, etc. prior to setting up to perform the method. Analyze standards and spiked samples to verify analytical recoveries prior to accepting any field samples for analysis. Provide field personnel with spiked samples to be transported and analyzed with the field samples.

F. Data Reporting

Data are reported in accordance with LEGEND SOP 'Report Format for Factual Reports' in the case of reports sent directly to an outside client. Internal data is submitted back to the member of the field staff who is acting as the client manager for data interpretation and reporting in accordance with LEGEND SOP 'Report Format for Formal Report'.

G. Quality Assurance/Quality Control (QA/QC)

LEGEND's QA Manual is used as the guiding document for all company operations. Procedures, training records, and equipment calibration are all dictated through this document.

SECTION 10

LABORATORY QUALITY ASSURANCE MANUAL REVIEW AND UPDATES

10 LABORATORY QUALITY ASSURANCE MANUAL REVIEW AND UPDATES

10.1 Review

A. The Quality Assurance Manual (QAM) will be reviewed a minimum of once a year by the QA/QC Coordinator or designated representative.

B. The review will be documented on the 'Document Review' Form.

10.2 Updates

A. Changes in the plan will be documented on the 'Document Review' Form and maintained within the QA Manual.

B. The changes will be incorporated in the plan and the issue date on the cover be changed to reflect the date of changes.

C. Changes in the Organizational chart may be made without documentation or revision to the QA Manual.

DOCUMENT REVIEW

DOCUMENT:	QUALITY ASSURANCE MANUAL
REVIEWER:	Erica Nastrom
DATE:	May 2008

SECTION	CHANGES
Section 2	Added ", and AIHA/NVLAP policies employing the principles of ISO/IEC 17025 (E)"
4.2.3	Added ", its revision date" and "Copies of all current 'LAB' forms are kept by the QA department."
4.2.4.A.4a	Added "For projects requiring specific accreditation, the client shall be informed of subcontracted work in writing. When appropriate, the client will approve the work, preferably in writing."
4.2.4.A.4b	Added "LEGEND is responsible to the client for the final result that the work is coordinated with the subcontractor and the completeness of the resulting data in the final report. LEGEND is not responsible to the client if the client or a regulatory authority indicates which subcontractor is to be used."
4.2.4.C.15	Added "The items listed above are further detailed under SOP 'Preparation of Proposals and Use of General Conditions and Sub-Contract Agreements'"
5.5.2.L	Added "Authorizes resumption of the production of laboratory data when corrective actions have been implemented and found effective."
5.6.2.G	Added "Report of proficiency testing results"
5.6.2.H	Added "Supervision of analytical reports"
6.2.2	Added " Where appropriate or required, training procedures are written. Training procedures shall include trainer qualifications, training content, training duration, and IDC procedure and documented authorization to perform the specific tasks."
6.3.E	Added CO-4 - Entech TO-15 Precon/Autosampler; CP-33 - Fisher Scientific Digital Timer; CP-34 - Fisher Scientific Digital Timer
7.5.2.I	Deleted "Unless stated otherwise, laboratory control spike acceptance criteria"; added "Acceptance criteria are calculated from 20 QC data points as the average ± 3s, and are" and "The QA/QC Coordinator reviews performance after the results from the blind spikes are technically reviewed. "
8.2.4.H	Added subsection on trend analysis

APPENDIX A

DEFINITIONS

Term	Definition
AA	Atomic Absorption
Accreditation	Procedure by which an authoritative body gives formal recognition that a body or person is competent to carry out specific tasks.
ASE	Accelerated Solvent Extractor, used to extract solid samples
Audit	Systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which audit criteria are fulfilled. First-party (internal) audits – conducted by, or on behalf of, the organization itself for internal purposes and can form the basis for an organizations self-declaration of conformity. Second-party audits – conducted by parties having an interest in the organization, such as customers, or by other persons on their behalf. Third-party audits – conducted by external independent organizations. Such organizations provide certification or registration of conformity with requirements such as those of ISO 9001 and ISO 14001:1996. Combined auditing – when quality and environmental management systems are audited together. Joint auditing – when two or more auditing organizations cooperate to audit a single auditee jointly.
Batch	One to twenty samples of the same matrix prepared for single or multiple analyses that will be analyzed during one operation at a given specific time frame.
Blind Standard	Sample with a known amount of analyte where the concentration of the analytes is unknown to the analyst but known to the supervisor or QA/QC Coordinator.
°C	Degrees Celsius (Temperature)
Calibration	Adjusting a measuring instrument to make it accurate. The set of operations which establish, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system and the corresponding values or a quantity realized by a reference standard.
CCC	Calibration Check Compounds
CCV	Continuing Calibration Verification
Certification	Procedure by which a third party gives written assurance that product, process or service conforms to specific requirements.

Term	Definition
Client Protocol	A document created specifically for a client that summarizes the method to be used.
COC	Chain-of-Custody, record that documents the possession and handling of samples from collection through submittal to the laboratory.
Competence	Demonstrated ability to apply knowledge and skills.
Compliance	An affirmative indication or judgment that the supplier of a product or service has met the requirements of the relevant specifications, contract or regulation; also the state of meeting the requirements.
Concession	Permission to use or release a product that does not conform to specified requirements. NOTE: A concession is generally limited to the delivery of a product that has nonconforming characteristics.
Conformity	Fulfillment of a requirement.
Continual Improvement	Set of activities routinely carried out to increase the ability to fulfill requirements. NOTE: The process of establishing objectives and finding opportunities for improvement is a continual process through the use of audit findings and conclusions, analysis of data, management reviews and corrective or preventive action.
Contract	Agreed requirements between a supplier and customer transmitted by any means.
Controlled	Orderly, repeatable, manageable, and predictable.
Correction	Action to eliminate a detected nonconformity. NOTE: A correction can be made in conjunction with a corrective action.
Corrective Action	Action to eliminate the cause of an existing nonconformity or other undesirable situation. Corrective action addresses the actual problem. NOTE 1: There can be more than one cause for nonconformity. NOTE 2: Corrective action is taken to prevent recurrence whereas preventive action is taken to prevent occurrence.
Customer	Organization or person that receives a product or service from a supplier (e.g. consumer, client, end-user, retailer, beneficiary and purchaser). NOTE: A customer can be internal or external to the organization.

Term	Definition
Customer Satisfaction	Customer's perception or the degree to which the customer's requirements have been fulfilled. NOTE: Customer complaints are a common indicator of low customer satisfaction but their absence does not necessarily imply high customer satisfaction.
CVAA	Cold Vapor Atomic Absorption
CVS	Calibration Verification Standard
Design and Development	Set of processes that transform requirements into specified characteristics or into the specification of a product, process or system. NOTE 1: The terms "design" and "development" are sometimes used synonymously and can be used to define different stages or the overall design and development process. NOTE 2: A qualifier can be applied to indicate the nature of what is being designed and developed (e.g. product design and development or process design and development).
Document	Information and its supporting medium (e.g. record, specification, procedure document, drawing, report, or standard). NOTE 1: The medium can be paper, magnetic, electronic or optical computer disc, photograph or master sample, or a combination thereof. NOTE 2: A set of documents, for example specifications and records, is frequently called "documentation".
DQO	Data Quality Objective (Precision, Accuracy, Representativeness, Comparability, Completeness)
Duplicate	Sample from which two equal representative portions have been taken and analyzed separately.
ECD	Electron Capture Detector
Effectiveness	Extent to which planned activities are realized and planned results achieved.
Efficiency	Relationship between the result achieved and the resources used.
ELCD	Electrolytic Conductivity Detector
Equipment Blank	Water sample that has been processed through the sampling equipment in the same manner as an actual sample to determine if field cleaning procedures were adequate.

Term	Definition
FID	Flame Ionization Detector
Finding	An important conclusion based on observations.
FLAA	Flame Atomic Absorption
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
GLP	Good Laboratory Practices
HPLC	High Performance Liquid Chromatography
ICP	Inductively Coupled Plasma
ICS	Interference Check Sample
ICV	Initial Calibration Verification
ID	Identification
IDC	Initial Demonstration of Capability
IEC	Interelement Correction
Infrastructure	System of facilities, equipment and services needed for the operation of an organization.
Inspection	Conformity evaluation by observation and judgment accompanied as appropriate by measurement, testing or gauging.
Interference	Any physical property or chemical constituent of a sample that causes either a positive or negative error in the analytical result.
International Organization for Standardization (ISO)	The specialized international agency for standardization, at present comprising the national standards bodies of 140 countries. The American National Standards Institute (ANSI) is the member body representing the United States. The address of ISO is: ISO, Case Postale 56 CH-1211 Geneva 20, Switzerland.
IStd.	Internal Standard, pure analyte or analytes, not typically found in environmental samples, added to a test sample, extract, or standard solution in known amounts and used to measure the relative responses of other method analytes and surrogates that are components of the sample or solution.
LCS	Laboratory Control Standard (or Sample), a laboratory blank that has known amounts of the analytes of interest added to it. Percent recoveries are calculated for each analyte to assess the analytical accuracy for the method.

Term	Definition
LCSD	Laboratory Control Standard (or Sample) Duplicate, a duplicate sample of the LCS. The RPD between the samples is used to assess the analytical precision for the method.
LIMS	Laboratory Information Management System
LUST	Leaking Underground Storage Tank
Management	Coordinated activities to direct and control an organization.
Management Representative	The person with the defined authority and responsibility to carry out the requirements of ISO 9001.
Management System	System to establish policy and objectives and to achieve those objectives. NOTE: A management system of an organization can include different management systems, such as quality management system, a financial management system or an environmental management system.
MB	Method Blank, clean matrix where all reagents are added in the typical amount used in the samples and then processed through the entire sample preparation and analytical process.
MDL	Method Detection Limit, lowest concentration level that can be determined to be statistically different from a blank for an analytical test method. The calculation is found in 40CFR, Part 136, Appendix B.
Measuring Equipment	Measuring instrument, software, measurement standard, reference material or auxiliary apparatus or combination thereof necessary to realize a measurement process.
Monitor	Observe, supervise, keep under review. Measure or test at intervals, especially for the purpose of regulation of control.
MS	Matrix Spike, sample to which a predetermined quantity of analytes of interest is added prior to sample preparation (extraction, digestion, etc.) and analysis. Percent recoveries are calculated for each analyte to assess the analytical precision including all potential sample interferences.
MSD	Matrix Spike Duplicate, a duplicate sample of the MS. The RPD between the samples is used to assess the analytical precision including all potential sample interferences.
MSDS	Material Safety Data Sheets
NIST	National Institute of Standards and Technology. An agency of the United States Department of Commerce the institute develops measurement standards and techniques for American science and industry and for

Term	Definition
	other government agencies. NIST also helps U.S. companies adopt new technologies to increase their international competitiveness.
Noncompliance	A deviation from the requirements of the standard.
Nonconformity	Non-fulfillment of a requirement.
Objective Evidence	Data supporting the existence or verity of something. NOTE: Objective evidence may be obtained through observation, measurement, test, or other means.
Organization	Group of people and facilities with an arrangement of responsibilities, authorities and relationships (e.g. company, corporation, firm, enterprise, institution, charity, sole trader, association, or parts or combination thereof). An organization can be public or private.
Outlier Test	$Grubb's\ T\ Test = \frac{\lvert suspected\ outlier - mean \rvert}{s}$ s = Standard Deviation
Parameter	Any chemical, biological, physical, microscopic test, examination, or analysis conducted on a specific matrix.
Preventive Action	Action to eliminate the cause of a potential nonconformity or other undesirable potential situation. NOTE 1: There can be more than one cause for a potential nonconformity. NOTE 2: Preventive action is taken to prevent occurrence whereas corrective action is taken to prevent recurrence.
Procedure	Specified way to carry out an activity or a process. NOTE 1: Procedures can be documented or not.
Process	Set of interrelated or interacting activities that transform inputs into outputs. NOTE 1: Inputs to a process are generally outputs of other processes. NOTE 2: Processes in an organization are generally planned and carried out under controlled conditions to add value. NOTE 3: A process where the conformity of the resulting product cannot be readily or economically verified is frequently referred to as a "Special process."

Term	Definition
Process Control	A system of measurements, decisions and adjustments within a process intended to ensure the output of the process conforms with pertinent specifications.
Product Realization	All processes that are used to bring products into being.
Proficiency Testing Sample	Sample obtained from an approved provider to evaluate the ability of a laboratory to produce an analytical test result meeting the definition of acceptable performance. The concentration of the analyte in the sample is unknown to the laboratory at the time of analysis.
Qualified	Verified as capable of providing the required performance.
Quality	Degree to which a set of inherent characteristics fulfills requirements. NOTE 1: The term "quality" can be used with adjectives such as poor, good or excellent. NOTE 2: "Inherent", as opposed to "assigned", means existing in something, especially as permanent characteristic.
Quality Assurance	Part of quality management focused on providing confidence that quality requirements will be fulfilled.
Quality Audit	An audit of the quality management system.
Quality Control	Part of quality management focused on fulfilling quality requirements.
Quality Management	Coordinated activities to direct and control an organization with regard to quality (e.g. quality policy, quality objectives, quality planning, quality control, quality assurance and quality improvement).
Quality Management System	Management system to direct and control an organization with regard to quality.
Quality Manual	Document specifying the quality management system of an organization.
Quality Objective	Something sought, or aimed for, related to quality. NOTE 1: Quality objectives are generally based on the organization's quality policy. NOTE 2: Quality objectives are generally specified for relevant functions and levels in the organization.

Term	Definition
Quality Policy	Overall intentions and direction of an organization related to quality as formally expressed by top management. NOTE 1: Generally the quality policy is consistent with the overall policy of the organization and provides a framework for the setting of quality objectives. NOTE 2: Quality management principles presented in this International Standard can form a basis for the establishment of a quality policy.
Record	Document stating results achieved or providing evidence of activities performed. NOTE 1: Records can be used, for example, to document traceability and to provide evidence of verification, preventive action and corrective action. NOTE 2: Generally records need not be under revision control.
Release	Permission to proceed to the next stage of a process.
Repair	Action on a nonconforming product to make it acceptable for the intended use. NOTE 1: Repair includes remedial action taken on a previously nonconforming product to restore it for use, for example as part of maintenance. NOTE 2: Unlike rework, repair can affect or change parts of the nonconforming product.
Requirement	Need, expectation, or obligation that is stated or generally implied. NOTE 1: "Generally implied" means that it is custom or common practice for the organization, its customers and other interested parties, that the need or expectation under consideration is implied. NOTE 2: A qualifier can be used to denote a specific type of requirement (e.g. product requirement, quality management requirement, customer requirement). NOTE 3: A specified requirement is one which is stated, for example, in a document. NOTE 4: Requirements can be generated by different interested parties.
Responsibility	Being obliged to answer, as for one's actions, to an authority that may impose a penalty for failure. The ability to respond to meet an obligation.

Term	Definition
Review	Activity undertaken to determine the suitability, adequacy and effectiveness of the subject matter to achieve established objectives.
RL	Reporting Limit, minimum value set by the laboratory that should be greater than the calculated PQL but must be greater than the calculated MDL.
Root Cause	A fundamental deficiency that results in nonconformity and must be corrected to prevent recurrence of the same or similar nonconformity.
RSD (%)	$\frac{Standard\ Deviation}{Average}(100)$
SOP	Standard Operating Procedures
SPCC	System Performance Check Compounds
Specification	A document stating requirements
Standard	An acknowledged measure of comparison for quantitative or qualitative value.
Standard Deviation	Measure of the dispersion of a series of results around their average (measured as n-1): $s = \sqrt{\frac{\sum(x - x)^2}{n-1}}$
Subcontractor	An organization that provides a product or service to the supplier.
Summary Protocol	An internal document that summarizes the method used.
Supplier	Organization or person that provides a product (e.g. producer, distributor, retailer or vendor of a product, or provider of a service or information). NOTE 1: A supplier can be internal or external to the organization. NOTE 2: In a contractual situation a supplier is sometimes called "contractor".
Surrogate	Organic compound that is similar to analytes of interest in chemical composition, extraction, and chromatography but is not normally found in environmental samples. It is spiked into all blanks, standards, samples and spike samples prior to preparation and analysis. Percent recoveries are calculated for each surrogate.
SW-846	EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods

Term	Definition
System	Set of interrelated or interacting elements.
Technical Expert	Person who provides specific knowledge of or expertise on the subject to be audited. NOTE 1: Specific knowledge or expertise includes knowledge of or expertise on the organization, process or activity to be audited, as well as language or cultural guidance. NOTE 2: A technical expert does not act as an auditor in the audit team.
Technology Audit	An audit of any testing method or technique.
Test	Determination of one or more characteristics according to a procedure.
Testing	A means of determining an [illegible] capability to meet specified requirements by subjecting [illegible] a set of physical, chemical, environmental, or operating actions and conditions.
Top Management	Person or group of people who direct and control an organization at the highest level.
Traceability	Ability to trace the history, application or location of that which is under consideration. NOTE 1: When considering product, traceability can relate to - the origin of materials and parts - the processing history - the distribution and location of the product after delivery
Trip Blank	[illegible]agent grade water (liquids) or methanol (solids) in a sample bottle that accompanies sample bottle(s) from the lab, to the field, and back to the lab.
Validation	Confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled. The term "validated" is used to designate the corresponding status. NOTE 1: The use condition for validation can be real or simulated.

Term	Definition
Verification	Confirmation, through the provision of objective evidence, that specified requirements have been fulfilled. The term "verified" is used to designate the corresponding status. NOTE 1: Confirmation can comprise activities such as - performing alternative calculations - comparing a new design specification with a similar proven design specification - undertaking tests and demonstrations - reviewing documents prior to issue
Work Environment	Set of conditions under which work is performed. NOTE: Conditions include physical, social, psychological and environmental factors (such as temperature, recognition schemes, ergonomics and atmospheric composition).
ZHE	Zero Headspace Extractor

END OF QA MANUAL

BRAUN

INTERTEC

Analytical Laboratory Quality Assurance Manual

Revision 3.1
Effective 07/31/08

I. SUMMARY

The Quality Assurance Manual is the reference guide used by laboratory staff to understand and implement the quality assurance plan for the Analytical Laboratory at Braun Intertec Corporation. This guide is part of the overall quality system and serves as the reference point for all of the other components of the system. The additional components of the quality system include but are not limited to standard operating procedures, reference methods, statistical tools, internal monitoring, and external oversight.

The purpose of this manual is to serve as a useful tool to scientists at the bench and in the office. The manual will be reviewed at least annually as part of the continuous improvement process. The manual is organized in such a way as to allow for more frequent updates of time sensitive information. This information is organized in appendices.

The goal is that should a scientist have a quality-related question, then he or she should consult the Quality Assurance Manual. If the manual does not provide an immediate answer, it should lead the scientist in a direction to find the answer.

II. SIGNATURES

The policies of this document take effect with the signatures and dates below. The signatures below document the author, reviewer and lab management approval. The signature of the Analytical Laboratory Manager gives approval, support and resources for all policies within the QAM.

Michelle M. Hubanks, Quality Assurance Officer — Date
Author

Craig S. Foxhoven, Quality Assurance Director — Date
Reviewer

Thomas P. Wagner, Analytical Laboratory Manager — Date
Approval

III. DOCUMENT CONTINUITY

- 05/12/03

The full name of this document is the Analytical Laboratory Quality Control Manual. It is an internal Braun Intertec Corporation document; therefore, it is redundant to include the company name in the title. This replaces the previous manual entitled Braun Intertec Corporation Analytical Laboratory Quality Assurance/Quality Control Document.

This is Revision "0.0". Please refer to Chapter 4: Document Control for an explanation of the system for documenting revisions. This is the first version of this document.

- 08/05/03

This is revision "0.1". Appendices B-1 and B-2 have been updated with personnel changes.

- 02/20/07

This is revision 1.0. This revision updates the official document name for the manual to the Analytical Laboratory Quality Assurance Manual.

This revision incorporates the changes to the Minnesota Department of Health new rules for laboratory certification.

This revision incorporates the changes to the Braun Intertec Analytical Laboratory 'Laboratory Information Management System' (LIMS). The LIMS vendor is Promium® and the product is Element®. The policies and procedures associated with the LIMS have also been updated and clarified.

The organizational structure and personnel titles have been updated.

The Code of Ethics policy, Chapter 1, and training, Chapter 3, have been added to this revision.

The authorization codes in Chapter 3 have been updated.

The review of contracts policy has been added to Chapter 10.

- 09/11/07

This is revision 2.0. The following revisions have been made.

The signature section has been defined.

A policy regarding undue pressures and influences has been added.

The corrective action policy for proficiency testing failures has been updated.

A demonstration of competency policy has been added.

The data retention time policy has been clarified.

A selection of approved vendors has been added.

- 01/31/08

This is revision 3.0. The following revisions have been made.

NVLAP and AIHA lab codes were added.

Additional documentation in the master index was added.

Clarification to data qualifiers was added.

Calibration of support equipment was updated. Calibration of pipets and dispensers was changed from annually to quarterly. Daily calibration of the IR Gun was added. Calibration of the weight sets was updated to annually.

- 07/31/08

This is revision 3.1. The following revisions have been made.

Preventive action policy was added.

Changes to the curriculum vitae (CV) portion of the training documentation were made.

Sampling material for industrial hygiene analysis was added.

Changes to the purchasing procedure have been added, including a new PO form.

Changes to the vendor approval system have been made..

Storage of consumables was added.

IV. USING THIS DOCUMENT

The document is divided into chapters 1-10 and appendices A-R. A Table of Contents is provided in Section V to follow, which outlines the major chapter sections.

Whenever an external document is referenced it is underlined. For example, if one were to refer to the standard operating procedure titled "LABSECURITY1" it would be referred to as LABSECURITY1.

Standard operating procedures, forms, and other reference sources are often cited. These are available from the quality group or may be obtained from the corporate network. They are arranged in a Master Index file (in Excel®) that can be reached via the path F:\Groups\QA-QC\MASTER INDEX.xls. The Master Index has a hyperlink to the required file.

Abbreviations and terms used in this manual as well as other documents produced by the Analytical Laboratory are summarized in Appendix A-1. If terms or abbreviations not listed in A-1 would be of value to the Analytical Laboratory, please submit them to the Quality Group.

The term "Quality Group" refers to the Quality Assurance Director and Quality Assurance Officer. This is defined in Chapter 1: Administration.

Page numbering starts over with each chapter. In other words, each chapter begins with page 1 of that chapter.

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VI. QUALITY POLICY STATEMENT

- In order to provide data that consistently meets high standards of quality, the analytical laboratory at Braun Intertec Corporation is committed to leadership in four key categories that affect quality: management support, quality systems, technical experience, and individual responsibility.

- Quality is a dynamic; Braun is committed to continuous quality improvement. Data is fed back into the process in order to make the process better and to raise standards of quality, quantify uncertainty, and to increase understanding.

- As scientists, the analytical laboratory understands that all activities performed must be documented in "real time" as the task is carried out. It is never acceptable to "back date" data entries. This is fundamental to good science.

- Accountability and traceability must be provided for each sample analyzed. An audit trail must be established that identifies materials used, the procedure followed, and the times and dates of sample preparation and analysis. This helps to limit random error and reduce risk to clients.

- It is critical that the laboratory always responds immediately to indications of questionable data, out-of-specification events, equipment failures, and other types of problems with corrective action investigation, documentation, and communication to clients and regulators. Internal and external clients must always be informed of any non-conformances so that they may plan accordingly.

- Meeting the needs of the next person in the workflow process is just as important as meeting the needs of external clients. There are many variables that go into the final product. Producing a quality product is the result of a team effort.

- The staff realizes that it makes sense to listen to concerns, questions, and ideas of customers, of co-workers, and of regulators. Input, dialogue, and debate are highly valued with respect to quality improvement.

- Braun Intertec Corporation is committed to compliance to ISO 17025:2005 and to continuing improving our quality and management systems.

VII. REFERENCES

The following is a list of reference documents used in compiling the Analytical Laboratory Quality Assurance Manual.

1. US EPA Guidance for Quality Assurance Project Plans EPA QA/G-5.
2. NELAP/NELAC Constitutions, Bylaws, and Standards: Quality Systems, Revision 16, July 2002.
3. ISO/IEC 17025:2005 (E).
4. Minnesota Rule 4740.2030.
5. AIHA Laboratory Quality Assurance Programs, Policies, April 2002.
6. ASTM Manual on Presentation of Data and Control Chart Analysis, 7th Edition.
7. Standard Methods for the Examination of Water and Waste Water, 20th Edition.
8. 40 CFR (Code of Federal Regulations) Part 136.
9. Basic Statistics for Laboratories, Kelley, Ratliff, Nenadic, ©1992.

1.0 SUMMARY OF CHAPTER 1: ADMINISTRATION

1.0.1 Chapter 1 describes the responsibilities and structure of the personnel at Braun Intertec Corporation.

1.1 ORGANIZATIONAL STRUCTURE & RESPONSIBILITIES

1.1.1 Please refer to Appendix B-1 for a copy of the Analytical Laboratory organizational chart as well as a copy of the corporate organizational chart depicting how the Analytical Laboratory is positioned within the company.

1.1.2 The Analytical Laboratory is part of the larger Braun Intertec Corporation. Braun Intertec Corporation employs roughly 400 people in 12 offices. The Analytical Laboratory employs approximately 25 employees.

1.1.3 Braun Intertec Corporation was established in 1957. The Analytical Laboratory was established in 1980.

1.1.4 Braun Intertec Corporation is an employee owned company. This is through the Employee Stock Ownership Program or ESOP.

1.1.5 For more information on the company please visit the company web page at www.braunintertec.com.

1.1.6 Braun Intertec Corporation is a leading provider of engineering consulting services and thus is a significant client of the Analytical Laboratory. The Analytical Laboratory Business Unit is operated independent of other business units to minimize the potential for a conflict of interest.

1.1.7 The Chief Executive Officer is responsible for the overall management and direction of Braun Intertec Corporation.

1.1.8 The Analytical Laboratory Manager is responsible for management of the Analytical Laboratory Business Unit including operations, data integrity, financials, business growth, and overall direction of the lab. The Analytical Laboratory Manager is responsible for the laboratory carrying out its testing activities in such a way as to meet the requirements of ISO/IEC 17025 and to satisfy the needs of the client and the regulatory authorities or organizations providing recognition. The Analytical Laboratory Manager reports to the Environmental Consulting Manager.

1.1.9 The position of Technical Director is responsible for coordinating the development of new methods and processes and problem solving of existing

methods and processes. The Technical Director acts as a technical advisor to internal staff and laboratory clients. The Technical Director regularly serves on the Quality Team as an internal advisor. The Technical Director reports to the Analytical Laboratory Manager.

1.1.10 The Quality Assurance Director is responsible for facilitating the Analytical Laboratory's compliance with ISO/IEC 17025 guidelines as well as all regulatory requirements for professional accreditations and certifications held by the laboratory. In addition, the Quality Assurance Director is responsible for monitoring customer satisfaction and laboratory performance in order to facilitate a continuous improvement process. The Quality Assurance Director reports to the Analytical Laboratory Manager; however, the Quality Assurance Director distributes a Quarterly Quality Report to senior management outside of the Analytical Laboratory. This process provides autonomy for the Quality Assurance Director apart from specific responsibilities of the Analytical Laboratory Manager that could have the potential to create a conflict of interest.

1.1.11 The laboratory Business Development Representative is responsible for coordinating marketing efforts including participation in trade shows, laboratory marketing materials, and development of customer relationships. The laboratory Business Development Representative works closely with the corporate Marketing/ Communications Business Development Unit to ensure consistency in Braun Intertec Corporation's marketing message. The Business Development Representative reports to the Analytical Laboratory Manager.

1.1.12 The Quality Assurance Officer is responsible for facilitating the laboratory's compliance with all regulatory requirements for professional certifications and accreditations held by the laboratory including but not limited to ISO/IEC 17025 guidelines. The Quality Assurance Officer is responsible for monitoring laboratory performance through the use of various statistical tools and discovering trends in data that will aid in correcting problems. The Quality Assurance Officer fills the role of Quality Assurance Coordinator as defined by the AIHA Policies document. The Quality Assurance Officer reports to the Quality Assurance Director.

1.1.13 Group supervisors serve in one of three functional groups including Client Services, Organic Chemistry, and Inorganic Chemistry. The Microscopy group is supervised by the inorganic group supervisor. The role of the group supervisor is to provide technical leadership, facilitate employee development, manage priorities, coordinate workflow, and ensure that each group meets deadlines for internal and external clients. The group supervisors report to the Analytical Laboratory Manager.

1.1.14 Due to Braun Intertec Corporation's participation in NVLAP and AIHA programs, there are specific requirements for Technical Managers for individual programs. These programs include AIHA IHLAP, ELLAP, and EMLAP programs as well as the NVLAP program. The primary role for these individuals is that of technical coordinator. It is the responsibility of each individual to ensure that the technical requirements of each area are met. It is also the responsibility of the technical managers to ensure that customer requirements are met including delivery of data in a timely manner. These individuals may or may not have group supervisor responsibilities as described above. The Technical Managers report to either a group supervisor or the Analytical Laboratory Manager depending on other responsibilities.

1.1.15 Deputies have been assigned for key managerial positions in the laboratory in case of an absence of the primary employee**.** A listing of assigned deputies may be found in Appendix B-2.

1.2 FUNCTIONAL GROUPS

1.2.1 The Client Services Group serves as a liaison between external and internal customers on a number of levels. Some of the key responsibilities are described here. The Client Services Group is responsible for sample receipt, log-in, storage, and disposal. The Client Services group is responsible for subcontracting testing to other laboratories.

1.2.2 The Inorganic Chemistry Group is responsible for chemistries classically classified as inorganic chemistry. This would include metals sample preparation and analysis and wet chemistry techniques. Examples of techniques that are employed are Hotblock™ digestions, microwave digestions, distillations, toxic characteristic & synthetic precipitation leaching procedures, atomic absorption and atomic emission spectroscopy, ultraviolet-visible spectroscopy, inductively coupled mass spectrometry, ion chromatography, electrometric determinations, titration determinations, and gravimetric analyses.

1.2.3 The Organic Chemistry Group is responsible for chemistries classically classified as organic chemistry. This would include organic sample preparations using various techniques such as separatory funnel extractions, continuous liquid-liquid extractions, solid phase extractions, accelerated soil extractions (ASE) as well as the analysis of volatile and semi-volatile organic compounds. Examples of analytical techniques that are employed are gas chromatography, gas chromatography-mass spectrometry, high-pressure liquid chromatography, and liquid chromatography-mass spectrometry.

1.2.4 The Microscopy Group is responsible for techniques that involve the use of high-powered microscope technology to characterize such compounds as asbestos and a variety of investigative applications. Examples of techniques that are employed are bright field microscopy, transmission electron microscopy, phase contrast microscopy, and polarized light microscopy.

1.3 PERSONNEL QUALIFICATIONS & RESPONSIBILITIES

1.3.1 The primary duties of the laboratory management staff are described above in section 1.1.

1.3.2 Responsibilities for the remainder of the staff as well as additional responsibilities of the staff described in section 1.1 vary with technical assignments and training. Due to the highly technical nature of the work performed, very strict requirements must be met in order to perform job functions.

1.3.3 Proper training is crucial for laboratory staff to perform their duties at a level that is acceptable to Braun Intertec Corporation's quality standards. Please refer to Chapter 3 for a detailed description of the training process.

1.3.4 In order to perform testing or validate data, the individual scientist must demonstrate appropriate knowledge, experience, and performance in a given technology and/or methodology. This demonstration of capability is documented in the individual's official training record. Please refer to Chapter 3 for a more detailed description of this document.

1.3.5 Once the scientist demonstrates proficiency, he or she must be formally authorized to perform a given task. The process is outlined in Chapter 3. As the individual demonstrates mastery beyond the basic level he or she is given more responsibilities in the particular discipline. Examples of such added responsibilities include review of another scientist's work, verification rights, and training of other scientists in that discipline.

1.3.6 Authorization to perform a given test, to verify data, or to train others is a function of training, demonstration of capability, experience, interpersonal skills, and operational objectives. A review of such authorizations is conducted annually at a minimum and may be updated at any time as long as all requirements, such as the annual continuing demonstration of capabilities requirement, are met and documented.

1.3.7 Technical job responsibilities are divided amongst qualified personnel on a regular basis. Job responsibilities generally tend to align along functional groups but there is no formal limitation. Scientists are encouraged to get cross training

and explore other areas of the laboratory. It is a team effort. There is a system for maintaining capability in a given area so that scientists do not allow their skills to deteriorate. Please refer to Chapter 3 for a description of this process.

1.3.8 Project Management is distributed to various members of the staff. Each client is assigned a specific project manager to handle his or her account so that continuity and a relationship can be established. Specific training is provided to staff that do project management. Please refer to Chapter 3 on training.

1.3.9 At the corporate level, Braun Intertec Corporation maintains what is known as "Broadband Position Summaries." This includes "Job Title", "Summary of Job Duties", and "Minimal Education and Experience Requirements."

1.4 MANAGEMENT REVIEW PROCESS

1.4.1 A written Management Review of the Analytical Laboratory is conducted at a minimum of once per year but may occur on a more frequent basis. The purpose of this process is to take stock of where we are, make adjustments as necessary, and set future goals. The topics for review include: suitability of policies, reports from managerial and supervisory personnel, outcome of recent internal audits, corrective and preventative actions, assessments by external bodies, results of interlaboratory comparisons for proficiency tests, changes in the volume or type of work, client feedback, complaints, quality control activities, resources (equipment, facilities, supplies, and staffing), staff training, goals, and progress.

1.4.2 Please refer to the standard operating procedure MNGMTREVIEW1 for a detailed account of the Analytical Laboratory Management Review Process.

1.5 CODE OF BUSINESS CONDUCT

1.5.1 Integrity is a core value in Braun Intertec Corporation's philosophy. In response to this belief, a document has been developed that outlines specific policies in regards to business conduct. This corporate document is entitled "Code of Business Conduct." Each employee must read and sign a contract agreeing to abide by this code. If an employee is found to not be abiding by the code, he or she is subject to disciplinary action.

1.5.2 The Code of Business Conduct addresses many issues including conflict of interest and client confidentiality.

1.5.3 Please refer to a copy of the Code of Business Conduct in Appendix C-1.

1.6 CODE OF ETHICS

1.6.1 Braun Intertec Corporation requires all employees to follow a strict code of ethics. Braun Intertec Corporation does not condone unethical behavior and requires all employees to report any ethical or data integrity issues to appropriate personnel.

1.6.2 Braun Intertec Corporation allows for safe and confidential reporting of all ethical or data integrity issues.

1.6.3 Analytical laboratory personnel are required to attend new employee ethics training and to repeat this training on an annual basis.

1.6.4 All employees read, understand, and agree to the Analytical Laboratory Code of Ethics. Please refer to a copy of the Code of Ethics in Appendix C-2.

1.6.5 All employees are required to read and understand the ETHICS standard operating procedure.

1.7 POLICIES REGARDING UNDUE PRESSURES AND INFLUENCE

1.7.1 Similar to the Code of Ethics, Braun Intertec Corporation has a stated policy regarding the pressures placed on analysts and the potential influences that may arise.

1.7.2 Braun Intertec Corporation is dedicated to providing only the highest quality services for its valued clients. We believe that minimizing potential liability for our clients is far more valuable than expediency.

1.7.3 We believe that quality data and good client service need not be mutually exclusive. We know that it is possible to provide a high quality product while still providing timely service.

1.7.4 At no time is it ever acceptable to compromise data quality in return for decreasing project turn-around time.

1.7.5 Each employee has full access to all levels of management including the Braun Intertec Human Resources group and are encouraged to report any issues related to what they feel is undue pressure or influence by any member of the staff.

1.7.6 Braun Intertec Corporation does not guarantee a given turn-around time because we realize that there are many variables that go into providing high quality results. We strive to meet and exceed our customer expectations but we are also up front about the possibilities of delays. We try to estimate turn-around time on a worst-

case scenario rather than a best-case scenario. This approach not only provides the client the best opportunity to plan but also places less pressure on the staff.

1.7.7 The above policies are communicated and reinforced for each member of the staff including project managers through quality training and the ethics training program.

1.8 QUALITY TEAM

1.8.1 Quality is the responsibility of every member of the Analytical Laboratory. This is reinforced through training as well as through the opportunity that each employee has to access all levels of management. Open communication and participation in the process is highly encouraged.

1.8.2 The Analytical Laboratory reserves two dedicated positions to quality control: the Quality Assurance Director and the Quality Assurance Officer. Although both of these individuals may consult with other departments providing technical expertise as required, neither position has job responsibilities that have the potential to detract from or conflict with carrying out the duties necessary to ensure quality standards. When referring to the "Quality Group" in this manual and in other laboratory documents or forms, this refers to the department, which includes the Quality Assurance Director and the Quality Assurance Officer. The term "quality team" is a looser definition, which refers to ad-hoc committees that form to solve particular issues.

1.8.3 The quality team often consists of additional key advisors that serve part time on an ad-hoc basis as needed. The Technical Directors, Analytical Laboratory Manager, and Group Supervisors are regularly involved in formulating and executing quality policies.

1.8.4 Ad hoc quality teams made up from various members of the laboratory are assigned to address specific process improvement projects. Teams are dissolved once the project is completed. Details regarding this process are given in Chapter 2 of this manual.

1.9 SAFETY PRACTICES & POLICIES

1.9.1 Safety is of the highest priority at Braun Intertec Corporation, particularly given the nature of the work done by the Analytical Laboratory.

1.9.2 At the corporate level, there is a Senior Management Safety Review Team comprised of a variety of employees represented at all levels including senior

management. An outside consultant also serves on this team. Each business unit of the company assigns a specific safety officer.

1.9.3 The Analytical Laboratory has an assigned laboratory Safety Officer. Although the laboratory Safety Officer has other duties within the laboratory, a significant amount of the individual's time is devoted to safety issues. The laboratory Safety Officer participates in meetings of the Senior Management Review Team in order to discuss policy and receive training. The laboratory Safety Officer conducts training on a variety of topics at monthly laboratory meetings.

1.9.4 Upon beginning employment at Braun Intertec Corporation each analytical laboratory employee is issued a copy of the Corporate Health and Safety Standard Operating Procedure Manual. This document describes all safety practices for the company. Employees are required to read this manual.

1.9.5 In addition to the document described in 1.9.4, each employee of the Analytical Laboratory is required to read two specific standard operating procedures written by the Laboratory Safety Officer: SPILLKITS1 and PERSPROT2.

1.9.6 Visitors to the Analytical Laboratory are required to comply with the laboratory policy regarding eye protection when touring the physical laboratory portion of the Analytical Laboratory. The visitor may use his or her own eye protection if appropriate or the eye protection will be provided.

1.9.7 It is very important that all safety equipment is operational. Eye wash stations, safety showers, and fire extinguishers are inspected on a weekly basis. First aid kits and spill kits are inspected on a monthly basis. Fire extinguishers are serviced on an annual basis.

1.10 SUPPORT SERVICES

1.10.1 The Information Systems Business Unit is a shared resource for the entire company. This department serves the Analytical Laboratory as required. Information Systems is responsible for all telecommunication infrastructure including phones, network servers, and personal computers. Information Systems is responsible for backing up electronic data generated by the Analytical Laboratory and storing this data for possible retrieval.

1.10.2 The Marketing/Communications Business Unit is a shared resource for the entire company. This department serves the Analytical Laboratory as required. Marketing/Communications is responsible for all marketing literature, the use of the company logo, public relations, and standardization of communications formats generated by the Analytical Laboratory.

1.10.3 The Operations Support Business Unit is a shared resource for the entire company. This department serves the Analytical Laboratory as required. This unit is responsible for facilities management and support services. The Copy Center, a group within the Operations Support Business Unit, serves as a particularly valuable resource for the Analytical Laboratory. The Copy Center is responsible for mailing out reports, communications, and invoices to clients; making copies of client reports for data archival; and making bulk copies and creating logbooks for use by the Analytical Laboratory.

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2.0 SUMMARY OF CHAPTER 2: QUALITY SYSTEM

2.0.1 Chapter 2 describes the various components of the quality system and the specific quality control processes at Braun Intertec Corporation.

2.1 RESPONSIBILITIES

2.1.1 The Quality Group is responsible for creating and maintaining components of the quality system. This is a dynamic process as the laboratory is constantly evolving and improving.

2.1.2 It is the responsibility of the Quality Group to drive the continuous improvement process. This is accomplished by monitoring performance both in terms of data quality and in terms of operational excellence, identifying problems, documenting those problems, and initiating projects to find solutions. The Quality Group has a responsibility to look at laboratory systems in terms of the big picture and facilitate change at every level. This is accomplished through the use of the Management Review Process (described in Chapter 1), internal and external audits (described later in this chapter), trend analysis, and process improvement suggestions (described later in this chapter). Additional tools are created and used as necessary.

2.1.3 It is the responsibility of the Quality Group to advise the Analytical Laboratory to discontinue testing of any parameter if, in the opinion of the Quality Group, systems pertaining to that parameter are "out of control." "Out of Control" means that systems cannot be brought back into control through use of the Corrective Action Process (described later in this chapter). In other words, a problem persists even after steps have been taken in the Corrective Action Process. If a chronic problem continues, it is sometimes necessary to shut things down, fully re-evaluate the situation and start fresh. This is rarely the case. The Corrective Action process should keep things on track.

2.2 REPORTS TO MANAGEMENT

2.2.1 A quality report is generated on a quarterly basis to inform upper management as to the status of quality activities in the Analytical Laboratory. This report is available to the entire Analytical Laboratory staff and to senior management outside of the Analytical Laboratory.

2.2.2 This report addresses issues concerning regulatory compliance, performance testing samples, data integrity, process control, and customer satisfaction.

2.2.3 On a quarterly basis each group supervisor will complete a quarterly report form to address issues within their group. This will be provided to the Analytical Laboratory Manager and the Quality Group to communicate and document any operational aspects that could impact quality in the laboratory. Some of this information may be included in the Quality Reports and/or the Management Review Reports.

2.3 DEFINITIONS

2.3.1 Quality Control (QC):

The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality. The system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring the results are of acceptable quality (EPA QA/G-5).

Quality Control is the process by which we establish standards and the process by which we measure results against those standards. There are numerous individual processes at work. The established standards must meet or exceed those required by the customer. In the case of analytical chemistry, there is a customer expectation that we provide a product that is scientifically sound, that meets the requirements of external regulatory authorities and accrediting bodies, that is supplied in a timely fashion, and that is complete.

2.3.2 Quality Assurance (QA):

An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client (EPA QA/G-5).

Quality Assurance is the plan by which we achieve the quality control objectives. There are numerous systems that must be created and executed to ensure that the analytical laboratory is meeting established standards. In addition, there are systems to report when standards are not met. The Analytical Laboratory has procedures in place to learn from these situations and to use this information to ensure standards are met in the future. It is critical to always look at ways to improve existing processes. This manual outlines Braun's quality assurance plan.

2.3.3 Accuracy:

A measure of the closeness of an individual measurement or the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; the EPA recommends using the terms "precision" and "bias", rather than "accuracy," to convey the information usually associated with accuracy (EPA QA/G-5).

Accuracy is simply about getting the "right answer" and how close one can get to that all elusive "right answer." When the laboratory is requested to analyze a sample, the customer is expecting that one get an answer that is close to what is actually in the sample. This seems rather straightforward. The problem is "how do you know?" Tests are performed on unknown samples of varying matrices. Analytical chemistry usually involves relative measurements to a known standard. One way to increase accuracy is to use standards of known quality. The analytical laboratory can generally trace a standard back to the National Institute of Standards (NIST). Another way to increase accuracy is to minimize the random and systemic errors associated with measurement. Random error is discussed further, below, under "Precision." Why does the EPA recommend the term "bias" over "accuracy?" Systematic error is a result of the technique being unable to get the exact answer due to inherent limitations in the procedure. An example of such a limitation would be a chemical or physical interference that prevents the procedure from thoroughly bringing a compound into solution. One way to limit the systematic error would be to use a variety of test procedures. It is unlikely that an interference would affect various test procedures in the same way. The problem with this approach is that it is sometimes impractical and it raises issues that affect comparability. Comparability is discussed in more detail below. Bias can come from laboratory technique; therefore, it is important that the laboratory quantify the bias as a function of this specific laboratory. Specific quality control measurements are taken to measure the amount of bias in a given method as it is applied within the laboratory. Method blanks, laboratory control samples, and instrument check samples are used to measure the laboratory bias. Systematic error may vary depending on the sample matrix. Therefore, a method may work well for one sample matrix but then have difficulties with another. Specific quality control measurements are taken to quantify the amount of bias associated with the sample matrix. Matrix spikes and the analysis of a variety of certified reference materials provide information on the bias that can be associated with a wide variety of matrices. This information is compiled to demonstrate the reliability of the method as used in the laboratory to perform on a variety of matrices.

2.3.4 Precision:

A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions expressed generally in terms of the standard deviation (EPA QA/G-5).

Precision represents the ability of the laboratory to reproduce the same result over and over using the same technique. Precision on a particular sample is measured by analyzing the sample in duplicate. A relative percent difference (RPD) is calculated. This is the measure of precision between two identical samples. The ability to consistently reproduce sample results is determined by charting the RPD values over time. Standardizing the way the measurement is taken minimizes random error. This is why the laboratory uses established methods when possible and why "standard operating procedures" are written and followed.

2.3.5 Comparability:

A measure of the confidence with which one data set or method can be compared to another (EPA QA/G-5).

The answer to the question above regarding why the US EPA prefers the term "bias" to "accuracy" lies in the idea of comparability. The US EPA prescribes methods to be followed; therefore, they accept a certain amount of bias in each measurement based on specific method limitations. Regulatory decisions are based on comparable data generated from a variety of laboratories. It is imperative that data be consistent from lab to lab even if the bias from systematic error leads to a level of "inaccuracy" in a pure sense. This is also true for NIOSH methods used in the industrial hygiene field and ASTM methods used in a wide variety of fields. This is why it is important to reference the methodology that was used to generate the result. This gives a framework where one can have a reasonable confidence in the consistency of the data produced. Performance testing samples and inter-laboratory round robin samples are used to measure comparability amongst laboratories that are testing the same parameters. When no such reference method exists, it is advisable to approach an analytical problem from a number of angles so that one can compare methods to see if one approach may have a bias. If you use three techniques and two of the three agree, chances are the one technique had a unique bias. Of course, a number of quality control tests are performed to help to quantify the reliability of a newly developed method. For more information on method selection and validation, please refer to Chapter 9 of this manual.

2.3.6 Completeness:

A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal, conditions (EPA QA/G-5).

Completeness refers to the thoroughness of the supporting data. Did you run all of the appropriate QC samples? Is the data readily available and traceable? Does the raw data contain all of the appropriate information to reproduce the testing? Does the final report include all of the appropriate information? The completeness of analysis can be documented by providing enough information to the data user via the analytical report to assess relevant validity concerns. Data, traceability information, and copies of the SOP used to generate the data are stored in the laboratory's archives.

2.3.7 Uncertainty:

Testing laboratories shall have and shall apply procedures for estimating uncertainty of measurement. In certain cases the nature of the test method may preclude rigorous, metrologically, and statistically valid, calculation of uncertainty of measurement. In these cases the laboratory shall at least attempt to identify all the components of uncertainty and make a reasonable estimation, and shall ensure that the form of reporting of the result does not give a wrong impression of the uncertainty. Reasonable estimation shall be based on knowledge of the performance of the method and on the measurement scope and shall make use of, for example, previous experience and validation data. (ISO/IEC 17025:1999(E), 5.4.6.2).

Uncertainty calculations are a useful tool in determining the reliability of a given technique and a useful tool to illuminate the various sources of error in a process so that appropriate emphasis can be placed on process improvement. Since the laboratory control sample (LCS) goes through the entire analytical process, it is a reasonable method of looking at uncertainty. In general it is not necessary to break down the uncertainty into individual components such as the preparation steps, weighing errors, instrument errors, etc. However breaking down individual components of the process can prove useful in understanding the sources of error and their relevance. Sometimes it is valuable to use certified reference materials rather than the LCS to get a better understanding of uncertainty in various matrices. In some cases, it is useful to use continuing calibration verifications (CCV) to focus on a particular part of the process. The laboratory uses the uncertainty measurements as a tool for troubleshooting and overall evaluation of a specific procedure as needed. In some cases, uncertainty information is calculated at the request of a client.

2.4 INTERNAL AUDITS

2.4.1 One of the most effective means of monitoring laboratory quality is through the use of internal audits. Internal audits may be performed on documents, data, facilities, personnel, and general laboratory processes.

2.4.2 Internal audits of the laboratory are performed by the Quality Assurance Director or the Quality Assurance Officer.

2.4.3 Internal audits of documents are performed to assess the appropriateness and accuracy of the document. Examples of documents that are audited include standard operating procedures, forms, and manuals. Standard operating procedures are at the core of the quality system. It is critical that such documents are thoroughly and regularly reviewed.

2.4.4 Internal audits of data are performed to assess a number of attributes regarding the data including, but not limited to, thoroughness of documentation, compliance to standard operating procedures, integrity, traceability, consistency with general good laboratory practices, and neatness.

2.4.5 Internal audits of facilities are performed to assess that conditions are adequate to perform applicable testing. Areas that are reviewed include condition of instrumentation, neatness, and proper labeling of chemicals and standards.

2.4.6 Internal audits of personnel are performed to assess that each individual is following established procedures as outlined in the QAM and as outlined in standard operating procedures. In addition, individuals are evaluated as to whether they are following general good laboratory practices. This is meant to be a two-way process. Laboratory personnel are encouraged to ask questions and discuss potential improvements.

2.4.7 Internal audits of general laboratory processes are used to assess compliance to processes or systems used throughout the laboratory. These may include standard traceability, pipette or thermometer calibration, equipment maintenance, or any other system in the laboratory. This also applies to functions or tools outside of the Analytical Laboratory but which can have an impact on the laboratory's overall quality. Examples include evaluating the ability of the LIMS to correctly generate accurate reports or determining the reliability to trace and recall archived network data from back-up tapes.

2.4.8 The frequency of audits is dependent on the type of information being audited. Documents are audited annually including the QAM, standard operating

procedures, and laboratory forms. Facilities are audited at a minimum of once per year. Data is audited at a minimal rate of one data item per month. Data audits are done as necessary and are often done informally as the need arises. Personnel are audited in such a manner that each functional group is audited once per year.

2.4.9 Results of audits are recorded on an audit checklist (see Appendix R-1). A formal report is issued to each group supervisor and any analysts involved in the audit within 5 working days of the internal audit. A response to deviations and recommendations is required within 30 days of the receipt of the formal audit report. If the corrective actions proposed by the analyst and/or group supervisor are acceptable, then the group supervisor is notified to proceed with the corrective actions. If the corrective actions are not acceptable and/or if the deviation requires a major change in procedure, then a meeting is called with the group supervisor and potentially the analytical laboratory manager. Appropriate corrective actions are revised to address the deviations in question. A follow up audit is scheduled. A summary of the findings is given in the Quarterly Quality Report to management. All internal audit findings are archived.

2.4.10 The Quality Director is responsible for the internal audit schedule and for tracking the completeness of the schedule. This will be summarized in each Quarterly Quality Report as well as the annual Management Report.

2.5 EXTERNAL AUDITS

2.5.1 Another effective means of monitoring laboratory quality is through the use of external audits. External audits are performed by regulatory agencies, accrediting authorities, and clients. Braun Intertec Corporation is currently audited by the Minnesota Department of Health, the Wisconsin Department of Natural Resources, The National Voluntary Laboratory Accreditation Program (NVLAP), and the American Industrial Hygiene Association (AIHA).

2.5.2 Each of the above auditing groups has a slightly different approach to the process. In all cases, some type of report is generated that describes deviations and recommendations. Deviations require a corrective action. Following receipt of the report from the audit, a response letter is generated to address each deviation and recommendation. In some cases, the corrective action process is initiated immediately. In other cases, a clarification is required from the auditor. Once the corrective action is agreed upon with the auditor, the corrective action process is initiated. Documentation to validate that a deviation was addressed is provided to the auditor in a follow up letter. Recommendations are taken very seriously as the analytical laboratory is committed to continuous quality improvement.

2.5.3 All communications with the auditing groups are archived.

2.6 LABORATORY CERTIFICATIONS

2.6.1 Braun is certified through the Minnesota Department of Health and the Wisconsin Department of Natural Resources.

2.6.2 Braun is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP Lab Code 101234-0) and the American Industrial Hygiene Association (AIHA Lab Code 101103).

2.6.3 Braun is recognized by the Minnesota Department of Agriculture as being an approved laboratory.

2.6.4 Complete copies of all of the laboratory's certifications and accreditations including the scope of testing are provided in Appendix D-1.

2.7 PERFORMANCE TESTING

2.7.1 Performance testing (PT) is a requirement of certification and accreditation programs. For state certifications, annual performance testing is required. For AIHA accreditation, quarterly performance testing is required. This performance testing is double blind. In other words, the results are unknown to the analyst or the quality group. PT providers submit results directly to the agencies.

2.7.2 In addition to the performance testing required above, the laboratory performs numerous additional performance testing on reference materials. In some cases these are analyzed to monitor parameters that are not certifiable and in some cases these are analyzed to further monitor performance on key parameters. Generally this testing is single blind: the results are known to the Quality Group.

2.7.3 Performance testing samples are treated identical to real client samples. Samples are logged into the LIMS system and given a unique sample identifier. Samples are then diluted as per the PT provider instructions, if applicable.

2.7.4 Samples are prepared and analyzed using the same methodologies as real world samples. All data is entered and reported through the LIMS system.

2.7.5 No special treatment is given to PT samples, i.e. additional sample runs. Samples are not analyzed multiple times unless routine samples are analyzed multiple times. The same calibration curve and quality control samples used for routine samples are used when analyzing PT samples.

2.7.6 It is not acceptable for any employee to communicate information regarding PT samples with any other laboratories. The laboratory does not send portions of PT samples to other laboratories to compare results nor does the laboratory receive PT sample portions from other laboratories.

2.7.7 The Quality Group compiles the laboratory PT data and enters the data for the PT providers. Different providers have different ways of reporting PT data. If possible, the Quality Group prefers to enter data via the internet. Records of entered results are retained with the PT project file.

2.7.8 PT data that falls below the laboratory method reporting limit (MRL) is reported as a less than value. The laboratory does not report PT data below the MRL.

2.7.9 Examples of performance testing results are included in Appendix E-1. Current PT results are retained by the Quality Group and are available anytime for review.

2.7.10 If the laboratory fails a PT, a corrective action investigation is required. A Track-IT! work order is generated by the Quality Group. Please refer to "Corrective Action" later in this chapter for an explanation of this process. For double blind PT samples where results are submitted to the appropriate regulatory bodies in order to maintain certification, copies of the findings of the corrective action investigation are forwarded to the regulatory contact. For all other PT samples (i.e. those for internal use only), copies of the corrective action investigation are retained by the Quality Group through Track-IT!. These are available for review.

2.7.11 A corrective action is provided to certifying or accrediting agencies for performance testing failures. Different agencies have varying requirements but in general a corrective action and investigation report is created by the QA Group and forwarded to the appropriate agency. Part of the corrective action process is ordering and performing remedial performance testing samples. These corrective action PTs are forwarded directly to the appropriate certifying/accrediting agency.

2.7.12 For PTs specific to MN Department of Health certification, the laboratory must complete a corrective action report within 30 days of notification of the failures. This report will include a full investigation of the failure and any corrective actions the laboratory will take to remedy the problem, including a remedial PT.

2.7.13 For PTs specific to WI Department of Natural Resources, the laboratory must order remedial PT samples after the first failure. A corrective action and investigation report will be completed and forwarded to the department after a second consecutive failure.

2.7.14 The PTs analyzed for the AIHA programs determine proficiency based on a 75% acceptance rate for the two out of three rounds. If the laboratory maintains proficiency, above 75%, there is no corrective action required. If the laboratory becomes non-proficient, the laboratory must submit a corrective action report to AIHA. The laboratory may perform a re-test to become proficient.

2.7.15 Regardless of the specific requirements of each separate accrediting agency, the laboratory will always investigate and implement corrective actions for PT failures. These are documented and archived in Track-IT!

2.7.16 Reports and records of PT sample analyses are kept for 10 years with the laboratory data.

2.8 DEMONSTRATION OF COMPETENCY

2.8.1 For fields of testing for which no proficiency testing samples are available, the laboratory conducts a demonstration of competency.

2.8.2 The demonstration of competency is conducted by first determining quality control limits using a minimum of 20 data points. The upper and lower control limits are determined as specified in section 2.11. Then one of the technical laboratory personnel will make up 4 blind samples at varying levels. These are run similarly to proficiency testing samples twice annually. Specific spiking information and acceptance criteria are documented in individual SOPs.

2.8.3 Demonstrations of competency will be completed in January and July of each year. The results of these studies are documented and retained by the Quality Group.

2.9 QUALITY CONTROL SAMPLES

2.9.1 The laboratory analyzes a number of specific quality control samples to monitor performance and to determine the validity of data. These can be categorized into three groups: Batch QC, Run QC, and Reference QC.

2.9.2 A “Batch” is defined as 20 samples or less prepared together as a group under the same set of conditions and at the same time. The “same time” is defined as a 24-hour period. This definition is taken from the Minnesota Department of Health Rules.

2.9.3 Batch QC refers to those quality control samples that are part of a sample preparation batch. This QC is required to be prepared and analyzed with the unique batch of samples. It is used to monitor the performance of the sample

preparation procedure and in some cases to assess matrix effects of the samples being tested. In some cases, minimal or no actual preparation is done to the sample. In these cases, one still must group samples together in a batch and analyze the batch quality control samples just as if they were taken through a preparation step.

2.9.4 Batch QC includes the method blank (BLK), the laboratory control sample (LCS), the laboratory control sample duplicate (LCSD), the matrix spike (MS), the matrix spike duplicate (MSD), the sample duplicate where appropriate, serial dilutions (denoted as "SRD", inorganics only), and surrogates (organics only). Specific requirements vary with the nature of the testing. The exact requirements are defined in the respective standard operating procedures for each method used. A method-by-method summary for each major laboratory technique and the related "Batch QC" is provided in Appendix F-1.

Note: A typical batch includes a BLK, an LCS, an LCSD, an MS, and an MSD. Not all techniques follow this batch model. Some do not use each of the 5 basic QC samples and some use additional QC samples. Please refer to the individual SOPs for an exact description of the QC. Appendix F-1 summarizes the QC requirements for major techniques within the analytical laboratory.

2.9.5 Recovery data for the LCS/LCSD, the MS/MSD, and the Surrogate is control charted to provide trend analysis information. This information is also used in determining control limits. Please refer to "Control Charting" and "Determination of QC Limits" later in this chapter.

Note: Control charting is not performed for all techniques within the laboratory and for a given procedure, not all compounds are control charted. Please refer to the individual SOP for details of what is to be control charted.

2.9.6 Relative Percent Difference (RPD) data for the LCS/LCSD pair, the MS/MSD pair, and sample/sample duplicate pair is charted to provide trend analysis information. This information is also used in determining control limits. Please refer to "Control Charting" and "Determination of QC Limits" later in this chapter.

Note: Control charting is not performed for all techniques within the laboratory and for a given procedure, not all compounds are control charted. Please refer to the individual SOP for details of what is to be control charted.

2.9.7 Run QC refers to those quality control samples that are used to monitor the analytical run. These vary from technique to technique. In general, there is a QC sample analyzed to verify the calibration curve initially and on a continuing basis.

In addition, a blank is usually analyzed to ensure that the system is clean and in control initially and on a continuing basis. In some methods, a QC sample is analyzed to indicate the presence of interferences. Any QC check that is used to monitor instrument performance is considered "Run QC." A detailed description of each QC check is defined in the individual analytical SOP. A method-by-method summary for each major laboratory technique and the related "Run QC" is provided in Appendix F-1.

2.9.8 Method Reporting Limit Verification refers to the standard used to verify the method reporting limit. Method detection limit studies use statistical analysis to determine the level of the instrument and method detection. The method reporting limit is an arbitrary number based upon the MDL, the analyst's experience and judgment, and requirements of the data end user. The purpose of this method reporting limit standard is to ensure that the laboratory can reasonably quantitate the result at that level. The MRL verification standard must recover at +/- 40% of the true value for all methods.

2.9.9 Second Source: the term "second source" refers to the notion of preparing and analyzing a QC sample that is produced from a source other than that of the calibration standards. The purpose is to independently verify that the calibration standards are accurate. The stock standard (purchased standard) used to prepare the second source must be of a lot number separate than that of the stock standard (purchased standard) used to prepare the calibration standard. Note: The stock standard can be purchased from the same vendor provided that the lot number is different. The second source standard must be NIST traceable, provided a NIST traceable standard exists for the analyte of interest. It is acceptable in some methods that the second source contains only a subset of the total compound list. The premise is that this subset of compounds is representative of the whole. These cases must be documented in the SOP. In the case where a standard is extremely rare, one may not be able to acquire a second source stock. In this case, the second source working standard is prepared by a second analyst within the laboratory. This last case is rare and must be documented in the SOP or approved by the Quality Group prior to use. Depending on the method, the second source is introduced in a variety of ways. For example, in some cases the Initial Calibration Verification (ICV) is a second source. In other cases, the Laboratory Control Sample (LCS) is the second source standard.

2.9.10 **"**Reference QC" refers to QC samples that are taken through the lab in such a way as to verify the entire procedure. They are not analyzed with every group of samples or every run. They are non-routine. The PT samples would fall into this category. All blind samples would fall into this category. Sometimes known reference samples are analyzed to verify that a procedure will work with a particular matrix. This is often done during method validation. The analytical

laboratory does quite a bit of investigative work so it is commonplace to use a reference material that represents a particular sample matrix. These are available from a variety of sources including NIST. Terms used to describe these samples include SRM (standard reference material) and CRM (certified reference material).

2.9.11 Please refer to Appendix A-1 for a definition of each QC term including a discussion of how it is used in the quality control process.

2.10 CONTROL CHARTING

2.10.1 An effective way to monitor laboratory performance is through the use of control charts. The main benefit of the control chart is that it provides a visual representation of performance. Data points are plotted on a chart and trends are noted. Control limits are represented; therefore, one can easily see if a data point is out of control or if a series of data points is moving toward an out of control situation. Control charts proceed in a linear timeline; therefore, one can note before and after trends if a condition is changed. An example of such a change would be instrument maintenance, a procedure modification, a shift in environmental conditions, a new chemical lot, or a change in personnel.

2.10.2 Control charting is used in the laboratory to help determine control limits. The procedure for calculating statistical limits via use of control charting is described below.

A normal distribution is assumed. A minimum of 20 data points is required to calculate limits. It is recommended that one start with 25, as outliers may reduce the population. Generally one has a sizable population to work with. If the population is less than 20, additional data points must be added in order to proceed. The mean is calculated. The standard deviation is calculated. The control limits are defined as 3 times the standard deviation of the mean. Warning limits are defined as 2 times the standard deviation from the mean.

2.10.3 The LIMS system stores quality control data by batch number. This data can easily be pulled together to generate control charts for LCS/LCSD, MS/MSD, Surrogates, and the RPDs of quality control samples.

2.11 DETERMINATION OF QC LIMITS

2.11.1 There are a number of factors that go into determining QC limits. The reason for this is that it is a complicated scenario. The purpose of QC limits is to provide a defined limit where the analysis is considered “in control” versus “out of control.” In other words, at what point are things outside of what one would expect to see?

The big question lies in "expectations." Often times this is associated with a comparison of what is "good data" or "bad data." The point really is not to determine good or bad. We can only document what is termed as "known quality." We can define typical or expected performance and then we can see on a day-to-day basis how the data that is generated compares to that set of expectations. Corrective actions are initiated to bring a process into control. Refer to "Corrective Action" later in this chapter. The main thing is that the limits that are set by the laboratory are the trigger that initiates specific corrective actions in association with the analysis of the QC samples described in 2.9.

2.11.2 When a new method is developed or implemented, limits are defined from reference sources. In most cases these are defined in the reference method. In the case where no method limits are given, a reference source that has some bearing on the test is used. For example, one may reference the Contract Laboratory Program (CLP) documentation for a basis on which to base limits for environmental testing. The main thing is that there is a starting point established and that limits are defined. These limits are used until there is sufficient control charting data to update the limits.

2.11.3 Once control charted limits become available, a process is initiated to update the limits. Key technical people meet with the Quality Group and a new set of limits is established. These limits are based on three factors: the method limits, the control charted limits, and the combined experience of the technical people involved.

The method limits are important because they provide a reference point based on what has been established as a scientific standard in the business one is involved. The control chart limits are important because they are a measure of what is going on in this laboratory. It is a measure of Braun Intertec Corporation's typical results or expectations. The combined experience of the technical people involved is important because it represents a wide range of experience both at Braun and in other laboratories. What one is trying to establish is a reasonable set of limits for the laboratory. The goal is constant improvement but also it is to have a representative picture.

Many would suggest that one just use the internally generated limits. Why is this a bad idea? First, the population is too small. It doesn't represent a wide enough sampling of data points. In addition, the data points are limited to samples that have been analyzed at Braun and reflect only Braun's processes. Many would suggest that one just use method limits. Why is this a bad idea? The limitation here is that there is no relationship to Braun's processes. Differences in technology and personnel from the data generated by the reference method

represents a significant variance. The goal is to measure Braun's performance and to strive for continuous improvement of Braun's specific processes.

It takes a combination of established expectations, internal expectations, and the expectations that come from the experience of the technical staff. After all, this data is generated by people; the human factor plays a large role. This is why it is critical to have a competent well-trained staff. The technical people involved must be able to put it all together.

Let's look at a theoretical example. Say one starts a new method and the method limits for the recovery of a laboratory control sample is 80-120%. Control limits are eventually created of 95-140%. This tells us that the recovery using the laboratory specific process is a little high. What do we do? First, the technical focus group would take some steps to look into why our recoveries might be coming up a little on the high side. Refer to the "Corrective Action" section later in this chapter. Limits are updated. Limits of 85-130% are established. Why? The new limits recognize the fact that our process tends to be on the high side; however, experience indicates that 140% is too high. We should be able to get within 130%. On the low end, is data that is 94% of the true value something that should initiate a corrective action? Our answer is "probably not." A reasonable level of 85% is set. It still accounts for the shift in the mean.

2.11.4 Exceptions to the above rule occur due to a number of circumstances. Examples of exceptions follow. A method may direct the use of exact limits. The Wisconsin DRO/GRO methods, for example, are very prescriptive. In this case, the laboratory just follows those prescribed limits. In the case of the LCS for metals in soil and paint, the laboratory uses a certified reference material. In this case, the limits are provided on the certificate of analysis. These materials change regularly so that control charted limits are not practical. If one is analyzing an unusual matrix like bronze, one might use a NIST CRM. The certified value and limits associated would be used. If limits are not available in this type of special case, then results of the analysis may simply be reported with the data for the client to use, as he or she sees fit. Finally, a client specific quality assurance project plan may require certain control limits. If this were the case, then the laboratory would follow those limits for that project.

2.11.5 QC limits are reviewed annually at a minimum. If significant changes have occurred, the limits are then updated in the LIMS. The laboratory is constantly looking at its processes in an attempt to optimize performance.

2.11.6 Current limits for major techniques are summarized in Appendix G-1.

2.12 CORRECTIVE ACTION

2.12.1 *Any measures taken to rectify conditions adverse to quality and, where possible, to preclude their recurrence (EPA QA/G-5).*

The corrective action process is one of the most important tools used to ensure good quality control in the laboratory. The most important words in the above definition are "preclude their recurrence." This is the true mission of the corrective action process. The corrective action process encompasses a number of things but the main focus is that we learn from our mistakes so that we do not make the same errors over and over.

2.12.2 Documentation is a critical part of the corrective action process. A corrective action may be initiated by any member of the laboratory staff for a wide variety of reasons. Analysts must document all discrepancies and/or departures from standard operating procedures at the time of analysis on the QC Checklist form. This form must be kept with the data packet and when necessary a Track-IT! work order must be initiated.

2.12.3 When a non-conformance issue arises, a Track-IT! work order is initiated by the staff member. The Track-IT! system automatically assigns a number to the initiated Track-IT! work order. The Quality Group routinely reviews the Track-IT! work orders and follows up as necessary. Copies are distributed to all affected individuals in the laboratory and when necessary to our clients. Please refer to Appendix I-1 for an example of a Track-IT! work order.

2.12.4 The key part of the process is execution. Laboratory personnel must be vigilant about initiating the corrective action process in order for it to work successfully. It is a requirement that laboratory personnel submit a Track-IT! work order when an appropriate situation presents itself.

2.12.5 The Track-IT! work order is reviewed and completed by a member of the Quality Group. Corrective action taken on the individual case is documented on the Track-IT! work order. It is then completed in the Track-IT! system and stored electronically. Track-IT! assigned reference numbers are documented in data packets and project files as necessary.

2.12.6 Examples of non-conformances include any QC sample results that are outside defined QC limits, missed holding times, sample temperatures outside acceptance limits, sample preservation issues, client complaints, and any procedural errors that result in compromised data integrity or excessive inefficiency. In addition to non-conformances, Track-IT! work orders are used to document most other QC issues, LIMS problems or concerns, and client complaints and concerns. Some

QC issues, such as internal audit findings, are documented outside of the Track-IT! System. These special situations are noted throughout the QAM.

2.12.7 The types of corrective action taken vary with the non-conformance. In some cases, the corrective action is handled within the functional group. In other cases, an ad-hoc quality team is formulated to further research the issue and find a solution. In some cases, an outside consultant or vendor must be involved.

2.12.8 For cases where the results of the analysis of a quality control sample are outside the defined limits, specific corrective action steps are mandated. For a list of these corrective actions please refer to Appendix F-1.

2.12.9 The Track-IT! System is used for documentation of the non-conformance as well as the corrective action. Often times the only corrective action taken and documented in the Track-IT! is the addition of a qualifier on the analytical data. In addition, the Quality Group uses the Track-IT! system to find trends and underlying problems which require additional corrective actions. If a particular issue recurs regularly and the Quality Group determines there is a trend, then further corrective action may be necessary to determine the root cause of the problem. When this happens, the Quality Group compiles the data to determine the next steps in the corrective action process. The data is stored electronically and the corrective action taken is completely documented on the quarterly quality report. The Quality Group does not go back to each Track-IT! to document the final corrective action taken but rather makes references to the Track-IT!s in the quarterly quality report.

2.12.10 In special cases, an ad-hoc quality team would be formed to look at the problem and/or it would be addressed in a Management Review Meeting**.**

2.13 PREVENTIVE ACTION

2.13.1 Preventive actions are proactive rather than reactive. They are designed to identify potential sources of nonconformities and/or needed improvements within the quality system to reduce or eliminate the likelihood of a non-conformance.

2.13.2 The Quality Group has many tools available to determine potential problem areas to focus the preventive action.

2.13.3 The Quality Group may expand initial preventive actions or corrective actions from one area of the laboratory to other areas of the laboratory to further reduce the likelihood of nonconformities.

2.13.4 When the Quality Group conducts preventive actions in the laboratory, all steps taken are documented in the Quarterly Quality Report as well as each annual Management Review Report.

2.14 CUSTOMER SATISFACTION

2.14.1 Customer satisfaction is a key component in the quality control process. The analytical laboratory provides a service to its customers.

2.14.2 Customer satisfaction is monitored in a number of ways by the Quality Group.

2.14.3 Client complaints are recorded using the Track-IT! system. Corrective action is taken for client complaints in a manner similar to corrective actions taken on technical or procedural issues. The idea is the same. We want to learn from mistakes and prevent recurrences of similar customer complaints.

2.14.4 Periodically, on-time percentage is tracked from sample receipt to final report. This information can easily be pulled out of the LIMS. The best technical data is of no value if the client does not receive it in a timely manner, where he or she can make an appropriate decision on a project. It is important to meet commitments and exceed expectations.

2.14.5 Client interviews and customer surveys are used to get a feel for how customers perceive the analytical laboratory at Braun Intertec Corporation. This data is combined to get a general profile of what most of our customers think.

2.15 PROCESS IMPROVEMENT

2.15.1 The major goal of the Quality Group is the continuous improvement of the processes used by the analytical laboratory in terms of data validity, regulatory compliance, operational excellence, and customer satisfaction. The mission is to facilitate the small and large steps necessary to become a better laboratory.

2.15.2 Many of the systems discussed previously help to accomplish the above goal. One area that has not been addressed is that of employee involvement in defining ways to improve and the commitment to using this valuable resource to improve.

2.15.3 The process improvement tool is a simple system by which employees of the analytical laboratory bring forth ideas for improvement. It is a method to identify problems and to identify solutions.

2.15.4 Laboratory personnel complete a Track-IT! work order and submit it to the Quality Group. The Management Review Team meets as necessary to review the

submittals. Items are prioritized and ad-hoc quality teams are assigned to investigate the respective problem and find a solution. In many cases, the initiator of the Track-IT! work order provides a suggested solution to the problem. This greatly speeds the process.

2.15.5 It is not necessary to provide a suggested solution or cost/benefit evaluation. It is enough to identify a problem that needs addressed.

2.15.6 This process minimizes the tendency of people to grumble about problems and empowers them to raise an issue to management and to the laboratory in general. Providing one's name is optional if one wishes to be anonymous.

2.15.7 Not all suggestions are practical to implement nor can the laboratory implement all of them immediately. The value of identifying the issues is important none-the-less. There have been a number of successes thus far in the laboratory using this process.

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3.0 INTRODUCTION TO TRAINING

3.01 Braun Intertec employees receive internal and external training to develop and maintain proficiency. Good employee training leads to a strong commitment to quality as well as superior job performance and high morale. It is critical that each laboratory employee is properly trained in a timely manner and that all training is documented and authorized by the Quality Group.

3.1 TRAINING DOCUMENTATION AND AUTHORIZATION

3.1.1 All training, internal and external, must be properly documented with a description of the content, length of training, the trainer, and completion date. The Quality Group maintains records of each employee's training documentation in personnel files.

3.1.2 In addition to the training documentation, personnel CVs contain employee education, work experience, job descriptions, and any previous training courses.

3.1.3 All employees must be authorized to perform critical job functions, including sample preparation and analysis, peer review and data verification, training of personnel, and issuing reports to clients. Authorizations are given after training is complete. Dates of authorizations for analysis are kept on the IDC summary spreadsheet. Authorizations to verify data and issue final reports are made in the LIMS System and are required in order for those LIMS functions to be performed.

3.2 AUTHORIZATION

3.2.1 Analysts are not allowed to analyze client samples until they are authorized by the Quality Group.

3.2.2 The Quality Group is responsible for creating users with rights in the LIMS system. Each user has a defined level of rights that is monitored in the LIMS.

3.2.3 The following describes the levels of authorization assigned to each employee regarding specific tasks in the laboratory. The terms below are not technical job descriptions but rather roles defining the status of an analysts' training in the laboratory. For example, an analyst may be considered an analyst in training for one analysis while being a data review analyst for other analyses.

3.2.4 Analyst in Training – this indicates an individual that is in training or that has completed training but does not have a current IDC or CDC study. This

individual cannot perform the indicated testing or task without the presence of a proficient analyst. This category is assigned when training is begun.

3.2.5 Analyst – this indicates a proficiency in the technique as demonstrated by completing appropriate training and having a current IDC or CDC on file. This individual can perform the indicated testing or task but cannot review/verify data or train others on the specific task or testing.

3.2.6 Verification Analyst – this indicates a proficiency in the technique as demonstrated by completing appropriate training, having a current IDC or CDC, or similar experience. In addition, this individual has a higher level of understanding, experience, and proven responsibility. This individual can review data and is authorized to verify data in the LIMS but cannot train others on the technique.

3.2.7 Authorized Trainer – this indicates a proficiency in the technique as demonstrated by completing appropriate training, having a current IDC or CDC, or similar experience. In addition, this individual has a higher level of understanding, experience, proven responsibility, and interpersonal communication skills. This individual can review data and is authorized to verify data in the LIMS as well as train others on the technique.

3.3 NEW EMPLOYEE TRAINING AND ORIENTATION

3.3.1 All employees must complete the curriculum vitae (CV) upon hire. The CV contains information regarding the employee's educational level, training courses, cross-training, and previous experience.

3.3.2 Upon hire, employees receive a Braun Intertec Employee Policy Guide and a Analytical Laboratory Quality Assurance Manual (QAM). Orientation training will include a laboratory orientation tour, safety tour, QA/QC training, and ethics training for all new employees. It is the responsibility of the employee's supervisor to organize these training sessions with the appropriate personnel.

3.3.3 The laboratory orientation tour is conducted by the employee's supervisor and will include a tour of the entire laboratory as well as the Braun Intertec Bloomington facilities. There will be an explanation of the sample flow through the laboratory and interdepartmental communication.

3.3.4 The Laboratory Safety Officer conducts a safety tour within the employee's first week of work. The tour will include the location and proper use of personal protective equipment, eyewash stations and showers, fire extinguishers, fire exits, and spill kits. Information regarding the use and proper storage of

chemicals and the chemical hazards associated with the employee's specific job are also included. The Laboratory Safety Officer will also describe procedures for handling accidents while on the job. The Laboratory Safety Officer and the employee sign the safety orientation form (Form SAF 05) and a copy is kept in the employee's personnel file.

3.3.5 A member of the Quality Group performs the QA/QC training and the ethics training. The training will include all topics relevant to the employee's position and general laboratory practices. The training will include, but is not limited to, required quality control samples for analysis, precision and accuracy control limits and charts, method detection limits, initial demonstration of capabilities, documentation policies, Quality Assurance Manual, standard operating procedures, laboratory ethics, personnel files, and data package assembly. At this time, new employees will also read and sign the Braun Intertec Corporation Code of Business Conduct found in Appendix C-1 as well as the Analytical Laboratory's Code of Ethics found in Appendix C-2.

3.3.6 Each employee is responsible for reading and understanding the latest version of the QAM. Form QC 03 must be signed and dated by each employee for each revision of the QAM. Copies are retained in the personnel files.

3.4 GENERAL LABORATORY TECHNIQUES

3.4.1 Internal courses to teach basic laboratory principles may be designed in order to meet an identified need. Requirements for completing and passing the course will be up to the individual instructor. Documentation that the employee has completed this training is kept in the employee's personnel file.

3.5 TECHNIQUE SPECIFIC TRAINING

3.5.1 An authorized trainer performs the training and becomes the trainee's mentor (refer to section 3.2). The mentor is responsible for the trainee's performance during training and will continue to mentor the employee for as long as necessary.

3.5.2 Initial training begins with the employee reading the pertinent standard operating procedures. There is no minimum length of time set for training since different individuals learn at different rates and different techniques require different lengths of training.

3.5.3 Prior to using any existing published method, and at any time there is a significant change in instrument type, personnel, or published test method, a demonstration of capability must be made, refer to section 3.7.

3.5.4 Individual departments may have specific training forms used to document employee training.

3.5.5 The length of training, the trainer, and documentation that the trainee has read and understands the current SOP and other relevant training materials as well as the date of their acceptable IDC is all documented on form QC 04, the training documentation checklist. The trainer and trainee sign off on this form stating their continued responsibilities.

3.5.6 All training documentation is supplied to the Quality Group and filed in the employee's personnel file.

3.5.7 Employees hired with extensive analytical experience may shorten the training time. These analysts must still complete the orientation training, sign off on form QC 04, complete an initial demonstration of capability study prior to the analysis of client samples, and be authorized by the Quality Group.

3.5.8 Where appropriate, the Quality Group will issue blind samples to analysts and technicians to demonstrate the employee's ability to produce reliable results. Results of these samples are kept in the employee's personnel file and may be used as continuing demonstration of capabilities (CDC).

3.6 SPECIAL CIRCUMSTANCE

3.6.1 For situations in which training does not occur from one employee to another, form QC 05 is completed. This form documents the special circumstance, the technique, the date of acceptable IDC study, and a summary of the employee's qualifications for proficiency. Sections 3.6.2 – 3.6.5 describe such situations. Authorization in these situations is granted after documentation of form QC 05 and an acceptable IDC study. An example of form QC 05 is found in Appendix J-2.

3.6.2 The "grandfather" clause. Employees hired prior to March 2003 may "grandfather" in certain current analyses.

3.6.3 Development of a new methodology.

3.6.4 Major method modification causing the method to be considered a new methodology.

3.6.5 New laboratory instrumentation.

3.7 INITIAL DEMONSTRATION OF CAPABILITIES

3.7.1 The initial demonstration of capability (IDC) and the continuing demonstration of capability (CDC) studies are used to document proficiency in a given technique by use of a quantitative benchmark that is representative of sample analysis and/or preparation.

3.7.2 Prior to the testing of client samples, an acceptable IDC study must be completed by each analyst. An IDC consists of 4 spike samples, either laboratory control samples or standard reference materials (SRMs). The IDC studies are matrix specific when procedures for handling each matrix are different. The studies are also method specific where methods are different enough to warrant separate criteria. A good rule of thumb is to run an IDC for each technical standard operating procedure.

3.7.3 The initial demonstration of capability summary form QC 02 contains the following information at a minimum: date of analysis, employee name, internal SOP number, reference method, matrix, analytical parameter, percent recovery of each replicate, and signatures of employee, supervisor, and a representative from the Quality Group. This form also references the LIMS work order number, batch ID, and sequence number for traceability.

3.7.4 If laboratory control samples are used, the average recovery of the 4 samples must fall within the established control limits. The percent relative standard deviation (%RSD) of the group must be less than 20% for each analyte.

3.7.5 If standard reference materials (SRMs) are used, the average recovery must be within the specifications as defined by the SRM certificate. The percent relative standard deviation (%RSD) of the group must be less than 20% for each analyte.

3.7.6 If any parameter fails acceptance criteria, the source of the error must be found and corrected. Those parameters that failed must be prepared and analyzed again.

3.8 MAINTENANCE OF CAPABILITIES

3.8.1 Beginning one year following an IDC and every year afterwards, each analyst is required to complete a continuing demonstration of capability (CDC) study to maintain proficiency. If an analyst fails to perform an acceptable CDC before the 12-month timeframe ends, his or her proficiency will expire.

3.8.2 The CDCs are matrix specific and method specific as described in section 3.7.2 for IDCs. Likewise, the analyst must perform a CDC prior to the testing of client samples.

3.8.3 A CDC consists of either analysis of 4 LCS samples, 4 reference samples, a blind PT study, or an MDL study.

3.8.4 Acceptance criteria for the laboratory control samples and reference materials are the same as for IDC studies (Section 3.7.4-3.7.5). If an MDL study is used, the spike recovery must be within the established control limits of the LCS. If a blind performance testing sample is used, the results must meet the acceptance criteria as defined by the PT provider.

3.9 RIGHT TO KNOW TRAINING

3.9.1 All employees involved with samples and/or hazardous materials are required to complete hazard communication/right to know training on an annual basis.

3.10 ETHICS TRAINING

3.10.1 All employees must complete the ethics training upon hire and annually thereafter. A member of the Quality Group conducts this training.

3.10.2 The ethics training is outlined in the ETHICS SOP and covers a variety of data integrity issues, the responsibilities of laboratory staff, reporting of data integrity issues, the early detection program, and the laboratory Code of Ethics.

3.10.3 At the end of the training, all employees are required to sign the laboratory Code of Ethics.

3.11 PROGRAM SPECIFIC TRAINING REQUIREMENTS (In addition to the Braun Intertec standard laboratory training program described above).

3.12 Environmental Lead Laboratory Accreditation Program (AIHA)

3.12.1 All analysts and technicians must complete training for environmental lead prior to performing sample preparation and/or analysis on ELLAP samples.

3.12.2 Training and independent test runs (IDCs- Initial Demonstration of Capabilities) must be performed, documented, and forwarded to the Quality Group prior to approved authorization for preparation and/or analysis.

3.12.3 All analysts and technicians must complete 4 independent test runs of sample preparation and/or instrumental analysis for each matrix.

3.12.4 All analyst and technicians must demonstrate the ability to produce reliable results through accurate analysis of certified reference materials (CRMs), proficiency testing samples, or in-house quality control samples at a minimum of every six months.

3.12.5 For each Environmental Lead Matrix (Soil, Wipes and Paints), each analyst must complete a minimum of four independent test runs of sample preparation and/or analysis consisting of at least 5 samples of known concentration. At least one of the samples must be a certified reference material or proficiency testing material.

3.12.6 For sample preparation training, the recoveries of each run must be +/- 10% of the certified value at least 75% of the time. Results are documented on Form MET 01.

3.12.7 For analysis training, the recoveries must be within +/- 10% of the certified value at least 75% of the time. Results are documented on Form MET 02.

3.12.8 Analysts in training cannot analyze ELLAP samples until these requirements are met and authorization granted by the Quality Group. In addition to the above, all analysts and technicians must have a minimum of 30 calendar days of hands-on experience conducting analyses in the inorganic/metals laboratory prior to analysis of ELLAP samples.

3.12.9 On-going proficiency is demonstrated at least every 6 months through the accurate analysis of certified reference materials, proficiency testing samples, or in-house quality control samples. Typically, this requirement is met by the accurate analysis of the quarterly AIHA ELPAT samples.

3.13 Industrial Hygiene Laboratory Accreditation Program (AIHA)

3.13.1 All analysts performing industrial hygiene analysis must demonstrate on-going proficiency through accurate analysis of certified reference materials, proficiency testing samples, or in-house quality control samples at a minimum of every six months.

3.13.2 A fiber counting microscopist must complete an AIHA-approved NIOSH 582 course or equivalent. Documentation of the training course is retained in the personnel file.

3.13.3 Microscopists conducting bulk asbestos analysis must complete a course on polarized light microscopy. Documentation of the training course is retained in the personnel file.

4.0 SUMMARY OF CHAPTER 4: DOCUMENT CONTROL

4.01 Chapter 4 describes the procedures in place for the creation, revision, and control of all Analytical Laboratory quality system documents.

4.1 QUALITY SYSTEM DOCUMENTS

4.1.1 All quality assurance policies and procedures are documented in the laboratory quality system documents. Quality systems documents include all manuals, forms, standard operating procedures, and external resource documents that are issued and used by the Analytical Laboratory personnel.

4.1.2 All quality system documents are uniquely identified. The Quality Group maintains a list of all quality system documents used by the Analytical Laboratory in the Master Index, found in Appendix K-1**.** The master index is a living document and is continually being updated to incorporate new quality system documents.

4.1.3 All internally generated quality system documents contain the Braun Intertec Corporate logo, electronic storage path, unique identifier, revision number, effective date, and page numbers when applicable. Manuals and standard operating procedures have the page number and total number of pages in the document. Forms are assumed to be one page in length unless otherwise noted.

4.1.4 Quality system documents are stored electronically as Adobe PDF® files and/or the Microsoft Word/Excel® files. They are stored in such a way to minimize or eliminate the possibility of corruption of the document. All Analytical Laboratory personnel have access to the electronically stored quality system documents.

4.1.5 All versions of quality system documents are retained for the life of the Analytical Laboratory as outlined in chapter 6. Obsolete documents are stamped as "obsolete" and are promptly removed from all points of use.

4.1.6 All quality system documents are reviewed and approved by the Quality Group prior to being issued to laboratory personnel.

4.1.7 Changes to quality system documents are documented as appropriate. Changes to both the QAM and SOPs are documented under the 'document continuity' section of the document.

4.1.8 All work is to be performed according to the documents that are in effect at the time that each procedure begins. When a new document becomes effective, those samples already being processed according to the previous version of the document are to be completed in accordance to the previous document.

4.2 MASTER INDEX

4.2.1 The Quality Group maintains a master index for all manuals, forms, standard operating procedures, LIMS reports, and external documents in an Excel® spreadsheet. The master index is made up of seven worksheets to document standard operating procedures, forms, external resource documents, LIMS reports, EDDs, excel spreadsheets and the distribution of QAM copies. Each worksheet indicates the unique document identification number, a description of the document, the functional group responsible for the document, revision number, effective date, and document status (complete, archived, preliminary). The master index also contains hyperlinks to the Adobe PDF® file and/or the Microsoft Word/Excel® file. The master index can be found in Appendix K-1.

4.2.2 Reference to each version of a quality system document is found on the master index with the latest being the current, effective version. A document is considered effective from the effective date until the next version's effective date unless otherwise indicated.

4.2.3 The master index is stored as a read only document on the network at f:/groups/qa-qc/MASTER INDEX.xls and is available to all Analytical Laboratory personnel. Only the Quality Group has rights to make changes to the master index.

4.3 QUALITY ASSURANCE MANUAL

4.3.1 The Quality Assurance Manual (QAM) defines all Analytical Laboratory quality system policies. Some additional policies and procedures are documented in Analytical Laboratory standard operating procedures.

4.3.2 The Microscopy Group Quality Assurance Manual defines quality control and quality assurance specific to transmission electron microscopy and polarized light microscopy analyses. Policies documented in this manual only pertain to these specific analyses.

4.3.3 The Microscopy Group is responsible for the revisions and updates of the Microscopy Department Quality Assurance Manual.

4.3.4 Each Analytical Laboratory employee has access to the most current version of the QAM on the Braun Intertec Corporation intranet home page. The employee is responsible for reading, understanding, and following the policies and procedures outlined in the QAM as documented on form QC 03 (section 3.3.6).

4.3.5 The QAM consists of ten chapters and additional supporting appendices. At a minimum, the entire manual is reviewed and approved by management annually. If there are no updates during the annual review, it will be noted in Section III of the Introduction (Document Continuity) that the manual was reviewed and found acceptable. This will be signed and dated by the members of the Quality Group and the Analytical Laboratory Manager.

4.3.6 The QAM is signed by the Quality Assurance Officer, the Quality Director, and the Analytical Laboratory Manager. The Quality Assurance Officer is the main author of the document. The signature from the Quality Director states that the manual has been reviewed and approved. The signature from the Analytical Laboratory Director states that the manual is reviewed, approved, and that laboratory management will provide appropriate resources to laboratory personnel to implement and comply with the quality policies stated within.

4.3.7 Each chapter of the QAM is page numbered as separate from the other chapters to assist in the revision of the manual. The chapter headers contain the Braun Intertec Corporate logo, the chapter number and name, effective date, revision number, the page number and total number of pages in that chapter.

4.3.8 Each chapter page also contains the name of the manual in the footer – Analytical Laboratory Quality Assurance Manual.

4.4 STANDARD OPERATING PROCEDURES

4.4.1 Standard Operating Procedures (SOPs) define procedures used in the analytical laboratory. Technical SOPs are written following SOPTECH1 and include all procedures that involve analytical measurement and/or require working with chemicals. Non-technical SOPs are written following SOPGENERAL1 and are procedures that do not involve analytical measurement or working with chemicals.

4.4.2 All changes made to an SOP during a revision are noted in the document continuity section of the SOP. It is also indicated if the SOP is replacing any existing quality system documents.

4.4.3 The title of each SOP is an abbreviated name that resembles that of the description of that SOP. For example, the SOP on Building and Lab security is titled LABSECURITY1.

4.4.4 The header in each SOP contains the Braun Intertec Corporate logo, SOP name, effective date, revision number, the page number and the total number of pages in the document.

4.4.5 The footer of each SOP contains the electronic storage path and the Braun Intertec Analytical Laboratory EPA Lab ID Number (MN00063).

4.5 QUALITY SYSTEM FORMS

4.5.1 Quality system forms include all forms used for documentation of analytical work. This includes, but is not limited to, benchsheets, sample preparation logbooks, analytical runlogs, data work up forms, internally generated references, sample receipt documentation, and chain of custody forms.

4.5.2 Quality system forms are uniquely identified using the shortened group name (see section 4.5.7) and a sequentially generated number. For example, ORG 01.00 is the first form created for the organic group.

4.5.3 The revision number follows the decimal point in the sequentially generated number. For example, ORG 01.00 is the original form and ORG 01.01 is the first revision of that form.

4.5.4 The footer on each form indicates the network storage link, form identifier, revision number, and effective date.

4.5.5 External quality system documents include external resource documents and equipment manuals that are used by the Analytical Laboratory personnel.

4.5.6 These external quality system documents are listed in the master index in the document worksheet. The document title, a brief description of the document, and the storage location of the document are listed.

4.5.7 The following is a list of the shortened group names used for the identification of quality system forms.

BIO	**Microbiology**
CMP	**Computer**
CS	**Client Services**
GEN	**General**
IH	**Industrial Hygiene**
MAINT	**Maintenance**
MICRO	**Microscopy**
ORG	**Organic**
QC	**Quality Control**
SAF	**Safety**
MET	**Metals**
INO	**Inorganic**

4.6 PROCEDURES FOR CREATION, REVIEW, AND APPROVAL OF QUALITY SYSTEM DOCUMENTS

4.6.1 Quality system documents are created to assist the quality assurance and quality control aspects of the laboratory. It also assures the laboratory that all activities are properly documented and that the highest level of quality is achieved. The personnel involved in the procedure and/or the Quality Group will create quality system documents as the need arises.

4.6.2 Once a quality system document is created, it is brought to the Quality Group for review, approval, and document control. Forms must not be used until the Quality Group has completed the approval of the document. The Quality Group is responsible for entering the approved document in the document control system, the MASTER INDEX.xls, and distributing it to the appropriate personnel.

4.6.3 Hand written changes are acceptable pending the update of the document. The Quality Group must approve all hand written changes. Changes are made following the documentation guidelines set forth in chapter 6, section 6.3 of the QAM.

4.6.4 The QAM is reviewed annually at a minimum. More likely the QAM will be updated on an annual basis. Each time there are chapter updates, the revision number will increase by one digit. The revision number and effective date will be changed on each page of the manual when updated. Documentation of the update is noted on the master index list.

4.6.5 Appendix updates may occur more frequently and documentation of these updates is included on the table of contents. When there is a change in an appendix, the revision number will increase by 0.1. This increase in revision number will be tracked and documented in the MASTER INDEX.xls as well as in the "Document Continuity (Introduction: III)" section of this manual.

4.6.6 Controlled copies of the QAM are updated to the most current version after each revision. When appendices are updated, only those updated appendices are changed. (Additional information on the procedure for the control and distribution of the QAM manual is found in section 4.7 of this manual).

4.6.7 The Quality Group is responsible for distributing updates to the QAM. Analytical Laboratory employees are responsible for reading, understanding, and following the policies and procedures within the revisions.

4.6.8 Standard Operating Procedures are reviewed on an annual basis. The primary analyst involved in the procedure is responsible for the annual review. At the

time of review, the analyst is responsible for reviewing the most current version of the reference method and making changes as necessary.

4.6.9 Once the analyst updates a SOP, the Quality Group reviews it for compliance to SOPTECH1 or SOPGENERAL1, established Analytical Laboratory policies, and external reference methods. A representative from the Quality Group signs and dates the SOP.

4.6.10 The SOP is also reviewed, signed, and dated by the technical lead in the department. The technical lead is responsible for the technical validity of the SOP.

4.6.11 All SOPs are also reviewed, signed, and dated by the Analytical Laboratory Manager.

4.7 QUALITY SYSTEM DOCUMENT CONTROL AND DISTRIBUTION

4.7.1 All Braun Intertec Analytical Laboratory personnel have access to the QAM through the Braun Intertec Corporation intranet home page. The certification and accreditation regulators also receive a copy and all revisions of the QAM. Internal and external clients may request copies of the QAM at any time. The QAM is available on CD-Rom or hard copy.

4.7.2 The QAM is stored electronically as a portable document file (PDF) created with Adobe Acrobat® software as well as a Microsoft Word® document.

4.7.3 Standard operating procedures are stored electronically as a portable document file (PDFs) created with Adobe Acrobat® software. These PDFs are the controlled copies of the SOPs. They are stored on the network (f:groups/qa-qc/sops/) and are available to all Analytical Laboratory personnel. Once the SOP is printed from the network, it is no longer considered to be controlled. It is the responsibility of the Analytical Laboratory personnel to retain only the current revision of the SOP and to destroy all obsolete copies. Copies of obsolete documents can be returned to the Quality Group to be destroyed.

4.7.4 Standard operating procedures are also stored electronically as Word® documents by the Quality Group for revision purposes. These documents are not available to all personnel. When an SOP is to be revised by an employee, it is saved to a network draft directory where the analyst can make the necessary changes.

4.7.5 Hard copies of SOPs are kept by the Quality Group and are available to clients and employees upon request.

4.7.6 Forms and documents are stored electronically as Word® or Excel® documents on the network (f:/groups/qa-qc/forms). These documents are stored in a read only directory and only the Quality Group has access to make changes.

4.7.7 Forms are not stored as PDF files since they are somewhat dynamic and changes to logbook numbers or dates are done as new books are created. It is up to the discretion of the Quality Group if the form is to be stored as a PDF.

4.8 DEFINITIONS OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

4.8.1 Analytical Laboratory personnel must use the definitions outlined in this manual in Appendix A-1. If other definitions are used they must be defined in the quality system document.

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5.0 SUMMARY OF CHAPTER 5: DATA HANDLING & REPORTING

5.0.1 Chapter 5 describes the procedures for data handling and reporting for the analytical laboratory including deliverables, data reduction, statistical analysis, reporting guidelines, and data review.

5.1 DATA REDUCTION

5.1.1 Raw data is generated by a wide variety of techniques within the laboratory with various outputs. The SOP for each technique describes the unique requirements for each methodology in the "Data Reduction" section of the SOP. The following gives a general outline of the data reduction process.

5.1.2 All LIMS-sequenced data is archived in the form of "data packets" or folders of information by the analytical sequence number generated in the LIMS system. Please refer to Chapter 6, Record keeping, for a detailed discussion of this procedure. The data packet contains all the data associated with the analytical sequence and refers back to the individual preparation batches and sample IDs. Each SOP describes unique data requirements for individual methods. All other data is archived in the work order folders of information by the work order number generated in the LIMS system.

5.1.3 A "QC Checklist" form is filled out that summarizes the results of an analytical run. An example of this form is provided in Appendix L-1. The analyst completes this form after the data has been worked up. It is a checklist for indicating pass/failure of QC requirements and a place for documenting unusual events that took place during analysis. Non-conformances are summarized as well.

5.1.4 If a non-conformance is noted, the analyst then completes a Track-IT! work order (refer to Appendix I-1) that is automatically sent to the Quality Group. Each Track-IT! generated is given a unique identifier. This number is documented on the QC Checklist form in the data packet. This will aid in the corrective action investigation.

5.1.5 An instrument run log is maintained for some of the instruments within the laboratory. This provides documentation of the run sequence, data files, the run number, the date, the analyst initials, traceability information for standards, and so forth. This is retained in a bound book for easy reference. A copy of the run log is created and archived with the analytical run for future reference when looking up data. The information on the hard copy run log is also found in the analytical sequence in the LIMS. Copies of both are retained in the data packet.

5.1.6 Sample preparation batches are created in the LIMS. Batch information is printed out of the LIMS and stored in the data packet for easy reference.

5.1.7 A significant piece of raw data from the analysis is the instrument calibration information. This data is printed and retained in the data packet. In some cases, consecutive analytical runs will refer back to an initial calibration or what is typically referred to as an "ICAL." The original ICAL is archived with the data packet that corresponds to the analytical sequence in which it was analyzed. When a new run is constructed following the ICAL, the unique identifier of the ICAL (usually the file name of the ICAL) is indicated in the run log. In most cases, this identifier is printed on the raw data itself to point back to the ICAL. This information allows the analyst to find the original ICAL in the data archives. In addition, a copy of the ICAL is placed in a folder and retained in a file cabinet in the laboratory so that analysts can have easy access to it without the need to go to the data archives. These additional copies are eventually discarded when their usefulness is determined to be at a minimum.

5.1.8 Electronic versions of the ICAL are kept for a time that is deemed reasonably useful. This is weighed against the disk space requirements. The computer network data is backed up daily to a tape copy by the Information Systems group. It may be recalled for future inspection. With the constant advances in computer technology, operating systems, and instrument control software, Braun Intertec Corporation makes no claims as to the long-term ability to retain electronic data as raw data. The printed data is considered raw data. Please refer to Chapter 6, Record Keeping, for more information regarding this distinction.

5.1.9 Various calibration algorithms are used in the Analytical Laboratory. The criteria for acceptance are identified in the individual SOPs. A discussion of calibration procedures and general analytical guidelines are presented in Chapter 9: Analytical Methods.

5.1.10 Raw data for each sample and QC sample is printed and archived in the data packets. This includes chromatographs and spectra where appropriate.

5.1.11 Once the analyst has reviewed the data, the data is transferred to the LIMS system. The bulk of the data is transferred into the LIMS system using Data Tool. This minimizes transcription errors. In the case where manual entry is required, the data reviewer will double check accuracy prior to data verification to minimize the possibility of transcription error.

5.1.12 The analyst enters any data qualifiers that may be appropriate to the data via the LIMS.

5.1.13 Once the data is reviewed and transferred, or manually entered into the LIMS by the analyst, it is provided to a data review person. This person verifies that the data is compliant to all of the quality standards and is ultimately responsible for the validity of the data. If there are any potential problems or errors found, the reviewer completes a QC14 form and returns the data packet to the analyst. This form provides corrective action feedback to the analyst. Any changes that must be made are initialed and dated. After corrections have been completed, the data review person reviews and verifies the data in the LIMS.

5.1.14 The LIMS system has a data audit trail system that tracks all data entered, data transfers, and all changes to the data. The date, time, and the employee are all tracked and easily determined through the audit trail.

5.1.15 For purposes of verifying the data, both the analyst and the review person have immediate access to the appropriate standard operating procedures, the Quality Assurance Manual, the laboratory control limits, and the reference method. All of this information is provided on the corporate computer network or in the LIMS system. In many cases, a paper copy is used as a convenience. Please refer to Chapter 4: Document Control for a discussion of available materials and systematic updates.

5.1.16 After the data has been verified by the reviewer, the complete data packet is then archived by sequence number.

5.1.17 Once all of the parameters for a work order have been verified, the work order status is updated to reportable. The project manager can then print the final report. A draft report, which is noted as such, may be created prior to the verification of all parameters. The LIMS system does not allow data to be printed on final reports if it has not been verified.

5.1.18 The project manager reviews the report to ensure that all client requirements have been met and that all method requirements have been met. Any discrepancies are noted in the discussion on the report. This includes any information provided by non-conformance investigations.

5.1.19 The LIMS system provides the electronic signature of the project manager responsible for the project. The electronic signature is tied to the person logged into the LIMS system at the time the report is generated and printed.

5.1.20 The report is delivered by any number of means based on the client's needs: mail, e-mail, fax, courier, or hand delivery.

5.1.21 Regardless of the delivery method in 5.1.20, a copy of the report is mailed to the client unless the client has specifically requested that the laboratory only provide electronic versions of the report to them. The Copy Center is responsible for making a copy of the report for archival prior to mailing. This copy, along with the remaining information in the project file, is then archived.

5.2 DELIVERABLES

5.2.1 The Analytical Laboratory provides a number of deliverable formats. Refer to Appendix L-2 for a sample of the standard laboratory report.

5.2.2 In addition to providing a number of custom report formats from the laboratory LIMS system, it is sometimes necessary to write a custom report. The minimum requirements for such a report include: a title, the name and address of Braun Intertec Corporation, name and address of any subcontract laboratories, the laboratory project number, name and address of the client, identification of the reference methods, a description of the samples tested, date of sample receipt, date of sample preparation, date of sample analysis, the analytical results including appropriate units of measurement, typed name and title of project manager, the signature of the project manager, and a statement indicating that "the report shall not be reproduced except in full, without written approval from the laboratory." The report must be paginated as well.

5.2.3 The laboratory also provides electronic data deliverables (EDD) as required by clients. Braun Intertec Corporation maintains a set of EDD formats; however, a custom format may be created at the client's request.

5.2.4 In addition to the analytical results, the report package includes a copy of the original chain of custody, the conditions upon receipt summary, data qualifier definitions, and raw data when requested or required (for example chromatograms or spectra may be included).

5.2.5 Please refer to chapter 7 for a discussion of sample receipt and chain of custody.

5.3 DATA QUALIFIERS

5.3.1 It is sometimes necessary to communicate additional information regarding the analytical results. This may be due to a non-conformance or it may be due to the need to provide additional information because of a unique characteristic of the sample. This information is communicated in one of two ways. It is either communicated via use of a data qualifier or communicated via use of the case narrative section of the report. In some cases, the data may be qualified and discussed in the report as well.

5.3.2 Qualifiers are like footnotes that are placed with the analytical results. Each qualifier consists of 1-4 alphanumeric characters. An example qualifier:

ff = The sample was received with headspace in vial. A loss of some analytes may have occurred.

The LIMS also has blank qualifiers that allow the analysts to type in a custom data qualifier when the need arises. A list of LIMS qualifiers can be found in Appendix F-2.

5.3.3 For items where a qualifier is not appropriate, the issue is covered in the case narrative. For example, if a sample had been received unpreserved and was then preserved in the laboratory. In some cases, one uses a qualifier but then the project manager also includes a further explanation in the case narrative section.

5.3.4 For all failed quality control samples and surrogates, the laboratory must qualify the associated sample data.

5.4 ROUNDING

5.4.1 The Analytical Laboratory at Braun Intertec Corporation employs the method termed "rounding to the even" as its standardized rounding technique.

- If the figure following those to be retained is less than 5, the figure is dropped and the retained figures are kept unchanged. For example, 0.443 is rounded to 0.44. The figure 3 is less than the figure 5.

- If the figure following those to be retained is greater than 5, the figure is dropped and the last retained figure is raised by 1. For example, 0.446 is rounded to 0.45. The figure 6 is greater than the figure 5.

- If the figure following those to be retained is 5, the figure 5 is dropped and the last retained figure is increased by 1 if the last retained figure is odd (i.e. 1,3,5,7, or 9). If the figure following those to be retained is 5, the figure 5 is dropped and the last retained figure is kept unchanged if the last retained figure is even (i.e. 0,2,4,6, or 8). For example, 0.435 is rounded to 0.44, while 0.425 is rounded to 0.42.

- The LIMS system rounds to the even as described above but instead of just looking at the number next to the last retained figure it evaluates the entire group of numbers. For example, in rounding the number 12.510 to 2 digits,

the LIMS system would use '510' to determine if the number should be rounded up or not instead of just the 5. In the LIMS system 12.510 would be rounded to 13. A result of 12.500 would be rounded to 12 in the LIMS system.

5.4.2 It is important that one not prematurely round a value prior to using it as part of a calculation. Carry as many decimal places as is practical to the final answer.

5.5 SIGNIFICANT FIGURES

5.5.1 The standard reporting practice for the Analytical Laboratory at Braun Intertec Corporation is to report all analytical results to two significant figures.

Some examples: 123 = 120, 1245 = 1200, 24.65 = 25, 24.51 = 24, 0.0347 = 0.035, 0.19999 = 0.20, 0.2054 = 0.20, 1.049 = 1.0

5.5.2 The standard reporting practice for the Analytical Laboratory at Braun Intertec Corporation is to report all quality control results to three significant figures.

Some examples: 95.65 = 95.6, 99.99 = 100, 115 = 115, 89.51 = 89.5, 120.5 = 120

Note: Rounding and/or significant figures cannot be used as a justification to pass a QC sample that is outside control limits. For example, if control limits are 90-110% and a result is 89.9%, the QC is outside of control and appropriate corrective action must be initiated.

5.5.3 In some cases it may be necessary to report a result to a client with more than 2 significant figures. This is perfectly acceptable as long as the documented measurements can justify the additional significant figures.

5.6 STATISTICAL ANALYSIS

5.6.1 During data reduction one must calculate the results of quality control measurements and compare them to acceptance limits. Please refer to Appendix G-1 for a summary of acceptance limits for key techniques. Acceptance limits are provided in each SOP for a given procedure.

5.6.2 When evaluating the results for all blanks (be it method blanks or instrument check blanks), one must take the absolute value of the number. For example, the absolute value of "12" is "12"; the absolute value of "-12" is "12." This is compared to the reporting limit. The absolute value of the blank must be less than

the reporting limit to be considered in control. Refer to Appendix G-1 for a list of the current reporting limits for key procedures in the Analytical Laboratory.

5.6.3 If a method blank is out of control but the results of the absolute value of all of the samples in the batch are less than the reporting limit or greater than 10 times the absolute value of the method blank, then the data is acceptable.

5.6.4 When evaluating the result of the LCS or LCSD, one must calculate the percent recovery of the LCS or LCSD and compare it to the acceptance limits. The recovery is calculated as follows:

% Recovery = (LCS/TV *100) where "LCS" = the result of the LCS or LCSD and "TV" = the true value of the LCS or LCSD.

5.6.5 When evaluating the result of the MS or MSD one must calculate the percent recovery of the MS or MSD and compare it to the acceptance limits.

5.6.6 % Recovery = ((MS-BKG)/SPK*100) where "MS" = the result of the MS or MSD, "BKG" = the result of the background sample (that sample upon which the matrix spike or matrix spike duplicate was performed) and "SPK" = the amount of spike added to the MS or MSD.

Note: If the spike amount (SPK) is less than 25% of the value of the background sample (BKG), the MS/MSD data is invalid and is not used.

Note: When calculating the spike amount (SPK) of a solid sample, one must take into account the weight of the MS and/or the MSD. For example, if you spiked 2.5 µg/mL onto 0.4 g of sample and then digested it to 40 mL the spike amount (SPK) would be 0.25 µg/g. The calculation to determine SPK would be:

(2.5 µg/L * 40 mL/0.4 g * 1L/1000 mL) = 0.25 µg/g

In the above example, if the MSD weighed 0.5 g then the SPK = 0.2 µg/g for the MSD sample.

5.6.7 The precision of a given procedure is determined by calculating the relative percent difference (RPD) of duplicate pairs and comparing that value to the acceptance limits. This may be calculated using a sample/sample duplicate pair, an MS/MSD pair or an LCS/LCSD pair.

RPD (%) = ((ABS(A-B))/((A+B)/2)) where "ABS" = absolute value, "A" = sample result, MS result, or LCS result and "B" = sample duplicate result, MSD result, or LCSD result.

Note: The RPD is calculated using the actual result of the LCS, LCSD, MS, or MSD. It is not calculated using the % Recovery determined in 5.6.6.

5.6.8 Surrogates are calculated in a similar way to the LCS/LCSD:

% Surrogate Recovery = (SUR/TV *100) where "SUR" = the result of the surrogate and "TV" = the true value of the surrogate (the amount that was spiked into the sample).

Note: The premise is that the surrogate compounds will not be present in the sample. If the sample were to contain these compounds, the recoveries would be erroneously high.

5.6.9 The ICV and CCV are calculated in a similar way to the LCS/LCSD.

% Recovery = (CV/TV *100) where "CV" = the result of the ICV or CCV and "TV" = the true value of the ICV or CCV.

5.6.10 The serial dilution (SRD) is evaluated by calculating the RPD between the straight analysis and the analysis of the sample at a 5-fold dilution.

RPD (%) for Serial Dilution = ((ABS(A-B))/((A+B)/2)) where "ABS" = absolute value, "A" = straight sample and "B" = 5-fold dilution of sample.

5.7 PLOTTING DATA

5.7.1 Recoveries for the LCS, LCSD, MS, MSD, and Surrogates are calculated and stored in the LIMS system and can be pulled together into charts as desired. Refer to specific SOPs to determine if a particular parameter requires charting and which compounds within that procedure are charted.

5.7.2 The Quality Group updates the charts annually at a minimum. New limits are then established and the LIMS system is updated.

5.7.3 This information is available to monitor trends and aid in corrective action.

5.8 METHOD DETECTION LIMITS

5.8.1 *The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a*

sample in a given matrix containing the analyte. (40 CFR Appendix B to Part 136-Definition and Procedure for the Determination of the MDL- Revision 1.1).

The above definition is from the Code of Federal Regulations. The MDL is a statistically generated value that provides a confidence that a test can see a signal above noise. The key point to remember regarding the above definition is: "that the analyte concentration is greater than zero." It does not mean that one can reliably quantify at the MDL. This is an important distinction. It is not a measure of accuracy. The procedure used to calculate the MDL does not make provisions for a measurement of accuracy. The purpose is to determine at what level one can reasonably say that the substance can be "detected."

For example, if your MDL was 4.0 µg/L or 4.0 part per billion, then when you analyzed a standard at 4.0 µg/L you would expect to see a positive result 99 of 100 times. You may see nothing at all 1 in 100 times. Your result may vary considerably from say 1.0 to 10 or more. The idea is that you can "detect" it.

Note: The MDL is calculated under ideal conditions using clean reagents. The matrix of a given sample will have an affect on the MDL.

5.8.2 A MDL study is required any time a new methodology is being created, a new instrument is being used, or after major maintenance has been performed that changes the sensitivity of the instrument.

5.8.3 A MDL study consists of preparing and analyzing several replicates at the same concentration. The number of replicates ranges from 7-10. Analysts are advised to use between 8 and 9 replicates.

5.8.4 When choosing the spiking level, pick a value that is 3-5 times the expected MDL result. Generally, data is available from a previous MDL study that can provide guidance when setting up the current MDL study. In the case of a new instrument, the manufacturer generally provides an "instrument detection limit or IDL" as a specification. Choose a spike concentration that is 3-5 times the IDL.

5.8.5 The MDL samples are processed through the preparation and analysis procedure just like any other sample would be processed.

5.8.6 MDL studies are logged into the LIMS system and results of the MDL study are calculated and approved by the Quality Group.

5.8.7 Data from MDL studies are archived in data packets by sequence number.

5.8.8 The MDL results are subjected to a Grubb's test to determine outliers. Refer to Appendix H-1 for a description of the Grubb's test. Outliers are deleted.

5.8.9 The standard deviation is calculated.

5.8.10 The MDL is determined by taking the standard deviation and multiplying that value by the student t value at a 99% confidence level. The student t value varies based on the number of replicates used in the MDL study. Refer to the following table:

Number of Replicates	Student t Value	Degrees of Freedom
7	3.143	6
8	2.998	7
9	2.896	8
10	2.821	9

5.8.11 Spike Ratio Test: To be considered a valid MDL study, the resultant MDL should be no less than one-tenth the spiking level that was used to generate the MDL. If the MDL study fails this test, then it must be redone using a lower spiking level.

For example, if one prepares and analyzes a series of MDL samples at 10 mg/L then the resultant MDL must be at least 1.0 mg/L. An MDL of 0.75 mg/L would be considered invalid. In addition the MDL cannot be higher than the spike level.

Note: There are certain techniques that have an unusually high degree of reproducibility. In these cases, it may be very difficult to meet the above requirement regarding the Spike Ratio Test. For each test, a reasonable effort must be made to meet the requirements of this test. If, after a significant amount of attempts, it is obvious that the ratio test is unreasonable for the technique, the MDL study will be approved. The non-conformance is documented and an explanation provided to the appropriate regulatory agencies.

5.8.12 Average recoveries for the replicate MDL spikes are calculated and retained. This is for informational purposes only. It has no bearing on the MDL study.

5.9 METHOD REPORTING LIMITS

5.9.1 The term "method reporting limit" or "MRL" is generally synonymous with the term "limit of quantitation" or "LOQ" for practical purposes.

5.9.2 *Reporting Limit – The lowest concentration or amount of the target analyte required to be reported from a data collection project. Reporting limits are generally greater than detection limits and are usually not associated with a probability level. (EPA QA/G-5).*

Limit of Quantitation – The minimum concentration of an analyte or category of analytes in a specific matrix that can be identified and quantified above the method detection limit and within specified limits of precision and bias during routine analytical operating conditions. (EPA QA/G-5)

The definitions above (from the EPA guidance document) distinguish both of these terms. The criteria used to determine the MRL or LOQ in the Analytical Laboratory are equivalent. The MRL and LOQ are established based on a number of factors. The MRL and LOQ are usually set to a level above the MDL (detection limit). An MRL cannot be set below the established MDL. The MRL and LOQ are established based on the experience of the technical staff. They are set at a level that is reasonable considering routine instrument performance, general contamination (as measured by laboratory blanks), and method limitations based on interferences. It is very common to have an MDL that is significantly lower than the MRL or LOQ. The MRL and LOQ are based on the laboratory's ability to generate quantitated values within specified limits of bias. The MRL and LOQ are generally equivalent to or greater than the low standard in a calibration curve.

5.9.3 MRLs must be verified after each initial calibration or monthly at a minimum. A standard at or below the MRL is evaluated and must recover within +/- 40% of the true value or corrective action must be taken.

5.9.4 Please refer to Appendix G-1 for the current laboratory MRL values.

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6.0 SUMMARY OF CHAPTER 6: RECORD KEEPING

6.01 Chapter 6 outlines the laboratory record keeping system, documentation guidelines, data packet, report, and electronic data archival systems and client confidentiality requirements.

6.1 RECORD KEEPING SYSTEM

6.1.1 A good record keeping system is essential to the laboratory's ability to reconstruct all of the laboratory activities that produced the analytical data. All technical records and supporting quality assurance documentation are properly stored and archived in such a way that allows the laboratory to recreate an analytical result.

6.1.2 The laboratory requires proper documentation practices as outlined in section 6.3 of this manual in order to assure accurate, legible records.

6.1.3 The laboratory retains all raw data, including sample preparation and analysis documentation, calibration records, associated quality control sample results, and supporting quality assurance documentation.

6.1.4 The laboratory retains records in a manner that allows for the historical reconstruction of all activities that produced the analytical data. All laboratory records are retained for 10 years beginning at the end of the year generated.

6.2 RAW DATA DEFINITION

6.2.1 Raw data is defined as original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study.

6.2.2 Raw data cannot be derived or recalculated from other sources or information. It may include original records of environmental conditions, samples weights, and/or logbooks. Printed data from operating systems are considered to be the raw data, not the electronic data.

6.2.3 Chromatographic, spectrophotometric, or titrimetric devices under computer control provide "tentative" or intermediary data on screen. The analyst may perform several reviews of the intermediary data on screen. Once the analyst accepts the data and prints out a copy of the data, it is considered to be the raw data and is indicated as such by the analyst initialing and dating the print out.

6.3 DOCUMENTATION GUIDELINES

6.3.1 All personnel are required to sign and date form QC 07, the laboratory personnel signature and initial sign-off form. This form documents each employee's name, signature, and initials for traceability purposes.

6.3.2 All records generated must be recorded in permanent ink.

6.3.3 All records must be completely filled out. Any space intentionally left blank is to be crossed out, initialed, and dated by the analyst completing the document.

6.3.4 Samples, calibration standards, calibration checks, laboratory control samples, blanks, duplicates, and matrix spikes must be clearly identified on associated paperwork.

6.3.5 Use the unique sample login number for sample identification on all data sheets. Properly identify all QC samples as calibration standards, calibration checks, laboratory control samples, matrix spikes, sample duplicates, method blanks, and instrument blanks.

6.3.6 Correct data by drawing a single line through the entire word or number, not just a letter or single digit. Erasures, scribbles, and write-overs are not acceptable. Entire words or numbers must be corrected not just single letters or digits.

6.3.7 The person making the changes must date, initial, and indicate a reason for the change. An error code explanation system is used to explain the reason for the change. The error codes are listed below.

Error Code Explanation	Error Code
Recording error	RE
Calculation error	CE
Changed for clarity	CC
Inadvertently not recorded at the time of initial observation	NR

6.3.8 White-out, liquid paper, or any product that can cover original data must not be used. Changes to the electronic LIMS data are tracked in the Laboratory Information Management System (LIMS), including sample login, sample batching, sequencing, data entry, and data verification.

6.4 QUALITY ASSURANCE RECORDS

6.4.1 Quality assurance records are kept for the life of the laboratory. They are archived separately from the technical records and are not destroyed.

6.4.2 Quality assurance records include copies of each version of the QAM and all laboratory standard operating procedures, forms and policies, personnel records, management and quarterly reviews, internal and external audits, performance testing results, certification and accreditation records, corrective action reports, and client complaint reports.

6.4.3 Quality assurance documents are archived using an Excel® spreadsheet. The date of archival, the range of dates being archived, type of records, and specific descriptions of records being archived are documented in Excel®

6.4.4 The storage box number, the title "certification records" and "do not destroy" are written on the outside of the box.

6.4.5 A list of quality assurance records is kept in the box as well as with the Quality Group. The quality assurance records are stored in a designated area in the on-site storage warehouse.

6.5 TECHNICAL RECORDS

6.5.1 Technical records include original observations, derived data and analytical run logbooks, equipment maintenance logbooks, chain of custody, sample preparation logs, sample receipt information, traceability information, and data verification and calibration records. The laboratory retains all technical records either in the analytical data packet or in analytical logbooks.

6.5.2 All required information required to validate analytical data is stored on hard copy. In some cases, electronic copies are also kept but are not the only copy.

6.5.3 All laboratory notebooks, instrument runlogs, sample preparation runlogs, maintenance logbooks, standard preparation logbooks, and laboratory facility equipment logbooks are given a logbook number. This number is documented in the laboratory logbook spreadsheet along with the name, location, and user name.

6.5.4 Once a logbook is completed, it is returned to the laboratory Quality Group for archival. The archiving box number is documented in the logbook spreadsheet for easy retrieval.

6.5.5 Logbooks are archived separately from the data packets and project files. They are retained with other supporting documentation and are retained for 10 years after the last date of use.

6.6 DATA PACKET ASSEMBLY

6.6.1 Data packets are assembled at the end of analysis and contain all of the essential information associated with the analysis to validate the analytical data.

6.6.2 Included in the data packet are the Data Review Report and QC Checklist, the LIMS Analysis Sequence and/or a copy of the run log(s), the LIMS Preparation Bench Sheet or a copy of the sample preparation log(s), and the raw data. Sample identification numbers (work order and sample numbers), sample preparation dates, analysis dates, the sample preparation and analysis operator's initials, and analysis and instrumentation type can all be found on these documents.

6.6.3 The raw data must include enough information to allow the data reviewer to re-trace the sample back through the preparation and analytical procedures.

6.6.4 All the quality control data, including initial and continuing calibration information, must either be located in the data packet or a reference to the storage location must be documented in the data packet so that the information can be reproduced.

6.6.5 A QC Checklist form is included in all data packets and documents any non-conformances associated with the data.

6.6.6 Traceability numbers for standard and reagent origination must also be documented in the data packet.

6.7 PROJECT FILES

6.7.1 Project files, created for each client project, contain the authorizations for work, client correspondences, final reports, invoices, and all other applicable project information that relates to the specific LIMS work order number.

6.7.2 Project files are started at the time of sample receipt. All applicable project information is stored in the file.

6.7.3 Once the work order is completed and the final report has been sent to the client, the project file is archived by the client services group.

6.8 DATA PACKET ARCHIVAL AND PROJECT FILES ARCHIVAL

6.8.1 Laboratory data packets and project files are retained by the laboratory for ten years beginning at the end of the year generated. The laboratory records are kept on-site in the storage warehouse as space allows and are then transferred to an off-site secure storage location.

6.8.2 At the end of the retention period, the laboratory records are destroyed according to established procedures, unless otherwise specified.

6.8.3 The laboratory will retain records for longer periods of time at the request of the client or as required by a specific regulatory program.

6.8.4 Laboratory data packets are archived after all data has been entered into the LIMS, been reviewed by the data reviewer, and been verified in the LIMS.

6.8.5 The data packets are archived in alphanumeric order by the LIMS sequence numbers. The sequence number is written on the top left-hand side of the data packet.

6.8.6 The data packets are initially placed into filing cabinets in sequential order. After approximately 4-8 weeks, depending on space limitations within the cabinets, the data packets are transferred to a bankers box in sequential order. Once the box is full, the contents of the box are displayed on the front as a range of LIMS sequence numbers.

6.8.7 The bankers boxes are then stored in sequential number order on the shelving in the laboratory storage warehouse until they are sent to the off-site storage facility.

6.8.8 When each work order is completed, the project file is initially placed into a filing cabinet in sequential order. These project files are later transferred and archived into a bankers box. Project files are archived sequentially by LIMS work order numbers.

6.8.9 Once a bankers box is full of project files, the contents of the box are displayed on the front as a range of LIMS work order numbers.

6.8.10 The bankers boxes are then stored sequentially on the shelving in the laboratory storage warehouse until they are sent to the off-site storage facility.

6.8.11 Access to the on-site storage warehouse is limited to authorized personnel only. Personnel removing files from the on-site storage warehouse must complete an

out card containing their name, date, and the file they are removing. This out card replaces the removed file until it is returned.

6.8.12 Both the on-site storage warehouse, as well as the off-site storage facility (Iron Mountain), are designed to protect the files from environmental deterioration, fire, loss, and theft.

6.8.13 When the on-site bankers boxes are to be sent to the off-site storage facility, transmittal sheets are completed to summarize the box contents and date of eligibility for destruction. Uniquely numbered bar-coded sticker pairs are provided by the off-site facility. These bar-coded stickers are placed on the boxes and the transmittal sheets in order to provide traceability.

6.8.14 The completed transmittal sheets are scanned into a portable document file (PDF) created with Adobe Acrobat® software and stored on the company computer network.

6.9 ELECTRONIC DATA

6.9.1 Instrument data files take two routes for initial storage. Data files generated using TotalChrom® software are saved directly to the network and are backed up on a daily basis. Data that is generated using other instrumentation software is saved directly to the stand-alone computer. This data is periodically saved to the network where it is backed up. Documentation of this backup is located in the data user's logbook.

6.9.2 All files are stored in network directories that are specified for each analysis. This enables the laboratory to set levels of security, allowing only those individuals with current rights to access them.

6.9.3 The network backups are done daily, with monthly tapes being removed for archival. These tapes are stored with the date of the backup indicated on them. Instrument data is kept on the network for a minimum of three months to allow for the data to be saved to three separate archived tapes.

6.9.4 Electronic files are stored in a manner that protects them from electronic or magnetic sources.

6.10 CLIENT CONFIDENTIALITY

6.10.1 Braun Intertec Corporation provides for the protection of client proprietary rights and confidentiality. All reports are submitted as the confidential property of

clients. Authorization for the publication of results, statements, conclusions, or extracts from or regarding our reports is reserved pending our written approval.

6.10.2 Data stored in client files, laboratory notebooks, and computer databases can only be accessed by authorized Braun Intertec Laboratory employees.

6.10.3 The Braun Intertec Analytical Laboratory considers the organization or individual paying for the laboratory services to be the client. Only the client receives the laboratory-generated data, unless the client requests in writing for another party to receive the data.

6.10.4 Client lists and other compiled business data containing client information are restricted to Braun Intertec Analytical Laboratory staff.

6.10.5 Braun Intertec Corporation employees are not permitted to disclose the names of clients or the volume of business. A client's name may be disclosed only with written permission of that client.

6.10.6 Braun Intertec Corporation does sign and respect proprietary agreements concerning analytical data and testing procedures developed for clients at Braun Intertec.

6.10.7 Employees handling client information are trained to protect and respect the confidential nature of client data.

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7.0 SUMMARY OF CHAPTER 7: LABORATORY SYSTEMS

7.0.1 Chapter 7 provides an overview of the systems of the Analytical Laboratory at Braun Intertec Corporation. There are specific SOPs that describe in detail how each process is implemented.

7.1 FACILITIES

7.1.1 The corporate headquarters of Braun Intertec Corporation reside at 11001 Hampshire Avenue South, Minneapolis, Minnesota, 55438. The general phone number is (952) 995-2000.

7.1.2 The Analytical Laboratory resides at the corporate headquarters.

7.1.3 The current residence was established in October of 2002. Braun Intertec Corporation owns the current facility.

7.1.4 The total square footage of the corporate headquarters is 85,060. The total square footage allotted to the Analytical Laboratory is 9,653.

7.1.5 A floor plan of the Analytical Laboratory is provided in Appendix M-1.

7.1.6 The Analytical Laboratory has been optimized for sample flow.

7.2 BOTTLE ORDERS

7.2.1 Before anything happens, the sample must be collected. In some cases, clients provide samples in their own containers. However, the bulk of the samples that arrive at the lab do so in sample containers provided by Braun Intertec.

7.2.2 In some cases, the client requests bottles directly from Client Services; however, in most cases clients request bottles through their Project Manager. The Project Manager takes responsibility for ensuring that the bottle order is filled properly.

7.2.3 Bottles are prepared ahead of time in bulk with appropriate preservatives. A large stock of bottles is maintained to ensure that plenty are available for customers.

7.2.4 Bottles are labeled with custom-made stickers that include the Braun Intertec logo. These labels provide ample room for clients to identify their samples. In addition, they are color coded by preservative to make preparation, distribution, and stocking more efficient.

7.2.5 The types of bottles purchased are selected to comply with regulatory requirements, be free of contamination, and be convenient for client use.

7.2.6 In most cases the laboratory purchases bottles that have been cleaned to EPA standards. The laboratory contracts with the appropriate vendors to purchase such bottles.

In some cases, non-cleaned bottles are purchased. In this case, the laboratory analyzes bottle blanks representative of each manufacturer's lot number to ensure that the bottles are free of contaminants. Results of these studies are retained and archived by the Quality Group. This process is employed only when there is reason to believe a contaminant is present, based on the testing performed out of the container.

7.3 SAMPLING MATERIAL FOR INDUSTRIAL HYGIENE ANALYSIS

7.3.1 In addition to sample bottles, the laboratory will provide sampling material required for industrial hygiene sampling upon request. The laboratory maintains a stock of commonly used media for client use.

7.3.2 Sampling material is properly stored at the laboratory as per the manufacturer's instructions.

7.3.3 The laboratory will ship media to clients or clients may pick up media at the laboratory prior to a sampling event.

7.3.4 The laboratory has staff onsite to assist clients in determining the proper media for the type of sampling they intend to perform. As well as laboratory staff, Braun Intertec Corporation employs Industrial Hygienists which may also be consulted when necessary.

7.3.5 The laboratory staff at Braun Intertec does not perform actual sampling for clients.

7.3.6 Guidelines for sampling and required media can be found in the Braun Intertec Laboratory Air Quality Sampling Guide.

7.4 SAMPLE RECEIPT

7.4.1 Samples are received at the North Side of the building. Customer parking spaces are reserved for sample drop off. Normal business hours are 8 AM – 5 PM Monday through Friday. An after-hours and weekend drop box is provided for customers dropping off asbestos samples. Arrangements must be made ahead of

time for services provided that are not compliant with normal operating hours. Beginning at a specified date in the Spring through a specified date in the Fall, the laboratory has Saturday hours of 8 AM to Noon.

7.4.2 A counter space is provided for clients to place samples upon receipt. Chain of custody documentation is signed at the point of receipt. It is required that all customers fill out and sign a chain of custody. A MS Word® version of the COC is available for clients to use. Please refer to the chain of custody forms in Appendix M-2. The laboratory representative who receives the incoming samples signs the chain of custody as well.

7.4.3 If samples are delivered by mail or other delivery service, the included documentation serves as the chain of custody. The Client Services representative that receives the samples signs and dates this documentation/chain of custody.

7.4.4 Once the samples have been formally received, they are moved to a private processing area near the sample receipt area. This serves to ensure client confidentiality.

7.4.5 Samples are generally received in a cooler. Certain conditions upon receipt are checked immediately. The samples are checked for custody seals, if the samples were received on ice, and if a temperature blank was received. The temperature is taken and recorded along with the date and time received.

Note: Temperature is taken using a non-invasive infrared "gun" type thermometer. In the absence of a temperature blank, a temperature is still measured by using a client sample.

7.4.6 The conditions upon receipt are initially recorded on the chain of custody form and then transferred into the LIMS; this information is provided to the client on the final report. Please refer to Appendix M-3 to see a screen shot of the LIMS Conditions Upon Receipt.

7.4.7 If sufficient time is available, the samples are fully processed including logging them into the LIMS system and filing them in the appropriate storage locations.

7.4.8 If sufficient time does not exist for processing at this point, the samples are placed in the walk-in cooler and stored at 4° C until sufficient time is available for processing. It is not acceptable to let samples "sit out."

7.4.9 Once the samples are processed, they are filed in the appropriate storage location.

7.4.10 Refer to the SOP SAMPLERECEIVING1 for a detailed description of the sample receiving process.

7.5 SAMPLE STORAGE

7.5.1 All samples that require refrigeration are stored in the walk-in cooler conveniently located with easy access from the sample receiving area and the Sample Preparation Lab (Note: When using the term "Lab" this refers to a subsection of the Analytical Laboratory). Sample containers that have been submitted for purge and trap analyses are the exception. These samples are initially stored in a small refrigerator in the sample receiving area (see section 7.5.5 below).

7.5.2 Sample tracking records are kept at the walk-in cooler. The sample identification, type and number of containers, date/location, and sign-out data are recorded here. An example of the form is provided in Appendix M-4.

7.5.3 Samples are grouped by work order number and receipt date.

7.5.4 Aqueous samples, received for metals analysis, are stored on shelves at ambient conditions in the sample receiving area. A similar record to that described in 7.5.2 exists for this storage location.

7.5.5 Samples received for the analysis of volatile organic compounds (VOCs) are stored temporarily in a VOC designated refrigerator in the sample receiving area. They are then stored in VOC designated refrigerators in the Volatiles Lab until completion of the testing.

7.5.6 Samples received for fungal testing are stored in the Microscopy Lab at ambient conditions.

7.5.7 Samples received for asbestos testing are stored in the appropriate Microscopy Lab (dependent on the type of testing) until completion of the testing.

7.5.8 Samples received for industrial hygiene GC, LC, or IC testing are stored in a freezer in the Volatiles Lab until extraction of the samples.

7.5.9 Organic extracts are stored in a refrigerator located in the Sample Preparation Lab. They are stored in plastic or wooden racks.

7.5.10 Metals digestates are stored in the Inorganic Lab within the hood. They are stored in foam racks labeled with the batch number.

7.5.11 Inorganic digestates for analysis on the auto-analyzer are generally analyzed immediately following sample preparation. If this is not the case, digestates are stored at either ambient or at 4 degrees Celsius depending on the nature of the test. Refer to the SOP for exact details.

7.5.12 TCLP extracts for organic analysis are stored in the walk-in-cooler.

7.5.13 TCLP extracts for metals analysis are stored on the shelves in the sample receiving area at ambient conditions.

7.5.14 TCLP ZHE extracts are stored in a refrigerator in the Volatiles Lab.

7.6 WASTE DISPOSAL & POLLUTION PREVENTION

7.6.1 Client samples are stored for a minimum of 14 days past the date the final report was issued. At that time, any samples requiring further testing or prolonged storage are moved to a special location. Samples that require no prolonged storage are disposed.

7.6.2 Samples requiring prolonged storage or on 'hold' are held in the walk-in cooler at 4º C until the acting project manager gets permission to activate or dispose of the samples. Multiple Save/Hold shelves, separate from the normal shelves, are located in the Walk-In cooler. In cases of long-term extended storage, samples may be stored at ambient conditions in the warehouse area upon agreement with the client.

7.6.3 Within the Analytical Laboratory at Braun Intertec Corporation there are three professionals trained through the Hennepin County Department of Environmental Protection in the disposal of hazardous materials. All Laboratory employees must participate in the company Hazardous Waste Training Program. Training of new employees is to be within six months of hire. There is a designated Hazardous Waste Coordinator. The laboratory Hazardous Waste Coordinator works closely with the corporate Health and Safety Coordinator and officials at Hennepin County.

7.6.4 Waste streams for organic chemicals are controlled and disposed of properly.

7.6.5 Waste streams for inorganic chemicals and aqueous samples are neutralized via two specially designed neutralization sinks in the Sample Preparation Lab.

7.6.6 Dry chemicals are appropriately lab-packed for disposal.

7.6.7 Please refer to the SOP HAZWASTE1 for a detailed description of the Analytical Laboratory's procedures regarding waste disposal and hazardous materials.

7.6.8 Braun Intertec Corporation is committed to being a good corporate steward of the environment; therefore, it is always looking at ways to minimize pollution.

7.6.9 Recycling and minimizing use of paper is a large part of this effort. Recycling bins are located next to all printers, fax machines, and copiers. The use of e-mail is maximized as a way to reduce the use of paper. Most memos are communicated via e-mail rather than via paper.

7.6.10 An electronic system to account for billable and non-billable hours was implemented, eliminating the need for paper timesheets.

7.6.11 The Analytical Laboratory makes use of the Adobe® Portable Document File (PDF) format whenever possible to minimize the amount of paper generated. It is not always necessary that everyone has a copy of every laboratory document but rather that one has access to each document. A corporate network drive is readily available.

7.6.12 Current revisions of all of the relevant EPA methods are available on the network to each analyst in a searchable electronic database. In addition to methods, relevant documentation from the Code of Federal Regulations is also available. Most of the laboratory's quality documents are available on-line, including all of the laboratory's SOPs.

7.6.13 The Analytical Laboratory is always looking at ways to minimize the use of chemicals, particularly organic solvents and inorganic acids. Methods are developed, optimized, and modified to reduce the amount of chemicals used. The Analytical Laboratory actively seeks out vendors with these same goals.

7.7 PROJECT MANAGEMENT

7.7.1 Each client is assigned a Project Manager (PM). The PM is responsible for all communication with his or her client as well as ensuring that the client receives his or her product in a timely fashion. The PM is both a project coordinator and a consultant. The PM is involved from bottle order to final report. The PM is always available to answer questions.

7.7.2 The relationship that the PM has with the client is very important. It is the goal at Braun Intertec for the clients to receive a value-added service from the PM. Because of this goal, the project manager team has been assembled to include many years of experience in a variety of fields.

7.7.3 It is important to match the right PM with the right client. In some cases, a PM may call on the specific experience of another PM to solve a unique customer problem. This flexibility is important in meeting the ever-changing demands of today's analytical chemistry client base.

7.7.4 It is important that the PM have excellent communication skills, that the PM understand the client relationship, that the PM have excellent organizational skills, that the PM understand the technical aspects of the laboratory's product, and that the PM be enthusiastic about helping the client achieve his or her goals.

7.7.5 The Quality Group conducts follow up surveys of clients via paper-based surveys, phone-based surveys, and face-to-face interviews to measure customer satisfaction. Several questions focus on the Project Manager relationship.

7.8 LABORATORY INFORMATION MANAGEMENT SYSTEM (LIMS)

7.8.1 Although information management is a combination of electronic data, paper data, and human communication, when referring to the LIMS one is normally referring only to the computer-based system. The following describes all three aspects with a focus on the computer-based portion.

7.8.2 The LIMS system is a central component to any contract laboratory's success and the Analytical Laboratory at Braun Intertec is no exception.

7.8.3 The LIMS vendor is Promium® and the product name is Element®. The system has been modified to fit Braun Intertec's individual needs. The Information Systems Group is responsible for hardware support and physical backup of the database. The LIMS Group is responsible for configuration of the LIMS systems, maintenance of the database content, and training of lab personnel.

7.8.4 A work order number is given to each client project. The sample number is formatted as follows: YYPPPPP-NN with the first part being the last two digits of the year and the next 5 being sequential starting over each year; this represents the work order number. The last two digits distinguish the sample. Thus, the first sample of 2006 was 0600001-01.

7.8.5 Once a sample is logged in and given a unique number, a label is printed for each container and affixed to the container. The LIMS also assigns a unique letter designation for each sample container that is received by the laboratory. The letter designation is also printed on the label.

7.8.6 A copy of the chain of custody and a printed project summary report, along with any other applicable paperwork, is put into a "project file." This file is a folder that is labeled with the client name, work order number, and sample receipt date. Please refer to the SOP SAMPLERECEIVING1 for a detailed description of the sample receipt process and this paperwork.

7.8.7 Based on the client preference and project manager's discretion, a sample receipt letter may be sent to the client at this point. This letter details exactly what was received and what tests were requested. This is normally faxed or e-mailed, as timing is important since samples often begin processing soon after receipt.

7.8.8 The project file is forwarded to the PM. The PM verifies that everything was logged in properly. If something is incorrect, the PM will correct it in the LIMS and laboratory personnel are immediately notified so that the proper testing is performed.

7.8.9 Once the project has been reviewed and is deemed correct, the PM updates the project status from received to available. Analyst can start work on samples at either the received or available status; however, the available status assures them the project is correctly logged into the LIMS.

7.8.10 The file is then filed in the "Active File System." All analysts have access to this file should they have any questions.

7.8.11 Information regarding what tests need to be performed as well as due dates and holding times are communicated to the analysts via a work list printed from LIMS. Analysts can view and print work lists at any time throughout the day.

7.8.12 Data is inputted into the LIMS by one of two ways: direct upload or hand entry.

7.8.13 The majority of the data is directly uploaded from the instrument to LIMS through Promium® DataTool. This significantly minimizes transcription errors. The analyst can view and change data in the LIMS after it has been uploaded.

7.8.14 Once the analyst completes the data transfer or entry, the status is set to analyzed. Data must be verified by an authorized data review analyst prior to being reported. Once the status of the data is set to verified, the data is ready for reporting.

7.8.15 Data that is hand entered is also reviewed and verified by authorized personnel prior to being finalized. Data is reviewed for transcription errors or other types of error. Once the data is deemed acceptable, the data reviewer sets the status of the data to verified.

7.8.16 Once all the data has been verified in the LIMS, the PM can print a final report. The LIMS uses electronic signatures based on who is logged into the system at the time the report is generated and printed.

7.8.17 The PM reviews the report for accuracy and clarity. The PM can add case narratives as necessary but cannot make changes to the data. If a problem is found with the data, it will go back to the original analyst for changes.

7.8.18 When the report is determined to be accurate and complete, it is delivered to the client.

7.8.19 The LIMS has a data audit trail that tracks all input and changes to the data.

7.8.20 Each employee has a unique LIMS log-in ID and password. This information is known only to the LIMS Group. There is no access to log-in passwords from others in the Analytical Laboratory. Not even the Analytical Laboratory Manager has access to this information.

7.8.21 MDL and MRL information stored in the LIMS database is updated as necessary. The analysts need not enter these on a sample-by-sample basis. Changes to the MDL and MRL due to sample size, dilutions or dry weight are all calculated in the LIMS.

7.8.22 The appropriate method references are part of the LIMS database and are set at log-in. They may be edited if a method is used that is different than that of the method set at log-in.

7.8.23 Calculations for sample dry-weight corrections are performed in the LIMS.

7.8.24 The LIMS is backed up daily by the Information Systems Group.

7.8.25 All non-standard calculations performed by the LIMS are validated prior to releasing data. These validations are maintained by the laboratory Quality Group.

7.9 CHEMICAL & STANDARDS TRACEABILITY

7.9.1 *Traceability – The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project. (EPA QA/G-5).*

What one is simply providing is a paper trail that allows one to associate the data generated in the laboratory to a nationally certified standard. Analytical chemistry is all about comparison. One generates a calibration curve based on known values and premises and then relates unknown sample results to those known values and premises. The known premises constitute a confidence that the technique will work as planned and that the instrumentation and software are properly configured. These premises are verified through QC tests covered in Chapter 2. What one is concerned about here is a comparison of the "known standard" used in the calibration to a source that can be certified independently. The independent source is usually the National Institute of Standards (NIST). In some cases, this may not be an option but the goal is to trace back to a NIST standard whenever possible.

7.9.2 Traceability is key to increasing accuracy, troubleshooting, data validation, ISO 17025 compliance, and regulatory compliance.

7.9.3 It is the policy of the Analytical Laboratory to always trace calibration and second source standards back to a NIST certified standard whenever possible. If this is not possible, then the best effort will be given to provide traceability based on the scientific method and multiple source comparison.

7.9.4 A practical benefit of good traceability is that it aids in troubleshooting. If one happens to purchase a bad lot of a particular reagent or a chemical was contaminated in the laboratory, then one can use that information when investigating non-conformances. Good investigative work will uncover the bad lot quickly. One can then use this information to relate to other projects that may be affected by the bad lot.

7.9.5 When the Analytical Laboratory receives a chemical, the box is opened and inspected to ensure that the containers are undamaged.

7.9.6 Purchased and/or parent standards are entered into the LIMS at the time of receipt. A unique chemical trace number is generated using the LIMS system. Data pertinent to the chemical, including compound(s), date of receipt, expiration date, vendor, units and concentration is all entered into the LIMS system. This information may be accessed at any time by laboratory staff and is used to prepare 'child' standards as necessary.

Note: For common solvents and reagents, a trace number is assigned based on lot number. For each bottle within the same lot, the same trace number may be used. For a case of six bottles, each would receive the same trace number. For two

cases of six of the same lot number, each of the twelve bottles would receive the same trace number.

7.9.7 The unique trace number is written on the Certificate of Analysis. The Certificate of Analysis is given to the Quality Group. The Quality Group archives the Certificate of Analysis for future reference.

7.9.8 The unique trace number is written on each bottle/container.

7.9.9 'Child' standards are made up of one or more 'parent' standards in the LIMS. These 'child' standards are given additional unique trace numbers generated by the LIMS.

7.9.10 Information about the preparation of the standard, including analyst initials, date prepared, expiration date, parent standards, type of standard, concentrations, and units are all entered into the LIMS.

Note: The expiration date of the working standard must be equal to or pre-date the expiration date of the purchased standard.

Note: One must always be careful to avoid using expired standards for sample analysis. The LIMS system will flag all data that is associated with an expired standard. If an expired standard is found to be used for a data set, the data set should be repeated using a valid standard. If this is not possible, then a Track-IT! work order must be completed and a corrective action initiated. All sample data associated with the expired standard must be qualified on the final report.

7.9.11 The container that is used for the working standard (vial, flask, bottle, etc.) is labeled with an easily identifiable name, the unique trace ID, the matrix, and the expiration date. It is very important that all four pieces of information be recorded.

For example, one prepares a PCB 1260 standard. The bottle reads "1000 ug/mL PCB 1260, 7A11015, Hexane, Exp. 09/26/07. This immediately tells another analyst what it is and when it expires. In addition, it provides safety information on a potentially hazardous matrix and a reference to the remaining information.

Note: If the container is very small then it may not be practical to fit all of the information. In this case, the minimum requirement is the unique trace ID. This will allow anyone to obtain the remaining data in the LIMS.

7.9.12 The unique trace ID numbers must be linked to the respective calibration curve they are used in preparing. The standards used to prepare a curve must be indicated in the LIMS sequence and can also be written on the instrument run log.

7.9.13 The unique trace ID numbers must be linked to the respective QC samples they are used in preparing as well. The standards used to prepare the QC samples are entered into the bench sheet in the LIMS.

Note: This applies to all QC samples (Run QC, Batch QC, and Reference QC).

7.9.14 When one says "NIST" traceable what does that mean? NIST prepares and certifies reference materials and standards. Vendors that prepare calibration standards used in laboratories purchase NIST certified materials. They use these NIST traceable materials to validate the preparation of their standards.

7.9.15 The main thing to be concerned about is that when one purchases a standard, a certificate must be supplied that indicates NIST traceability. The Quality Group reviews all Certificates of Analysis for this requirement.

8.0 SUMMARY OF CHAPTER 8: LABORATORY EQUIPMENT

8.01 Chapter 8 describes the laboratory equipment, maintenance records, and calibration of laboratory equipment.

8.1 LABORATORY EQUIPMENT

8.1.1 Braun Intertec Analytical Laboratory has a wide range of analytical instrumentation, sample preparation apparatus, and general laboratory equipment.

8.1.2 The Quality Group maintains an up-to-date list of all equipment used by the Analytical Laboratory. This equipment list can be found in Appendix N-1.

8.1.3 The equipment list contains a description of the equipment, the manufacturer's name, model number, serial number, unique Braun Intertec identification number, the current location, month(s) for preventative maintenance checks, and, if applicable, to which instrumentation system it belongs.

8.1.4 All equipment in the Analytical Laboratory has a unique identification number. This identification number is a five-digit number proceeded by the letter "V". All equipment is labeled with a bar code sticker that contains this number.

8.1.5 Laboratory equipment must be properly calibrated and/or checked to establish compliance to the Analytical Laboratory's specification requirements prior to use.

8.1.6 Initial documentation of calibration and method development is archived by the Quality Group and is retained for the life of the laboratory as outlined in Chapter 6 of this manual.

8.1.7 Only authorized personnel, as defined in Chapter 3, are allowed to operate laboratory equipment.

8.1.8 All applicable equipment manuals, maintenance schedules, and standard operating procedures are available to all laboratory personnel and are available at or near the location of the instrumentation. Standard operating procedures can be found online using the master index at f:\groups\QA-QC\MASTER INDEX.xls. External reference documents and the storage locations are listed on the master index.

8.2 EQUIPMENT CALIBRATION

8.2.1 Properly functioning equipment is a key component to the quality and integrity of the data produced by the laboratory as well as to the accuracy and precision of the analytical data.

8.2.2 Procedures for the initial and continuing calibration verification are documented in specific standard operating procedures as well as Chapter 9 of this manual. Generally, each instrument is calibrated using a set number of NIST traceable standards at a given frequency.

8.2.3 Calibration records must include the concentration of the standards used, the responses for each of the standards, the operator whom performed the calibration, the date of the calibration, and the equation for the line if a regression was performed. All of the analytical information, date analyzed, calibration standards, and analyst initials are entered in the LIMS sequence for traceability and reference. The hard copy data is stored in the appropriate data packet.

8.2.4 Equipment that is found to be out of calibration or defective must not be used until the problem is corrected. Laboratory personnel must notify the Quality Group of any equipment that is suspect or has been found to be defective. The Quality Group will update the equipment list and label the equipment as out of service when necessary.

8.2.5 When equipment is found to be defective, the analyst involved must determine if previously reported data is suspect. If it is determined that data has been negatively affected, a corrective action report must be completed and forwarded to the appropriate Project Manager(s), the Quality Group, and Laboratory Management. Any data affected will be qualified as such.

8.3 EQUIPMENT AND INSTRUMENT MAINTENANCE

8.3.1 Proper maintenance of instrumentation and laboratory equipment is critical to the overall performance of the instrument and impacts the data quality and integrity. It is most important for the analyst to monitor the performance of the instrument and to determine a maintenance schedule based on that instrument's performance. Through training and experience, analysts should be able to determine when a system is requiring maintenance in order to prevent major equipment failures.

8.3.2 All analytical instrumentation and laboratory equipment are on a preventative maintenance schedule. The equipment list in Appendix N-1 also designates the month each piece of equipment is scheduled for preventative maintenance. This maintenance can range from simple documentation that the equipment is working

properly to complete and thorough maintenance. Documentation of this maintenance is found in the maintenance logbooks, runlogs, or metrology logbook.

8.3.3 Some instruments have routine maintenance that must be performed at regular intervals. For these instruments, the laboratory has set up a schedule for routine maintenance. This routine maintenance is either documented in an instrument maintenance logbook or the instrument runlog. An example of a routine maintenance schedule is found in Appendix O-1. For instruments that do not have a set schedule for routine maintenance, analysts use their experience and judgment to determine when routine maintenance is necessary.

8.3.4 The analyst involved in the maintenance must document the date, operator initials, and what maintenance was performed.

8.3.5 Non-routine or unexpected maintenance is sometimes required. In these cases, documentation is recorded in a maintenance runlog specific to non-routine maintenance. Typically these forms require a detailed description of what occurred and what maintenance was required along with the date and operator initials.

8.3.6 Any service call regarding instrumentation and equipment failures must be recorded and all documentation must be retained in the maintenance logbook or instrument runlog. When necessary, a Track-IT! work order must be completed and forwarded to the Quality Group and Project Managers.

8.4 DAILY METROLOGY CHECKS

8.4.1 On a daily basis, the walk-in cooler, all refrigerators, freezers, ovens, incubators, balances, IR Temperature Guns, and the Ultra Pure Deionized Water (UPDI) system are checked to ensure they are within specifications.

8.4.2 Documentation of these checks are completed in the daily metrology checks logbook, refer to Appendix P-1 for an example. The metrology checks are done each day the Analytical Laboratory is open.

8.4.3 Any time equipment is found to be out of specifications, corrective action must be taken and documented on the metrology form. Minor corrective actions may include adjustment of the temperature or re-calibration of a balance. If this corrective action is sufficient to correct the problem, the equipment may continue to be used. However, if there is a major equipment failure or minor adjustments do not correct the problem, the equipment must be removed from service and a Track-IT! work order must be completed.

8.4.4 The walk-in cooler and all refrigerators have acceptance limits of 2-4^{o}C. Corrective action must be taken if any are outside of these specifications.

8.4.5 Freezer temperature acceptance limits are less than negative 10^{o}C. Corrective action must be taken if any are outside of these specifications.

8.4.6 The temperature recorded by the IR Temperature Gun is checked daily in the walk-in cooler to verify accuracy. The purpose of this check is to ensure the temperature recorded by the IR gun is not drifting.

8.4.7 The Analytical Laboratory currently has two incubators in use and acceptance criteria vary between the two; see the metrology check logbook.

8.4.8 Balance acceptance criteria vary from balance type to balance type; see metrology check logbook. Acceptance criteria for each balance is calculated based on the guidelines in NIST Handbook 44. Refer to the SOP METROLOGY1 for a detailed description of limits and procedures.

8.4.9 The resistivity of the UPDI water system is monitored daily and must be greater than 17 megaohm. If it drops below this level, U.S. filter is contacted to service the system.

8.5 THERMOMETERS AND AUTOPIPETORS

8.5.1 Thermometers used in the Analytical Laboratory are calibrated annually against a NIST certified thermometer. The laboratory Safety Officer is responsible for the calibration and documentation of all thermometer calibrations. Refer to SOP THERMCAL1 for more detail on the thermometer calibration procedure.

8.5.2 The data is recorded and thermometers are labeled with any necessary correction factors. If a thermometer has a correction factor greater than 2^{o}C it is removed from service.

8.5.3 The IR Temperature Gun is calibrated biannually either by an outside or in-house source. Records of this calibration are kept by the Quality Group.

8.5.4 Digital pipettors and set volume pipettors are calibrated quarterly; this includes all Finnpipette and Eppendorf pipettors used in the Analytical Laboratory. Aliquots of UPDI water are weighed on an analytical balance. Acceptance criteria for the pipetters are 98-102% of the true value. Pipettors that do not meet this criterion are removed from use, then repaired and recalibrated or discarded.

8.5.5 All volumetric dispensers requiring a precise amount for method analysis are also calibrated quarterly.

8.5.6 Documentation of each calibration is recorded in the Pipette Calibration Log.

8.5.7 The Quality Group retains all certificates or documentation that is provided with the purchase of a pipettor.

8.6 BALANCES AND WEIGHT SETS

8.6.1 The Analytical Laboratory uses a NIST calibrated weight set for checking the analytical balances. This weight set is calibrated by an outside source on an annual basis.

8.6.2 The Analytical Laboratory has 4 four-place analytical balances, 1 five-place analytical balance, and 3 top loading balances. Each of these is checked and calibrated at varying levels depending on the use of the balance.

8.6.3 Anytime an analytical or top loading balance falls outside of acceptance limits, it is recalibrated and rechecked. If the balance check is acceptable after recalibration, it may continue to be used. If not, the balance must be taken out of service until an outside vender is able to recalibrate it. Documentation that the balance was calibrated is done in the comment section of the metrology logbook.

8.6.4 All balances used by the Analytical Laboratory are calibrated by an outside source annually or more frequently if needed. The Quality Group files the documentation of these calibrations.

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9.0 SUMMARY OF CHAPTER 9: ANALYTICAL METHODS

9.0.1 Chapter 9 provides an overview of analytical methods used in the laboratory.

9.1 METHOD SELECTION

9.1.1 It is a requirement that the analytical method be referenced on the analytical report. This is generally based on what is input at log-in; however, this may be modified as necessary.

9.1.2 The laboratory uses a wide variety of methods from sources such as ASTM, US EPA, NIOSH, OSHA, and Standard Methods. In some cases, the analyst must develop a method.

9.1.3 There are a number of rules that guide method selection.

9.1.4 For industrial hygiene samples a variety of methods are available. Most of the choices; however, are restricted to NIOSH or OSHA methods. There can be two or more methods for analyzing the same parameter.

For example, silica in air may be analyzed by x-ray diffraction (XRD) or by Fourier transform infrared (FTIR). Both methods are acceptable.

In this case, the laboratory analyzes quarterly proficiency samples to maintain accreditation. AIHA requires that the laboratory indicate which method was used for the testing of the PT samples. The laboratory is only accredited for the one method: XRD. Samples may not be analyzed by FTIR because the lab is not accredited by that method.

9.1.5 The laboratory is regularly audited by AIHA and NVLAP regarding its industrial hygiene methods. If the laboratory wishes to change methods, these agencies must be informed and PT samples analyzed by the new method.

9.1.6 In the case of environmental methods, the laboratory is similarly certified for certain methods. It is a bit more complicated because there are three distinct programs of oversight: SDWA, CWA, and RCRA.

9.1.7 The distinction is based on the sample matrix. The SDWA (Safe Drinking Water Act) includes only potable water. The CWA (Clean Water Act) refers to wastewater. This is commonly generated by plant discharge or municipal discharge waste streams. The RCRA (Resource Conservation and Recovery Act) refers to ground water and soil.

9.1.8 It is sometimes difficult to characterize what type of sample one has in order to use the appropriate method. The client is ultimately responsible for defining what testing is required and under what program. The problem is that many clients do not know what they need. The project manager must often do some detective work to determine what the data will be used for. This is the key. The data eventually is used by a regulatory authority higher up the food chain. Knowing what regulatory authority this is and under what program within the agency will often help illuminate the situation.

9.1.9 There are distinctly separate approved methodologies for each program. The SDWA and CWA generally use what is commonly referred to as "EPA" methods. These are recognized by the numbering sequence. These methods use a 3 digit number left of the decimal followed by 0 to 2 digits to the right of the decimal.

Some examples include EPA 160.2, EPA 200.7, EPA 200.15, and EPA 625

9.1.10 In addition to the EPA methods above, another common source is Standard Methods for the Examination of Waters and Waste Waters. The format for standard methods is a little different. It is common to use 4 digits plus a series of letters. Standard methods are referred to using the "SM" distinction.

Some examples include SM2340 B, SM3500-Cu B, and SM4500-CN^-

9.1.11 In addition to EPA methods and Standard Methods, the SDWA and CWA may approve any other variety of methods including those from the US Geological Survey, the Office of Solid Waste (SW-846), or ASTM.

9.1.12 A complete listing of all approved methods for a given test and program for SDWA and CWA may be found in the Code of Federal Regulations (40 CFR). The most current version is available on the corporate network in a searchable database. Please see the Quality Group for instructions on accessing this information. It is important that one consult the most current version as this changes regularly as methods are added and updated. Only methods approved in the Code of Federal Regulations can be used for the given test. Use of a substitute method is a violation of such acts and is punishable by law. It is possible to get formal approval to use an alternative test procedure. This is known as an "ATP". This must be formally granted by the US EPA.

9.1.13 The RCRA program generally uses methods developed by the US EPA Office of Solid Waste. These are distinguished by "SW-846." These usually carry a 4 digit number and a letter suffix to denote revision. The initial method would have no suffix; revision 1 would have the suffix A, revision 2 the suffix B, etc.

Some examples include US EPA SW-846 1311, US EPA SW-846 6010B, US EPA SW-846 8270C, and US EPA SW-846 1010.

9.1.14 It is important to remember that the designation "solid waste" does not infer that these methods are only for soils. This is a common source of confusion. When analyzing groundwater one should reference the "EPA SW-846" series of methods and not the "EPA" series described in 9.1.9. The exception is when no equivalent SW-846 method exists.

9.1.15 The SW-846 methods are referenced for a wide variety of testing. A good rule of thumb is that if a sample is not wastewater or drinking water, then it uses the SW-846 methods. The Analytical Laboratory does more RCRA work than CWA or SDWA type work. The laboratory is certified for specific parameters under all three programs.

9.1.16 With the RCRA program, method selection is slightly more flexible than with CWA or SDWA. The RCRA program accepts "any reasonable method". This generally refers to published methods. In other words, one can use EPA series methods, ASTM methods, or standard methods where appropriate. The use of alternative methods should be approved by the agency using the data.

9.1.17 When selecting methods for projects that fall outside the jurisdiction of the US EPA, NVLAP, or AIHA, one should use the method that provides the best scientific data. This selection is based on experience of the laboratory personnel.

9.1.18 In some cases, a client has a specific method to be used. This may be an ASTM method or it may be an internally developed method (i.e. developed by the client). In this case, document the methodology used on the report. One may refer to the client method as such.

9.1.19 In some cases, the Analytical Laboratory must develop a method for use on a client sample. In this case, one must document each step in the process and provide it on an analytical report to the client. If there is concern about property rights of the method, then obtain a non-disclosure agreement from the client. Disclosure of the methodology must be provided to minimize legal liability to Braun Intertec Corporation. The Analytical Laboratory must describe the methodology either by reference to an accepted method or by a written description of the method.

9.2 METHOD VALIDATION

9.2.1 Before using a method, one must first demonstrate that it is fit for use. In the case of standardized methods, one must demonstrate that the procedure employed at

Braun Intertec Corporation by this laboratory meets acceptable performance standards.

9.2.2 An Initial Demonstration of Capability (IDC) study is performed to validate the laboratory procedure. This is similar to what is done by each analyst to demonstrate capability in Chapter 3.

9.2.3 In the case of non-standardized methods (those developed by the lab), a similar validation must be performed. At a minimum, an IDC must be performed to demonstrate capability. Additional steps are often taken to validate the method in addition to an IDC study. In this case, a set of experimental tests is derived. The scientist provides a summary of the experiment to the Quality Group. Before proceeding, the Quality Group must approve the method. Results of the tests are documented in the project file and provided to the client as part of the report.

9.3 CALIBRATION

9.3.1 Analytical chemistry is a comparative science. A known property is compared to an unknown property.

9.3.2 For the majority of tests in the laboratory, a rather standard calibration is performed. Usually this involves the analysis of known standards and the plotting of a calibration curve. The curve is a plot of instrument signal versus known concentration. Unknown samples are run against the curve to determine their concentrations.

9.3.3 There are a variety of curve fit algorithms that can be employed. Details of each procedure are described in individual standard operating procedures.

9.3.4 The most conventional curve fit is the linear calibration fit. In the absence of method guidance or instrument manufacturers recommendations, the linear curve fit is normally employed.

The linear curve fit is characterized by the formula:

y = mx + b, where y = the raw response, x = the concentration, m = the slope of the line, and b = the y-axis intercept.

In the absence of method criteria, a minimum of a 4-point curve is analyzed where one of the points can be the calibration blank. A correlation coefficient is calculated. In the absence of method criteria, the minimum acceptance limit for the correlation coefficient is 0.995. It is sometimes valuable to force the curve fit through the origin. In this case, "b" is set to zero.

Microsoft Excel® is the preferred tool for calculating the curve; however, a scientific calculator may be used as long as it has been validated. In cases of software packages used by specific instruments, the software package is used to calculate the curve. The LIMS may also be used to calculate the curve.

9.3.5 There are a number of instances where a non-linear curve fit is used due to limitations of the analytical technique. There are numerous techniques that simply do not have a linear response. In these cases, the Analytical Laboratory defers to method guidelines or instrument manufacturer's recommendations. Each case is defined in the individual standard operating procedure.

9.3.6 Exceptions to the linear curve fits described in 9.3.4 may include, but are not limited to: quadratic, average response factor, cubic, rational, second order, and third order.

When employing a non-linear curve fit, a minimum of 6 points must be used. One of the points may be the calibration blank (if the technique normally employs a calibration blank).

9.3.7 For organic chemistry, a minimum of 5 points is required to characterize a linear curve fit.

9.3.8 For inorganic chemistry, generally, a minimum of 4 points is used to characterize the linear curve fit (one of the points may be the calibration blank).

9.3.9 For ICP-OES and ICP-MS, a minimum of 2 points is used to characterize the linear curve fit (one of the points must be the calibration blank). Some regulatory requirements for ICP-OES or ICP-MS may require the use of additional points.

9.3.10 A summary of curve fit criteria for most analyses is presented in Appendix F-1.

9.3.11 All calibration curves must be validated by a second source. Refer to Chapter 2 for an explanation of the second source.

9.4 METHOD OF STANDARD ADDITIONS

9.4.1 The method of standard additions is a technique employed when the matrix of the sample cannot be reasonably matched by independent calibration standards.

9.4.2 In this case, known amounts of the analyte of interest are spiked into an aliquot of sample. Ideally, spike levels of 50%, 100%, and 150% of the concentration in the actual sample are used. In order to estimate the concentration in the sample, one

generally runs the sample against calibration standards on a standard curve first as a screening.

9.4.3 A calibration curve is plotted using the spiked sample aliquots. In effect, one creates a calibration curve in the actual matrix of the sample.

9.4.4 The unknown sample is plotted against this curve to obtain its concentration.

9.4.5 If one has a number of samples with a similar matrix, then one curve can be plotted using a representative sample and the remainder of the samples can be plotted against that curve. If matrices vary greatly, then a curve is plotted for each sample matrix.

9.4.6 This technique is employed as a last resort. It is used only in extreme cases where a matrix effect is so great as to prevent standard analysis.

9.4.7 The method of standard additions is known to generally bias results high.

10.0 SUMMARY OF CHAPTER 10: SUBCONTRACTING AND PURCHASING

10.01 Chapter 10 describes the laboratory procedures and policies on the subcontracting of samples, purchasing of supplies, approved vendors, and the review of contracts.

10.1 SELECTION OF SUBCONTRACT LABORATORIES

10.1.1 Braun Intertec uses subcontract laboratories for analyses that are not routinely performed at the Analytical Laboratory. Subcontract laboratories are also used due to certification restrictions, instrumentation failure, capacity concerns, or method development.

10.1.2 Braun Intertec is ultimately responsible for the work performed by a subcontracting laboratory. For this reason, Braun Intertec Analytical Laboratory must approve a subcontracting laboratory prior to the subcontracting of sample analyses.

10.1.3 The Analytical Laboratory reviews the subcontracting laboratories certification and/or accreditation status, current performance testing sample results, a current quality assurance manual, and all applicable standard operating procedures are requested from the subcontracting laboratory.

10.1.4 Subcontracting laboratories must meet the Braun Intertec Analytical Laboratory's quality control and quality assurance policies and procedures. In order to be approved by the Quality Group, the subcontract laboratory must be currently certified or accredited in the specific analysis and regulated program when applicable. The subcontracting laboratory is responsible for notifying Braun Intertec Analytical Laboratory of any changes in certification and/or accreditation status.

10.1.5 The Quality Group reviews the annual quality assurance documentation from the subcontracting laboratory for compatibility with Braun Intertec Analytical Laboratory and either approves or un-approves the subcontracting laboratory.

10.1.6 The Quality Group maintains the subcontracting files for reference, along with a list of approved subcontracting laboratories. This information is available to the Client Services Group and the Project Managers to ensure that subcontracted samples are sent to an approved laboratory.

10.1.7 A subcontracting laboratory may be removed from the approved list at any time. If there are any doubts to the quality or integrity of the data or service from the subcontracting laboratory, the Quality Group has the discretion to remove the subcontracting laboratory from the list.

10.1.8 In the event a subcontractor must be used prior to receiving approval from the Quality Group, either by client request or an emergency need, it is the responsibility of the Quality Group to verify adequacy of proficiency testing scores and certifications. The Quality Group will immediately request full quality control and quality assurance documentation from the subcontractor.

10.2 SUBCONTRACTING PROCEDURE

10.2.1 Braun Intertec Laboratory must notify the client of all samples that are being tested by a subcontracting laboratory. If possible, the laboratory will gain written approval from the client for the subcontracting of their samples.

10.2.2 Samples that are received by the laboratory that must be subcontracted are stored and packed in such a manner to maintain sample integrity. Depending on the location of the subcontracting laboratory, the samples are either shipped following the procedure outlined in SOP SHIPPING1 or are transported by courier to the subcontracting laboratory.

10.2.3 The LIMS generates a Sub-contract Work Order (Appendix Q-1) that serves as a CoC and accompanies all sub-contract samples being shipped out. The Client Services Group updates the status of the samples in the LIMS system to indicate that they have been subcontracted. The Client Services Group will note in the LIMS which subcontract laboratory the samples have been sent to.

10.2.4 Once Braun Intertec receives the data back from the subcontracting laboratory, that data is entered into the LIMS including the subcontracting laboratory's method detection limits, reporting limits, and all associated quality control analyzed with the sample(s).

10.2.5 The final report will generate a header stating which subcontract laboratory the samples were analyzed at and will include their certification or accreditation number if applicable. All data that was generated by a subcontracting laboratory will fall under this header on the final report.

10.2.6 The subcontracted data is archived in the project file. See sections 6.8 of this manual for a detailed explanation of archiving.

10.3 PURCHASING

10.3.1 Most purchasing by the Braun Intertec Analytical Laboratory is done with the creation of purchase orders. A purchase order number is generated and a purchase order form is completed (see Appendix Q-3) by the analyst. The purchase order form should contain the vendor's contact information, item quantity, catalog numbers, item description, purchase price, and the date the order will be placed.

10.3.2 The analyst, or requester, must sign and date the purchase order form to verify and confirm what has been ordered. For consumables that are critical to the analysis, the analyst ordering the item must make a technical review to ensure the item is acceptable for the intended analysis.

10.3.3 Orders are placed either by telephone, fax, or on-line via the internet. Purchase order numbers must be supplied to the vendor.

10.3.4 When the item arrives at the Analytical Laboratory, the purchasing analyst is responsible for verifying the contents of the package and comparing the supply with the original purchase order. If there is a problem with the purchase, incorrect supply, or damaged item, either the analyst or the purchase coordinator contacts the supplier and returns the item.

10.3.5 If everything is received as acceptable, the purchase order is signed and dated. The purchase order form is then given to the laboratory's purchase coordinator for record keeping.

10.3.6 If the product received is incorrect or not acceptable, this is noted on the form and in the purchasing order spreadsheet.

10.3.7 The purchasing coordinator records the purchasing information on the purchase order spreadsheet. The spreadsheet will contain the date, PO number, vendor name, order amount, tax amount, anticipated total, invoice date, invoice total, date to finance and any comments about the order. This information is used later as part of the evaluation of suppliers.

10.3.8 The Quality Group maintains certificates of analysis for consumables and supplies that may affect the quality of testing. Certificates of analysis describe all the critical information regarding the standard, chemical, or supply. Certificates of analysis for standards would have, at a minimum, specific information regarding what is in the standard, the certified values, lot number, and expiration date of that standard.

10.3.9 When certificates are not available, the laboratory assures that the supply is of the necessary quality by testing the product prior to use. The Quality Group maintains all records of such testing. For example, bottle blanks are analyzed on all bottles that are not purchased as pre-cleaned. These are done per lot number or at least quarterly to ensure that the bottles are not a source of contamination.

10.3.10 Once the supply is deemed acceptable, and if applicable, the analyst enters the item into the LIMS and a traceability number is generated for that supply. A detailed description of standard and chemical traceability is outlined in section 7.9 of this manual.

10.3.11 For standards, chemicals, and reagents, the traceability number is written on the supply and any accompanying paperwork. The paperwork is forwarded to the Quality Group and kept for reference.

10.3.12 Once consumables are received and deemed acceptable, they are stored appropriately as stated by the manufacturer to reduce the possibility of contamination and/or degradation.

10.4 SELECTION OF APPROVED VENDORS

10.4.1 Braun Intertec Corporation evaluates its vendors based on several criteria including quality, service, industry reputation, and price. Vendors must be approved by the Quality Group.

10.4.2 The Quality Group initially approved our vendors through a "grandfather" clause effective June 1, 2008. After this point, all vendors must go through a vendor evaluation prior to being approved. All criteria listed in 10.4.1 is reviewed for each vendor. If the vendor is deemed acceptable, the Quality Group will add their name and contact information to the approved vendor list.

10.4.3 The approved list of vendors is maintained by the Quality Group. See Appendix Q-2 for an example of the list. This list is updated as needed with an effective date assigned at the time of updating. Any time a new vendor is added to the list documentation will be included on the next Quarterly Quality Report.

10.4.4 At least annually the list is reviewed and evaluated by the Quality Group. Using the purchasing order spreadsheet, the Quality Group reviews all comments made throughout the year in regards to supplies ordered. If there is an indication that the quality or service has been compromised the Quality Group may remove the vendor from the list.

10.4.5 A vendor may be removed from the approved list at any time. If there are any doubts to the quality or integrity of the product provided by the vendor, the Quality Group has the discretion to remove the vendor immediately.

10.4.6 Records of the purchasing order spreadsheet are retained by the laboratory.

10.4.7 The overall number of vendors is kept to a minimum so as to minimize the amount of variability in our overall processes.

10.4.8 In the event a new vendor must be used prior to receiving approval from the Quality Group, either by client request or an emergency need, it is the responsibility of the Quality Group to review the vendor's qualifications when possible after the fact. If the vendor is approved during this process it is simply added to the Approved Vendor List. If the vendor is not approved and work has been completed using the vendor's product then a corrective action must be initiated. If the reason the vendor was not approved is a quality issue that could have impact on data, then the corrective action process must be initiated to take steps to resolve any issues that may have resulted from the use of the product.

10.5 REVIEW OF CONTRACTS

10.5.1 In most cases, the laboratory chain of custody acts as the legal contract between the client and the laboratory.

10.5.2 All contracts received by the analytical laboratory must be properly read and reviewed by the company principal paralegal.

10.5.3 Requirements for testing must be clearly defined and documented.

10.5.4 The laboratory must ensure it has the capability and resources to meet the requirements for testing.

10.5.5 Payment terms and methods of determining prices will be clearly defined. The entities responsible for the agreement and/or payment shall be identified.

10.5.6 Necessary time will be taken to properly read and review client-provided contracts. The laboratory will not be pressured into signing agreements, even if we have to turn down the project. In particular, any client proposed indemnity provisions must be reviewed by the principal paralegal.

10.5.7 Prepayment of fees for services shall be considered for small or speculative projects, projects that involve significant start-up costs, and clients with a poor payment history or a poor credit report. In addition, the payment of fees can be cited as a condition for the delivery or release of reports.

Appendix A-1

Abbreviations and Terms

Revision 3.1
Effective 07/31/08

Analytical Definitions – Terms and Abbreviations Used by the Analytical Laboratory

Abbreviations

AA	Atomic Absorption
AHERA	Asbestos Hazard Emergency Response Act
AIHA	American Industrial Hygiene Association
ASE	Accelerated Solvent Extractor
ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
BFB	4-Bromofluorobenzene
BIC	Braun Intertec Corporation
BNA	Base Neutral and Acids
BKG	Background Sample
BLK	Instrument Blank
BS	Blank Spike – Same as Laboratory Control Sample (LCS)
BSD	Blank Spike Duplicate – Same as Laboratory Control Sample (LCSD)
BTEX	Benzene, Toluene, Ethyl Benzene and Total Xylenes
CA	Corrective Action
CAL	Calibration
CAP	Corrective Action Process
CEO	Chief Executive Officer
COC	Chain of Custody
CCB	Continuing Calibration Blank
CCC	Calibration Check Compounds
CCV	Continuing Calibration Verification
CDC	Continuing Demonstration of Capability
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CRDL	Contract Required Detection Limit
CRM	Certified Reference Material
CV	Curriculum Vitae
CVAA	Cold Vapor Atomic Absorption

CWA	Federal Clean Water Act
DFTPP	Decafluorotriphenylphosphine
DI	De-ionized
DRO	Diesel Range Organics
DRE	Diesel Range Extractables
DUP	Duplicate Sample
ECD	Electron Capture Detector
EDD	Electronic Data Deliverables
ELPAT	Environmental Lead Proficiency Analytical Testing
e-mail	Electronic Mail
EMPAT	Environmental Microbiology Proficiency Analytical Testing
EPA	Environmental Protection Agency
FIA	Flow Injection Autoanalyzer
FID	Flame Ionization Detector
FTIR	Fourier Transform Infrared Spectrophotometer
GC	Gas Chromatograph
GC/MS	Gas Chromatograph/Mass Spectrometry
GRO	Gasoline Range Organics
GRE	Gasoline Range Extractables
HPLC	High Pressure Liquid Chromatography
IC	Ion Chromatography
ICAL	Initial Calibration
ICAP/AES	Inductive Coupled Argon Plasma/Atomic Emission Spectrometry
ICB	Initial Calibration Blank
ICP/MS	Inductive Coupled Plasma/Mass Spectrometry
ICSA	Interference Check Sample A
ICSAB	Interference Check Sample AB
ICV	Initial Calibration Verification
IDC	Initial Demonstration of Capability
IEC	Inter-element Correction Factor
IPC	Instrument Performance Check – Synonymous with CCV
IS	Internal Standard
ISO	International Standards Organization

LIMS	Laboratory Information Management System –Promium's Element ®
LCL	Lower Control Limit
LC/MS	Liquid Chromatograph/Mass Spectrometry
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LFB	Laboratory Fortified Blank – Synonymous with LCS
LFM	Laboratory Fortified Matrix – Synonymous with MS
LOD	Limit of Detection
LOQ	Limit of Quantitation
LRB	Laboratory Reagent Blank – Synonymous with MB
MB	Method Blank
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MDL	Method Detection Limit
MLA	Minnesota Laboratory Association
MPCA	Minnesota Pollution Control Agency
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NC	Non-Conformance
NELAP	National Environmental Laboratory Accreditation Program
NIOSH	National Institute of Occupational Safety and Health
NIST	National Institute for Standards and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbons
PAT	Proficiency Analytical Testing
PBB	Polybrominated Biphenyl
PBDE	Polybrominated Diphenyl Ether
PCB	Polychlorinated Biphenyl
PCM	Phase Contrast Microscope
Pest	Pesticide
PID	Photo-Ionization Detector
PLM	Polarized Light Microscope

PM	Project Manager
PVOC	Petroleum Volatile Organic Compounds
PT	Performance Test Sample
QA	Quality Assurance
QAM	Quality Assurance Manual
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCS	Quality Control Sample – Synonymous with ICV
QQR	Quarterly Quality Report
r	Correlation Coefficient
r^2	Coefficient of Determination
RCRA	Resource Conservation and Recovery Act
RL	Reporting Limit
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
s	Standard deviation of a sample of a population
SDWA	Federal Safe Drinking Water Act
SEM	Scanning Electron Microscope
SOP	Standard Operating Procedure
SPCC	System Performance Check Compounds
SPLP	Synthetic Precipitation Leachate Procedure
SPK	Spike Amount Added
SRD	Serial Dilution
SRM	Standard Reference Material
STD	Standard
TCLP	Toxic Characteristic Leachate Procedure
TDS	Total Dissolved Solids
TEM	Transmission Electron Microscope
THC	Total Hydrocarbons
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbon
TS	Total Solids
TSS	Total Suspended Solids

TV	True Value
TVS	Total Volatile Solids
UCL	Upper Control Limit
UPDI	Ultra-Pure De-Ionized
US-EPA	United States Environmental Protection Agency
UV-VIS	Ultra-Violet Visible Spectrophotometer
VOC	Volatile Organic Compounds
XRD	X-Ray Diffraction

Terms

Accreditation	The process by which an agency or organization evaluates and recognizes that an organization is competent to carry out specific tasks or specific types of testing.
Audit	A systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives. (EPA QA/G-5).
Batch	A maximum of 20 samples of a similar matrix prepared under the same conditions and at the same time.
Bias	The systematic or persistent distortion of a measurement process, which causes errors in one direction. (EPA QA/G-5).
Blank Sample	The LIMS system uses BS and BSD as opposed to LCS and LCSD for designating laboratory control samples. Within the laboratory the terms BS and BSD are used interchangeably with LCS and LCSD.
Blank Sample Duplicate	The LIMS system uses BS and BSD as opposed to LCS and LCSD for designating laboratory control samples. Within the laboratory the terms BS and BSD are used interchangeably with LCS and LCSD.
Blind Sample	This refers to a PT sample that is unknown to the analyst but known to the Quality Group. It is used to monitor laboratory performance.
Calibration	A comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies and to report or eliminate those inaccuracies by adjustments. (EPA QA/G-5). Measurements that establish the relationship between values indicated by a measuring system and the corresponding known values, standards.
Calibration Check Compounds	Those compounds specified by a method to be used when evaluating QC performance of the CCV, LCS, LCSD, MS, and MSD.
Calibration Curve	A graphical relationship between the known values for a series of calibration standards and instrument responses.
Calibration Standard	A standard of known value used to establish a calibration graph. The calibration standard should be NIST traceable when possible.
Certification	The process of testing and evaluating against specifications designed to document, verify and recognize the competence of a person, organization, or other entity to perform a function or service, usually for a specified time. (EPA QA/G-5).
Chain of Custody	An unbroken trail of accountability that ensures the physical security of samples, data, and records. (EPA QA/G-5). This is the process by which the client signs over possession of the sample to the laboratory as well as the description of the sample and the analytical request.
Confirmation	Verification of the presence of a component through the use of an analytical technique based on a different scientific principle from the original method. This may include the use of a second GC column, an alternative wavelength, or alternative detectors. In some cases it may involve using an entirely different methodology.
Coefficient of Determination	The square of the correlation coefficient. Used to evaluate the "goodness of fit" of a polynomial equation. A value of 1.00 indicates a perfect fit.

Correlation Coefficient	A measure of the degree of correlation of the regression line to the data. Generally used to evaluate the linearity of the least squares linear regression. A value of 1.00 indicates a perfect fit.
Continuing Calibration Blank	This blank is analyzed to monitor instrument/system stability and/or freedom from contamination on an ongoing basis. The CCB is distinctly used to monitor the analytical run and is not used to monitor the sample preparation procedure.
Continuing Calibration Verification	This is a check standard used to monitor instrument/system stability on an ongoing basis. It is distinctly used to monitor the analytical run and is not used to monitor the sample preparation procedure. It must be analyzed at or below the mid point of the calibration curve. The CCV may be one of the calibration standards or be prepared from the same stock as the calibration standards. Also, the ICV solution may be substituted for the CCV solution; however, the analytical run must be labeled to distinctly indicate the CCV. This is synonymous with IPC.
Control Chart	A plot of a QC measurement (like %Recovery of an LCS) versus the analytical event (like the batch), represented in a chronological order. The purpose of this chart is to visually represent performance over time in order to spot trends and help develop control limits.
Control Limits	Control limits are the acceptance criteria that QC samples are compared against when evaluating in or out of control situations.
Double Blind Sample	This refers to a PT sample that is unknown to the analyst or the Quality Group. It is normally used to maintain certification or accreditation.
Duplicate samples	Two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method, including sampling and analysis. (EPA QA/G-5). Duplicates take two forms. A field duplicate is used to assess the sampling process and homogeneity of the site. Two samples are collected and sent to the laboratory. They are prepared and analyzed independently and compared once the testing is completed. A laboratory duplicate is used to assess the homogeneity of a single sample as received. Two aliquots of the same sample are processed and analyzed independently. The results are compared. This procedure is similar to what is accomplished with the MSD. In order to evaluate the analytical procedure, the LCSD is used.
Field blank	A blank used to provide information about contaminants that may be introduced during sample collection, storage, and transport.
Holding Times	The required period of time in which to prepare or analyze the sample (depending on the method) from when it is collected.
Initial Demonstration Capability	The IDC is the process used to show that a new procedure is valid for use or that a new analyst is proficient in the technique.
Initial Calibration Blank	This blank is analyzed to verify instrument/system stability and/or freedom from contamination immediately following the calibration. The ICB is distinctly used to monitor the analytical run and is not used to monitor the sample preparation procedure.

Initial Calibration Verification	This is a check standard used to verify the calibration curve. It is distinctly used to monitor the analytical run and is not used to monitor the sample preparation procedure. It must be analyzed at or below the mid point of the calibration curve. The ICV is prepared from a stock that is a second source from that of the stock that was used to prepare the calibration standards. This is synonymous with the QCS (quality control sample) referenced in some methods.
Instrument Blank	A clean matrix processed through the instrumental steps of the measurement process; used to determine instrument contamination. Does not include the sample preparation procedure.
Instrument maintenance log	A chronological record of preventive and non-routine maintenance performed on an analytical instrument.
Interference Check Standard	A standard solution used to monitor analyte response in the presence of possible spectral interferences from other analytes present in samples.
Internal Standard	A known amount of standard added to a sample extract and carried through the analysis process as a reference for evaluation and to apply correction factors to minimize variability.
Laboratory Control Sample	The purpose of the laboratory control sample is to monitor the accuracy and consistency of the preparation procedure. The LCS is prepared and analyzed in the exact same way as a client sample. The LCS is prepared to closely approximate the sample matrix. In the case of aqueous samples, UPDI water is spiked with the same spiking solution used for the MS. In the case of solid samples, certified reference materials are used where available. This is the case with metals parameters and some of the wet chemistry parameters. For organic parameters, clean sand is spiked with the same spiking solution as the MS. Since the laboratory control sample is processed through both the preparation step and the analysis step, results of this measurement are often used to determine uncertainty in the method.
Laboratory Control Sample Duplicate	The purpose of the laboratory control sample duplicate is to measure the precision of the preparation procedure. The LCSD is an exact duplicate of the LCS. The LCSD is prepared by taking a second aliquot of the material used for the LCS.
Limit of Detection (LOD)	The lowest concentration level that can be determined to be statistically different from a blank (99% confidence). The limits of detection are matrix, method, and analyte specific.
Method Blank	The purpose of the Method Blank is to monitor the sample preparation procedure in terms of possible contamination. The Method Blank is a clean matrix processed through the sample preparation procedure and analysis procedure exactly like the sample.
Matrix Spike	The purpose of the Matrix Spike is to monitor the matrix effects of the sample spiked. There are two uses for this information. Routine analysis of matrix spikes provides a measure of how well the procedure performs on the wide variety of matrices encountered in the laboratory. For a specific sample delivery group, the matrix spike is used to evaluate particular matrix bias for that sample matrix. Matrix spiked samples are samples fortified with the target analyte and subjected to the sample preparation procedure as well as the sample analysis procedure.

Matrix Spike Duplicate	The purpose of the matrix spike duplicate is to assess the homogeneity of the sample matrix so duped and spiked. This is very similar to the use of the sample duplicate. The advantage of using the MSD over the sample duplicate is that you will always have a value to compare. In other words, if one uses a sample duplicate there is a chance the results will be non-detect. In that case, the resultant precision data is meaningless. The MSD will provide precision data on the matrix even if the sample is of low concentration.
Outlier	An extreme observation that is shown to have a low probability of belonging to a specified data population.
Proficiency Test Sample	A reference sample used to evaluate the laboratory's ability to perform the identified methodology. This sample is processed through the entire preparation and analytical procedure.
Raw Data	Any original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study.
Selectivity	The capability of a method or instrument to respond to a target substance or constituent in the presence of non-target substances.
Surrogates	The purpose of the surrogate is to monitor the efficiency of the sample preparation procedure on a sample-by-sample basis. Compounds used are similar to the analytes of interest in chemical composition, but are not normally expected to be found in samples. These compounds are spiked into the MB, the LCS, the LCSD, the MS, the MSD, the DUP, and samples prior to the sample preparation process.
Temperature Blank	A container of water used to measure the temperature in the sample cooler without contaminating the samples. It travels with the cooler.
Traceability	The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons.
Trip blank	A clean sample, including collection media, that is carried to the sampling site and transported back to the laboratory for analysis without being opened. This blank is analyzed as a regular sample through all steps. The trip blank evaluates the integrity of the sample container, specifically for volatiles analyses.

Laboratory Certifications and Accreditation

Certifying/Accrediting Agency	Categories
American Industrial Hygiene Association	Organic Vapors on Absorbent Tubes and Passive Monitors Metals, Asbestos on Filter Cassettes and Environmental Lead in Dust, Soil and Paint.
National Institute for Standards and Technology	NVLAP - Airborne and Bulk Asbestos
Minnesota Department of Health	Drinking Water Parameters, Wastewater Parameters, RCRA Parameters
Minnesota Department of Agricultural	MDA 1 and MDA 2 Approval
Wisconsin Department of Natural Resources	Drinking Water Parameters, Wastewater Parameters

Certificates are located in Appendix D-1.

Methodology

Braun Intertec Laboratory's standard operating procedures and analytical methods are from sources acceptable to the state or government agencies. Sources include:

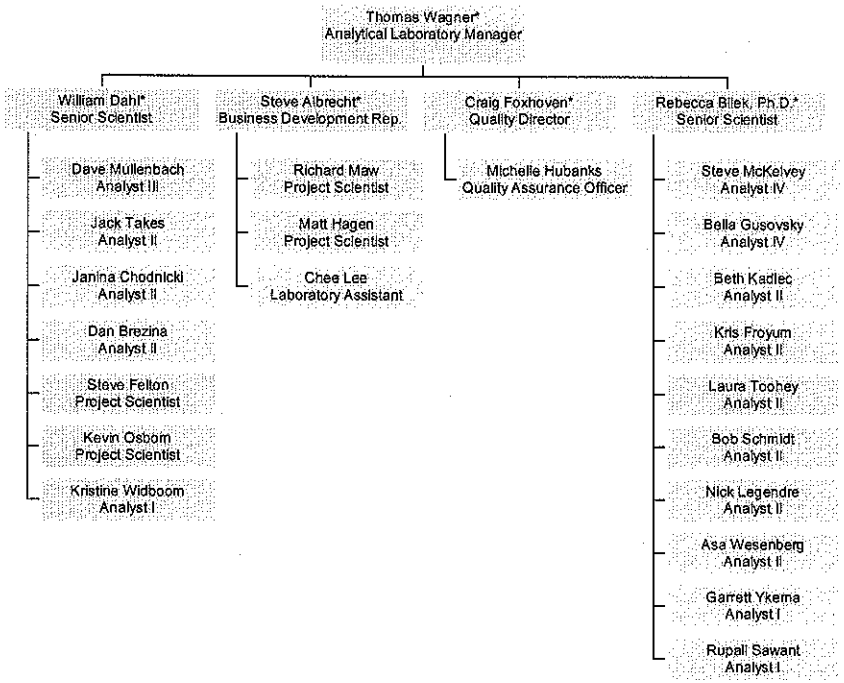
Methods for Chemical Analysis of Water and Waste, EPA-600/4-79-020, Revised March 1983
Methods for Asbestos Analysis, EPA 600/R-93/116 (PLM), EPA 600/4-83-043 (TEM)
Standard Methods for the Examination of Water and Wastewater, 18th and 20th Editions
40 CFR Part 136 - Guidelines Establishing Test Procedures for the Analysis of Pollutants
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, 3rd Edition
Methods for the Determination of Organic Compounds in Drinking Water EPA-600/4-88-039, December 1988
Annual Books of ASTM Standards 11.01 through 11.04
Annual Books of ASTM Standards 10.03
Annual Books of ASTM Standards D5756-95, Asbestos
Official Methods of Analysis AOAC, 15th Edition
Occupational Safety and Health Administration, Analytical Methods Manual 2nd Edition
National Institute for Occupational Safety and Health, Manual of Analytical Methods, 4th Edition
Minnesota Department of Health 465 & 466 Series, 4620 Asbestos
Minnesota Department of Agriculture
Wisconsin Department of Natural Resources
Methods of Respirable Silica NIOSH 7500 ID-142

Appendix B-1

Organizational Charts

Revision 3.1
Effective 07/31/08

Organizational Chart – 03/03/08



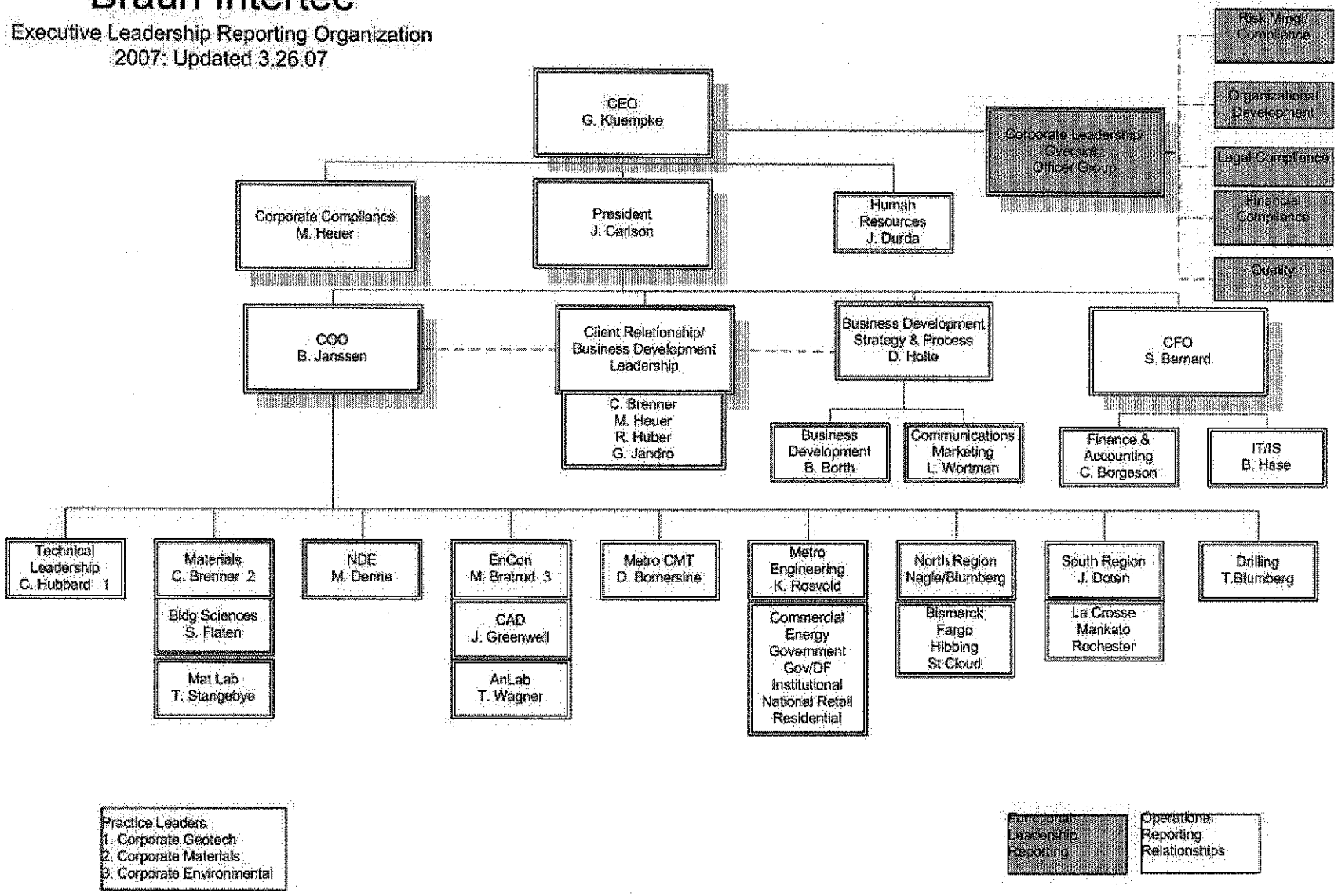
Analytical Laboratory Manager Duties
- Coordinate Laboratory Operations Group
- COO Implementer
- Work with Business Unit Managers
- All Pay Adjustments

* Laboratory Operation Group Duties
- Financial Management
- Business Development
- QA/QC
- All Other Business Management Functions

Supervisor Duties
- Time Sheets
- Expense Sheets
- Facilitate Reviews
- Coordinate Work Flow

Braun Intertec

Executive Leadership Reporting Organization
2007: Updated 3.26.07



Appendix B-2

Assigned Deputies

Revision 3.1
Effective 07/31/08

Primary and Deputy Roles and Responsibilities

Role	Primary Responsibility	Deputy Responsibility
Analytical Laboratory Manager	Thomas Wagner	Steve Albrecht
Business Development Manager	Steve Albrecht	Thomas Wagner
Quality Assurance Director	Craig Foxhoven	Michelle Hubanks
Quality Assurance Officer	Michelle Hubanks	Craig Foxhoven
IHLAP Technical Manager –Organics	Rebecca Bilek	Craig Foxhoven
IHLAP Technical Manager –Inorganics	Dave Mullenbach	William Dahl
IHLAP Technical Manager –Silica	Laura Toohey	Matt Gorrell
IHLAP Technical Manager –Asbestos	Steve Felton	Kevin Osborn
ELLAP Technical Manager	Dave Mullenbach	William Dahl

Appendix C-1

Code of Conduct

Revision 3.1
Effective 07/31/08

BRAUN
INTERTEC

Code of Business Conduct

Braun Intertec Corporation and its affiliates and subsidiaries (Braun Intertec) have been successful in large part by operating with honesty, fairness, and respect for all and by serving its clients with integrity. As such, employees are expected to:

- Meet the standard of care for the service being provided,
- Meet commitments made to internal and external clients, and
- Treat others as they wish to be treated.

Braun Intertec manuals, memoranda, and other materials identify values that are vital to functioning effectively and making positive contributions. Those standards are consolidated in this Code of Business Conduct (Code). Every employee must be familiar with the Code, and each employee of Braun Intertec will periodically be asked to review the Code and sign an agreement to abide by the provisions stated herein. The Board of Directors periodically reviews this Code, and each director signs an agreement to abide by the provisions stated herein.

Compliance with Applicable Laws and Company Policy. Braun Intertec employees are required to familiarize themselves with the laws and regulations that apply to their work areas as well as company policies relating to their jobs. In any instance where laws or policies appear difficult to interpret or apply or where there may appear to be some conflict with other principals, employees are encouraged to contact the company president, corporate compliance officer, or director of human resources for clarification, interpretation or application. It is the company's responsibility to provide training as needed to educate employees so they can properly understand the requirements of this Code.

Certain laws demand the attention of each employee. These include, but are not limited to, the following:

- **Employment Laws** - Braun Intertec and its employees will not discriminate on the basis of race, color, religion, sex, sexual orientation, national origin, age, physical handicap or disability, veteran status, marital status, or status with regard to public assistance.

  Employees will not harass, sexually or otherwise, any co-worker or third party by creating or participating in an offensive work environment or by conditioning employment or a benefit of employment on submission to unacceptable demands.

- **Antitrust Laws** - As a general rule, most forms of pricing agreements or understandings with competitors, as well as various types of price discrimination between competing customers, are unlawful and must be avoided. Employees will comply with Federal and State antitrust laws. Failure to do so may subject the company, as well as the individual employee, to criminal or civil penalties. This is a very complex area and requires that someone with extensive knowledge in the antitrust laws must be consulted if these laws have the potential for enactment.

- **International Laws** - Employees involved with international trade must be aware of the Foreign Corrupt Practices Act (FCPA), as well as the range of export-import controls and customs duties regulations. In short, the FCPA makes it a crime for U.S. companies and individuals to make certain types of payments to foreign government officials. Non-compliance could subject the company or employees to serious fines and criminal penalties.

- **Environmental Laws** - Braun Intertec and its employees will obey applicable Federal, State and local environmental laws. Employees responsible for managing hazardous, toxic, or other substances that may cause a potential risk to our clients, our employees, the public or the environment, must be aware of those applicable laws and comply with them.

Ratified by the Board of Directors of Braun Intertec Corporation on June 24, 2003

- **Health and Safety Laws** - Braun Intertec wishes to provide a safe and healthy work environment for its employees. It is the company's responsibility to provide necessary training and equipment and to follow the guidelines detailed in the Braun Intertec Health and Safety Manual and the applicable health and safety regulations of Occupational Safety and Health Administration (OSHA), Nuclear Regulatory Commission (NRC) and other agency standards.

  It is the responsibility of the employee to perform work activities in a manner that will minimize or eliminate the potential for accidents, injuries or illnesses, will promote a work environment free of substance abuse, and will conform to company policies and programs.

- **Copyright Laws** - Braun Intertec complies with the copyright requirements of computer software. Employees of Braun Intertec are required to understand these requirements and acknowledge that they will not, on any Braun Intertec provided electronic media, illegally use or copy software or permit others to copy from them.

Electronic Media Usage. Information contained on electronic media owned by Braun Intertec is treated the same as printed information. Documents stored on Braun Intertec provided equipment is the confidential property of Braun Intertec and is not the property of the electronic media user. When directed by an officer of the company, those responsible for managing this media can, without notice or cause, review any and all stored files on Braun Intertec-provided electronic media.

Conflicts of Interest. Employees will avoid situations where their loyalties in business activities and assignments are divided between the company's interest and their own. An employee will not use his or her position with the company to create a conflict of interest **or the appearance** of a conflict of interest between the employee's personal interests and the interests of the company. Factors **which may cause** a conflict include: receiving or giving a gift, entertainment, free travel, accommodations or other favors or privileges of more than a limited value from or to someone working for a supplier or client **with the intent** of influencing the outcome of an evaluation or study, a pending purchase or sale, a financial or other interest in any business by the employee or a member of the employee's family; personal discounts, bribes, or "kickbacks." Employees will respect clients' policies and practices regarding avoiding conflicts of interest. If in doubt, direct questions to the corporate compliance officer, director of human resources, or the company president.

Proprietary Information/Intellectual Property. Braun Intertec encourages its employees to explore and develop potential processes and improvements related to the services Braun Intertec provides. So that the company can assist in the protection and preservation of new developments and other potential intellectual property if it chooses, the employee will inform the company president, corporate compliance officer or director of human resources of inventions, discoveries, improvements, or designs conceived or reduced to practice during the period of employment.

Employees will protect and preserve Braun Intertec trademarks, service marks, trade names, copyrights, trade secrets, and other intellectual property. Conversely, employees will respect the intellectual property rights of other companies and persons and not knowingly misappropriate such property. Also, employees will not engage outside consultants, independent contractors, or developers without adequately protecting the proprietary/intellectual rights of the company.

Confidentiality. Employees will not disclose, unless under written consent from a company officer, internal communications about financial data or other confidential business and product development plans. Employees responsible for contract compliance or implementation will fully inform employees performing work under a contract containing a client's confidentiality provision of the existence and terms of the confidentiality provisions.

Communications from News Gathering Media. Because of the high risks involved in the potential mishandling of information, employees questioned by these sources will refrain from answering and refer inquiries to the company president, then to the communications manager or, if needed, another officer.

Ratified by the Board of Directors of Braun Intertec Corporation on June 24, 2003

Political Contributions. Federal law prohibits corporations from making political contributions to Federal elections. Employees are encouraged to participate in political processes in compliance with Federal, State, and local legislation regarding individual political contributions.

Code of Conduct Agreement and Certification. The Board of Directors will review this Code when modifications are made and will review the general compliance with this Code periodically via a report presented to the Board.

The corporate compliance officer will periodically review this Code and the activities of the company and its employees and make a report to the Board of Directors stating general compliance with this Code and the need for changes in company performance.

Members of the Board of Directors and employees will review and sign an agreement to abide by this Code when hired or when modifications are made. Actions contrary to the Code will subject employees to disciplinary measures as outlined in the *Braun Intertec Employee Policy Guide* and as determined by the corporate compliance officer, director of human resources and the department manager. Disciplinary actions may include, but are not limited to the following:

- Loss of wages for the period in which non-compliant activities occurred,
- Termination of employment, or
- Withdrawal of employment offer.

This standard also imposes the responsibility upon directors and employees to **report suspected violations.** Employees will not suffer any adverse actions or career disadvantage for reporting in good faith a suspected violation, by directors, employees or the company, of this Code or any other irregularities. The person reporting the suspected violation will be informed of the outcome of any investigation.

Please direct your questions about the Code or confidential reports of suspected violations in person or in writing (excluding voice or email) to the corporate compliance officer or director of human resources. Each will be responsible for discussing the issue with the other and develop a plan of action to address the reported incident. Anonymously submitted written reports will be investigated to the extent possible. Employees agree to fully cooperate with any investigation of any misconduct.

Ratified by the Board of Directors of Braun Intertec Corporation on June 24, 2003

Appendix C-2

Code of Ethics

Revision 3.1
Effective 07/31/08

BRAUN INTERTEC

Braun Intertec Corporation Analytical Laboratory
Code of Ethics

I, the undersigned, agree to abide by the following code of ethics:

- To understand and follow standard operating procedures pertinent to my job description and to properly document any deviations.
- To understand the needs of our clients and to assert competency only for work in which the laboratory has proper equipment and personnel.
- To oppose and refrain from fraudulent practices in all departments of the laboratory (This includes but is not limited to: (sample receiving, inspection, preparation, analysis and reporting).
- To represent data as accurately as possible and to safeguard reports from misrepresentation and misuse.
- To report any and all fraudulent or suspected fraudulent practices in the laboratory.
- To read, understand and follow the ETHICS standard operating procedure.
- To attend the Braun Intertec Corporation Analytical Laboratory annual ethics training course.

Employee (print name)	Employee (signature)	Date
Witness (print name)	Witness (signature)	Date

Appendix D-1

Certificates

Revision 3.1
Effective 07/31/08

Minnesota Department of Health
Environmental Laboratory Certification Program

In accordance with Minnesota Law and Rules

State Laboratory ID: 027-053-117

Braun Intertec Corporation
11001 Hampshire Avenue South
Minneapolis, MN 55438

has been certified for the examination of environmental samples for fields of testing listed on the laboratory's Scope of Certification.

Continued certification is contingent upon successful on-going compliance with Minnesota Rules 4740.2010 through 4740.2120. Specific methods and analytes certified are cited on the laboratory's Scope of Certification.

This certificate is valid proof of certification only when associated with its accompanying Scope of Certification.

The Scope of Certification and reports of on-site inspections are on file at the Minnesota Department of Health, P.O. Box 64899, St. Paul, Minnesota, 55164-0899. Clients and customers should verify with this agency the laboratory's certification status in Minnesota for particular methods and analytes.

Issued: 7/2/2008

Expires: 4/3/2009

Denise Schumacher

Denise Schumacher, Certification Officer

Certificate Number: 11381AA

UMP006008

Environmental Laboratory Certification Program
Scope of Certification
Certified Minnesota Environmental Laboratories

THIS LISTING OF CERTIFIED FIELDS OF TESTING MUST BE ACCOMPANIED BY CERTIFICATE NUMBER: 11381AA

State Laboratory ID: 027-053-117 **EPA Lab Code: MN00063** **Expiration Date: 4/3/2009**

Issue Date: 7/2/2008

Braun Intertec Corporation
11001 Hampshire Avenue South
Minneapolis, MN 55438

Clean Water Program

Analyte	Method	Matrix
Acidity, as CaCO3	SM 2310 B (4a)-97	Non-Potable Water
Alkalinity, as CaCO3	SM 2320 B-97	Non-Potable Water
Ammonia, as N	EPA 350.1 Rev 2.0	Non-Potable Water
Chemical oxygen demand	EPA 410.4 Rev 2.0	Non-Potable Water
Chloride	SM 4500-Cl^- E-97	Non-Potable Water
Chlorine, Total Residual	SM 4500-Cl G-00	Non-Potable Water
Chromium VI	SM 3500-Cr B (COLOR)-01	Non-Potable Water
Color	SM 2120 B-01	Non-Potable Water
Conductivity	EPA 120.1	Non-Potable Water
Fluoride	SM 4500-F^- C-97	Non-Potable Water
Hardness as CaCO3, Total	SM 2340 B-97	Non-Potable Water
Kjeldahl nitrogen, Total (TKN)	EPA 351.2 Rev 2.0	Non-Potable Water
Nitrate, as N	SM 4500-$NO3^-$ F-00 (calc.)	Non-Potable Water
Nitrate+nitrite, as N	SM 4500-$NO3^-$ F-00	Non-Potable Water
Nitrite, as N	SM 4500-$NO3^-$ F-00	Non-Potable Water
Oil & Grease	EPA 1664A (HEM)	Non-Potable Water
Oil & Grease	EPA 1664A (SGT-HEM)	Non-Potable Water
Organic nitrogen	EPA 351.2 minus EPA 350.1 (calc.) Rev 2.0	Non-Potable Water
Orthophosphate, as P	EPA 365.3	Non-Potable Water
pH	SM 4500-H^+ B-00	Non-Potable Water
Phenolics, Total	EPA 420.4 Rev 1.0	Non-Potable Water
Phosphorus	EPA 365.3	Non-Potable Water
Residue, filterable (TDS)	SM 2540 C-97	Non-Potable Water
Residue, nonfilterable (TSS)	SM 2540 D-97	Non-Potable Water
Residue, settleable	SM 2540 F-97	Non-Potable Water
Residue, Total (TS)	SM 2540 B-97	Non-Potable Water
Residue, volatile (VS)	EPA 160.4	Non-Potable Water
Silica-dissolved	EPA 200.7 Rev 4.4	Non-Potable Water
Temperature, deg. C	SM 2550 B-00	Non-Potable Water
Turbidity	EPA 180.1 Rev 2.0	Non-Potable Water
Aluminum	EPA 200.7 Rev 4.4	Non-Potable Water

Environmental Laboratory Certification Program
Scope of Certification
Certified Minnesota Environmental Laboratories

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Issue Date: 7/2/2008

Braun Intertec Corporation
11001 Hampshire Avenue South
Minneapolis, MN 55438

Clean Water Program

Analyte	Method	Matrix
Aluminum	EPA 200.8 Rev 5.4	Non-Potable Water
Antimony	EPA 200.7 Rev 4.4	Non-Potable Water
Antimony	EPA 200.8 Rev 5.4	Non-Potable Water
Arsenic	EPA 200.7 Rev 4.4	Non-Potable Water
Arsenic	EPA 200.8 Rev 5.4	Non-Potable Water
Barium	EPA 200.7 Rev 4.4	Non-Potable Water
Barium	EPA 200.8 Rev 5.4	Non-Potable Water
Beryllium	EPA 200.7 Rev 4.4	Non-Potable Water
Beryllium	EPA 200.8 Rev 5.4	Non-Potable Water
Boron	EPA 200.7 Rev 4.4	Non-Potable Water
Cadmium	EPA 200.7 Rev 4.4	Non-Potable Water
Cadmium	EPA 200.8 Rev 5.4	Non-Potable Water
Calcium	EPA 200.7 Rev 4.4	Non-Potable Water
Chromium, Total	EPA 200.7 Rev 4.4	Non-Potable Water
Chromium, Total	EPA 200.8 Rev 5.4	Non-Potable Water
Cobalt	EPA 200.7 Rev 4.4	Non-Potable Water
Cobalt	EPA 200.8 Rev 5.4	Non-Potable Water
Copper	EPA 200.7 Rev 4.4	Non-Potable Water
Copper	EPA 200.8 Rev 5.4	Non-Potable Water
Iron	EPA 200.7 Rev 4.4	Non-Potable Water
Lead	EPA 200.7 Rev 4.4	Non-Potable Water
Lead	EPA 200.8 Rev 5.4	Non-Potable Water
Magnesium	EPA 200.7 Rev 4.4	Non-Potable Water
Manganese	EPA 200.7 Rev 4.4	Non-Potable Water
Manganese	EPA 200.8 Rev 5.4	Non-Potable Water
Mercury	EPA 245.1 Rev 3.0	Non-Potable Water
Molybdenum	EPA 200.7 Rev 4.4	Non-Potable Water
Molybdenum	EPA 200.8 Rev 5.4	Non-Potable Water
Nickel	EPA 200.7 Rev 4.4	Non-Potable Water
Nickel	EPA 200.8 Rev 5.4	Non-Potable Water
Potassium	EPA 200.7 Rev 4.4	Non-Potable Water

Environmental Laboratory Certification Program
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Issue Date: 7/2/2008

Braun Intertec Corporation
11001 Hampshire Avenue South
Minneapolis, MN 55438

Clean Water Program

Analyte	Method	Matrix
Selenium	EPA 200.7 Rev 4.4	Non-Potable Water
Selenium	EPA 200.8 Rev 5.4	Non-Potable Water
Silver	EPA 200.7 Rev 4.4	Non-Potable Water
Silver	EPA 200.8 Rev 5.4	Non-Potable Water
Sodium	EPA 200.7 Rev 4.4	Non-Potable Water
Thallium	EPA 200.7 Rev 4.4	Non-Potable Water
Thallium	EPA 200.8 Rev 5.4	Non-Potable Water
Tin	EPA 200.7 Rev 4.4	Non-Potable Water
Vanadium	EPA 200.7 Rev 4.4	Non-Potable Water
Vanadium	EPA 200.8 Rev 5.4	Non-Potable Water
Zinc	EPA 200.7 Rev 4.4	Non-Potable Water
Zinc	EPA 200.8 Rev 5.4	Non-Potable Water
1,2,4-Trichlorobenzene	EPA 625 Appendix A	Non-Potable Water
2,4,6-Trichlorophenol	EPA 625 Appendix A	Non-Potable Water
2,4-Dichlorophenol	EPA 625 Appendix A	Non-Potable Water
2,4-Dimethylphenol	EPA 625 Appendix A	Non-Potable Water
2,4-Dinitrophenol	EPA 625 Appendix A	Non-Potable Water
2,4-Dinitrotoluene (2,4-DNT)	EPA 625 Appendix A	Non-Potable Water
2,6-Dinitrotoluene (2,6-DNT)	EPA 625 Appendix A	Non-Potable Water
2-Chloronaphthalene	EPA 625 Appendix A	Non-Potable Water
2-Chlorophenol	EPA 625 Appendix A	Non-Potable Water
2-Methyl-4,6-dinitrophenol	EPA 625 Appendix A	Non-Potable Water
2-Nitrophenol	EPA 625 Appendix A	Non-Potable Water
3,3'-Dichlorobenzidine	EPA 625 Appendix A	Non-Potable Water
4,4'-DDD	EPA 608 Appendix A	Non-Potable Water
4,4'-DDE	EPA 608 Appendix A	Non-Potable Water
4,4'-DDT	EPA 608 Appendix A	Non-Potable Water
4-Bromophenyl phenyl ether	EPA 625 Appendix A	Non-Potable Water
4-Chloro-3-methylphenol	EPA 625 Appendix A	Non-Potable Water
4-Chlorophenyl phenylether	EPA 625 Appendix A	Non-Potable Water
4-Nitrophenol	EPA 625 Appendix A	Non-Potable Water

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Issue Date: 7/2/2008

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Minneapolis, MN 55438

Clean Water Program

Analyte	Method	Matrix
Acenaphthene	EPA 625 Appendix A	Non-Potable Water
Acenaphthylene	EPA 625 Appendix A	Non-Potable Water
Aldrin	EPA 608 Appendix A	Non-Potable Water
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 608 Appendix A	Non-Potable Water
Anthracene	EPA 625 Appendix A	Non-Potable Water
Aroclor-1016 (PCB-1016)	EPA 608 Appendix A	Non-Potable Water
Aroclor-1221 (PCB-1221)	EPA 608 Appendix A	Non-Potable Water
Aroclor-1232 (PCB-1232)	EPA 608 Appendix A	Non-Potable Water
Aroclor-1242 (PCB-1242)	EPA 608 Appendix A	Non-Potable Water
Aroclor-1248 (PCB-1248)	EPA 608 Appendix A	Non-Potable Water
Aroclor-1254 (PCB-1254)	EPA 608 Appendix A	Non-Potable Water
Aroclor-1260 (PCB-1260)	EPA 608 Appendix A	Non-Potable Water
Benzo[a]anthracene	EPA 625 Appendix A	Non-Potable Water
Benzo[a]pyrene	EPA 625 Appendix A	Non-Potable Water
Benzo[b]fluoranthene	EPA 625 Appendix A	Non-Potable Water
Benzo[g,h,i]perylene	EPA 625 Appendix A	Non-Potable Water
Benzo[k]fluoranthene	EPA 625 Appendix A	Non-Potable Water
beta-BHC (beta-Hexachlorocyclohexane)	EPA 608 Appendix A	Non-Potable Water
bis(2-Chloroethoxy)methane	EPA 625 Appendix A	Non-Potable Water
bis(2-Chloroethyl)ether	EPA 625 Appendix A	Non-Potable Water
bis(2-Chloroisopropyl)ether	EPA 625 Appendix A	Non-Potable Water
bis(2-Ethylhexyl)phthalate (DEHP)	EPA 625 Appendix A	Non-Potable Water
Butyl benzyl phthalate	EPA 625 Appendix A	Non-Potable Water
Chlordane (tech.)	EPA 608 Appendix A	Non-Potable Water
Chrysene	EPA 625 Appendix A	Non-Potable Water
delta-BHC (delta-Hexachlorocyclohexane)	EPA 608 Appendix A	Non-Potable Water
Dibenz[a,h]anthracene	EPA 625 Appendix A	Non-Potable Water
Dieldrin	EPA 608 Appendix A	Non-Potable Water
Diethyl phthalate	EPA 625 Appendix A	Non-Potable Water
Dimethyl phthalate	EPA 625 Appendix A	Non-Potable Water
Di-n-butyl phthalate	EPA 625 Appendix A	Non-Potable Water

Environmental Laboratory Certification Program
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Braun Intertec Corporation
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Minneapolis, MN 55438

Clean Water Program

Analyte	Method	Matrix
Di-n-octyl phthalate	EPA 625 Appendix A	Non-Potable Water
Endosulfan I	EPA 608 Appendix A	Non-Potable Water
Endosulfan II	EPA 608 Appendix A	Non-Potable Water
Endosulfan sulfate	EPA 608 Appendix A	Non-Potable Water
Endrin	EPA 608 Appendix A	Non-Potable Water
Endrin aldehyde	EPA 608 Appendix A	Non-Potable Water
Fluoranthene	EPA 625 Appendix A	Non-Potable Water
Fluorene	EPA 625 Appendix A	Non-Potable Water
gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	EPA 608 Appendix A	Non-Potable Water
Heptachlor	EPA 608 Appendix A	Non-Potable Water
Heptachlor epoxide	EPA 608 Appendix A	Non-Potable Water
Hexachlorobenzene	EPA 625 Appendix A	Non-Potable Water
Hexachlorobutadiene	EPA 625 Appendix A	Non-Potable Water
Hexachlorocyclopentadiene	EPA 625 Appendix A	Non-Potable Water
Hexachloroethane	EPA 625 Appendix A	Non-Potable Water
Indeno[1,2,3-cd]pyrene	EPA 625 Appendix A	Non-Potable Water
Nitrobenzene	EPA 625 Appendix A	Non-Potable Water
n-Nitrosodimethylamine	EPA 625 Appendix A	Non-Potable Water
n-Nitrosodi-n-propylamine	EPA 625 Appendix A	Non-Potable Water
n-Nitrosodiphenylamine	EPA 625 Appendix A	Non-Potable Water
Pentachlorophenol	EPA 625 Appendix A	Non-Potable Water
Phenanthrene	EPA 625 Appendix A	Non-Potable Water
Phenol	EPA 625 Appendix A	Non-Potable Water
Pyrene	EPA 625 Appendix A	Non-Potable Water
Toxaphene (Chlorinated camphene)	EPA 608 Appendix A	Non-Potable Water
1,1,1-Trichloroethane	EPA 624 Appendix A	Non-Potable Water
1,1,2,2-Tetrachloroethane	EPA 624 Appendix A	Non-Potable Water
1,1,2-Trichloroethane	EPA 624 Appendix A	Non-Potable Water
1,1-Dichloroethane	EPA 624 Appendix A	Non-Potable Water
1,1-Dichloroethylene	EPA 624 Appendix A	Non-Potable Water

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Braun Intertec Corporation
11001 Hampshire Avenue South
Minneapolis, MN 55438

Clean Water Program

Analyte	Method	Matrix
1,2,4-Trichlorobenzene	EPA 624 Appendix A	Non-Potable Water
1,2-Dichlorobenzene	EPA 624 Appendix A	Non-Potable Water
1,2-Dichloroethane	EPA 624 Appendix A	Non-Potable Water
1,2-Dichloropropane	EPA 624 Appendix A	Non-Potable Water
1,3-Dichlorobenzene	EPA 624 Appendix A	Non-Potable Water
1,4-Dichlorobenzene	EPA 624 Appendix A	Non-Potable Water
2-Chloroethyl vinyl ether	EPA 624 Appendix A	Non-Potable Water
Acrolein (Propenal)	EPA 624 Appendix A	Non-Potable Water
Acrylonitrile	EPA 624 Appendix A	Non-Potable Water
Benzene	EPA 624 Appendix A	Non-Potable Water
Bromodichloromethane	EPA 624 Appendix A	Non-Potable Water
Bromoform	EPA 624 Appendix A	Non-Potable Water
Bromomethane (Methyl bromide)	EPA 624 Appendix A	Non-Potable Water
Carbon tetrachloride	EPA 624 Appendix A	Non-Potable Water
Chlorobenzene	EPA 624 Appendix A	Non-Potable Water
Chloroethane	EPA 624 Appendix A	Non-Potable Water
Chloroform	EPA 624 Appendix A	Non-Potable Water
Chloromethane (Methyl chloride)	EPA 624 Appendix A	Non-Potable Water
cis-1,3-Dichloropropylene	EPA 624 Appendix A	Non-Potable Water
Dibromochloromethane	EPA 624 Appendix A	Non-Potable Water
Ethylbenzene	EPA 624 Appendix A	Non-Potable Water
Isopropylbenzene (Cumene)	EPA 624 Appendix A	Non-Potable Water
Methylene chloride	EPA 624 Appendix A	Non-Potable Water
Tetrachloroethylene (Perchloroethylene)	EPA 624 Appendix A	Non-Potable Water
Toluene	EPA 624 Appendix A	Non-Potable Water
trans-1,2-Dichloroethylene	EPA 624 Appendix A	Non-Potable Water
trans-1,3-Dichloropropylene	EPA 624 Appendix A	Non-Potable Water
Trichloroethene (Trichloroethylene)	EPA 624 Appendix A	Non-Potable Water
Trichlorofluoromethane	EPA 624 Appendix A	Non-Potable Water
Vinyl chloride	EPA 624 Appendix A	Non-Potable Water

Environmental Laboratory Certification Program
Scope of Certification
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Braun Intertec Corporation
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Minneapolis, MN 55438

Resource Conservation Recovery Program

Analyte	Method	Matrix
2,4,5-T	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Non-Potable Water
2,4,5-T	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Solid and Chemical Materials
2,4,5-TP (Silvex)	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Non-Potable Water
2,4,5-TP (Silvex)	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Solid and Chemical Materials
2,4-D	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Non-Potable Water
2,4-D	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Solid and Chemical Materials
2,4-DB (Butyrac)	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Non-Potable Water
2,4-DB (Butyrac)	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Solid and Chemical Materials
Acetochlor (Harness/Surpass)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Acetochlor (Harness/Surpass)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Alachlor (Lasso)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Alachlor (Lasso)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Atrazine	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Atrazine	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Bentazon (Basagran)	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Non-Potable Water
Bentazon (Basagran)	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Solid and Chemical Materials
Chlorpyrifos (Lorsban)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Chlorpyrifos (Lorsban)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials

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Analyte	Method	Matrix
Cyanazine	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Cyanazine	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Deethylatrazine	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Deethylatrazine	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Deisopropyl atrazine	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Deisopropyl atrazine	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Dicamba	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Non-Potable Water
Dicamba	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Solid and Chemical Materials
Dimethenamid (Frontier)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Dimethenamid (Frontier)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
EPTC (Eptam/Eradicane; s-ethyl-dipropyl thio carbamate)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
EPTC (Eptam/Eradicane; s-ethyl-dipropyl thio carbamate)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Ethalfluralin	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Ethalfluralin	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Fonophos	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Fonophos	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Garlon (Triclopyr)	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Non-Potable Water
Garlon (Triclopyr)	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Solid and Chemical Materials

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Analyte	Method	Matrix
MCPA	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Non-Potable Water
MCPA	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Solid and Chemical Materials
Metolachlor	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Metolachlor	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Metribuzin (Lexone/Sencor)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Metribuzin (Lexone/Sencor)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Pendimethaline (Penoxalin)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Pendimethaline (Penoxalin)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Phorate	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Phorate	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Picloram	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Non-Potable Water
Picloram	Performance Based Method Compliant with MDA Requirements (EPA 8151 mod)	Solid and Chemical Materials
Prometon	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Prometon	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Propachlor (Ramrod)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Propachlor (Ramrod)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Propazine (Milogard)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Propazine (Milogard)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials

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Analyte	Method	Matrix
Simazine (Princep)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Simazine (Princep)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Terbufos	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Terbufos	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Triallate	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Triallate	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Trifluralin (Treflan)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Non-Potable Water
Trifluralin (Treflan)	Performance Based Method Compliant with MDA Requirements (EPA 8270 mod or 8141 mod)	Solid and Chemical Materials
Silica as SiO2	EPA 6010B	Non-Potable Water
Silica as SiO2	EPA 6010B	Solid and Chemical Materials
Aluminum	EPA 6010B	Non-Potable Water
Aluminum	EPA 6010B	Solid and Chemical Materials
Aluminum	EPA 6020	Non-Potable Water
Aluminum	EPA 6020	Solid and Chemical Materials
Antimony	EPA 6010B	Non-Potable Water
Antimony	EPA 6010B	Solid and Chemical Materials
Antimony	EPA 6020	Non-Potable Water
Antimony	EPA 6020	Solid and Chemical Materials
Arsenic	EPA 6010B	Non-Potable Water
Arsenic	EPA 6010B	Solid and Chemical Materials
Arsenic	EPA 6020	Non-Potable Water
Arsenic	EPA 6020	Solid and Chemical Materials
Barium	EPA 6010B	Non-Potable Water
Barium	EPA 6010B	Solid and Chemical Materials
Barium	EPA 6020	Non-Potable Water

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Analyte	Method	Matrix
Barium	EPA 6020	Solid and Chemical Materials
Beryllium	EPA 6010B	Non-Potable Water
Beryllium	EPA 6010B	Solid and Chemical Materials
Beryllium	EPA 6020	Non-Potable Water
Beryllium	EPA 6020	Solid and Chemical Materials
Boron	EPA 6010B	Non-Potable Water
Boron	EPA 6010B	Solid and Chemical Materials
Cadmium	EPA 6010B	Non-Potable Water
Cadmium	EPA 6010B	Solid and Chemical Materials
Cadmium	EPA 6020	Non-Potable Water
Cadmium	EPA 6020	Solid and Chemical Materials
Calcium	EPA 6010B	Non-Potable Water
Calcium	EPA 6010B	Solid and Chemical Materials
Chromium	EPA 6010B	Solid and Chemical Materials
Chromium	EPA 6020	Solid and Chemical Materials
Chromium, Total	EPA 6010B	Non-Potable Water
Chromium, Total	EPA 6020	Non-Potable Water
Cobalt	EPA 6010B	Non-Potable Water
Cobalt	EPA 6010B	Solid and Chemical Materials
Cobalt	EPA 6020	Non-Potable Water
Cobalt	EPA 6020	Solid and Chemical Materials
Copper	EPA 6010B	Non-Potable Water
Copper	EPA 6010B	Solid and Chemical Materials
Copper	EPA 6020	Non-Potable Water
Copper	EPA 6020	Solid and Chemical Materials
Iron	EPA 6010B	Non-Potable Water
Iron	EPA 6010B	Solid and Chemical Materials
Lead	EPA 6010B	Non-Potable Water
Lead	EPA 6010B	Solid and Chemical Materials
Lead	EPA 6020	Non-Potable Water
Lead	EPA 6020	Solid and Chemical Materials

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Analyte	Method	Matrix
Lithium	EPA 6010B	Non-Potable Water
Lithium	EPA 6010B	Solid and Chemical Materials
Magnesium	EPA 6010B	Non-Potable Water
Magnesium	EPA 6010B	Solid and Chemical Materials
Manganese	EPA 6010B	Non-Potable Water
Manganese	EPA 6010B	Solid and Chemical Materials
Manganese	EPA 6020	Non-Potable Water
Manganese	EPA 6020	Solid and Chemical Materials
Mercury	EPA 7470A	Non-Potable Water
Mercury	EPA 7471A	Solid and Chemical Materials
Mercury	MNPBMS 012 (3052)	Non-Potable Water
Molybdenum	EPA 6010B	Non-Potable Water
Molybdenum	EPA 6010B	Solid and Chemical Materials
Nickel	EPA 6010B	Non-Potable Water
Nickel	EPA 6010B	Solid and Chemical Materials
Nickel	EPA 6020	Non-Potable Water
Nickel	EPA 6020	Solid and Chemical Materials
Potassium	EPA 6010B	Non-Potable Water
Potassium	EPA 6010B	Solid and Chemical Materials
Selenium	EPA 6010B	Non-Potable Water
Selenium	EPA 6010B	Solid and Chemical Materials
Silver	EPA 6010B	Non-Potable Water
Silver	EPA 6010B	Solid and Chemical Materials
Sodium	EPA 6010B	Non-Potable Water
Sodium	EPA 6010B	Solid and Chemical Materials
Strontium	EPA 6010B	Non-Potable Water
Strontium	EPA 6010B	Solid and Chemical Materials
Thallium	EPA 6010B	Non-Potable Water
Thallium	EPA 6010B	Solid and Chemical Materials
Thallium	EPA 6020	Non-Potable Water
Thallium	EPA 6020	Solid and Chemical Materials

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Analyte	Method	Matrix
Tin	EPA 6010B	Non-Potable Water
Tin	EPA 6010B	Solid and Chemical Materials
Vanadium	EPA 6010B	Non-Potable Water
Vanadium	EPA 6010B	Solid and Chemical Materials
Zinc	EPA 6010B	Non-Potable Water
Zinc	EPA 6010B	Solid and Chemical Materials
Zinc	EPA 6020	Non-Potable Water
Zinc	EPA 6020	Solid and Chemical Materials
1,1'-Biphenyl	EPA 8270C SIM	Non-Potable Water
1,1'-Biphenyl	EPA 8270C SIM	Solid and Chemical Materials
1,2-Diphenylhydrazine	EPA 8270C	Non-Potable Water
1,2-Diphenylhydrazine	EPA 8270C	Solid and Chemical Materials
2,4,5-Trichlorophenol	EPA 8270C	Non-Potable Water
2,4,5-Trichlorophenol	EPA 8270C	Solid and Chemical Materials
2-Methylnaphthalene	EPA 8270C	Non-Potable Water
2-Methylnaphthalene	EPA 8270C	Solid and Chemical Materials
2-Methylphenol (o-Cresol)	EPA 8270C	Non-Potable Water
2-Methylphenol (o-Cresol)	EPA 8270C	Solid and Chemical Materials
2-Nitroaniline	EPA 8270C	Non-Potable Water
2-Nitroaniline	EPA 8270C	Solid and Chemical Materials
3-Methylphenol (m-Cresol)	EPA 8270C	Non-Potable Water
3-Methylphenol (m-Cresol)	EPA 8270C	Solid and Chemical Materials
4,4'-DDT	EPA 8081A	Non-Potable Water
4,4'-DDT	EPA 8081A	Solid and Chemical Materials
4,6-Dinitro-2-methylphenol	EPA 8270C	Non-Potable Water
4,6-Dinitro-2-methylphenol	EPA 8270C	Solid and Chemical Materials
4-Chloroaniline	EPA 8270C	Non-Potable Water
4-Chloroaniline	EPA 8270C	Solid and Chemical Materials
4-Nitroaniline	EPA 8270C	Non-Potable Water
4-Nitroaniline	EPA 8270C	Solid and Chemical Materials
Aniline	EPA 8270C	Non-Potable Water

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Analyte	Method	Matrix
Aniline	EPA 8270C	Solid and Chemical Materials
Aroclor-1016 (PCB-1016)	EPA 8082	Non-Potable Water
Aroclor-1016 (PCB-1016)	EPA 8082	Solid and Chemical Materials
Aroclor-1221 (PCB-1221)	EPA 8082	Non-Potable Water
Aroclor-1221 (PCB-1221)	EPA 8082	Solid and Chemical Materials
Aroclor-1232 (PCB-1232)	EPA 8082	Non-Potable Water
Aroclor-1232 (PCB-1232)	EPA 8082	Solid and Chemical Materials
Aroclor-1242 (PCB-1242)	EPA 8082	Non-Potable Water
Aroclor-1242 (PCB-1242)	EPA 8082	Solid and Chemical Materials
Aroclor-1248 (PCB-1248)	EPA 8082	Non-Potable Water
Aroclor-1248 (PCB-1248)	EPA 8082	Solid and Chemical Materials
Aroclor-1254 (PCB-1254)	EPA 8082	Non-Potable Water
Aroclor-1254 (PCB-1254)	EPA 8082	Solid and Chemical Materials
Aroclor-1260 (PCB-1260)	EPA 8082	Non-Potable Water
Aroclor-1260 (PCB-1260)	EPA 8082	Solid and Chemical Materials
Benzo[a]anthracene	EPA 8270C	Non-Potable Water
Benzo[a]anthracene	EPA 8270C	Solid and Chemical Materials
Benzo[a]anthracene	EPA 8270C SIM	Non-Potable Water
Benzo[a]anthracene	EPA 8270C SIM	Solid and Chemical Materials
Benzo[a]pyrene	EPA 8270C	Non-Potable Water
Benzo[a]pyrene	EPA 8270C	Solid and Chemical Materials
Benzo[a]pyrene	EPA 8270C SIM	Non-Potable Water
Benzo[a]pyrene	EPA 8270C SIM	Solid and Chemical Materials
Benzo[b]fluoranthene	EPA 8270C	Non-Potable Water
Benzo[b]fluoranthene	EPA 8270C	Solid and Chemical Materials
Benzo[b]fluoranthene	EPA 8270C SIM	Non-Potable Water
Benzo[b]fluoranthene	EPA 8270C SIM	Solid and Chemical Materials
Benzo[k]fluoranthene	EPA 8270C	Non-Potable Water
Benzo[k]fluoranthene	EPA 8270C	Solid and Chemical Materials
Benzo[k]fluoranthene	EPA 8270C SIM	Non-Potable Water
Benzo[k]fluoranthene	EPA 8270C SIM	Solid and Chemical Materials

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Analyte	Method	Matrix
Benzoic acid	EPA 8270C	Non-Potable Water
Benzoic acid	EPA 8270C	Solid and Chemical Materials
Benzyl alcohol	EPA 8270C	Non-Potable Water
Benzyl alcohol	EPA 8270C	Solid and Chemical Materials
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081A	Non-Potable Water
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081A	Solid and Chemical Materials
bis(2-Chloroisopropyl)ether	EPA 8270C	Non-Potable Water
bis(2-Chloroisopropyl)ether	EPA 8270C	Solid and Chemical Materials
bis(2-Ethylhexyl)phthalate (DEHP)	EPA 8270C	Non-Potable Water
bis(2-Ethylhexyl)phthalate (DEHP)	EPA 8270C	Solid and Chemical Materials
Butyl benzyl phthalate	EPA 8270C	Non-Potable Water
Butyl benzyl phthalate	EPA 8270C	Solid and Chemical Materials
Dibenz[a,h]anthracene	EPA 8270C	Non-Potable Water
Dibenz[a,h]anthracene	EPA 8270C	Solid and Chemical Materials
Dibenz[a,h]anthracene	EPA 8270C SIM	Non-Potable Water
Dibenz[a,h]anthracene	EPA 8270C SIM	Solid and Chemical Materials
Dibenzofuran	EPA 8270C	Non-Potable Water
Dibenzofuran	EPA 8270C	Solid and Chemical Materials
Dimethyl phthalate	EPA 8270C	Non-Potable Water
Dimethyl phthalate	EPA 8270C	Solid and Chemical Materials
Di-n-butyl phthalate	EPA 8270C	Non-Potable Water
Di-n-butyl phthalate	EPA 8270C	Solid and Chemical Materials
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8270C	Non-Potable Water
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8270C	Solid and Chemical Materials
Endrin	EPA 8081A	Non-Potable Water
Endrin	EPA 8081A	Solid and Chemical Materials
Fluoranthene	EPA 8270C	Non-Potable Water
Fluoranthene	EPA 8270C	Solid and Chemical Materials
Fluoranthene	EPA 8270C SIM	Non-Potable Water
Fluoranthene	EPA 8270C SIM	Solid and Chemical Materials

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Analyte	Method	Matrix
gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	EPA 8081A	Non-Potable Water
gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	EPA 8081A	Solid and Chemical Materials
Indeno[1,2,3-cd]pyrene	EPA 8270C	Non-Potable Water
Indeno[1,2,3-cd]pyrene	EPA 8270C	Solid and Chemical Materials
Indeno[1,2,3-cd]pyrene	EPA 8270C SIM	Non-Potable Water
Indeno[1,2,3-cd]pyrene	EPA 8270C SIM	Solid and Chemical Materials
PCBs in Oil	EPA 8082	Solid and Chemical Materials
Pyrene	EPA 8270C	Non-Potable Water
Pyrene	EPA 8270C	Solid and Chemical Materials
Pyrene	EPA 8270C SIM	Non-Potable Water
Pyrene	EPA 8270C SIM	Solid and Chemical Materials
Terbufos (Counter)	EPA 8270C	Non-Potable Water
Terbufos (Counter)	EPA 8270C	Solid and Chemical Materials
Toxaphene (Chlorinated camphene)	EPA 8081A	Non-Potable Water
Toxaphene (Chlorinated camphene)	EPA 8081A	Solid and Chemical Materials
1,1,1,2-Tetrachloroethane	EPA 8260B	Non-Potable Water
1,1,1,2-Tetrachloroethane	EPA 8260B	Solid and Chemical Materials
1,1,1-Trichloroethane	EPA 8260B	Non-Potable Water
1,1,1-Trichloroethane	EPA 8260B	Solid and Chemical Materials
1,1,2,2-Tetrachloroethane	EPA 8260B	Non-Potable Water
1,1,2,2-Tetrachloroethane	EPA 8260B	Solid and Chemical Materials
1,1,2-Trichloroethane	EPA 8260B	Non-Potable Water
1,1,2-Trichloroethane	EPA 8260B	Solid and Chemical Materials
1,1-Dichloroethane	EPA 8260B	Non-Potable Water
1,1-Dichloroethane	EPA 8260B	Solid and Chemical Materials
1,1-Dichloroethylene	EPA 8260B	Non-Potable Water
1,1-Dichloroethylene	EPA 8260B	Solid and Chemical Materials
1,1-Dichloropropylene	EPA 8260B	Non-Potable Water
1,1-Dichloropropylene	EPA 8260B	Solid and Chemical Materials

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Analyte	Method	Matrix
1,2,3-Trichlorobenzene	EPA 8260B	Non-Potable Water
1,2,3-Trichlorobenzene	EPA 8260B	Solid and Chemical Materials
1,2,3-Trichloropropane	EPA 8260B	Non-Potable Water
1,2,3-Trichloropropane	EPA 8260B	Solid and Chemical Materials
1,2,4-Trichlorobenzene	EPA 8260B	Non-Potable Water
1,2,4-Trichlorobenzene	EPA 8260B	Solid and Chemical Materials
1,2,4-Trimethylbenzene	EPA 8260B	Non-Potable Water
1,2,4-Trimethylbenzene	EPA 8260B	Solid and Chemical Materials
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260B	Non-Potable Water
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260B	Solid and Chemical Materials
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260B	Non-Potable Water
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260B	Solid and Chemical Materials
1,2-Dichlorobenzene	EPA 8260B	Non-Potable Water
1,2-Dichlorobenzene	EPA 8260B	Solid and Chemical Materials
1,2-Dichloroethane	EPA 8260B	Non-Potable Water
1,2-Dichloroethane	EPA 8260B	Solid and Chemical Materials
1,2-Dichloropropane	EPA 8260B	Non-Potable Water
1,2-Dichloropropane	EPA 8260B	Solid and Chemical Materials
1,3,5-Trimethylbenzene	EPA 8260B	Non-Potable Water
1,3,5-Trimethylbenzene	EPA 8260B	Solid and Chemical Materials
1,3-Dichlorobenzene	EPA 8260B	Non-Potable Water
1,3-Dichlorobenzene	EPA 8260B	Solid and Chemical Materials
1,3-Dichloropropane	EPA 8260B	Non-Potable Water
1,3-Dichloropropane	EPA 8260B	Solid and Chemical Materials
1,4-Dichlorobenzene	EPA 8260B	Non-Potable Water
1,4-Dichlorobenzene	EPA 8260B	Solid and Chemical Materials
2,2-Dichloropropane	EPA 8260B	Non-Potable Water
2,2-Dichloropropane	EPA 8260B	Solid and Chemical Materials
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260B	Non-Potable Water
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260B	Solid and Chemical Materials
2-Chloroethyl vinyl ether	EPA 8260B	Non-Potable Water

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Analyte	Method	Matrix
2-Chloroethyl vinyl ether	EPA 8260B	Solid and Chemical Materials
2-Chlorotoluene	EPA 8260B	Non-Potable Water
2-Chlorotoluene	EPA 8260B	Solid and Chemical Materials
2-Hexanone (methyl butyl ketone)	EPA 8260B	Non-Potable Water
2-Hexanone (methyl butyl ketone)	EPA 8260B	Solid and Chemical Materials
Acetone	EPA 8260B	Non-Potable Water
Acetone	EPA 8260B	Solid and Chemical Materials
Acrolein (Propenal)	EPA 8260B	Non-Potable Water
Acrolein (Propenal)	EPA 8260B	Solid and Chemical Materials
Acrylonitrile	EPA 8260B	Non-Potable Water
Acrylonitrile	EPA 8260B	Solid and Chemical Materials
Allyl chloride (3-Chloropropene)	EPA 8260B	Non-Potable Water
Allyl chloride (3-Chloropropene)	EPA 8260B	Solid and Chemical Materials
Benzene	EPA 8260B	Non-Potable Water
Benzene	EPA 8260B	Solid and Chemical Materials
Bromobenzene	EPA 8260B	Non-Potable Water
Bromobenzene	EPA 8260B	Solid and Chemical Materials
Bromochloromethane	EPA 8260B	Non-Potable Water
Bromochloromethane	EPA 8260B	Solid and Chemical Materials
Bromoform	EPA 8260B	Non-Potable Water
Bromoform	EPA 8260B	Solid and Chemical Materials
Carbon disulfide	EPA 8260B	Non-Potable Water
Carbon disulfide	EPA 8260B	Solid and Chemical Materials
Carbon tetrachloride	EPA 8260B	Non-Potable Water
Carbon tetrachloride	EPA 8260B	Solid and Chemical Materials
Chlorobenzene	EPA 8260B	Non-Potable Water
Chlorobenzene	EPA 8260B	Solid and Chemical Materials
Chloroethane	EPA 8260B	Non-Potable Water
Chloroethane	EPA 8260B	Solid and Chemical Materials
Chloroform	EPA 8260B	Non-Potable Water
Chloroform	EPA 8260B	Solid and Chemical Materials

Environmental Laboratory Certification Program
Scope of Certification
Certified Minnesota Environmental Laboratories

THIS LISTING OF CERTIFIED FIELDS OF TESTING MUST BE ACCOMPANIED BY CERTIFICATE NUMBER: 11381AA

State Laboratory ID: 027-053-117 **EPA Lab Code: MN00063** **Expiration Date: 4/3/2009**

Issue Date: 7/2/2008

Braun Intertec Corporation
11001 Hampshire Avenue South
Minneapolis, MN 55438

Resource Conservation Recovery Program

Analyte	Method	Matrix
Chloromethane (Methyl chloride)	EPA 8260B	Non-Potable Water
Chloromethane (Methyl chloride)	EPA 8260B	Solid and Chemical Materials
Chloroprene	EPA 8260B	Non-Potable Water
Chloroprene	EPA 8260B	Solid and Chemical Materials
cis-1,2-Dichloroethylene	EPA 8260B	Non-Potable Water
cis-1,2-Dichloroethylene	EPA 8260B	Solid and Chemical Materials
cis-1,3-Dichloropropylene	EPA 8260B	Non-Potable Water
cis-1,3-Dichloropropylene	EPA 8260B	Solid and Chemical Materials
Dibromochloromethane	EPA 8260B	Non-Potable Water
Dibromochloromethane	EPA 8260B	Solid and Chemical Materials
Dibromomethane	EPA 8260B	Non-Potable Water
Dibromomethane	EPA 8260B	Solid and Chemical Materials
Dichlorodifluoromethane	EPA 8260B	Non-Potable Water
Dichlorodifluoromethane	EPA 8260B	Solid and Chemical Materials
Diethyl ether	EPA 8260B	Non-Potable Water
Diethyl ether	EPA 8260B	Solid and Chemical Materials
Ethyl methacrylate	EPA 8260B	Non-Potable Water
Ethyl methacrylate	EPA 8260B	Solid and Chemical Materials
Ethylbenzene	EPA 8260B	Non-Potable Water
Ethylbenzene	EPA 8260B	Solid and Chemical Materials
Hexachlorobutadiene	EPA 8260B	Non-Potable Water
Hexachlorobutadiene	EPA 8260B	Solid and Chemical Materials
Isopropylbenzene (Cumene)	EPA 8260B	Non-Potable Water
Isopropylbenzene (Cumene)	EPA 8260B	Solid and Chemical Materials
m+p-xylene	EPA 8260B	Non-Potable Water
m+p-xylene	EPA 8260B	Solid and Chemical Materials
Methyl isobutyl ketone (MIBK)	EPA 8260B	Non-Potable Water
Methyl methacrylate	EPA 8260B	Non-Potable Water
Methyl methacrylate	EPA 8260B	Solid and Chemical Materials
Methyl tert-butyl ether (MTBE)	EPA 8260B	Non-Potable Water
Methyl tert-butyl ether (MTBE)	EPA 8260B	Solid and Chemical Materials

Environmental Laboratory Certification Program
Scope of Certification
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State Laboratory ID: 027-053-117 **EPA Lab Code: MN00063** **Expiration Date: 4/3/2009**

Issue Date: 7/2/2008

Braun Intertec Corporation
11001 Hampshire Avenue South
Minneapolis, MN 55438

Resource Conservation Recovery Program

Analyte	Method	Matrix
Methylene chloride	EPA 8260B	Non-Potable Water
Methylene chloride	EPA 8260B	Solid and Chemical Materials
Naphthalene	EPA 8260B	Non-Potable Water
Naphthalene	EPA 8260B	Solid and Chemical Materials
n-Butylbenzene	EPA 8260B	Non-Potable Water
n-Butylbenzene	EPA 8260B	Solid and Chemical Materials
o-Xylene	EPA 8260B	Non-Potable Water
o-Xylene	EPA 8260B	Solid and Chemical Materials
p-Dioxane (1,4-Dioxane)	EPA 8260B	Non-Potable Water
p-Dioxane (1,4-Dioxane)	EPA 8260B	Solid and Chemical Materials
p-Isopropyltoluene	EPA 8260B	Non-Potable Water
p-Isopropyltoluene	EPA 8260B	Solid and Chemical Materials
Propionitrile (Ethyl cyanide)	EPA 8260B	Non-Potable Water
Propionitrile (Ethyl cyanide)	EPA 8260B	Solid and Chemical Materials
sec-Butylbenzene	EPA 8260B	Non-Potable Water
sec-Butylbenzene	EPA 8260B	Solid and Chemical Materials
Styrene	EPA 8260B	Non-Potable Water
Styrene	EPA 8260B	Solid and Chemical Materials
tert-Butylbenzene	EPA 8260B	Non-Potable Water
tert-Butylbenzene	EPA 8260B	Solid and Chemical Materials
Toluene	EPA 8260B	Non-Potable Water
Toluene	EPA 8260B	Solid and Chemical Materials
trans-1,2-Dichloroethylene	EPA 8260B	Non-Potable Water
trans-1,2-Dichloroethylene	EPA 8260B	Solid and Chemical Materials
trans-1,3-Dichloropropylene	EPA 8260B	Non-Potable Water
trans-1,3-Dichloropropylene	EPA 8260B	Solid and Chemical Materials
Trichloroethene (Trichloroethylene)	EPA 8260B	Non-Potable Water
Trichloroethene (Trichloroethylene)	EPA 8260B	Solid and Chemical Materials
Vinyl acetate	EPA 8260B	Non-Potable Water
Vinyl acetate	EPA 8260B	Solid and Chemical Materials
Vinyl chloride	EPA 8260B	Non-Potable Water

Environmental Laboratory Certification Program
Scope of Certification
Certified Minnesota Environmental Laboratories

THIS LISTING OF CERTIFIED FIELDS OF TESTING MUST BE ACCOMPANIED BY CERTIFICATE NUMBER: 11381AA

State Laboratory ID: 027-053-117 **EPA Lab Code: MN00063** **Expiration Date: 4/3/2009**

Issue Date: 7/2/2008

Braun Intertec Corporation
11001 Hampshire Avenue South
Minneapolis, MN 55438

Resource Conservation Recovery Program

Analyte	Method	Matrix
Vinyl chloride	EPA 8260B	Solid and Chemical Materials

Safe Drinking Water Program

Analyte	Method	Matrix
Nitrate	EPA 353.2 Rev 2.0	Drinking Water
Nitrite	EPA 353.2 Rev 2.0	Drinking Water
Aluminum	EPA 200.8 Rev 5.4	Drinking Water
Antimony	EPA 200.8 Rev 5.4	Drinking Water
Arsenic	EPA 200.8 Rev 5.4	Drinking Water
Barium	EPA 200.8 Rev 5.4	Drinking Water
Beryllium	EPA 200.8 Rev 5.4	Drinking Water
Cadmium	EPA 200.8 Rev 5.4	Drinking Water
Calcium	EPA 200.7 Rev 4.4	Drinking Water
Chromium	EPA 200.8 Rev 5.4	Drinking Water
Copper	EPA 200.8 Rev 5.4	Drinking Water
Iron	EPA 200.7 Rev 4.4	Drinking Water
Lead	EPA 200.8 Rev 5.4	Drinking Water
Magnesium	EPA 200.7 Rev 4.4	Drinking Water
Manganese	EPA 200.8 Rev 5.4	Drinking Water
Mercury	EPA 245.1 Rev 3.0	Drinking Water
Nickel	EPA 200.8 Rev 5.4	Drinking Water
Selenium	EPA 200.8 Rev 5.4	Drinking Water
Silver	EPA 200.8 Rev 5.4	Drinking Water
Sodium	EPA 200.7 Rev 4.4	Drinking Water
Thallium	EPA 200.8 Rev 5.4	Drinking Water
Zinc	EPA 200.8 Rev 5.4	Drinking Water

Sample Preparation

Analyte	Method	Matrix
Preparation Inorganic	Digestion, hotplate or HotBlock	N/A
Preparation Inorganic	Distillation, MIDI	N/A

Environmental Laboratory Certification Program
Scope of Certification
Certified Minnesota Environmental Laboratories

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Issue Date: 7/2/2008

Braun Intertec Corporation
11001 Hampshire Avenue South
Minneapolis, MN 55438

Sample Preparation

Analyte	Method	Matrix
Preparation Inorganic	Extraction, solid phase (SPE)	N/A
Preparation Metals	Digestion, hotplate or HotBlock	N/A
Preparation Metals	Digestion, microwave-assisted	N/A
Preparation Metals	Extraction, EPA 1311 TCLP, non-volatiles	N/A
Preparation Other Organic	Extraction, continuous liquid-liquid (LLE)	N/A
Preparation Other Organic	Extraction, EPA 1311 TCLP, non-volatiles	N/A
Preparation Other Organic	Extraction, pressurized fluid (PFE)	N/A
Preparation Other Organic	Extraction, separatory funnel liquid-liquid (LLE)	N/A
Preparation Other Organic	Extraction, ultrasonic	N/A
Preparation Volatile Organic	Extraction, EPA 1311 TCLP, zero headspace (ZHE)	N/A
Preparation Volatile Organic	Purge and trap	N/A

Underground Storage Tank Program

Analyte	Method	Matrix
Diesel range organics (DRO)	WI(95) DRO	Non-Potable Water
Diesel range organics (DRO)	WI(95) DRO	Solid and Chemical Materials
1,1,1-Trichloroethane	EPA TO-15	Air
1,1,2,2-Tetrachloroethane	EPA TO-15	Air
1,1,2-Trichloroethane	EPA TO-15	Air
1,1-Dichloroethane	EPA TO-15	Air
1,1-Dichloroethylene	EPA TO-15	Air
1,2,4-Trichlorobenzene	EPA TO-15	Air
1,2,4-Trimethylbenzene	EPA TO-15	Air
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-15	Air
1,2-Dichlorobenzene	EPA TO-15	Air
1,2-Dichloroethane	EPA TO-15	Air
1,2-Dichloropropane	EPA TO-15	Air
1,3,5-Trimethylbenzene	EPA TO-15	Air
1,3-Butadiene (1,3-Hexachlorobutadiene)	EPA TO-15	Air
1,3-Dichlorobenzene	EPA TO-15	Air

Environmental Laboratory Certification Program
Scope of Certification
Certified Minnesota Environmental Laboratories

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State Laboratory ID: 027-053-117 **EPA Lab Code: MN00063** **Expiration Date: 4/3/2009**

Issue Date: 7/2/2008

Braun Intertec Corporation
11001 Hampshire Avenue South
Minneapolis, MN 55438

Underground Storage Tank Program

Analyte	Method	Matrix
1,4-Dichlorobenzene	EPA TO-15	Air
2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-15	Air
2-Hexanone (methyl butyl ketone)	EPA TO-15	Air
4-Ethyltoluene	EPA TO-15	Air
Acetone	EPA TO-15	Air
Benzene	EPA TO-15	Air
Benzyl chloride	EPA TO-15	Air
Bromoform	EPA TO-15	Air
Bromomethane (Methyl bromide)	EPA TO-15	Air
Carbon disulfide	EPA TO-15	Air
Carbon tetrachloride	EPA TO-15	Air
Chlorobenzene	EPA TO-15	Air
Chloroethane	EPA TO-15	Air
Chloroform	EPA TO-15	Air
Chloromethane (Methyl chloride)	EPA TO-15	Air
cis-1,2-Dichloroethylene	EPA TO-15	Air
cis-1,3-Dichloropropylene	EPA TO-15	Air
Cyclohexane	EPA TO-15	Air
Dibromochloromethane	EPA TO-15	Air
Dichlorobromomethane	EPA TO-15	Air
Ethanol	EPA TO-15	Air
Ethyl acetate	EPA TO-15	Air
Ethylbenzene	EPA TO-15	Air
Freon-11 (Trichlorofluoromethane)	EPA TO-15	Air
Freon-113 (Trichlorotrifluoroethane)	EPA TO-15	Air
Freon-114 (Dichlorotetrafluoroethane)	EPA TO-15	Air
Gasoline range organics (GRO)	WI(95) GRO	Non-Potable Water
Gasoline range organics (GRO)	WI(95) GRO	Solid and Chemical Materials
Hexachlorobutadiene	EPA TO-15	Air
Hexane	EPA TO-15	Air
Isopropyl alcohol (2-Propanol)	EPA TO-15	Air

Environmental Laboratory Certification Program
Scope of Certification
Certified Minnesota Environmental Laboratories

THIS LISTING OF CERTIFIED FIELDS OF TESTING MUST BE ACCOMPANIED BY CERTIFICATE NUMBER: 11381AA

State Laboratory ID: 027-053-117 **EPA Lab Code: MN00063** **Expiration Date: 4/3/2009**

Issue Date: 7/2/2008

Braun Intertec Corporation
11001 Hampshire Avenue South
Minneapolis, MN 55438

Underground Storage Tank Program

Analyte	Method	Matrix
m+p-xylene	EPA TO-15	Air
Methyl isobutyl ketone (MIBK)	EPA TO-15	Air
Methyl tert-butyl ether (MTBE)	EPA TO-15	Air
Methylene chloride	EPA TO-15	Air
Naphthalene	EPA TO-15	Air
n-Heptane	EPA TO-15	Air
o-Xylene	EPA TO-15	Air
Petroleum Volatile Organic Compounds	WI(95) GRO	Non-Potable Water
Petroleum Volatile Organic Compounds	WI(95) GRO	Solid and Chemical Materials
Propylene	EPA TO-15	Air
Styrene	EPA TO-15	Air
Tetrachloroethylene (Perchloroethylene)	EPA TO-15	Air
Tetrahydrofuran (THF)	EPA TO-15	Air
Toluene	EPA TO-15	Air
trans-1,2-Dichloroethylene	EPA TO-15	Air
trans-1,3-Dichloropropylene	EPA TO-15	Air
Trichloroethene (Trichloroethylene)	EPA TO-15	Air
Vinyl acetate	EPA TO-15	Air
Vinyl chloride	EPA TO-15	Air

Note: Methods beginning with "SM" refer to the approved editions of Standard Methods for the Examination of Water and Wastes. Approved methods are listed in the applicable parts of Title 40 of the Code of Federal Regulations (including its subsequent Federal Register updates), MN Statutes and Rules, and state-issued permits.

State of Wisconsin
Department of Natural Resources

WISCONSIN
DEPT. OF NATURAL RESOURCES

recognizes

Wisconsin Certification under NR 149

of

Braun Intertec Corporation

Laboratory Id: **999462640**

as a laboratory licensed to perform environmental sample analysis in support of covered environmental programs (ch. NR149.02 Note) for the parameter(s) specified in the attached Scope of Accreditation.

August 31, 2008

Expiration Date

August 30, 2007

Issued on

David Webb

Chief, Environmental Science Services

P. Scott Hassett

Secretary

This certificate does not guarantee validity of data generated, but indicates the methodology, equipment, quality control practices, records, and proficiency of the laboratory have been reviewed and found to satisfy the requirements of ch. NR 149, Wis. Adm. Code.

Scope of Accreditation

Braun Intertec Corporation
11001 Hampshire Avenue S
Minneapolis, MN 55438

Laboratory Id: **999462640**
Expiration Date: **08/31/08**
Issued Date: **08/30/07**

Wisconsin Certification under NR 149

Category 02 - Nitrogen
- Ammonia as N
- Nitrite as N
- Nitrate as N
- Total Kjeldahl Nitrogen

Category 03 - Phosphorus
- Orthophosphate
- Total Phosphorus

Category 04 - Physical
- Oil and Grease (Freon)
- Total Dissolved Solids
- Total Solids
- Total Suspended Solids
- Total Vol. Suspend Solids
- Total Volatile Solids

Category 05 - General I
- Alkalinity/Acidity
- Chlorophyll a
- Color
- Hardness
- Silica

Category 06 - General II
- Chloride
- Sulfide
- Sulfate

Category 07 - General III
- EP Toxicity
- Ignitability
- SPLP
- TCLP
- Total Organic Carbon

Category 08 - Metals I
- Silver
- Aluminum
- Arsenic
- Boron
- Barium
- Beryllium
- Calcium
- Cadmium
- Cobalt
- Chromium (Total)
- Copper
- Iron
- Chromium (Hexavalent)
- Mercury
- Potassium
- Magnesium
- Manganese
- Molybdenum
- Sodium
- Nickel
- Lead
- Antimony
- Selenium
- Tin
- Strontium
- Thallium
- Vanadium
- Zinc

Category 09 - Metals II
- Titanium

Category 10 - Organics; Purgeable
- Purgeable Aromatics
- Purgeable Halocarbons
- Volatile Organics (VOCs)

Category 12 - Semivolatiles by GC/MS
- Base/Neutral/Acid Extract
- PAHs by GC/MS-SIM

Category 15 - Petroleum Hydrocarbons
- Diesel Range Organics
- Gasoline Range Organics
- Petroleum VOCs

The laboratory named above, having duly met the requirements of ch. NR 149, Wis. Adm. Code, is hereby licensed for the measurement of parameters listed in this attachment.

Scope of Accreditation

Braun Intertec Corporation
11001 Hampshire Avenue S
Minneapolis, MN 55438

Laboratory Id: **999462640**
Expiration Date: **08/31/08**
Issued Date: **08/30/07**

Wisconsin Certification under NR 149

Category 16 - Organics; Organochlorine
PCBs
Organochlorine Pesticides
Category 18 - Safe Drinking Water
Arsenic- EPA 200.8
Barium- EPA 200.8
Cadmium- EPA 200.8
Chromium- EPA 200.8
Copper- EPA 200.8
Mercury- EPA 245.1
Nitrite- EPA 353.2
Lead- EPA 200.8
Selenium- EPA 200.8

The laboratory named above, having duly met the requirements of ch. NR 149, Wis. Adm. Code, is hereby licensed for the measurement of parameters listed in this attachment.

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101234-0

Braun Intertec Corporation

Minneapolis, MN

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

AIRBORNE ASBESTOS FIBER ANALYSIS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated 18 June 2005).

2007-07-01 through 2008-06-30

Effective dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

Sally S. Bruce

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2006-09-13)

UMP0060036

NVLAP® **National Voluntary Laboratory Accreditation Program**

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Braun Intertec Corporation
11001 Hampshire Ave. South
Minneapolis, MN 55438
Mr. Kevin Osborn
Phone: 952-995-2688 Fax: 952-995-2601
E-Mail: kosborn@brauncorp.com

AIRBORNE ASBESTOS FIBER ANALYSIS (TEM) **NVLAP LAB CODE 101234-0**

NVLAP Code	*Designation / Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

2007-07-01 through 2008-06-30
Effective dates

Sally S. Bruce
For the National Institute of Standards and Technology

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101234-0

Braun Intertec Corporation

Minneapolis, MN

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

BULK ASBESTOS FIBER ANALYSIS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated 18 June 2005).

2007-07-01 through 2008-06-30

Effective dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

Sally S. Bruce

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2006-09-13)

UMP006038

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Braun Intertec Corporation
11001 Hampshire Ave. South
Minneapolis, MN 55438
Mr. Kevin Osborn
Phone: 952-995-2688 Fax: 952-995-2601
E-Mail: kosborn@brauncorp.com

BULK ASBESTOS FIBER ANALYSIS (PLM) **NVLAP LAB CODE 101234-0**

NVLAP Code	*Designation / Description*
18/A01	EPA-600/M4-82-020: Interim Method for the Determination of Asbestos in Bulk Insulation Samples

2007-07-01 through 2008-06-30
Effective dates

Sally S. Bruce
For the National Institute of Standards and Technology

NVLAP-01S (REV. 2005-05-19)

The American Industrial Hygiene Association

CELEBRATING 30 Thirty Years of AIHA Accrediting Labs
SOUND DATA SMART DECISIONS
1974 – 2004

acknowledges that

Braun Intertec Corporation

11001 Hampshire Avenue S., Bloomington, MN 55438
Laboratory ID: 101103

has fulfilled the requirements of the AIHA Laboratory Quality Assurance Programs (LQAP), thereby, conforming to the ISO/IEC 17025 international standard, *General Requirements for the Competence of Testing and Calibration Laboratories.*
The above named laboratory has been accredited by AIHA in the following:

ACCREDITATION PROGRAMS

✓	**INDUSTRIAL HYGIENE**	Accreditation Expires: 02/01/2008
✓	**ENVIRONMENTAL LEAD**	Accreditation Expires: 02/01/2008
☐	**ENVIRONMENTAL MICROBIOLOGY**	Accreditation Expires:
☐	**FOOD**	Accreditation Expires:
☐	**UNIQUE SCOPE**	Accreditation Expires:

Specific categories of testing, within each Accreditation Program, for which the above named laboratory maintains accreditation is outlined on the attached **Scope of Accreditation.** Continued accreditation is contingent upon successful on-going compliance with LQAP requirements. This certificate is not valid without the attached **Scope of Accreditation.**

Kimberly A. Ruthe, CIH
Chairperson, Analytical Accreditation Board

Donna M. Doganiero, CIH
President, AIHA

Date Issued: 12/15/2004

UMP006040

AIHA
Your Essential Connection: Advancing Occupational and Environmental Health and Safety Globally
2700 Prosperity Ave., Suite 250, Fairfax, VA 22031 U.S.A.
(703) 849-8888; Fax (703) 207-3561; www.aiha.org

The laboratory participates in the following AIHA* or AIHA-approved proficiency testing programs:

- ✓ Metals*
- ✓ Silica*
- ✓ Asbestos*
- ☐ Bulk Asbestos*
- ☐ Beryllium*
- ✓ Organic Solvents*
- ✓ Diffusive Sampler (3M)*
- ☐ Diffusive Sampler (SKC)*
- ☐ Diffusive Sampler (AT)*
- ☐ WASP[1] (Formaldehyde)
- ☐ WASP[1] (Thermal Desorption Tubes)
- ☐ Pharmaceutical Round Robin
- ☐ Compressed/Breathing Air Round Robin
- ☐ NVLAP (determined at the time of site assessment)

[1] Workplace Analytical Scheme for Proficiency

LABORATORY QUALITY ASSURANCE PROGRAMS

AIHA
Your Essential Connection: Advancing Occupational and Environmental Health and Safety Globally
2700 Prosperity Ave., Suite 250, Fairfax, VA 22031 U.S.A.
(703) 849-8888; Fax (703) 207-3561; www.aiha.org

AIHA Laboratory Quality Assurance Programs

SCOPE OF ACCREDITATION

Braun Intertec Corporation
11001 Hampshire Avenue South, Bloomington, MN 55438

Laboratory ID: 101103
Issue Date: 11/13/2006

The laboratory is approved for those specific field(s) of testing/methods listed in the table below. Clients are urged to verify the laboratory's current accreditation status for the particular field(s) of testing/Methods, since these can change due to proficiency status, suspension and/or revocation. A complete listing of currently accredited Industrial Hygiene laboratories is available on the AIHA website at:
http://www.aiha.org/Content/LQAP/accred/AccreditedLabs.htm

Industrial Hygiene Laboratory Accreditation Program (IHLAP)

Initial Accreditation Date: 02/01/1987

IHLAP Category	Field of Testing (FoT)	Method	Method Description *(for internal methods only)*
Core Program Testing	Gas Chromatography	3M 3500	
		3M 3550	
		3M 3551	
		ASTM D5197	
		NIOSH 1614	
		NIOSH 2549	
		NIOSH 5523	
		NIOSH 5600	
	HPLC	OSHA 42	
		OSHA 47	
		NIOSH 5029	
		NIOSH 5506	
		NIOSH 5601	
	ICP	EPA SW-846 6010B	
		NIOSH 7024	
		NOSH 7030	
		NIOSH 7048	
		NIOSH 7082	
	XRD	NIOSH 7500	
	Ion Chromatography	OSHA ID-215	
	Gravimetric	NIOSH 0500	
		NIOSH 0600	
	Phase Contrast Microscopy (PCM)	NIOSH 7400	

AIHA
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(703) 849-8888; Fax (703) 207-3561; www.aiha.org

LABORATORY QUALITY ASSURANCE PROGRAMS

AIHA Laboratory Quality Assurance Programs
SCOPE OF ACCREDITATION

Braun Intertec Corporation
11001 Hampshire Avenue South, Bloomington, MN 55438

Laboratory ID: 101103
Issue Date: 11/13/2006

The laboratory is approved for those specific field(s) of testing/methods listed in the table below. Clients are urged to verify the laboratory's current accreditation status for the particular field(s) of testing/Methods, since these can change due to proficiency status, suspension and/or revocation. A complete listing of currently accredited Industrial Hygiene laboratories is available on the AIHA website at:
http://www.aiha.org/Content/LQAP/accred/AccreditedLabs.htm

The EPA recognizes the AIHA ELLAP program as meeting the requirements of the National Lead Laboratory Accreditation Program (NLLAP) established under Title X of the Residential Lead-Based Paint Hazard Reduction Act of 1992 and includes paint, soil and dust wipe analysis. Air analysis is not included as part of the NLLAP.

Environmental Lead Laboratory Accreditation Program (ELLAP)

Initial Accreditation Date: 02/01/1999

Field of Testing (FoT)	Method	Method Description *(for internal methods only)*
Airborne Dust	EPA SW-846 3050B	
	EPA SW-846 6010B	
Paint	EPA SW-846 3050B	
	EPA SW-846 6010B	
Settled Dust by Wipe	EPA SW-846 3050B	
	EPA SW-846 6010B	
Soil	EPA SW-846 3050B	
	EPA SW-846 6010B	

The laboratory participates in the following AIHA testing programs:

- ✓ Paint
- ✓ Soil
- ✓ Airborne Dust
- ✓ Settled Dust by Wipe

AIHA
Protecting Worker Health

January 25, 2008

Lab ID#: 101103

Michelle Hubanks
Braun Intertec Corporation
11001 Hampshire Ave. South
Bloomington, MN 55439 .

Dear Ms. Hubanks:

The AIHA has approved an extension to your laboratory's current certificate of accreditation in the Industrial Hygiene Laboratory Accreditation Program (IHLAP) and Environmental Lead Laboratory Accreditation Program (ELLAP). This extension will expire on May 1, 2008. Remember that your laboratory's proficiency rating in the PAT programs must be maintained for the new certificate to be issued.

Your laboratory remains an accredited laboratory in the IHLAP and ELLAP programs. Please keep a copy of this letter with your expired certificate. If you have questions or concerns, please feel free to contact Heather I. Thompson, Laboratory Accreditation Specialist at (703) 846-0716.

Sincerely,

Cheryl O. Morton

Cheryl O. Morton
Director, Laboratory Quality Assurance Dept.

American Industrial Hygiene Association 2700 Prosperity Avenue, Suite 250, Fairfax, Virginia 22031 USA *main:* 1+ 703-849-8888 *fax:* 1+ 703-207-3561

AIHA
Protecting Worker Health

April 25, 2008

Lab ID#: 101103

Michelle Hubanks
Braun Intertec Corporation
11001 Hampshire Ave. South
Bloomington, MN 55439

Dear Ms. Hubanks:

The AIHA has approved an extension to your laboratory's current certificate of accreditation in the Industrial Hygiene Laboratory Accreditation Program and Environmental Lead Laboratory Accreditation Program. This extension will expire on July 1, 2008. Remember that your laboratory's proficiency rating in the PAT programs must be maintained for the new certificate to be issued.

Your laboratory remains an accredited laboratory in the IHLAP and ELLAP programs. Please keep a copy of this letter with your expired certificate. If you have questions or concerns, please feel free to contact Heather I. Thompson, Laboratory Accreditation Specialist at (703) 846-0716.

Sincerely,

Cheryl O. Morton

Cheryl O. Morton
Director, Laboratory Quality Assurance Dept.

American Industrial Hygiene Association 2700 Prosperity Avenue, Suite 250, Fairfax, Virginia 22031 USA *main* 1+ 703-849-8888 *fax* 1+ 703-207-3561

AIHA
Protecting Worker Health

June 18, 2008 Lab ID#: 101103

Michelle Hubanks
Braun Intertec Corporation
11001 Hampshire Ave. South
Bloomington, MN 55439

Dear Ms. Hubanks:

The AIHA has approved an extension to your laboratory's current certificate of accreditation in the Industrial Hygiene Laboratory Accreditation Program (IHLAP) and Environmental Lead Laboratory Accreditation Program (ELLAP). This extension will expire on September 1, 2008. Remember that your laboratory's proficiency rating in the PAT programs must be maintained for the new certificate to be issued.

Your laboratory remains an accredited laboratory in the IHLAP and ELLAP program(s). Please keep a copy of this letter with your expired certificate. If you have questions or concerns, please feel free to contact Olena Bulgakova, Laboratory Accreditation Specialist at (703) 846-0792.

Sincerely,

Cheryl O. Morton

Cheryl O. Morton
Director, Laboratory Quality Assurance Dept.

American Industrial Hygiene Association 2700 Prosperity Avenue, Suite 250, Fairfax, Virginia 22031 USA *main* 1+ 703-849-8888 *fax* 1+ 703-207-3561

Appendix E-1

Example: PT Sample Report

Revision 3.1
Effective 07/31/08

Michelle Hubanks
Braun Intertec Corporation
11001 Hampshire Ave S
Minneapolis, MN 55438

061108D1 Final Report

QuiK™ Response Proficiency Testing

QuiK™ Response Study

Open Date: 06/11/08

Close Date: 07/29/08

Report Issued Date: 07/29/08

July 29, 2008

Michelle Hubanks
Braun Intertec Corporation
11001 Hampshire Ave S
Minneapolis, MN 55438

Fax: 952-995-2601

Enclosed is your final report for ERA's QuiK™Response program. Your final report includes an evaluation of all results submitted by your laboratory to ERA. None of the assigned value(s) or acceptance limits were available to your laboratory at or before the time of reporting.

As part of your accreditation(s), you may be required to identify the root cause of any "Not Acceptable" results, implement the necessary corrective actions, and then satisfy your PT requirements by participating in a supplemental (QuiK™Response) or future ERA PT study. ERA's technical staff is available to help your laboratory resolve any technical issues that may be impairing your PT performance and possibly affecting the quality of your routine data. Our laboratory and technical staff have well over three hundred years of collective experience in performing the full range of environmental analyses. As part of our technical support, ERA offers QC samples that can be helpful in helping you work through your technical issues.

Thank you for your participation in ERA's QuiK™Response program. If you have any questions, please contact myself, or Amber Bolger, QuiK™Response Coordinator, at 1-800-372-0122.

Sincerely,

Shawn Kassner

Shawn Kassner
Proficiency Testing Manager

Cc: Project File Number 061108D1

Report Recipient	Contact/Phone Number	Reporting Type
Minnesota	Susan Wyatt / 651-201-5323	All Analytes
Wisconsin	Diane Drinkman / 608-264-8950	All Analytes

Project Number: **061108D1**

ERA Customer Number: **B667601**

Laboratory Name: **Braun Intertec Corporation**

Inorganic Results

061108D1 Final Complete Report

Michelle Hubanks
Quality Assurance Officer
Braun Intertec Corporation
11001 Hampshire Ave S
Minneapolis, MN 55438
952-995-2638

EPA ID: MN00063
ERA Customer Number: B667601
Report Issued: 07/29/08
Study Dates: 06/11/08 - 07/29/08

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
WP Minerals							
0027	Alkalinity as CaCO3	mg/L		51.8	44.9 - 58.9	Not Reported	
0028	Chloride	mg/L		106	91.1 - 121	Not Reported	
0020	Conductivity at 25°C	µmhos/cm		533	480 - 586	Not Reported	
0029	Fluoride	mg/L		1.85	1.50 - 2.21	Not Reported	
0026	Potassium	mg/L		25.6	21.1 - 30.5	Not Reported	
0025	Sodium	mg/L		91.5	77.7 - 105	Not Reported	
0030	Sulfate	mg/L		26.7	21.2 - 31.5	Not Reported	
0021	Total Dissolved Solids at 180°C	mg/L	263	329	248 - 410	Acceptable	SM2540C
1950	Total Solids at 105°C	mg/L		346	304 - 383	Not Reported	

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Appendix F-1

QC Summary Tables

Revision 3.1
Effective 07/31/08

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Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
VOCs by 5030/5035/8260B	BFB Tune	Every 12 hours	Refer to Lab SOP GCMS8260624VOC	Retune or service mass spectrometer Repeat BFB analysis
	Initial (ICAL)	Initially and as required	%RSD ≤ 30 for CCCs , ≤15 for all other targets Min. RF ≥0.10 for SPCCs, ≥ 0.3 for 1,1,2,2-tetrachloroethane and chlorobenzene Quadratic fit with 6 points for any compound with %RSD >15, linear fit needs 5 pts. R > 0.99	Reprep Standards Recalibrate Clean/service GC/MS system
	Continuing Calibration (CCAL)	At the beginning of each run and every 12 hours thereafter.	%D +/-20 for CCCs Min. RF for SPCCs meet same criteria as ICAL	Reprep the CCAL and rerun Recalibrate
	Internal Standards and Retention times	Added to every project sample and QC sample	Retention times for the IS within +/- 0.5 minutes of the ICAL standard IS response is -50% to +100% of the response of the associated ICAL standard	Reinject to confirm matrix effect after a sample whose internal standard recoveries were acceptable Dilute Sample Re-analyze all samples while system was malfunctioning.
	Surrogates	Added to every project sample and QC sample	Refer to Appendix E-2	If surrogate is outside control limits, sample may be reanalyzed and/or reprepped If reanalysis confirms original analysis, flag data Complete nonconformance form
	Method Blank / Instrument Blank	One per analytical batch (not to exceed 20 samples)	Absolute value must be < RL	Identify source of contamination reanalyzed and/or reprepped Complete Track-IT!
	Laboratory Control Sample Pair (LCS/LCSD)	One per analytical batch (not to exceed 20 samples)	Refer to Appendix E-2	Correct problem and reanalyze LCS/LCSD and all samples in the affected analytical batch. If necessary, flag data. Complete Track-IT!
	Matrix Spike Samples (MS/MSD)	Analyzed at 5% frequency for project samples	Refer to Appendix E-2	Examine unspiked sample Check LCS of batch. Evaluate for matrix effects and flag data as necessary Complete Track-IT!
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

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Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
VOCs by EPA 624	BFB Tune	Every 12 hours	Refer to Lab SOP GCMS8260624VOC	Retune or service mass spectrometer Repeat BFB analysis
	Initial (ICAL)	Initially and as required	%RSD < 30%	Reprep Standards Recalibrate Clean/service GC/MS system
	Continuing Calibration (CCAL)	At the beginning of each run and every 12 hours thereafter.	%D +/-20% for analytes	Reprep the CCAL and rerun Recalibrate
	Internal Standards and Retention times	Added to every project sample and QC sample	Retention times for the IS within +/- 0.5 minutes of the CCAL standard IS response is -50% to +100% of the response of the associated CCAL standard	Reinject to confirm matrix effect after a sample whose internal standard recoveries were acceptable Dilute Sample Re-analyze all samples while system was malfunctioning.
	Surrogates	Added to every project sample and QC sample	Refer to Lab SOP GCMS8260624VOC	If surrogate is outside control limits, sample may be reanalyzed and/or reprepped If reanalysis confirms original analysis, flag data Complete Track-IT!
	Method Blank / Instrument Blank	One per analytical batch (not to exceed 20 samples)	Absolute value must be < RL	Identify source of contamination reanalyzed and/or reprepped Complete Track-IT!
	Laboratory Control Samples	1 LCS/LCSD pair per batch	Refer to Appendix E-2	Correct problem and reanalyze LCS/LCSD and all samples in the affected analytical batch. If necessary, flag data. Complete Track-IT!
	Matrix Spike Samples	1 MS/MSD pair per batch	Refer to Appendix E-2	Examine unspiked sample Check LCS of batch. Evaluate for matrix effects and flag data as necessary Complete Track-IT!
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
SVOCs/SW846 3510/3550/8270C	DFTPP Tune Also PCP, Benzidine, and 4,4'DDT	Every 12 hour shift	Refer to Lab SOP GCMS6258270C	Retune or service mass spectrometer Repeat DFTPP analysis
	Initial (ICAL)	Initially and as required	%RSD < 30 for average RF of CCCs , %RSD <15 for all other compounds, if not then use a quadratic fit with 6 points, linear fit analytes needs to have 5 pts. R > 0.99	Recalibrate Clean/service GC/MS system
	SPCCs – 4 compounds	Every 12 hour shift	RF ≥0.050	Maintenance
	Continuing Calibration (CCAL)	At the beginning of each run and every 12 hours	%D +/-20 for CCCs Min. RF for SPCCs meet same criteria as ICAL	Reanalyze Samples Maintenance Recalibrate
	Internal Standards and Retention Times	Added to every project sample and QC sample	Retention times for the IS in the CCAL within +/- 0.5 minutes of the ICAL IS response from CCAL is -50% to +200% of the response of the ICAL	Reinject to confirm matrix effect after a sample whose internal standard recoveries were acceptable Dilute Sample Flag data
	Surrogates	Added to every project sample and QC sample	Refer to Appendix E-2	If surrogate is outside control limits, sample may be reanalyzed and/or reprepped If reanalysis confirms original analysis, flag data Complete Track-IT!
	Method Blank	One per extraction batch (up to a maximum of 20 samples per batch)	Absolute value must be < RL	Identify source of contamination reanalyzed and/or reprepped Flag data Complete Track-IT!
	Laboratory Control Samples (LCS/LCSD)	One pair per extraction batch (up to a maximum of 20 samples per batch)	Refer to Appendix E-2	If either LCS/LCSD is out the associated samples may be re-prepped and re-analyzed. If reanalysis does not fix problem or the laboratory is unable to reanalyze, data must be flagged. Complete Track-IT!

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Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
	Matrix Spike Samples (MS/MSD)	One pair per extraction batch (up to a maximum of 20 samples per batch) when sufficient sample provided	Refer to Appendix E-2	Examine unspiked sample for high analyte concentration Check LCS of batch Evaluate for matrix effects and flag data as necessary Complete Track-IT!
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

BRAUN INTERTEC

Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
SVOCs EPA 625	DFTPP Tune	Every 12 hours	Refer to Lab SOP ORG GCMS6258270C	Retune or service mass spectrometer Repeat DFTPP analysis
	Initial (ICAL)	Initially and as required	%RSD < 35 for average RF for all analytes	Reprep Standards Recalibrate Clean/service GC/MS system
	Continuing Calibration (CCAL)	At the beginning of each run and every 12 hours thereafter.	≤20%D for all analytes	Reprep the CCAL and rerun Recalibrate
	Internal Standards and Retention Times	Added to every project sample and QC sample	Retention times for the IS within +/- 0.5 minutes of the ICAL standard IS response is -50% to + + 00% of the response of the associated ICAL.	Reinject to confirm matrix effect after a sample whose internal standard recoveries were acceptable Dilute Sample Flag data
	Surrogates	Added to every project sample and QC sample	Refer to Appendix E-2	If surrogate is outside control limits, sample will be reanalyzed and/or reprepped If reanalysis confirms original analysis, flag data Complete Track-IT!
	Method Blank	One per extraction batch	Absolute value must be < RL	Identify source of contamination reanalyzed and/or reprepped Flag data Complete Track-IT!
	Laboratory Control Samples (LCS/LCSD)	One set per extraction batch, then at a 5% frequency)	Refer to Appendix E-2	If either LCS/LCSD is out the associated samples must be reanalyzed and/or reprepped If reanalysis does not fix problem or the laboratory is unable to reanalysis data must be flagged. Complete Track-IT!
	Matrix Spike Samples	One per extraction batch, and then at a 5% frequency when sufficient sample is provided	Refer to Appendix E-2	Examine unspiked sample for high analyte concentration Check LCS of batch Evaluate for matrix effects and flag data as necessary Complete Track-IT!
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

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Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
Pesticides by SW846 3510/3550/8081A	Initial (ICAL) 5-point minimum	Initially and as required	R > 0.995	Clean/service GC system Recalibrate Reprep standards
	Continuing Calibration (CCAL)	Every 12 hours, and at the beginning and end of run	% D +/- 15	Recalibrate Reprep Standard Perform GC maintenance
	PEM	Beginning and every 12 hours	Breakdown for DDT and endrin < 15%	Clean injection port and rerun all samples
	Surrogates	Added to every project sample and QC sample	70-130% Recovery RSD < 20%	If %R < LCL reanalyzed and/or reprepped If reanalysis confirms low %R, flag data Complete Track-IT!
	Method Blank	One per analytical batch	Absolute value must be < RL	Identify source of contamination reanalyzed and/or reprepped samples Complete Track-IT!
	Laboratory Control Samples (LCS/LCSD)	One set per extraction batch (up to a maximum of 20 samples per batch)	70-130% Recovery RPD < 20%	If either LCS/LCSD is out the associated samples must be reanalyzed and/or reprepped If reanalysis does not fix problem or the laboratory is unable to reanalysis data must be flagged. Complete Track-IT!
	Matrix Spike Samples (MS/MSD)	One set per extraction batch (up to a maximum of 20 samples per batch) when sufficient sample provided	70-130% Recovery RPD < 20%	Evaluate for matrix effects and flag data as necessary. If out, refer to LCS/LCSD. Complete Track-IT!
	Second Column Confirmation	For results quantitated > RL on both columns	Within retention time windows on both columns	
	Retention Times	For each column type	Overlay surrogate peak of sample to surrogate peak of QC	
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

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BRAUN INTERTEC

Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
Pesticides/PCBs by EPA 608	Initial (ICAL) 5-point minimum	Initially and as required	R > 0.99	Clean/service GC system Recalibrate Reprep standards
	Continuing Calibration (CCAL)	Every 12 hours, and at the beginning and end of run	% D +/- 15	Reprep Standard Recalibrate Perform GC maintenance
	PEM	Beginning and every 12 hours	Breakdown for DDT and endrin < 15%	Clean injection port and rerun all samples
	Surrogates	Added to every project sample and QC sample	70-130% Recovery RSD < 20%	If %R < LCL reanalyzed and/or reprepped If reanalysis confirms low %R, flag data Complete Track-IT!
	Method Blank	One per analytical batch	Absolute value must be < RL	Identify source of contamination reanalyzed and/or reprepped Complete Track-IT!
	Laboratory Control Samples (LCS/LCSD)	One set per extraction batch (up to a maximum of 20 samples per batch)	70-130% Recovery RPD < 20%	If either LCS/LCSD is out the associated samples may be reanalyzed and/or reprepped If reanalysis does not fix problem or the laboratory is unable to reanalysis data must be flagged. Complete Track-IT!
	Matrix Spike Samples (MS/MSD)	One set per extraction batch (up to a maximum of 20 samples per batch) when sufficient sample provided	70-130% Recovery RPD < 20%	Evaluate for matrix effects and flag data as necessary. If out, refer to LCS/LCSD. Complete Track-IT!
	Second Column Confirmation (Pesticides)	For results quantitated > RL on both columns	Within retention time windows on both columns Values agree within a factor of 20%	
	Retention Times	For each column type	Overlay surrogate peak of sample to surrogate peak of QC	
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

BRAUN INTERTEC

Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
PCBs by SW846 3510/3550/8082	Initial (ICAL) 5-point minimum	Initially and as required	R > 0.99	Clean/service GC system Recalibrate Reprep standards
	Continuing Calibration (CCAL)	Every 12 hours, and at the beginning and end of run	% Difference (%D) +/- 15	Reprep Standard Recalibrate Perform GC maintenance
	Surrogates	Added to every project sample and QC sample	60-150% Recovery RSD < 20%	If %R < LCL reprep and reanalyze samples If reanalysis confirms low %R, flag data Complete Track-IT!
	Method Blank	One per analytical batch	Less than two to five times the reporting limit	Identify source of contamination Reprep and reanalyze samples Complete Track-IT!
	Laboratory Control Samples (LCS/LCSD)	One set per extraction batch (up to a maximum of 20 samples per batch)	70-130% Recovery RPD < 20%	If either LCS/LCSD is out the associated samples must be re-prepped and re-analyzed. If reanalysis does not fix problem or the laboratory is unable to reanalysis data must be flagged. Complete Track-IT!
	Matrix Spike Samples (MS/MSD)	One set per extraction batch (up to a maximum of 20 samples per batch) when sufficient sample provided	70-130% Recovery RPD < 20%	Evaluate for matrix effects and flag data as necessary. If out, refer to LCS/LCSD. Complete Track-IT!
	Retention Times	For each column type	Overlay surrogate peak of sample to surrogate peak of QC	
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

BRAUN INTERTEC

Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
ICP Metals by SW -846 3005A/3010/3020/ 3050B/6010B EPA 200.7	Initial (ICAL) Minimum of a 2-point calibration (blank + standard)	At the beginning of each day's analytical run.	Acceptable curve fit per instrument specifications	Recalibrate Reprep standards
	Initial Calibration Verification (ICV)	Immediately following calibration	Within 10% of true value for SW-846 6010B. Within 5% of true value for EPA 200.7	Recalibrate Reprep standard
	Initial Calibration Blank (ICB)	Immediately following initial run of the internfernence check standards.	Absolute value must be < RL	Recalibrate
	Continuing Calibration Verification (CCV)	Immediately following calibration, after every 10 samples, and after the last sample analyzed	Within 5% of true value immediately following calibration. Within 10% of the true value for subsequent CCVs.	Recalibrate Repeat samples that were analyzed between the last acceptable CCV and the invalid CCV. Reprep standard
	Continuing Calibration Blank (CCB)	Every 10 samples and after the last sample analyzed	Absolute value must be < RL	Recalibrate. Repeat analysis of CCB Repeat samples that were analyzed between the last acceptable CCB and the invalid CCB.
	Interference Check Standards (IFA/IFB)	Beginning and end of the analytical run	IFA Absolute value must be < RL IFB +/- 20%	Make adjustment to IEC's Recalibrate Rerun samples if necessary
	Method Blank	One per analytical batch	Absolute value must be < RL	Identify source of contamination Reprep and reanalyze samples Complete Track-IT!
	Laboratory Control Samples	One LCS/LCSD pair per batch	Refer to E-2	Redigest & reanalyze sample batch Complete Track-IT!
	Matrix Spike Samples (MS/MSD)	One pair per analytical batch or as required by client	Refer to E-2	Evaluate for matrix effects. Flag data as appropriate. Complete Track-IT!

BRAUN INTERTEC

Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

BRAUN INTERTEC

Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
ICP-MS Metals by SW -846 6020A EPA 200.8	Initial (ICAL) Minimum of a 2-point calibration (blank + standard)	Initially and as required daily	Acceptable curve fit per instrument specifications	Recalibrate Reprep standards
	Initial Calibration Verification (ICV)	Beginning of the analytical run	Within 10 % of true value	Recalibrate Reprep standard
	Initial Calibration Blank (ICB)	Immediately following the ICV	Absolute value must be < RL	Recalibrate
	Continuing Calibration Verification (CCV)	after every 10 samples, and after the last sample analyzed	Within 10% of true value	Recalibrate Repeat samples that were analyzed between the last acceptable CCV and the invalid CCV. Reprep standard
	Continuing Calibration Blank (CCB)	After every CCV	Absolute value must be < RL	Recalibrate. Repeat samples that were analyzed between the last acceptable CCB and the invalid CCB.
	Interference Check Standards	End of the analytical run	Absolute value must be < RL	Qualify data
	Method Blank	One per analytical batch	Absolute value must be < RL	Identify source of contamination Redigest & reanalyze Sample Batch Complete Track-IT!
	Laboratory Control Samples (LCS/LCSD)	One pair per analytical batch	Refer to E-2	If either LCS/LCSD is out redigest batch Complete Track-IT!
	Matrix Spike Samples (MS/MSD)	One pair per analytical batch or as required by client	Refer to E-2	Evaluate for matrix effects. Flag data as appropriate. Complete Track-IT!
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

BRAUN INTERTEC

Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
Mercury by SW 7470A/7471A EPA 245.1	Initial (ICAL) 5-point calibration	Beginning of each sample run	Acceptable curve fit per instrument specifications	Recalibrate Reprep Standards
	Initial Calibration Verification (ICV)	Immediately following the calibration	Within 5% of true value	Recalibrate
	Initial Calibration Blank (ICB)	Immediately following the ICV	Absolute value must be < RL	Recalibrate
	Continuing Calibration Verification (CCV)	Every 10 samples and after the last sample analyzed	Within 10% of true value	Recalibrate Repeat samples that were analyzed between the last acceptable CCV and the invalid CCV.
	Continuing Calibration Blank (CCB)	After each CCB	Absolute value must be < RL	Recalibrate Repeat samples that were analyzed between the last acceptable CCB and the invalid CCB.
	Method Blank	One per analytical batch	Absolute value must be < RL	Identify source of contamination Redigest and reanalyze samples Complete Track-IT!
	Laboratory Control Samples (LCS/LCSD)	One pair per analytical batch	Refer to E-2	If either LCS/LCSD is out reprep]If LCS/LCSD is OK but RPD is out, flag data Complete Track-IT!
	Matrix Spike Samples (MS/MSD)	One pair per analytical batch or as required by client	Refer to E-2	Evaluate for matrix effects. Flag data where appropriate Complete Track-IT!
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

BRAUN INTERTEC

Parameter/Method	Calibration/ QC	Frequency	Acceptance Criteria	Typical Corrective Action
Diesel Range Organics (DRO) by Wisconsin DNR Modified DRO – PUBL-SW- 141	Initial Calibration 5-point minimum	Initially and as required	R ≥ 0.995	Clean/service GC system Recalibrate Reprep standards
	Continuing Calibration	Every 10 samples	≤ 20% Difference	Reprep Standard Recalibrate GC maintenance
	Method Blank	One per analytical batch	Water: ≤ 50 ug/l, Soil: ≤ 5. mg/kg	Identify source of contamination Reprep and reanalyze samples Complete nonconformance form
	Laboratory Control Samples (LCS/LCSD)	One set per extraction batch (up to a maximum of 20 samples per batch)	70-120% Recovery for Soils 75%-115% Recovery for Waters RPD < 20% for both waters and soils	If either LCS/LCSD is out the associated samples must be re-prepped and re-analyzed. If reanalysis does not fix problem or the laboratory is unable to reanalysis data must be flagged. Complete nonconformance form
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

BRAUN INTERTEC

Gasoline Range Organics (GRO) PVOC by Wisconsin DNR Modified GRO Method PUB-SW-140	Initial Calibration 5-point minimum	Initially and as required	R ≥ 0.995	Clean/service GC and purge/trap system Recalibrate Reprep standards
	Continuing Calibration	Every 24 hours and after every 20 samples	≤ 15%Difference	Reprep Standard Recalibrate GC maintenance
	Surrogate	Added to every project sample and QC sample	> 80 % Recovery	If %R < LCL reprep and reanalyze samples If reanalysis confirms low %R, flag data Complete Track-IT!
	Method Blank	One per analytical batch	Water: ≤ 50 ug/l, Soil: ≤ 5. mg/kg	Identify source of contamination Reprep and reanalyze samples
	Laboratory Control Samples (LCS/LCSD)	One set per extraction batch (up to a maximum of 20 samples per batch)	80-120% Recovery RSD ≤ 20%	If either LCS/LCSD is out the associated samples must be re-prepped and re-analyzed. If reanalysis does not fix problem or the laboratory is unable to reanalysis data must be flagged. Complete Track-IT!
	Matrix Spike Samples (MS/MSD)	One set per extraction batch (up to a maximum of 20 samples per batch) when sufficient sample provided	80-120% Recovery RSD ≤ 20%	Evaluate for matrix effects and flag data as necessary. If out, refer to LCS/LCSD. Complete Track-IT!
	Method Reporting Limit Verification	After each initial calibration or once per month at a minimum	60-140% Recovery	Update MRL to the next lower standard that passes 60-140%. Recalibrate.

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UMP009069

Appendix F-2

LIMS Data Qualifiers

Revision 3.1
Effective 07/31/08

LIMS Qualifiers 7/30/2008

Braun Intertec Corporation

* The qualifiers marked with an "X" in the "isRetain" column are used to replace numerical data with text information on the report (current maximum of 13 characters).
(i.e. the "P" qualifier would be used to report a requested test parameter as "Present"; customized text information is done with the "Z1" and "Z2" qualifiers.)

Qualifiers marked with "X" in the "isActive" column are currently available for use.

Qualifiers	isRetain*	isActive	Text Body
A1		X	[Custom Value]
A2		X	[Custom Value]
A3		X	[Custom Value]
A4		X	[Custom Value]
A5		X	[Custom Value]
B		X	Analyte is found in the associated blank as well as in the sample (CLP B-flag).
bba	X	X	Baseboard with adhesive
bft	X	X	Black fibrous tarry
bfts	X	X	Black fibrous tarry with stones
bm	X	X	Black mastic
bmya	X	X	Black mastic/yellow adhesive
bra	X	X	Brown adhesive
brctp	X	X	Brown fibrous ceiling tile with paint
brf	X	X	Brown fibrous
brp	X	X	Brown paper
brwp	X	X	Brown/white paper
btp	X	X	Black tar paper
bv	X	X	Bronze vermiculite
cta	X	X	Ceiling tile with adhesive
dp		X	N-Nitrosodiphenylamine decomposes to Diphenylamine. Therefore, the combined concentrations of both analytes are represented in the reported value for N-Nitrosodiphenylamine.
dw	X		Dust Wipe
E		X	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate (CLP E-flag).
fa		X	Total hydrocarbon chromatography was compared to gasoline and fuel oil standards. It more closely matches gasoline.
fb		X	Total hydrocarbon chromatography was compared to gasoline and fuel oil standards. It more closely matches fuel oil.
ff		X	The sample was received with headspace in the vial. A loss of some analytes may have occurred.
fs		X	The method reporting limit (MRL) was raised due to limited sample volume or weight.
ft	X	X	Floor tile
fta	X	X	Floor tile with adhesive
ftam	X	X	Floor tile with adhesive and mastic
ftm	X	X	Floor tile with mastic
gf	X	X	Gray fibrous
gfb	X	X	Gray fibrous backing
gfba	X	X	Gray fibrous backing with adhesive
gfc	X	X	Gray fibrous cementitious
gfp	X	X	Gray fibrous powdery
gft	X	X	Gray floor tile
gg		X	The sample was received past the method specified holding time.
gg1		X	The sample was received with insufficient time remaining to perform the analysis within the EPA recommended holding time.
ggc	X	X	Gray granular cementitious
gh		X	The sample was received past the 15-minute EPA specified holding time.
gk		X	The sample was analyzed [Custom Value] past the method specified holding time.
gm		X	The sample pH was greater than 2.
gn		X	This analyte was detected in the trip blank.
go		X	The laboratory control sample recovery is outside of laboratory control limits.
gp		X	The relative percent difference (RPD) for the laboratory control sample and laboratory control sample duplicate is outside of laboratory control limits.
gpc	X	X	Gray powdery compound
gpcp	X	X	Gray powdery compound with paint
gs		X	The sample was not collected according to the specifications of the Diesel Range Organics (DRO) method; therefore, the results are reported as Diesel Range Extractables (DRE).
gt		X	The sample was not collected according to the specifications of the Gasoline Range Organics (GRO) method; therefore, the results are reported as Gasoline Range Extractables (GRE).
gw		X	The sample was extracted [Custom Value] past the method specified holding time.
hc		X	Early eluting peaks typical of gasoline were not present in the sample chromatogram.
hd		X	The sample chromatogram appears to indicate a mixture of gasoline, fuel oil, or other petroleum product.
hf		X	A baseline rise was detected after the diesel range window. However, no discernible hydrocarbon pattern was detected.
hh		X	Early eluting peaks not typical of fuel oil are present in the sample chromatogram.
hi		X	The sample chromatogram indicates the presence of lower boiling hydrocarbons than expected in the gasoline range chromatogram.
hij		X	The sample chromatogram indicates the presence of lower and higher boiling hydrocarbons than expected in the gasoline range chromatogram.
hj		X	The sample chromatogram indicates the presence of higher boiling hydrocarbons than expected in the gasoline range chromatogram.
hk		X	The sample chromatogram does not match that of a typical diesel fuel chromatogram.
hl		X	The sample chromatogram does not match that of a typical gasoline fuel chromatogram.

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hn		X	The sample chromatogram indicates the presence of lower boiling hydrocarbons than expected in the diesel range chromatogram.
hno		X	The sample chromatogram indicates the presence of lower and higher boiling hydrocarbons than expected in the diesel range chromatogram.
ho		X	The sample chromatogram indicates the presence of higher boiling hydrocarbons than expected in the diesel range chromatogram.
hs		X	The sample weight exceeded the maximum weight specification for the diesel range organic (DRO) method; therefore, the results are reported as diesel range extractables (DRE).
ht		X	The sample weight does not meet the minimum weight requirements established in the method.
htz		X	The sample weight exceeded the maximum weight specification in the gasoline range organic (GRO) method; therefore, the results are reported as gasoline range extractables (GRE).
hv		X	The sample chromatogram indicates the presence of lower boiling hydrocarbons than expected in a typical fuel oil chromatogram.
hw		X	The sample chromatogram indicates the presence of higher boiling hydrocarbons than expected in a typical fuel oil chromatogram.
hx		X	The relative percent difference (RPD) was outside of laboratory control limits.
ia		X	The back section of the sample tube contained greater than 10 percent of the amount collected on the front section. This indicates possible analyte breakthrough (loss) during field sampling.
ib		X	Unidentified compounds are present in the sample.
ic		X	Due to the high levels present in the sample, this analyte was quantified and reported.
ie		X	The result was corrected for field blank concentrations.
in		X	The laboratory cannot verify that the wipe used for this sample meets ASTM requirements.
ins	X	X	Insulation
io		X	The result was corrected for method blank concentrations.
ir		X	The recovery study yielded results of <75%. Per the NIOSH Manual of Analytical Methods, the result is considered semi-quantitative.
is		X	The secondary sorbent pad of the 3M 3520/3530 OVM contained greater than 50% of that found on the primary sorbent pad. This indicates possible analyte loss during field sampling due to overloading the monitor.
isp	X	X	Insuf. sample
iu		X	The results are based on the response factor of benzene.
J		X	Detected but below the Method Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
ln	X	X	Linoleum
ndft		X	ND Floor Tile
NP	X	X	Not present
ns	X	X	No sample present
O4		X	This sample was analyzed outside the EPA recommended holding time.
O5		X	This sample was extracted outside of the EPA recommended holding time.
P	X	X	Present
pc		X	PCB 1260 is also present in the sample but at a lower concentration than PCB 1254.
pe		X	PCB 1254 is also present in the sample but at a lower concentration than PCB 1260.
pH		X	The sample pH was [Custom Value]; this is above the method specified limit (pH<2).
po		X	Particulate overload, reported value may be underestimated.
pp		X	Particulate found on cassette.
QM-05			The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
qn		X	The spike recovery is outside of laboratory control limits for the matrix spike (MS) and/or the matrix spike duplicate (MSD).
qo		X	The relative percent difference (RPD) was outside of laboratory control limits for the matrix spike (MS) and matrix spike duplicate (MSD) samples.
qp		X	The relative percent difference (RPD) was outside of laboratory control limits for the sample and sample duplicate (DUP).
R-01		X	The Method Reporting Limit for this analyte has been raised to account for matrix interference.
R-05		X	The sample was diluted due to the presence of high levels of non-target analytes resulting in elevated reporting limits.
rm	X	X	Roofing material
rr		X	The reported data has been revised.
S-01		X	The surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interferences.
sd		X	See case narrative section for further information.
se	X	X	See case nar.
sk		X	The surrogate recovery is outside of laboratory control limits due to matrix interference.
sp	X	X	Silver paint
sr	X	X	Sheetrock
sur		X	One or more surrogate recoveries reported with this sample analysis are outside of the laboratory control limits.
tc	X	X	Too numerous to count. The presence of total coliform bacteria was confirmed and found to be at a concentration of greater than 200 CFU/100 mL.
tf	X	X	Tan fibrous
tfb	X	X	Tan fibrous backing
tfct	X	X	Tan fibrous ceiling tile with paint
tfm	X	X	Tan fibrous micaeaous
tfp	X	X	Tan fibrous powdery
tfpt	X	X	Tan fabric with paint
tft	X	X	Tan floor tile
tgct	X	X	Gray fibrous ceiling tile with paint
tic		X	Compounds were tentatively identified by comparison to the NIST (NBS) database of mass spectra. These identifications represent the best fit obtained from the database search, subject to the interpretation of the analyst.
tntc	X	X	To numerous to count.
tp	X	X	Tan paper
tpc	X	X	Tan powdery compound
tpcp	X	X	Tan powdery compound with paint
trace		X	Detected during routine analysis, but no points were counted during the point count analysis.
ts		X	This analysis was performed by a subcontract laboratory.
tt		X	Concentrations are estimated values calculated relative to the closest eluting internal standard using peak areas from the total ion chromatogram and a relative response factor of one.
tu		X	The reported value for the unknown analyte is based on a molecular weight of 100 because the actual molecular weight is not known.
tv	X	X	Tan vermiculite
tw		X	The weight of the sample submitted for TCLP testing was less than the minimum specified in the method.

vc		X	2-Chloroethyl Vinyl Ether does not recover when analysis is performed from an acid-preserved sample container.
ve		X	The method reporting limits (MRLs) are elevated due to adjustments of the sample preparation amounts. This was necessary because of the sample matrix.
vf		X	The method reporting limit was raised for one or more analytes. A dilution of the sample was necessary due to high analyte levels.
vfa		X	The method reporting limit (MRL) was raised for one or more analytes; a dilution of the sample was necessary due to high analyte levels and/or matrix interferences.
vg		X	The method reporting limits (MRLs) were raised due to reduced sample volume as a result of high sample sediment content.
vh		X	Methanol was not added to the soil at the time of collection as per method specifications.
vm		X	The surrogate recovery is above the laboratory generated control limits.
vn		X	The surrogate recovery is below the laboratory generated control limits.
vo		X	Due to matrix interference, the surrogate recovery is unavailable.
vp		X	Low-level unidentified compounds are present.
vq			The matrix spike recovery is outside of laboratory control limits due to matrix interferences.
wc	X	X	White chalky
wf	X	X	White fibrous
wfba	X	X	White fibrous backing with adhesive
wfc	X	X	White fibrous chalky
wfp	X	X	White fibrous powdery
wft	X	X	White floor tile
wgt	X	X	White granular texture
wmt	X	X	White micaceous texture
wp	X	X	White powdery
wpc	X	X	White powdery compound
wpcp	X	X	White powdery compound with paint
ya	X	X	Yellow adhesive
yf	X	X	Yellow fibrous
Z1	X	X	[Custom Value]
Z2	X	X	[Custom Value]

Appendix G-1

QC Limits and MDL/MRL Tables

Revision 3.1
Effective 07/31/08

SW-846 8260 VOC WATERS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
1,1,1,2-Tetrachloroethane	0.051	1.0 ug/L		75 - 125	20	75 - 125	20
1,1,1-Trichloroethane	0.045	1.0 ug/L		75 - 125	20	75 - 125	20
1,1,2,2-Tetrachloroethane	0.042	1.0 ug/L		75 - 125	20	75 - 125	20
1,1,2-Trichloroethane	0.097	1.0 ug/L		75 - 125	20	75 - 125	20
1,1,2-Trichlorotrifluoroethane	0.064	1.0 ug/L		75 - 125	20	75 - 125	20
1,1-Dichloroethane	0.050	1.0 ug/L		75 - 125	20	75 - 125	20
1,1-Dichloroethene	0.098	1.0 ug/L		75 - 125	20	75 - 125	20
1,1-Dichloropropene	0.062	1.0 ug/L		75 - 125	20	75 - 125	20
1,2,3-Trichlorobenzene	0.13	1.0 ug/L		75 - 125	20	75 - 125	20
1,2,3-Trichloropropane	0.16	1.0 ug/L		75 - 125	20	75 - 125	20
1,2,4-Trichlorobenzene	0.093	1.0 ug/L		75 - 125	20	75 - 125	20
1,2,4-Trimethylbenzene	0.030	1.0 ug/L		75 - 125	20	75 - 125	20
1,2-Dibromo-3-chloropropane	0.11	1.0 ug/L		75 - 125	20	75 - 125	20
1,2-Dibromoethane	0.062	1.0 ug/L		75 - 125	20	75 - 125	20
1,2-Dichlorobenzene	0.053	1.0 ug/L		75 - 125	20	75 - 125	20
1,2-Dichloroethane	0.042	1.0 ug/L		75 - 125	20	75 - 125	20
1,2-Dichloropropane	0.072	1.0 ug/L		75 - 125	20	75 - 125	20
1,3,5-Trimethylbenzene	0.039	1.0 ug/L		75 - 125	20	75 - 125	20
1,3-Dichlorobenzene	0.062	1.0 ug/L		75 - 125	20	75 - 125	20
1,3-Dichloropropane	0.060	1.0 ug/L		75 - 125	20	75 - 125	20
1,4-Dichlorobenzene	0.051	1.0 ug/L		75 - 125	20	75 - 125	20
2,2-Dichloropropane	0.032	1.0 ug/L		75 - 125	20	75 - 125	20
2-Butanone (MEK)	0.70	10 ug/L		75 - 125	20	75 - 125	20
2-Chloroethyl Vinyl Ether	0.054	2.5 ug/L		75 - 125	20	75 - 125	20
2-Chlorotoluene	0.067	1.0 ug/L		75 - 125	20	75 - 125	20
2-Hexanone	0.30	5.0 ug/L		75 - 125	20	75 - 125	20
4-Chlorotoluene	0.053	1.0 ug/L		75 - 125	20	75 - 125	20
4-Isopropyltoluene	0.036	1.0 ug/L		75 - 125	20	75 - 125	20
Acetone	1.7	20 ug/L		75 - 125	20	75 - 125	20
Acrolein	1.4	15 ug/L		75 - 125	20	75 - 125	20
Acrylonitrile	0.16	1.0 ug/L		75 - 125	20	75 - 125	20
Allyl Chloride	0.087	1.0 ug/L		75 - 125	20	75 - 125	20
Benzene	0.042	1.0 ug/L		75 - 125	20	75 - 125	20
Bromobenzene	0.070	1.0 ug/L		75 - 125	20	75 - 125	20
Bromochloromethane	0.086	1.0 ug/L		75 - 125	20	75 - 125	20
Bromodichloromethane	0.067	1.0 ug/L		75 - 125	20	75 - 125	20
Bromoform	0.29	5.0 ug/L		75 - 125	20	75 - 125	20
Bromomethane	0.081	1.0 ug/L		70 - 130	20	70 - 130	20
Carbon disulfide	0.048	1.0 ug/L		75 - 125	20	75 - 125	20
Carbon Tetrachloride	0.050	1.0 ug/L		75 - 125	20	75 - 125	20
Chlorobenzene	0.052	1.0 ug/L		75 - 125	20	75 - 125	20
Chlorodibromomethane	0.047	1.0 ug/L		75 - 125	20	75 - 125	20
Chloroethane	0.21	1.0 ug/L		75 - 125	20	75 - 125	20
Chloroform	0.036	1.0 ug/L		75 - 125	20	75 - 125	20
Chloromethane	0.13	1.0 ug/L		75 - 125	20	75 - 125	20
Chloroprene	0.047	1.0 ug/L		75 - 125	20	75 - 125	20
cis-1,2-Dichloroethene	0.096	1.0 ug/L		75 - 125	20	75 - 125	20
cis-1,3-Dichloropropene	0.051	1.0 ug/L		75 - 125	20	75 - 125	20
Dibromomethane	0.12	1.0 ug/L		75 - 125	20	75 - 125	20
Dichlorodifluoromethane	0.056	1.0 ug/L		70 - 130	20	70 - 130	20
Dichlorofluoromethane	0.11	1.0 ug/L		75 - 125	20	75 - 125	20
Ethyl Ether	0.13	1.0 ug/L		75 - 125	20	75 - 125	20
Ethyl methacrylate	0.22	1.0 ug/L		75 - 125	20	75 - 125	20
Ethylbenzene	0.036	1.0 ug/L		75 - 125	20	75 - 125	20
Hexachlorobutadiene	0.27	2.0 ug/L		75 - 125	20	75 - 125	20
Hexachloroethane	0.065	5.0 ug/L		75 - 125	20	75 - 125	20
Isopropyl ether	4.4	10 ug/L		75 - 125	20	75 - 125	20
Isopropylbenzene	0.036	1.0 ug/L		75 - 125	20	75 - 125	20
m,p-Xylenes	0.059	1.0 ug/L		75 - 125	20	75 - 125	20
Methacrylonitrile	0.20	5.0 ug/L		75 - 125	20	75 - 125	20
Methyl iodide	0.037	1.0 ug/L		75 - 125	20	75 - 125	20
Methyl Isobutyl Ketone	0.29	5.0 ug/L		75 - 125	20	75 - 125	20

Methyl Methacrylate	0.24	1.0 ug/L		75 - 125	20	75 - 125	20
Methylene chloride	0.090	5.0 ug/L		75 - 125	20	75 - 125	20
Methyl-t-butyl ether	0.032	1.0 ug/L		75 - 125	20	75 - 125	20
Naphthalene	0.039	1.0 ug/L		75 - 125	20	75 - 125	20
n-Butylbenzene	0.031	1.0 ug/L		75 - 125	20	75 - 125	20
n-Hexane	0.062	1.0 ug/L		75 - 125	20	75 - 125	20
n-Propylbenzene	0.078	1.0 ug/L		75 - 125	20	75 - 125	20
o-Xylene	0.072	1.0 ug/L		75 - 125	20	75 - 125	20
Propionitrile	100	10 ug/L		70 - 130	20	70 - 130	20
sec-Butylbenzene	0.89	1.0 ug/L		75 - 125	20	75 - 125	20
Styrene	0.027	1.0 ug/L		75 - 125	20	75 - 125	20
tert-Butylbenzene	0.049	1.0 ug/L		75 - 125	20	75 - 125	20
Tetrachloroethene	0.027	2.0 ug/L		75 - 125	20	75 - 125	20
Tetrahydrofuran	0.062	5.0 ug/L		75 - 125	20	75 - 125	20
Toluene	0.48	1.0 ug/L		75 - 125	20	75 - 125	20
trans-1,2-Dichloroethene	0.048	1.0 ug/L		75 - 125	20	75 - 125	20
trans-1,3-Dichloropropene	0.087	1.0 ug/L		75 - 125	20	75 - 125	20
trans-1,4-Dichloro-2-butene	0.037	5.0 ug/L		75 - 125	20	75 - 125	20
Trichloroethene	0.39	1.0 ug/L		75 - 125	20	75 - 125	20
Trichlorofluoromethane	0.067	1.0 ug/L		75 - 125	20	75 - 125	20
Vinyl acetate	0.060	5.0 ug/L		75 - 125	20	75 - 125	20
Vinyl chloride	0.062	2.5 ug/L		75 - 125	20	75 - 125	20
surr: 1,2-Dichloroethane-d4			80 - 120				
surr: 4-Bromofluorobenzene			80 - 120				
surr: Dibromofluoromethane			80 - 120				
surr: Toluene-d8			80 - 120				

EPA 624 Volatile Waters

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
1,1,1-Trichloroethane	0.045	1.0 ug/L		75 - 125	20	75 - 125	20
1,1,2,2-Tetrachloroethane	0.042	1.0 ug/L		75 - 125	20	75 - 125	20
1,1,2-Trichloroethane	0.097	1.0 ug/L		75 - 125	20	75 - 125	20
1,1-Dichloroethane	0.050	1.0 ug/L		75 - 125	20	75 - 125	20
1,1-Dichloroethene	0.098	1.0 ug/L		75 - 125	20	75 - 125	20
1,2-Dichlorobenzene	0.053	1.0 ug/L		75 - 125	20	75 - 125	20
1,2-Dichloroethane	0.042	1.0 ug/L		75 - 125	20	75 - 125	20
1,2-Dichloropropane	0.072	1.0 ug/L		75 - 125	20	75 - 125	20
1,3-Dichlorobenzene	0.062	1.0 ug/L		75 - 125	20	75 - 125	20
1,4-Dichlorobenzene	0.051	1.0 ug/L		75 - 125	20	75 - 125	20
2-Chloroethyl Vinyl Ether	0.054	1.0 ug/L		75 - 125	20	75 - 125	20
Acrolein	1.4	15 ug/L		75 - 125	20	75 - 125	20
Acrylonitrile	0.16	1.0 ug/L		75 - 125	20	75 - 125	20
Benzene	0.042	1.0 ug/L		75 - 125	20	75 - 125	20
Bromodichloromethane	0.067	1.0 ug/L		75 - 125	20	75 - 125	20
Bromoform	0.29	5.0 ug/L		75 - 125	20	75 - 125	20
Bromomethane	0.081	1.0 ug/L		75 - 125	20	75 - 125	20
Carbon Tetrachloride	0.050	1.0 ug/L		75 - 125	20	75 - 125	20
Chlorobenzene	0.052	1.0 ug/L		75 - 125	20	75 - 125	20
Chlorodibromomethane	0.047	1.0 ug/L		75 - 125	20	75 - 125	20
Chloroethane	0.21	1.0 ug/L		75 - 125	20	75 - 125	20
Chloroform	0.036	1.0 ug/L		75 - 125	20	75 - 125	20
Chloromethane	0.13	1.0 ug/L		75 - 125	20	75 - 125	20
cis-1,2-Dichloroethene	0.096	1.0 ug/L		75 - 125	20	75 - 125	20
cis-1,3-Dichloropropene	0.051	1.0 ug/L		75 - 125	20	75 - 125	20
Ethylbenzene	0.036	1.0 ug/L		75 - 125	20	75 - 125	20
m,p-Xylenes	0.059	1.0 ug/L		75 - 125	20	75 - 125	20
Methylene chloride	0.090	5.0 ug/L		75 - 125	20	75 - 125	20
o-Xylene	0.072	1.0 ug/L		75 - 125	20	75 - 125	20
Tetrachloroethene	0.062	2.0 ug/L		75 - 125	20	75 - 125	20
Toluene	0.048	1.0 ug/L		75 - 125	20	75 - 125	20
trans-1,2-Dichloroethene	0.087	1.0 ug/L		75 - 125	20	75 - 125	20
trans-1,3-Dichloropropene	0.037	1.0 ug/L		75 - 125	20	75 - 125	20
Trichloroethene	0.067	1.0 ug/L		75 - 125	20	75 - 125	20
Trichlorofluoromethane	0.060	1.0 ug/L		75 - 125	20	75 - 125	20
Vinyl chloride	0.21	1.0 ug/L		75 - 125	20	75 - 125	20
surr: 1,2-Dichloroethane-d4			80 - 120				
surr: 4-Bromofluorobenzene			80 - 120				
surr: Dibromofluoromethane			80 - 120				
surr: Toluene-d8			80 - 120				

SW 846 8260 VOC SOILS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
1,1,1,2-Tetrachloroethane	0.0071	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,1,1-Trichloroethane	0.0030	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,1,2,2-Tetrachloroethane	0.012	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,1,2-Trichloroethane	0.010	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,1,2-Trichlorotrifluoroethane	0.0058	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,1-Dichloroethane	0.0027	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,1-Dichloroethene	0.0043	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,1-Dichloropropene	0.0037	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,2,3-Trichlorobenzene	0.0055	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,2,3-Trichloropropane	0.015	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,2,4-Trichlorobenzene	0.0072	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,2,4-Trimethylbenzene	0.0035	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,2-Dibromo-3-chloropropane	0.020	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,2-Dibromoethane	0.0032	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,2-Dichlorobenzene	0.0059	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,2-Dichloroethane	0.0027	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,2-Dichloropropane	0.0025	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,3,5-Trimethylbenzene	0.0049	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,3-Dichlorobenzene	0.0042	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,3-Dichloropropane	0.0063	0.050 mg/kg	20	75 - 125	20	75 - 125	20
1,4-Dichlorobenzene	0.0060	0.050 mg/kg	20	75 - 125	20	75 - 125	20
2,2-Dichloropropane	0.0052	0.050 mg/kg	20	75 - 125	20	75 - 125	20
2-Butanone (MEK)	0.066	0.50 mg/kg	20	75 - 125	20	75 - 125	20
2-Chloroethyl Vinyl Ether	0.011	0.12 mg/kg	20	75 - 125	20	75 - 125	20
2-Chlorotoluene	0.0097	0.050 mg/kg	20	75 - 125	20	75 - 125	20
2-Hexanone	0.050	0.25 mg/kg	20	75 - 125	20	75 - 125	20
4-Chlorotoluene	0.0066	0.050 mg/kg	20	75 - 125	20	75 - 125	20
4-Isopropyltoluene	0.0029	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Acetone	0.077	1.0 mg/kg	20	75 - 125	20	75 - 125	20
Acrolein	0.057	0.75 mg/kg	20	75 - 125	20	75 - 125	20
Acrylonitrile	0.020	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Allyl Chloride	0.013	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Benzene	0.0022	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Bromobenzene	0.0074	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Bromochloromethane	0.011	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Bromodichloromethane	0.0053	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Bromoform	0.0064	0.25 mg/kg	20	75 - 125	20	75 - 125	20
Bromomethane	0.0068	0.050 mg/kg	20	70 - 130	20	70 - 130	20
Carbon disulfide	0.0032	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Carbon Tetrachloride	0.0028	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Chlorobenzene	0.0021	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Chlorodibromomethane	0.0015	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Chloroethane	0.0056	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Chloroform	0.0058	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Chloromethane	0.010	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Chloroprene	0.0024	0.050 mg/kg	20	75 - 125	20	75 - 125	20
cis-1,2-Dichloroethene	0.0052	0.050 mg/kg	20	75 - 125	20	75 - 125	20
cis-1,3-Dichloropropene	0.0020	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Dibromomethane	0.010	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Dichlorodifluoromethane	0.0063	0.050 mg/kg	20	70 - 130	20	70 - 130	20
Dichlorofluoromethane	0.0052	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Ethyl Ether	0.015	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Ethyl methacrylate	0.0081	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Ethylbenzene	0.0053	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Hexachlorobutadiene	0.012	0.10 mg/kg	20	75 - 125	20	75 - 125	20
Hexachloroethane	0.014	0.25 mg/kg	20	75 - 125	20	75 - 125	20
Isopropyl ether	0.12	0.50 mg/kg	20	75 - 125	20	75 - 125	20
Isopropylbenzene	0.0032	0.050 mg/kg	20	75 - 125	20	75 - 125	20
m,p-Xylenes	0.0063	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Methacrylonitrile	0.064	0.25 mg/kg	20	75 - 125	20	75 - 125	20
Methyl iodide	0.0055	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Methyl Isobutyl Ketone	0.021	0.25 mg/kg	20	75 - 125	20	75 - 125	20

Methyl Methacrylate	0.012	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Methylene chloride	0.032	0.25 mg/kg	20	75 - 125	20	75 - 125	20
Methyl-t-butyl ether	0.0060	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Naphthalene	0.0050	0.050 mg/kg	20	75 - 125	20	75 - 125	20
n-Butylbenzene	0.0061	0.050 mg/kg	20	75 - 125	20	75 - 125	20
n-Hexane	0.0056	0.050 mg/kg	20	75 - 125	20	75 - 125	20
n-Propylbenzene	0.0052	0.050 mg/kg	20	75 - 125	20	75 - 125	20
o-Xylene	0.0070	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Propionitrile	0.11	0.50 mg/kg	20	75 - 125	20	75 - 125	20
sec-Butylbenzene	0.0021	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Styrene	0.0023	0.050 mg/kg	20	75 - 125	20	75 - 125	20
tert-Butylbenzene	0.0051	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Tetrachloroethene	0.0095	0.10 mg/kg	20	75 - 125	20	75 - 125	20
Tetrahydrofuran	0.058	0.25 mg/kg	20	75 - 125	20	75 - 125	20
Toluene	0.0086	0.050 mg/kg	20	75 - 125	20	75 - 125	20
trans-1,2-Dichloroethene	0.0068	0.050 mg/kg	20	75 - 125	20	75 - 125	20
trans-1,3-Dichloropropene	0.0059	0.050 mg/kg	20	75 - 125	20	75 - 125	20
trans-1,4-Dichloro-2-butene	0.022	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Trichloroethene	0.0037	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Trichlorofluoromethane	0.0095	0.050 mg/kg	20	75 - 125	20	75 - 125	20
Vinyl acetate	0.13	0.25 mg/kg	20	75 - 125	20	75 - 125	20
Vinyl chloride	0.012	0.12 mg/kg	20	70 - 130	20	70 - 130	20

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Analyte	Method Detection Limit	Method Reporting Limit	Surrogate % Recovery	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
1,2,4-Trichlorobenzene	0.33	5.0 ug/L		30 - 130	30	30 - 120	20
1,2-Dichlorobenzene	0.27	5.0 ug/L					
1,2-Diphenylhydrazine	0.37	5.0 ug/L					
1,3-Dichlorobenzene	0.30	5.0 ug/L					
1,4-Dichlorobenzene	0.29	5.0 ug/L		30 - 130	30	40 - 110	20
2,4,5-Trichlorophenol	0.15	5.0 ug/L					
2,4,6-Trichlorophenol	0.23	5.0 ug/L					
2,4-Dichlorophenol	0.28	10 ug/L					
2,4-Dimethylphenol	0.40	5.0 ug/L					
2,4-Dinitrophenol	0.96	5.0 ug/L					
2,4-Dinitrotoluene	0.20	5.0 ug/L		30 - 130	30	60 - 120	20
2,6-Dinitrotoluene	0.58	5.0 ug/L					
2-Chloronaphthalene	0.30	5.0 ug/L					
2-Chlorophenol	0.63	10 ug/L		30 - 130	30	40 - 100	20
2-Methylnaphthalene	0.39	5.0 ug/L					
2-Methylphenol	2.5	10 ug/L					
2-Nitroaniline	0.46	5.0 ug/L					
2-Nitrophenol	0.54	10 ug/L					
3,3-Dichlorobenzidine	0.54	5.0 ug/L					
3-/4-Methylphenol	0.28	10 ug/L					
3-Nitroaniline	0.66	5.0 ug/L					
4,6-Dinitro-2-methylphenol	0.70	5.0 ug/L					
4-Bromophenyl phenyl ether	0.24	5.0 ug/L					
4-Chloro-3-methylphenol	0.23	5.0 ug/L		30 - 130	30	50 - 110	20
4-Chloroaniline	0.59	5.0 ug/L					
4-Chlorophenyl phenyl ether	0.25	2.0 ug/L					
4-Nitroaniline	0.34	5.0 ug/L					
4-Nitrophenol	0.82	5.0 ug/L		30 - 130	30	30 - 80	20
Acenaphthene	0.26	2.0 ug/L		30 - 130	30	50 - 110	20
Acenaphthylene	0.19	2.0 ug/L					
Aniline	0.88	5.0 ug/L					
Anthracene	0.21	2.0 ug/L					
Benz(a)anthracene	0.71	2.0 ug/L					
Benzidine	1.3	10 ug/L					
Benzo(a)pyrene	0.77	2.0 ug/L					
Benzo(b)fluoranthene	0.42	2.0 ug/L					
Benzo(g,h,i)perylene	0.67	2.0 ug/L					
Benzo(k)fluoranthene	0.75	2.0 ug/L					
Benzoic acid	0.15	10 ug/L					
Benzyl alcohol	0.32	10 ug/L					
bis(2-Chloroethoxy)methane	0.34	5.0 ug/L					
Bis(2-Chloroethyl)ether	0.42	5.0 ug/L					
Bis(2-chloroisopropyl)ether	0.32	5.0 ug/L					
Bis(2-Ethylhexyl)phthalate	1.5	5.0 ug/L					
Butyl benzyl phthalate	0.31	5.0 ug/L					
Carbazole	0.34	5.0 ug/L					
Chrysene	0.70	2.0 ug/L					
Dibenz(a,h)anthracene	0.78	2.0 ug/L					
Dibenzofuran	0.27	5.0 ug/L					
Diethylphthalate	0.30	5.0 ug/L					
Dimethyl phthalate	0.21	5.0 ug/L					
Di-n-butyl phthalate	0.47	5.0 ug/L					
Di-n-octyl phthalate	0.80	5.0 ug/L					
Fluoranthene	0.26	2.0 ug/L					
Fluorene	0.46	2.0 ug/L					
Hexachlorobenzene	0.24	5.0 ug/L					
Hexachlorobutadiene	0.31	5.0 ug/L					
Hexachlorocyclopentadiene	0.28	5.0 ug/L					
Hexachloroethane	0.35	5.0 ug/L					
Indeno(1,2,3-cd)pyrene	0.78	2.0 ug/L					
Isophorone	0.21	5.0 ug/L					
Naphthalene	0.32	5.0 ug/L					

Nitrobenzene	0.27	5.0 ug/L					
N-Nitrosodimethylamine	0.26	5.0 ug/L					
N-Nitrosodi-n-propylamine	0.31	5.0 ug/L		30 - 130	30	45 - 120	20
N-Nitrosodiphenylamine	0.31	5.0 ug/L					
Pentachlorophenol	0.54	5.0 ug/L		30 - 130	30	45 - 115	20
Phenanthrene	0.21	2.0 ug/L					
Phenol	2.1	10 ug/L		30 - 130	30	30 - 80	20
Pyrene	0.50	2.0 ug/L		30 - 130	30	55 - 120	20
Pyridine	2.4	10 ug/L					
surr: 2,4,6-Tribromophenol			65 - 100				
surr: 2-Fluorobiphenyl			59 - 101				
surr: 2-Fluorophenol			30 - 75				
surr: Nitrobenzene-d5			57 - 101				
surr: Phenol-d6			30 - 75				
surr: Terphenyl-d14			65 - 100				

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Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
1,2,4-Trichlorobenzene	0.010	0.067 mg/kg		30 - 110	30	55 - 115	25
1,2-Dichlorobenzene	0.0050	0.067 mg/kg					
1,2-Diphenylhydrazine	0.0060	0.067 mg/kg					
1,3-Dichlorobenzene	0.0080	0.067 mg/kg					
1,4-Dichlorobenzene	0.010	0.067 mg/kg		30 - 110	30	55 - 115	25
2,4,5-Trichlorophenol	0.019	0.067 mg/kg					
2,4,6-Trichlorophenol	0.017	0.067 mg/kg					
2,4-Dichlorophenol	0.019	0.067 mg/kg					
2,4-Dimethylphenol	0.059	0.17 mg/kg					
2,4-Dinitrophenol	0.018	0.17 mg/kg					
2,4-Dinitrotoluene	0.0070	0.067 mg/kg		30 - 130	35	60 - 130	25
2,6-Dinitrotoluene	0.0060	0.067 mg/kg					
2-Chloronaphthalene	0.0070	0.067 mg/kg					
2-Chlorophenol	0.018	0.067 mg/kg		35 - 110	25	55 - 115	25
2-Methylnaphthalene	0.023	0.067 mg/kg					
2-Methylphenol	0.017	0.17 mg/kg					
2-Nitroaniline	0.018	0.067 mg/kg					
2-Nitrophenol	0.019	0.067 mg/kg					
3,3-Dichlorobenzidine	0.017	0.33 mg/kg					
3-/4-Methylphenol	0.021	0.17 mg/kg					
3-Nitroaniline	0.018	0.17 mg/kg					
4,6-Dinitro-2-methylphenol	0.010	0.17 mg/kg					
4-Bromophenyl phenyl ether	0.010	0.067 mg/kg					
4-Chloro-3-methylphenol	0.022	0.067 mg/kg		40 - 110	30	55 - 115	25
4-Chloroaniline	0.018	0.17 mg/kg					
4-Chlorophenyl phenyl ether	0.011	0.067 mg/kg					
4-Nitroaniline	0.015	0.067 mg/kg					
4-Nitrophenol	0.021	0.067 mg/kg		30 - 120	30	45 - 130	30
Acenaphthene	0.010	0.067 mg/kg		30 - 115	30	50 - 115	25
Acenaphthylene	0.0070	0.067 mg/kg					
Aniline	0.042	0.17 mg/kg					
Anthracene	0.010	0.067 mg/kg					
Benz(a)anthracene	0.010	0.067 mg/kg					
Benzidine	0.049	0.67 mg/kg					
Benzo(a)pyrene	0.0080	0.067 mg/kg					
Benzo(b)fluoranthene	0.017	0.067 mg/kg					
Benzo(g,h,i)perylene	0.0060	0.067 mg/kg					
Benzo(k)fluoranthene	0.014	0.067 mg/kg					
Benzoic acid	0.017	0.17 mg/kg					
Benzyl alcohol	0.027	0.067 mg/kg					
bis(2-Chloroethoxy)methane	0.011	0.067 mg/kg					
Bis(2-Chloroethyl)ether	0.012	0.067 mg/kg					
Bis(2-chloroisopropyl)ether	0.014	0.067 mg/kg					
Bis(2-Ethylhexyl)phthalate	0.0090	0.33 mg/kg					
Butyl benzyl phthalate	0.0080	0.067 mg/kg					
Carbazole	0.015	0.067 mg/kg					
Chrysene	0.010	0.067 mg/kg					
Dibenz(a,h)anthracene	0.021	0.067 mg/kg					
Dibenzofuran	0.013	0.067 mg/kg					
Diethylphthalate	0.011	0.067 mg/kg					
Dimethyl phthalate	0.011	0.067 mg/kg					
Di-n-butyl phthalate	0.014	0.33 mg/kg					
Di-n-octyl phthalate	0.010	0.067 mg/kg					
Fluoranthene	0.0070	0.067 mg/kg					
Fluorene	0.0040	0.067 mg/kg					
Hexachlorobenzene	0.0090	0.067 mg/kg					
Hexachlorobutadiene	0.0060	0.067 mg/kg					
Hexachlorocyclopentadiene	0.0090	0.067 mg/kg					
Hexachloroethane	0.0090	0.067 mg/kg					
Indeno(1,2,3-cd)pyrene	0.0090	0.067 mg/kg					
Isophorone	0.010	0.067 mg/kg					

Naphthalene	0.0050	0.067 mg/kg					
Nitrobenzene	0.012	0.067 mg/kg					
N-Nitrosodimethylamine	0.021	0.067 mg/kg					
N-Nitrosodi-n-propylamine	0.012	0.067 mg/kg		35 - 115	30	65 - 115	25
N-Nitrosodiphenylamine	0.0070	0.067 mg/kg					
Pentachlorophenol	0.019	0.17 mg/kg		30 - 130	30	30 - 130	30
Phenanthrene	0.0080	0.067 mg/kg					
Phenol	0.018	0.067 mg/kg		30 - 115	25	55 - 115	25
Pyrene	0.010	0.067 mg/kg		30 - 130	35	50 - 130	25
Pyridine	0.039	0.067 mg/kg					
surr: 2,4,6-Tribromophenol			30 - 150				
surr: 2-Fluorobiphenyl			30 - 104				
surr: 2-Fluorophenol			30 - 106				
surr: Nitrobenzene-d5			30 - 90				
surr: Phenol-d6			30 - 102				
surr: Terphenyl-d14			30 - 115				

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Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
2-Methylnaphthalene	0.22	1.0 ug/kg					
Acenaphthene	0.18	1.0 ug/kg		43 - 130	20	43 - 130	20
Acenaphthylene	0.18	1.0 ug/kg					
Anthracene	0.14	1.0 ug/kg					
Benz(a)anthracene	0.22	1.0 ug/kg					
Benzo(a)pyrene	0.23	1.0 ug/kg		70 - 148	20	70 - 148	20
Benzo(b)fluoranthene	0.10	1.0 ug/kg					
Benzo(e)pyrene	0.28	1.0 ug/kg					
Benzo(g,h,i)perylene	0.26	1.0 ug/kg					
Benzo(k)fluoranthene	0.10	1.0 ug/kg					
Carbazole	0.29	1.0 ug/kg					
Chrysene	0.28	1.0 ug/kg					
Dibenz(a,h)anthracene	0.28	1.0 ug/kg		70 - 130	20	70 - 130	20
Fluoranthene	0.30	1.0 ug/kg		67 - 130	20	67 - 130	20
Fluorene	0.22	2.0 ug/kg					
Indeno(1,2,3-cd)pyrene	0.32	1.0 ug/kg		70 - 130	20	70 - 130	20
Naphthalene	0.25	1.0 ug/kg					
Phenanthrene	0.18	1.0 ug/kg					
Pyrene	0.32	1.0 ug/kg					
Quinoline	0.025	0.33 ug/kg					
surr: 2-Fluorobiphenyl			30 - 110				
surr: Nitrobenzene-d5			30 - 120				
surr: Terphenyl-d14			30 - 120				

SW-846 8270 PPT SIM WATERS

Analyte	Method Detection	Method Reporting	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
2-Methylnaphthalene	2.8	50 ng/L		70 - 130	20	70 - 130	20
Acenaphthene	1.9	10 ng/L		43 - 120	20	43 - 120	20
Acenaphthylene	2.1	10 ng/L		70 - 130	20	70 - 130	20
Anthracene	5.0	10 ng/L		70 - 130	20	70 - 130	20
Benz(a)anthracene	5.0	10 ng/L		70 - 130	20	70 - 130	20
Benzo(a)pyrene	2.1	10 ng/L		75 - 148	20	75 - 148	20
Benzo(b)fluoranthene	5.0	10 ng/L		70 - 130	20	70 - 130	20
Benzo(e)pyrene	5.0	10 ng/L		70 - 130	20	70 - 130	20
Benzo(g,h,i)perylene	5.6	10 ng/L		70 - 130	20	70 - 130	20
Benzo(k)fluoranthene	5.0	10 ng/L		70 - 130	20	70 - 130	20
Carbazole	5.0	10 ng/L		70 - 130	20	70 - 130	20
Chrysene	5.0	10 ng/L		70 - 130	20	70 - 130	20
Dibenz(a,h)anthracene	3.5	10 ng/L		70 - 130	20	70 - 130	20
Fluoranthene	5.0	10 ng/L		67 - 130	20	67 - 130	20
Fluorene	2.1	10 ng/L		70 - 130	20	70 - 130	20
Indeno(1,2,3-cd)pyrene	2.5	10 ng/L		70 - 130	20	70 - 130	20
Naphthalene	1.9	50 ng/L		70 - 130	20	70 - 130	20
Phenanthrene	5.0	10 ng/L		70 - 130	20	70 - 130	20
Pyrene	5.0	10 ng/L		70 - 130	20	70 - 130	20
surr: 2-Fluorobiphenyl			30 - 110				
surr: Nitrobenzene-d5			30 - 120				
surr: Terphenyl-d14			30 - 120				

SW-846 8270 MDA LIST 1 WATERS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
Acetochlor	0.072	0.50 ug/L		65 - 115	30	65 - 115	30
Alachlor	0.062	0.50 ug/L		65 - 115	30	65 - 115	30
Atrazine	0.078	0.50 ug/L		65 - 115	30	65 - 115	30
Chlorpyrifos	0.068	0.50 ug/L		65 - 115	30	65 - 115	30
Cyanazine	0.066	0.20 ug/L		65 - 115	30	65 - 115	30
Deisopropylatrazine	0.15	0.50 ug/L		65 - 115	30	65 - 115	30
Desethylatrazine	0.10	0.50 ug/L		65 - 115	30	65 - 115	30
Dimethenamid	0.053	0.50 ug/L		50 - 120	30	50 - 120	30
EPTC	0.089	0.50 ug/L		65 - 115	30	65 - 115	30
Ethalfluralin	0.26	0.50 ug/L		65 - 115	30	65 - 115	30
Fonofos	0.058	0.50 ug/L		65 - 115	30	65 - 115	30
Metolachlor	0.075	0.50 ug/L		65 - 115	30	65 - 115	30
Metribuzin	0.053	0.50 ug/L		65 - 115	30	65 - 115	30
Pendimethalin	0.099	0.50 ug/L		65 - 115	30	65 - 115	30
Phorate	0.089	0.30 ug/L		65 - 115	30	65 - 115	30
Prometon	0.034	0.50 ug/L		65 - 115	30	65 - 115	30
Propachlor	0.080	0.50 ug/L		65 - 115	30	65 - 115	30
Propazine	0.089	0.50 ug/L		65 - 115	30	65 - 115	30
Simazine	0.062	0.50 ug/L		65 - 115	30	65 - 115	30
Terbufos	0.11	0.20 ug/L		65 - 115	30	65 - 115	30
Triallate	0.080	0.50 ug/L		65 - 115	30	65 - 115	30
Trifluralin	0.27	0.50 ug/L		65 - 115	30	65 - 115	30
surr: Atrazine-d5			50 - 120				
surr: Diazinon-d10			50 - 120				

SW-846 8270 MDA LIST 1 SOILS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
Acetochlor	0.010	0.040 mg/kg		50 - 110	25	70 - 110	20
Alachlor	0.0089	0.040 mg/kg		40 - 110	25	70 - 110	20
Atrazine	0.0099	0.040 mg/kg		45 - 115	25	70 - 110	20
Chlorpyrifos	0.0090	0.040 mg/kg		30 - 125	35	54 - 110	20
Cyanazine	0.0089	0.040 mg/kg		30 - 125	25	65 - 110	20
Deisopropylatrazine	0.0093	0.040 mg/kg		30 - 125	25	55 - 115	20
Desethylatrazine	0.0099	0.040 mg/kg		30 - 125	25	70 - 110	20
Dimethenamid	0.0086	0.040 mg/kg		55 - 110	25	75 - 110	20
EPTC	0.0091	0.040 mg/kg		40 - 105	25	60 - 120	20
Ethalfluralin	0.0081	0.040 mg/kg		30 - 125	35	55 - 120	20
Fonofos	0.0085	0.040 mg/kg		30 - 120	35	65 - 115	20
Metalaxyl	0.020	0.040 mg/kg		50 - 120	25	50 - 120	20
Metolachlor	0.0088	0.040 mg/kg		40 - 115	25	75 - 110	20
Metribuzin	0.0095	0.040 mg/kg		40 - 115	25	75 - 110	20
Pendimethalin	0.0071	0.040 mg/kg		30 - 115	35	70 - 110	20
Phorate	0.0081	0.040 mg/kg		35 - 110	35	60 - 120	20
Prometon	0.0081	0.040 mg/kg		50 - 115	25	75 - 110	20
Propachlor	0.0090	0.040 mg/kg		55 - 110	25	70 - 110	20
Propazine	0.010	0.040 mg/kg		30 - 125	25	70 - 110	20
Simazine	0.010	0.040 mg/kg		40 - 115	25	70 - 110	20
Terbufos	0.010	0.040 mg/kg		30 - 125	35	70 - 110	20
Triallate	0.0095	0.040 mg/kg		30 - 110	35	60 - 115	20
Trifluralin	0.0086	0.040 mg/kg		30 - 120	35	70 - 110	20
surr: Atrazine-d5			70 - 120				
surr: Diazinon-d10			50 - 120				

SW-846 8270 MDA LIST 2 SOILS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
2,4,5-T	0.011	0.050 mg/kg		30 - 130	35	50 - 115	25
2,4,5-T.P.	0.014	0.050 mg/kg		40 - 130	25	60 - 120	25
2,4-D	0.012	0.050 mg/kg		30 - 120	35	50 - 115	25
2,4-D.B.	0.014	0.050 mg/kg		55 - 125	35	70 - 120	25
Bentazon	0.011	0.050 mg/kg		40 - 120	25	55 - 120	25
Dicamba	0.012	0.050 mg/kg		30 - 110	35	50 - 115	25
Dinoseb	0.010	0.050 mg/kg		30 - 120	25	30 - 120	25
M.C.P.A.	0.010	0.050 mg/kg		30 - 120	30	45 - 110	25
Pentachlorophenol	0.0093	0.050 mg/kg		40 - 125	35	40 - 130	25
Picloram	0.014	0.050 mg/kg		30 - 140	25	30 - 75	25
Triclopyr	0.013	0.050 mg/kg		30 - 75	25	30 - 120	25
surr: D.C.A.A.			31 - 129				

SW-846 8270 MDA LIST 2 WATERS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
2,4,5-T	0.16	0.50 ug/L		36 - 142	25	36 - 142	25
2,4,5-T.P.	0.17	0.50 ug/L		47 - 135	25	47 - 135	25
2,4-D	0.17	0.50 ug/L		25 - 149	25	25 - 149	25
2,4-D.B.	0.10	0.50 ug/L		49 - 139	25	49 - 139	25
Bentazon	0.13	0.50 ug/L		45 - 132	25	45 - 132	25
Dicamba	0.16	0.50 ug/L		25 - 157	25	25 - 157	25
Dinoseb	0.080	0.50 ug/L		25 - 161	25	25 - 161	25
M.C.P.A.	0.17	0.30 ug/L		25 - 147	25	25 - 147	25
Pentachlorophenol	0.14	0.50 ug/L		25 - 120	25	25 - 120	25
Picloram	0.34	0.50 ug/L		25 - 83	25	25 - 83	25
Triclopyr	0.18	0.50 ug/L		41 - 111	25	41 - 111	25
surr: D.C.A.A.			25 - 131				

SW-846 8082 PCB WATERS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
PCB 1016	0.15	0.90 ug/L		60 - 120	25	70 - 115	20
PCB 1221	0.15	0.90 ug/L		60 - 120	25	70 - 115	20
PCB 1232	0.15	0.90 ug/L		60 - 120	25	70 - 115	20
PCB 1242	0.15	0.90 ug/L		60 - 120	25	70 - 115	20
PCB 1248	0.15	0.90 ug/L		60 - 120	25	70 - 115	20
PCB 1254	0.077	0.90 ug/L		60 - 120	25	70 - 115	20
PCB 1260	0.077	0.90 ug/L		60 - 120	25	70 - 115	20
PCB 1262	0.077	0.90 ug/L		60 - 120	25	70 - 115	20
PCB 1268	0.077	0.90 ug/L		60 - 120	25	70 - 115	20
surr: TCMX			50 - 120				
surr: DBC			50 - 120				

SW-846 8082 PCB SOILS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
PCB 1016	0.025	0.070 mg/kg		60 - 120	25	70 - 120	20
PCB 1221	0.025	0.070 mg/kg		60 - 120	25	70 - 120	20
PCB 1232	0.025	0.070 mg/kg		60 - 120	25	70 - 120	20
PCB 1242	0.025	0.070 mg/kg		60 - 120	25	70 - 120	20
PCB 1248	0.025	0.070 mg/kg		60 - 120	25	70 - 120	20
PCB 1254	0.048	0.14 mg/kg		60 - 120	25	70 - 120	20
PCB 1260	0.048	0.14 mg/kg		60 - 120	25	70 - 120	20
PCB 1262	0.048	0.14 mg/kg		60 - 120	25	70 - 120	20
PCB 1268	0.048	0.14 mg/kg		60 - 120	25	70 - 120	20
surr: TCMX			60 - 130				
surr: DBC			60 - 130				

SW-846 8082 PCB WIPES

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	LCS/LCSD % Recovery	LCS/LCSD % RPD
PCB 1016	0.35	2.0 ug/Wipe		70 - 130	20
PCB 1221	0.35	2.0 ug/Wipe		70 - 130	20
PCB 1232	0.35	2.0 ug/Wipe		70 - 130	20
PCB 1242	0.35	2.0 ug/Wipe		70 - 130	20
PCB 1248	0.35	2.0 ug/Wipe		70 - 130	20
PCB 1254	0.34	2.0 ug/Wipe		70 - 130	20
PCB 1260	0.34	2.0 ug/Wipe		70 - 130	20
PCB 1262	0.34	2.0 ug/Wipe		70 - 130	20
PCB 1268	0.34	2.0 ug/Wipe		70 - 130	20
surr: TCMX			70 - 120		
surr: DBC			70 - 120		

SW-846 8082 PCB OILS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
PCB 1016	0.34	2.0 mg/kg		70 - 150	30	75 - 120	20
PCB 1221	0.34	2.0 mg/kg		70 - 150	30	75 - 120	20
PCB 1232	0.34	2.0 mg/kg		70 - 150	30	75 - 120	20
PCB 1242	0.34	2.0 mg/kg		70 - 150	30	75 - 120	20
PCB 1248	0.34	2.0 mg/kg		70 - 150	30	75 - 120	20
PCB 1254	0.087	2.0 mg/kg		70 - 150	30	75 - 120	20
PCB 1260	0.087	2.0 mg/kg		70 - 150	30	75 - 120	20
PCB 1262	0.087	2.0 mg/kg		70 - 150	30	75 - 120	20
PCB 1268	0.087	2.0 mg/kg		70 - 150	30	75 - 120	20
surr: TCMX			70 - 115				
surr: DBC			70 - 115				

SW-846 8081 and EPA 608 Organo Chlorine Pesticide WATERS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
4,4'-DDD	0.016	0.26 ug/L		50 - 130	25	50 - 130	25
4,4'-DDE	0.016	0.26 ug/L		50 - 130	25	50 - 130	25
4,4'-DDT	0.020	0.26 ug/L		50 - 130	25	50 - 130	25
Aldrin	0.018	0.26 ug/L		50 - 130	25	50 - 130	25
alpha-BHC	0.021	0.26 ug/L		50 - 130	25	50 - 130	25
alpha-Chlordane	0.016	0.26 ug/L		50 - 130	25	50 - 130	25
beta-BHC	0.016	0.26 ug/L		50 - 130	25	50 - 130	25
delta-BHC	0.014	0.26 ug/L		50 - 130	25	50 - 130	25
Dieldrin	0.024	0.26 ug/L		50 - 130	25	50 - 130	25
Endosulfan I	0.021	0.26 ug/L		50 - 130	25	50 - 130	25
Endosulfan II	0.019	0.26 ug/L		50 - 130	25	50 - 130	25
Endosulfan Sulfate	0.019	0.26 ug/L		50 - 130	25	50 - 130	25
Endrin	0.020	0.26 ug/L		50 - 130	25	50 - 130	25
Endrin Aldehyde	0.040	0.26 ug/L		50 - 130	25	50 - 130	25
Endrin Ketone	0.019	0.26 ug/L		50 - 130	25	50 - 130	25
gamma-BHC	0.020	0.26 ug/L		50 - 130	25	50 - 130	25
gamma-Chlordane	0.042	0.26 ug/L		50 - 130	25	50 - 130	25
Heptachlor	0.018	0.26 ug/L		50 - 130	25	50 - 130	25
Heptachlor Epoxide	0.038	0.26 ug/L		50 - 130	25	50 - 130	25
Methoxychlor	0.026	0.26 ug/L		50 - 130	25	50 - 130	25
Toxaphene	1.0	5.0 ug/L		50 - 130	25	50 - 130	25
surr: TCMX			70 - 130				
surr: DBC			70 - 130				

SW-846 8081 Organo Chlorine Pesticide SOILS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
4,4'-DDD	0.0015	0.026 mg/kg		70 - 130	25	70 - 130	25
4,4'-DDE	0.0026	0.026 mg/kg		70 - 130	25	70 - 130	25
4,4'-DDT	0.0023	0.026 mg/kg		70 - 130	25	70 - 130	25
Aldrin	0.0032	0.026 mg/kg		70 - 130	25	70 - 130	25
alpha-BHC	0.0023	0.026 mg/kg		70 - 130	25	70 - 130	25
alpha-Chlordane	0.0020	0.026 mg/kg		70 - 130	25	70 - 130	25
beta-BHC	0.0023	0.026 mg/kg		70 - 130	25	70 - 130	25
delta-BHC	0.0018	0.026 mg/kg		70 - 130	25	70 - 130	25
Dieldrin	0.0022	0.026 mg/kg		70 - 130	25	70 - 130	25
Endosulfan I	0.0028	0.026 mg/kg		70 - 130	25	70 - 130	25
Endosulfan II	0.0021	0.026 mg/kg		70 - 130	25	70 - 130	25
Endosulfan Sulfate	0.0023	0.026 mg/kg		70 - 130	25	70 - 130	25
Endrin	0.0028	0.026 mg/kg		70 - 130	25	70 - 130	25
Endrin Aldehyde	0.0096	0.026 mg/kg		70 - 130	25	70 - 130	25
Endrin Ketone	0.0031	0.026 mg/kg		70 - 130	25	70 - 130	25
gamma-BHC	0.0025	0.026 mg/kg		70 - 130	25	70 - 130	25
gamma-Chlordane	0.0017	0.026 mg/kg		70 - 130	25	70 - 130	25
Heptachlor	0.0054	0.026 mg/kg		70 - 130	25	70 - 130	25
Heptachlor Epoxide	0.0043	0.026 mg/kg		70 - 130	25	70 - 130	25
Methoxychlor	0.0021	0.026 mg/kg		70 - 130	25	70 - 130	25
Toxaphene	0.096	1.0 mg/kg		70 - 130	25	70 - 130	25
surr: TCMX			70 - 130				
surr: DBC			70 - 130				

WIGRO PVOC and GRO WATERS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	Sample Duplicate % RPD	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
Gasoline Range Organics	13	100 ug/L		20	80 - 120	20	80 - 120	20
1,2,4-Trimethylbenzene	0.081	1.0 ug/L		20	80 - 120	20	80 - 120	20
1,3,5-Trimethylbenzene	0.043	1.0 ug/L		20	80 - 120	20	80 - 120	20
Benzene	0.17	1.0 ug/L		20	80 - 120	20	80 - 120	20
Ethylbenzene	0.081	1.0 ug/L		20	80 - 120	20	80 - 120	20
m,p-Xylene	0.19	1.0 ug/L		20	80 - 120	20	80 - 120	20
Methyl-t-butyl ether (MTBE)	0.15	1.0 ug/L		20	80 - 120	20	80 - 120	20
Naphthalene	0.060	1.0 ug/L		20	80 - 120	20	80 - 120	20
o-Xylene	0.095	1.0 ug/L		20	80 - 120	20	80 - 120	20
Toluene	0.11	1.0 ug/L		20	80 - 120	20	80 - 120	20
surr: 4-FCB			80 - 200					

WIGRO PVOC and GRO SOILS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	Sample Duplicate % RPD	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
Gasoline Range Organics (GRO)	0.73	10 mg/kg		20	80 - 120	20	80 - 120	20
1,2,4-Trimethylbenzene	0.0060	0.050 mg/kg		20	80 - 120	20	80 - 120	20
1,3,5-Trimethylbenzene	0.0030	0.050 mg/kg		20	80 - 120	20	80 - 120	20
Benzene	0.0090	0.050 mg/kg		20	80 - 120	20	80 - 120	20
Ethylbenzene	0.0080	0.050 mg/kg		20	80 - 120	20	80 - 120	20
m,p-Xylene	0.013	0.050 mg/kg		20	80 - 120	20	80 - 120	20
Methyl-t-butyl ether (MTBE)	0.0050	0.050 mg/kg		20	80 - 120	20	80 - 120	20
Naphthalene	0.0090	0.050 mg/kg		20	80 - 120	20	80 - 120	20
o-Xylene	0.0090	0.050 mg/kg		20	80 - 120	20	80 - 120	20
Toluene	0.0090	0.050 mg/kg		20	80 - 120	20	80 - 120	20
surr: 4-FCB			80 - 200					

WIDRO DRO WATERS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	Sample Duplicate % RPD	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
Diesel Range Organics	23	100 ug/L		20	30 - 150	25	75 - 115	20
surr: n-Nonane			30 - 80					
surr: n-Triacontane			50 - 150					

WIDRO DRO SOILS

Analyte	Method Detection Limit	Method Reporting Limit	Surrogate %R	Sample Duplicate % RPD	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
Diesel Range Organics (DRO)	1.0	10 mg/kg		20	30 - 150	25	70 - 120	20
surr: n-Nonane			30 - 80					
surr: n-Triacontane			50 - 150					

SW-846 8015 TPH in SOILs

Analyte	Method Detection Limit	Method Reporting Limit	Sample Duplicate % RPD	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
TPH as Gasoline	2.0	10 mg/kg	20	70 - 130	20	70 - 130	20
TPH as Fuel Oil	10	50 mg/kg	20	70 - 130	20	70 - 130	20

SW-846 8015 TPH in Waters

Analyte	Method Detection Limit	Method Reporting Limit	Sample Duplicate % RPD	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD
TPH as Gasoline	20	100 ug/L	20	70 - 130	20	70 - 130	20
TPH as Fuel Oil	10	500 ug/L	20	70 - 130	20	70 - 130	20

EPA 6010 AND EPA 200.7 METALS WATERS

	Method Detection Limit	Method reporting Limit	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD	Sample Duplicate % RPD
Aluminum	1.2	10 ug/L	75 - 125	20	85 - 115	20	20
Antimony	0.22	0.50 ug/L	75 - 125	20	85 - 115	20	20
Arsenic	0.52	2.0 ug/L	75 - 125	20	85 - 115	20	20
Barium	0.17	1.0 ug/L	75 - 125	20	85 - 115	20	20
Beryllium	0.067	0.20 ug/L	75 - 125	20	85 - 115	20	20
Boron	2.8	8.0 ug/L	75 - 125	20	85 - 115	20	20
Cadmium	0.044	0.20 ug/L	75 - 125	20	85 - 115	20	20
Calcium	20	50 ug/L	75 - 125	20	85 - 115	20	20
Cerium	0.30	1.0 ug/L	75 - 125	20	85 - 115	20	20
Chromium	0.090	0.50 ug/L	75 - 125	20	85 - 115	20	20
Cobalt	0.023	0.20 ug/L	75 - 125	20	85 - 115	20	20
Copper	0.082	0.70 ug/L	75 - 125	20	85 - 115	20	20
Iron	2.4	20 ug/L	75 - 125	20	85 - 115	20	20
Lead	0.042	0.60 ug/L	75 - 125	20	85 - 115	20	20
Lithium	0.25	0.80 ug/L	75 - 125	20	85 - 115	20	20
Magnesium	10	30 ug/L	75 - 125	20	85 - 115	20	20
Manganese	0.13	0.50 ug/L	75 - 125	20	85 - 115	20	20
Molybdenum	0.24	0.30 ug/L	75 - 125	20	85 - 115	20	20
Nickel	0.52	0.60 ug/L	75 - 125	20	85 - 115	20	20
Palladium	0.10	0.30 ug/L	75 - 125	20	85 - 115	20	20
Platinum	0.10	0.30 ug/L	75 - 125	20	85 - 115	20	20
Potassium	100	100 ug/L	75 - 125	20	85 - 115	20	20
Selenium	0.40	1.0 ug/L	75 - 125	20	85 - 115	20	20
Silver	0.020	0.20 ug/L	75 - 125	20	85 - 115	20	20
Sodium	12	50 ug/L	75 - 125	20	85 - 115	20	20
Thallium	0.045	0.40 ug/L	75 - 125	20	85 - 115	20	20
Tin	0.088	1.0 ug/L	75 - 125	20	85 - 115	20	20
Titanium	0.12	0.40 ug/L	75 - 125	20	85 - 115	20	20
Uranium	0.052	0.20 ug/L	75 - 125	20	85 - 115	20	20
Vanadium	0.61	1.1 ug/L	75 - 125	20	85 - 115	20	20
Zinc	1.2	6.0 ug/L	75 - 125	20	85 - 115	20	20

EPA 6010 METALS SOILS

Analyte	Method Detection Limit	Method Reporting Limit	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD	Sample Duplicate RPD
Aluminum	0.21	5.0 mg/kg	75 - 125	20	80 - 120	20	20
Antimony	0.064	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Arsenic	0.16	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Barium	0.021	2.0 mg/kg	75 - 125	20	80 - 120	20	20
Beryllium	0.0010	0.20 mg/kg	75 - 125	20	80 - 120	20	20
Boron	1.8	5.0 mg/kg	75 - 125	20	80 - 120	20	20
Cadmium	0.0090	0.50 mg/kg	75 - 125	20	80 - 120	20	20
Calcium	0.23	6.0 mg/kg	75 - 125	20	80 - 120	20	20
Chromium	0.018	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Cobalt	0.010	0.50 mg/kg	75 - 125	20	80 - 120	20	20
Copper	0.012	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Iron	1.2	10 mg/kg	75 - 125	20	80 - 120	20	20
Lead	0.067	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Magnesium	0.13	6.8 mg/kg	75 - 125	20	80 - 120	20	20
Manganese	0.011	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Molybdenum	0.030	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Nickel	0.037	0.50 mg/kg	75 - 125	20	80 - 120	20	20
Potassium	1.9	21 mg/kg	75 - 125	20	80 - 120	20	20
Selenium	0.14	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Silver	0.013	0.50 mg/kg	75 - 125	20	80 - 120	20	20
Sodium	0.16	11 mg/kg	75 - 125	20	80 - 120	20	20
Strontium	0.016	0.80 mg/kg	75 - 125	20	80 - 120	20	20
Sulfur	0.10	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Thallium	0.085	2.0 mg/kg	75 - 125	20	80 - 120	20	20
Tin	0.075	15 mg/kg	75 - 125	20	80 - 120	20	20
Titanium	0.0080	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Vanadium	0.014	0.50 mg/kg	75 - 125	20	80 - 120	20	20
Zinc	0.043	1.0 mg/kg	75 - 125	20	80 - 120	20	20

EPA 6010 METAL WIPES

Analyte	Method Detection Limit	Method Reporting Limit	LCS/LCSD % Recovery	LCS/LCSD % RPD
Antimony	0.15	5.0 ug/Wipe	80 - 120	20
Arsenic	0.15	5.0 ug/Wipe	80 - 120	20
Berylium	0.015	0.50 ug/Wipe	80 - 120	20
Cadmium	0.15	5.0 ug/Wipe	80 - 120	20
Lead	1.6	5.0 ug/Wipe	80 - 120	20

EPA 6010 METALS PAINT

	Method Detection Limit	Method Reporting Limit	LCS/LCSD % Recovery	LCS/LCSD % RPD
Lead	0.00080	0.0050 % Wt	80 - 120	20
Cadmium	0.00010	0.00050 % Wt	80 - 120	20
Chromium	0.00040	0.0010 % Wt	80 - 120	20

EPA 6020 AND EPA 200.8 METALS WATERS

	Method Detection Limit	Method reporting Limit	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD	Sample Duplicate % RPD
Aluminum	1.2	10 ug/L	75 - 125	20	85 - 115	20	20
Antimony	0.22	0.50 ug/L	75 - 125	20	85 - 115	20	20
Arsenic	0.52	2.0 ug/L	75 - 125	20	85 - 115	20	20
Barium	0.17	1.0 ug/L	75 - 125	20	85 - 115	20	20
Beryllium	0.067	0.20 ug/L	75 - 125	20	85 - 115	20	20
Boron	2.8	8.0 ug/L	75 - 125	20	85 - 115	20	20
Cadmium	0.044	0.20 ug/L	75 - 125	20	85 - 115	20	20
Calcium	20	50 ug/L	75 - 125	20	85 - 115	20	20
Cerium	0.30	1.0 ug/L	75 - 125	20	85 - 115	20	20
Chromium	0.090	0.50 ug/L	75 - 125	20	85 - 115	20	20
Cobalt	0.023	0.20 ug/L	75 - 125	20	85 - 115	20	20
Copper	0.082	0.70 ug/L	75 - 125	20	85 - 115	20	20
Iron	2.4	20 ug/L	75 - 125	20	85 - 115	20	20
Lead	0.042	0.60 ug/L	75 - 125	20	85 - 115	20	20
Lithium	0.25	0.80 ug/L	75 - 125	20	85 - 115	20	20
Magnesium	10	30 ug/L	75 - 125	20	85 - 115	20	20
Manganese	0.13	0.50 ug/L	75 - 125	20	85 - 115	20	20
Molybdenum	0.24	0.30 ug/L	75 - 125	20	85 - 115	20	20
Nickel	0.52	0.60 ug/L	75 - 125	20	85 - 115	20	20
Palladium	0.10	0.30 ug/L	75 - 125	20	85 - 115	20	20
Platinum	0.10	0.30 ug/L	75 - 125	20	85 - 115	20	20
Potassium	100	100 ug/L	75 - 125	20	85 - 115	20	20
Selenium	0.40	1.0 ug/L	75 - 125	20	85 - 115	20	20
Silver	0.020	0.20 ug/L	75 - 125	20	85 - 115	20	20
Sodium	12	50 ug/L	75 - 125	20	85 - 115	20	20
Thallium	0.045	0.40 ug/L	75 - 125	20	85 - 115	20	20
Tin	0.088	1.0 ug/L	75 - 125	20	85 - 115	20	20
Titanium	0.12	0.40 ug/L	75 - 125	20	85 - 115	20	20
*Uranium	0.052	0.20 ug/L	75 - 125	20	85 - 115	20	20
Vanadium	0.61	1.1 ug/L	75 - 125	20	85 - 115	20	20
Zinc	1.2	6.0 ug/L	75 - 125	20	85 - 115	20	20

EPA 6020 METALS SOILS

	Method Detection Limit	Method reporting Limit	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD	Sample Duplicate % RPD
Aluminum	0.38	4.2 mg/kg	75 - 125	20	80 - 120	20	20
Antimony	0.087	0.56 mg/kg	75 - 125	20	80 - 120	20	20
Arsenic	0.23	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Barium	0.033	0.35 mg/kg	75 - 125	20	80 - 120	20	20
Beryllium	0.034	0.075 mg/kg	75 - 125	20	80 - 120	20	20
Boron	1.4	4.2 mg/kg	75 - 125	20	80 - 120	20	20
Cadmium	0.030	0.13 mg/kg	75 - 125	20	80 - 120	20	20
Cerium	2.0	6.0 mg/kg	75 - 125	20	80 - 120	20	20
Cesium	1.3	4.0 mg/kg	75 - 125	20	80 - 120	20	20
Chromium	0.061	0.20 mg/kg	75 - 125	20	80 - 120	20	20
Cobalt	0.012	0.12 mg/kg	75 - 125	20	80 - 120	20	20
Copper	0.062	0.40 mg/kg	75 - 125	20	80 - 120	20	20
Gallium	2.0	6.0 mg/kg	75 - 125	20	80 - 120	20	20
Iron	1.3	5.0 mg/kg	75 - 125	20	80 - 120	20	20
Lanthanum	2.0	6.0 mg/kg	75 - 125	20	80 - 120	20	20
Lead	0.016	0.48 mg/kg	75 - 125	20	80 - 120	20	20
Manganese	0.042	0.35 mg/kg	75 - 125	20	80 - 120	20	20
Molybdenum	0.059	0.30 mg/kg	75 - 125	20	80 - 120	20	20
Nickel	0.21	0.45 mg/kg	75 - 125	20	80 - 120	20	20
Niobium	1.0	5.0 mg/kg	75 - 125	20	80 - 120	20	20
Selenium	0.29	0.40 mg/kg	75 - 125	20	80 - 120	20	20
Silver	0.015	0.50 mg/kg	75 - 125	20	80 - 120	20	20
Strontium	0.065	0.50 mg/kg	75 - 125	20	80 - 120	20	20
Thallium	0.016	0.19 mg/kg	75 - 125	20	80 - 120	20	20
Tin	0.025	0.50 mg/kg	75 - 125	20	80 - 120	20	20
Titanium	0.065	0.20 mg/kg	75 - 125	20	80 - 120	20	20
Uranium	0.060	0.18 mg/kg	75 - 125	20	80 - 120	20	20
Vanadium	0.32	0.50 mg/kg	75 - 125	20	80 - 120	20	20
Zinc	0.56	2.7 mg/kg	75 - 125	20	80 - 120	20	20
Zirconium	2.0	6.0 mg/kg	75 - 125	20	80 - 120	20	20

CLASSICAL CHEMISTRY - WATERS

Analyte	Method Detection limit	Method Reporting Limit	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD	Sample Duplicate RPD
Acidity	1.0	1.0 mg/L	75 - 125	20	80 - 120	20	20
Ammonia as N	0.0040	0.020 mg/L	75 - 125	20	80 - 120	20	20
Bicarbonate Alkalinity	4.0	4.0 mg/L	75 - 125	20	80 - 120	20	20
Carbonate Alkalinity	4.0	4.0 mg/L	75 - 125	20	80 - 120	20	20
Chemical Oxygen Demand	3.1	20 mg/L	75 - 125	20	80 - 120	20	20
Chloride	0.16	1.0 mg/L	75 - 125	20	80 - 120	20	20
Chlorophyll-A	0.50	0.50 mg/L	75 - 125	20	80 - 120	20	20
Chromium, Hexavalent	0.0012	0.010 mg/L	75 - 125	20	80 - 120	20	20
Hardness	0.10	1.0 mg/L	75 - 125	20	80 - 120	20	20
Nitrate + Nitrite as N	0.0069	0.020 mg/L	75 - 125	20	80 - 120	20	20
Nitrate as N	0.0070	0.020 mg/L	75 - 125	20	80 - 120	20	20
Nitrite as N	0.0040	0.020 mg/L	75 - 125	20	80 - 120	20	20
Oil & Grease (HEM)	1.03	5.0 mg/L	75 - 125	20	80 - 120	20	20
Orthophosphate as P	0.00060	0.0060 mg/L	75 - 125	20	80 - 120	20	20
pH	0.10	0.10 mg/L	75 - 125	20	80 - 120	20	20
Phenolics	0.0030	0.010 mg/L	75 - 125	20	80 - 120	20	20
Phosphorus	0.0016	0.010 mg/L	75 - 125	20	80 - 120	20	20
Phosphorus, Total as P	0.0016	0.010 mg/L	75 - 125	20	80 - 120	20	20
Phosphorus-Extractable	0.0016	0.010 mg/L	75 - 125	20	80 - 120	20	20
Specific conductance	10	10 mg/L	75 - 125	20	80 - 120	20	20
Sulfate	0.37	5.0 mg/L	75 - 125	20	80 - 120	20	20
Total Alkalinity	5.3	20 mg/L	75 - 125	20	80 - 120	20	20
Total Dissolved Solids	1.0	20 mg/L	75 - 125	20	80 - 120	20	20
Total Kjeldahl Nitrogen	0.17	0.50 mg/L	75 - 125	20	80 - 120	20	20
Total Solids	1.0	20 mg/L	75 - 125	20	80 - 120	20	20
Total Suspended Solids	3.6	5.0 mg/L	75 - 125	20	80 - 120	20	20
Total Volatile Solids	1.0	20 mg/L	75 - 125	20	80 - 120	20	20
Volatile Suspended Solids	1.0	5.0 mg/L	75 - 125	20	80 - 120	20	20

CLASSICAL CHEMISTRY - SOILS

Analyte	Method Detection limit	Method Reporting Limit	MS/MSD % Recovery	MS/MSD % RPD	LCS/LCSD % Recovery	LCS/LCSD % RPD	Sample Duplicate RPD
Ammonia as N	0.34	1.6 mg/kg	75 - 125	20	80 - 120	20	20
Chloride	13	80 mg/kg	75 - 125	20	80 - 120	20	20
Nitrate + Nitrite as N	0.21	1.6 mg/kg	75 - 125	20	80 - 120	20	20
Nitrate as N	0.55	1.6 mg/kg	75 - 125	20	80 - 120	20	20
Nitrite as N	0.54	1.6 mg/kg	75 - 125	20	80 - 120	20	20
Orthophosphate as P	0.048	48 mg/kg	75 - 125	20	80 - 120	20	20
Phenolics	0.28	1.0 mg/kg	75 - 125	20	80 - 120	20	20
Phosphorus, Total as P	0.072	0.50 mg/kg	75 - 125	20	80 - 120	20	20
Phosphorus-Extractable	0.072	0.50 mg/kg	75 - 125	20	80 - 120	20	20
Sulfate	29	400 mg/kg	75 - 125	20	80 - 120	20	20
Total Kjeldahl Nitrogen	69	200 mg/kg	75 - 125	20	80 - 120	20	20
Total Nitrogen	40	100 mg/kg	75 - 125	20	80 - 120	20	20

AIR ANALYSIS 7300 METAL SCAN

Analyte	Method Detection Limit	Method Reporting Limit	LCS/LCSD % Recovery	LCS/LCSD % RPD
Aluminum	0.0080	0.10 ug/m³	80 - 120	20
Antimony	0.0032	0.020 ug/m³	80 - 120	20
Arsenic	0.0013	0.020 ug/m³	80 - 120	20
Barium	0.0011	0.020 ug/m³	80 - 120	20
Beryllium	0.000014	0.0020 ug/m³	80 - 120	20
Cadmium	0.00022	0.020 ug/m³	80 - 120	20
Chromium	0.0010	0.040 ug/m³	80 - 120	20
Cobalt	0.00038	0.020 ug/m³	80 - 120	20
Copper	0.00084	0.040 ug/m³	80 - 120	20
Iron	0.015	0.10 ug/m³	80 - 120	20
Lead	0.0015	0.020 ug/m³	80 - 120	20
Manganese	0.00012	0.040 ug/m³	80 - 120	20
Molybdenum	0.00086	0.020 ug/m³	80 - 120	20
Nickel	0.00046	0.020 ug/m³	80 - 120	20
Selenium	0.0019	0.020 ug/m³	80 - 120	20
Silver	0.00046	0.0040 ug/m³	80 - 120	20
Sodium	0.0015	0.20 ug/m³	80 - 120	20
Tin	0.0013	0.020 ug/m³	80 - 120	20
Titanium	0.00012	0.020 ug/m³	80 - 120	20
Vanadium	0.00044	0.020 ug/m³	80 - 120	20
Zinc	0.0016	0.10 ug/m³	80 - 120	20

Appendix H-1

Grubbs Test

Revision 3.1
Effective 07/31/08

Grubb's Test for Detecting Outliers

Statisticians have devised several ways to detect outliers. Grubbs' test is particularly easy to follow. This method is also called the ESD method (extreme studentized deviate).

The first step is to quantify how far the outlier is from the others. Calculate the ratio Z as the difference between the outlier and the mean divided by the SD. If Z is large, the value is far from the others. Note that you calculate the mean and SD from all values, including the outlier.

$$Z = \frac{|\text{mean} - \text{value}|}{\text{SD}}$$

Since 5% of the values in a Gaussian population are more than 1.96 standard deviations from the mean, your first thought might be to conclude that the outlier comes from a different population if Z is greater than 1.96. This approach only works if you know the *population* mean and SD from other data. Although this is rarely the case in experimental science, it is often the case in quality control. You know the overall mean and SD from historical data, and want to know whether the latest value matches the others. This is the basis for quality control charts.

When analyzing experimental data, you don't know the SD of the population. Instead, you calculate the SD from the data. The presence of an outlier increases the calculated SD. Since the presence of an outlier increases both the numerator (difference between the value and the mean) and denominator (SD of all values), Z does not get very large. In fact, no matter how the data are distributed, Z can not get larger than $(N-1)/\sqrt{N}$, where N is the number of values. For example, if N=3, Z cannot be larger than 1.155 for any set of values.

Grubbs and others have tabulated critical values for Z which are tabulated below. The critical value increases with sample size, as expected.

If your calculated value of Z is greater than the critical value in the table, then the P value is less than 0.05. This means that there is less than a 5% chance that you'd encounter an outlier so far from the others (in either direction) by chance alone, if all the data were really sampled from a single Gaussian distribution. Note that the method only works for testing the most extreme value in the sample (if in doubt, calculate Z for all values, but only calculate a P value for Grubbs' test from the largest value of Z.

Once you've identified an outlier, you may choose to exclude that value from your analyses. Or you may choose to keep the outlier, but use robust analysis techniques that do not assume that data are sampled from Gaussian populations.

If you decide to remove the outlier, you then may be tempted to run Grubbs' test again to see if there is a second outlier in your data. If you do this , you cannot use the same table. Rosner has extended the method to detecting several outliers in one sample. See the first referernce below for details..

References: (Click to see full citation, and to order from amazon.com)

How to Detect and Handle Outliersby B Iglewicz and DC Hoaglin,

Outliers in Statistical Data (3rdedition)by V. Barnett and T. Lewis

Critical values for Z. Calculate Z as shown above. Look up the critical value of Z in the table below, where N is the number of values in the group. If your value of Z is higher than the tabulated value, the P value is less than 0.05.

N	Critical Z	N	Critical Z
3	1.15	27	2.86
4	1.48	28	2.88
5	1.71	29	2.89
6	1.89	30	2.91
7	2.02	31	2.92
8	2.13	32	2.94
9	2.21	33	2.95
10	2.29	34	2.97
11	2.34	35	2.98
12	2.41	36	2.99
13	2.46	37	3.00
14	2.51	38	3.01
15	2.55	39	3.03
16	2.59	40	3.04
17	2.62	50	3.13
18	2.65	60	3.20
19	2.68	70	3.26
20	2.71	80	3.31
21	2.73	90	3.35
22	2.76	100	3.38
23	2.78	110	3.42
24	2.80	120	3.44
25	2.82	130	3.47
26	2.84	140	3.49

Computing an approximate P value

You can also calculate an approximate P value as follows.

1. Calculate $T = \sqrt{\frac{N(N-2)Z^2}{(N-1)^2 - NZ^2}}$.
   N is the number of values in the sample, Z is calculated for the suspected outlier as shown above.
2. Look up the two-tailed P value for the student t distribution with the calculated value of T and N-2 degrees of freedom. Using Excel, the formula is =TDIST(T,DF,2) (the '2' is for a two-tailed P value).
3. Multiply the P value you obtain in step 2 by N. The result is an approximate P value for the outlier test. This P value is the chance of observing one point so far from the others if the data were all sampled from a Gaussian distribution. If Z is large, this P value will be very accurate. With smaller values of Z, the calculated P value may be too large.

Appendix I-1

Example: Track-It Form

Revision 3.1
Effective 07/31/08

Powered By: Intuit Trackit

Work Order No.: 12931

Summary:	Draft invoice
Type:	Enterprise Software
Subtype:	LIMS
Category:	Suggestion
Requestor:	Hubanks, Micky
Date Entered:	1/24/2007 9:19 AM
Priority:	4 - LOW
Date Due:	
Technician Assigned:	AnLab
Date Assigned:	1/24/2007 9:19 AM
Completed Date:	
Description:	Richard suggested recreating the draft invoice.
Resolution:	
Status:	Pending
Workstation ID:	CNF4120GG0

No File Attachments Found.

Appendix J-1

Standard Training Certificate

Revision 3.1
Effective 07/31/08

BRAUN INTERTEC

Braun Intertec Corporation
Analytical Laboratory
Training Documentation Checklist

Date Started		Date Completed	
Trainee		Technique	
Trainer		Current SOP	

Assigned Materials:

I have read and understand the current SOP _____
[Trainee]

I have read the assigned materials above _____
[Trainee]

Total time spent in one on one training _____

Previous Experience (years/months) _____

Date of Acceptable Initial Demonstration of Capability (IDC) _____

The above employee has completed all training requirements to be proficient in the indicated technique. I accept responsibility for thoroughly having trained the individual and for his/her continued mentoring over the next year.

_____
[Trainer]

I am confident that I can consistently demonstrate the skills learned during this training and I agree to continue my mentorship with the above trainer over the next year.

_____
[Trainee]

Appendix J-2

Special Circumstance Training Certificate

Revision 3.1
Effective 07/31/08

BRAUN INTERTEC

Braun Intertec Corporation
Analytical Laboratory
Special Circumstance
Proficiency Checklist

Date Started		Date Completed	
Employee		Technique	
Code		Current SOP	

Codes: 1 = Grandfather 2 = New Method 3 = Method Modification 4 = New Instrument

Summary of Technique and Circumstance:

Summary of Qualifications for Proficiency:

Total time spent on development _____

Effective Date of SOP _____

Date of Acceptable Initial Demonstration of Capability (IDC) _____

I am confident that I can consistently demonstrate proficiency in the above technique based on results of empirical data and an understanding of the methodology.

_____

[Employee]

Appendix K-1

Master Index

Revision 3.1
Effective 07/31/08

MASTER INDEX -SOP

Old Doc ID	New Doc ID	Description	Func Group	Rev #	Effective Date	Status	Link to PDF File	Link to Word Doc
GEN 30.3	LABSECURITY1	Building and Lab Security	GEN	0	11/14/02	C	FORMS\GEN\labsecurity.pdf	SOP\GEN\LABSECURITY.doc
	MANUALINTEGRATION	Manual Integration of Analytical Data in the Analytical Laboratory	GEN	0		P		
GEN	MNGMTREVIEW1	Management Review Protocol	GEN	0	01/16/03	C	SOP\GEN\MNGMTREVIEW1.pdf	
GEN 34.3	PIPETTCAL	Calibration of the Eppendorf Digital Pipets and Set Volume Pipets	GEN	3	01/30/08	C	SOP\GEN\PIPETTCAL.pdf	SOP\Word\PIPETTCAL.doc
GEN	PROCESSCTRL1	Process Tracking Form instructions	GEN	0	11/01/02	C		SOP\processctrl1.doc
GEN 09.6	THERMCAL1	The Calibration and Use of Thermometers	GEN	0	09/08/04	C	SOP\GEN\THERMCAL1.pdf	SOP\Word\THERMCAL1.doc
GEN 36.3		Calibration of the Oxford Pipets	GEN			N		
GEN 38.4		Calibration of the Hot Plates	GEN			N		
GEN 41.3		Removal of Organic Contaminants from Sodium Sulfate or Sodium Chloride	GEN			N		
IH 4018.1	ICINORGANICANIONS	The Analysis of Inorganic Acids in Water, Wastewater and soils by Ion Chromatography (IC)/ Conductivity	IH	------	01/06/06	C	SOP\INORG\ICINORGANICANIONS.pdf	SOP\Word\ICINORGANICANIONS.doc
IH 4020.1	IHETOPO	The Analysis of Ethylene Oxide and Propylene Oxide on 3M 3550/3551 OVM Media by GC/ECD	IH	1	04/16/08	C	SOP\IH\IHETOPO.pdf	SOP\Word\IHETOPO1.doc
IH 4021.1	IHPAH	The Determination of Polynuclear Aromatic Hydrocarbons in air by Reverse Phase HPLC/UV&FL	IH	1	01/16/08	C	SOP\IH\IHPAH.pdf	SOP\Word\IHPAH.doc
IH 4011.3	IHVOCS	The Analysis of Volatile Organic Compounds Trapped on Charcoal and Silica Gel Media by GC	IH	1	02/19/08	C	SOP\IH\IHVOCS.pdf	SOP\Word\IHVOCS1.doc
	ISOCYANATES	The Analysis of Isocyanates in air trapped on 1,2 PP treated	IH	1	03/06/08	C	SOP\IH\ISOCYANAYE.pdf	SOP\Word\ISOCYANATES.doc
IH 1018.2		Determination of Formaldehyde in Bisulfite Extracts	IH			N		
IH 4012.2		The Analysis of Volatile Organic Compounds Trapped in solvent Scans by GC	IH			N		
IH 4013.3		The Analysis of Aldehydes in air trapped on 2,4,DNPH treated Silica Gel Media by Reverse Phase HPLC/I	IH			N		
IH 4016.1		The analysis of Inorganic Acids in air trapped on washed Silica Gel Media by Ion Chromatography (IC)/ Cc	IH			N		
IH 4017.1		The Determination of Polychlorinated Biphenyl Aroclors (PCBs) in Air by Gas Chromatography/ECD	IH			N		
IH 4022.1		The Determination of Chlorinated Pesticides in Air by GC/ECD	IH			N		
IH 4023.1		The Determination of Organic Acids in Air by High Performance Liquid Chromatography equipped with an I	IH			N		
INO 3836.7	ACIDITY	Total Acidity	INO	0	05/02/07	C	SOP\INO\ACIDITY.pdf	SOP\Word\ACIDITY.doc
INO 1934.6	ALKTITRATION	Total Alkalinity - titrimetric	INO	0	01/04/06	C	SOP\INORG\ALKTITRATION.pdf	SOP\Word\ALKTITRATION.doc
INO 5263.1	APPEARANCE	Appearance	INO			P		DRAFT\APPEARANCE.doc
INO 0024.4	CATION-ANION	Cation/anion Balance Equation	INO			P		DRAFT\CATIOIN-ANION.doc
INO	CHLORIDE325.2	How to analyze for chloride using the Westco SmartChem analyzer	INO	0	05/03/07	C	SOP\INO\CHLORIDE325.2.doc.pdf	
INO 04C.2	CHLORIDECEMENT	Cement Chloride Water Digestion	INO			P		DRAFT\CHLORIDECEMENT.doc
INO 0747.2	CHLOROPHYLLA	Chlorophyll A	INO			P		DRAFT\SOPChlorophyll A.doc
INO 9809.6	COD	COD	INO	1	01/03/08	C	SOP\INO\COD.pdf	SOP\Word\COD.doc
INO 2809.3	COLOR	Color	INO	0	05/03/07	C	SOP\INO\COLOR.pdf	
INO 3085.3	CORROSIVITY	Corrosivity	INO			P		DRAFT\CORROSIVITY.doc
INO 7025.3	EXTPHOSPHORUS	Extractable Phosphorus	INO			P		DRAFT\EXTPHOSPHORUS.doc
INO 4079.4	FLASHPOINT	Flash Point	INO			P		DRAFT\FLASHPOINT.doc
INO 4267.6	FLUORIDE	Fluoride	INO			P		DRAFT\SOPFluoride.doc
INO	FRACTPHOSPHORUS	Fractionation of Phosphorous in Sediment	INO			P		DRAFT\FRACTPHOSPHORUS.doc
INO 2250.1	FREELIQUIDS	Free Liquids	INO			P		DRAFT\FREELIQUIDS.doc
INO 2789.4	HEXACHROM	Hexavalent chromium	INO	0	05/03/07	C	SOP\INO\HEXACHROM.pdf	SOP\Word\HEXACHROM.doc
INO 44.2	INSOLUABLERESIDUE	Insoluable Residue	INO			P		DRAFT\INSOLUBLERESIDUE.doc
INO 43.5	LACHAT8000	Operation Instructions for the Lachat QuikChem 8000 Automated Flow Injection Ion Analyzer	INO	0	10/11/06	C	SOP\NUT\LACHAT8000.pdf	SOP\Word\lachat8000.doc
INO 42.4	MTDSTDB	Preparation of Method Standard B	INO			P		DRAFT\SOPmethod stand.B.doc
INO	OILANDGREASE	The analysis of Oil and Grease by Solid Phase Extraction	INO	3	05/03/07	C	SOP\INO\OILGREASEH20.pdf	
INO	PERCENTSOLIDS	Percent Solids for the dry-weight correction of solid samples	INO	0	04/25/07	C	SOP\INO\PERCENTSOLIDS.pdf	SOP\Word\PERCENTSOLIDS.doc
INO 0913.5	PHSOILS	pH for Soil Samples	INO	0	03/11/08	C	SOP\INO\PHSOIL.pdf	SOP\Word\PHSOIL.doc
INO 1088.6	PHWATERS	pH for Aqueous Sample	INO	0	05/02/07	C	SOP\INO\PHWATERS.pdf	SOP\Word\PHWATERS.doc
INO 7601.4	SETTEABLESOILDS	Setteable Solids	INO			P		DRAFT\SETTABLESOLIDS.doc
INO 45.1	SPECGENESYS	Spectronic Genesys 2 Operating Procedure	INO			P		DRAFT\SPEGENEYSIS.doc
INO 5086.4	SPECIFIC CONDUCTANCE	Specific Conductance	INO	0	05/15/08	C	SOP\INO\SPECIFIC CONDUCTANCE.pdf	SOP\Word\SPECIFICCONDUCTANCE.doc
INO 1184.4	SPECIFIC GRAVITY	Specific Gravity	INO			P		DRAFT\SPECIFICGRAVITY.doc
INO 4417.7	TDS	TDS	INO	1	04/24/07	Cc	SOP\INO\TDS.pdf	SOP\Word\TDS1.doc
INO	TEMPERATURE	Temperature	INO	0	05/03/07	C	SOP\INO\TEMPERATURE.pdf	SOP\Word\TEMPERATURE.doc
INO 0338.5	TSS	TSS	INO	1	04/24/07	C	SOP\INO\TSS.pdf	SOP\Word\TSS.doc
INO 5228.7	TS-TVS	TS/TVS	INO	1	04/25/07	C	SOP\INO\TS-TVS.pdf	SOP\Word\TS-TVS1.doc
INO 0892.3	TURBIDITY	Turbidity	INO	0	05/03/07	C	SOP\INO\TURBIDITY.pdf	SOP\Word\TURBIDITY.doc
INO 3011.2	VSS	VSS	INO	0	05/03/07	C	SOP\INO\VSS.pdf	SOP\Word\VSS.doc
	WATERSOLUBLESULFATE	ASTM Water soluble sulfate	INO	0	03/11/08	C	SOP\INO\WATERSOLUBLESULFATE.pdf	SOP\Word\WATERSOLUBLESULFATE.doc
	WESTCOSO4	Sulfate by turbidimetric technique using the WestCo SmartChem analyzer	INO	1	01/08/08	C	SOP\INO\WESTCOSO4.pdf	SOP\Word\WestcoSO4.doc
INO 1243.3		Total Chlorine Residual Hach	INO			N		
INO 6151.3		Exchangeable Potassium	INO			N		DRAFT\EXCHANGEABLEPOTASSIUM.doc
INO 9407.3		Soluble salts	INO			N		DRAFT\SOLUBLESALTS.doc
INO 9477.3		Cation Exchange Capacity by sodium Saturation	INO			N		DRAFT\CATIONEXCHANGE.doc
INO 1411.2		Percent Organic Matter	INO			P		DRAFT\ORGANICMATTER.doc

MET 08.5	ASTMWATERLEACH	Shake Extraction of Solid Waste with Water	MET			P		DRAFT\ASTMWATERLEACH.doc
MET 12.6	FILTERDIG	Filter Digestion for Metal Analysis	MET	2	02/27/07	C	SOP\MET\FILTERDIG.pdf	SOP\Word\FILTERDIG.doc
MET 10.5	HARDNESS	Hardness by Calculation	MET	1	02/27/07	C	SOP\MET\HARDNESS.pdf	SOP\Word\HARDNESS.doc
MET	HGAQUEOUSPREP4	Standard Sample Preparation for Mercury in Aqueous Samples.	MET	O	10/19/05	C	SOP\MET\HGAQUEOUSPREP.pdf	SOP\Word\HGAQUEOUSPREP.doc
MET 6931.14	HGCVAA	Mercury Analysis and Digestion	MET	0	02/05/05	C	SOP\MET\HGCVAA2.pdf	SOP\MET\HGCVAA2.doc
MET	HGENDCAP	Metal End Cap Preparation for the Determination of Mercury	MET	0	09/29/05	C	SOP\MET\HGENDCAPS.pdf	SOP\Word\HGENDCAPS.doc
MET	HGLAMP1	Mercury in Lamp Residuals	MET	0	10/04/02	C		SOP\MET\HGLAMP1.doc
MET	HGONTAIRO	Standard Sample Preparation for Mercury in Coal Fired Stationary Sources, Ontairo-Hydro Method	MET	1	05/15/07	C	SOP\MET\HgONTAIRO.pdf	SOP\Word\HGONTAIRO.doc
MET	HGPARTICULATE	Particulate Mercury in Workplace Atmospheres	MET	0	09/29/05	C	SOP\MET\HGPARTICULATE.pdf	SOP\Word\HGPARTICULATE.doc
MET	HGSOLIDPREP3	Standard Sample Preparation for Mercury in Solid Samples.	MET	0	10/19/05	C	SOP\MET\HGSOLIDPREP.pdf	SOP\Word\HGSOLIDPREP.doc
MET	HGVAPOR	Mercury Vapor in Workplace Atmospheres	MET	0	09/29/05	C	SOP\MET\HGVAPOR.pdf	SOP\Word\HGVAPOR.doc
MET	ICP6010VARIAN	Analysis of Paint, Dust Wipes, Filters and Soil samples by ICAP/OES using the Varian Vista Pro	MET	3	04/02/08	C	SOP\MET\ICP6010VARIAN.pdf	SOP\Word\ICP6010VARIAN.doc
MET 02.12	ICPAQDIG	Trace Metal Digestion for Aqueous Samples	MET	2	01/16/07	C	SOP\MET\ICPAQDIG.pdf	SOP\Word\ICPAQDIG.doc
MET 0718.6	ICPMS2086020A1	Analysis of Metals by ICP-MS	MET	1	04/24/07	C	SOP\MET\ICPMS20086020A.pdf	SOP\Word\ICPMS20086020A.doc
MET 13.10	ICPSOILDIG	Acid Digestion of Sediments, Sludges and Soils	MET	2	01/18/07	C	SOP\MET\ICPSOILDIG.pdf	SOP\Word\ICPSOILDIG.doc
MET	ICPVARIAN20076010B	Analysis of Metals by ICP using the Varian Vista-Pro	MET	2	02/27/07	C	SOP\MET\ICPVARIAN20076010B.pdf	SOP\Word\ICPVARIAN20076010B.doc
MET 27.1	METALSPREPH20MICRO	Microwave assisted acid digestion of aqueous samples	MET	0	01/05/06	C	SOP\MET\METALSPREPH20MICRO.pdf	SOP\Word\METALSPREPH20MICRO.doc
MET 26.1	METALSPREPSOLIDMICRO	Microwave assisted acid digestion of solid matrices	MET			P		DRAFT\METALSPREPSOLIDMICRO.doc
MET 25.1	METHOD29	Sample Preparation for EPA Method 29 Samples	MET			P		DRAFT\METHOD29.doc
MET 09.7	PBPAINTDIG	Lead in Paint Digestion	MET	2	04/02/08	C	SOP\MET\PBPAINTDIG.pdf	SOP\Word\PBPAINTDIG.doc
MET	PBSOILDIG	Acid Digestion of Soils for Lead	MET	2	04/02/08	C	SOP\MET\PBSOILDIG.pdf	SOP\Word\PBsoildig.doc
	PBWIPEDIG	Dust Wipe Digestion	MET	2	03/12/08	C	SOP\MET\PBWIPEDIG.pdf	SOP\Word\PBWIPEDIG.doc
	TCLPEXT	TCLP for non-volatile and Inorganic Analysis	MET	3	01/30/08	C	SOP\MET\TCLPEXT.pdf	SOP\Word\TCLPEXT.doc
MET 20.4	WIPETEST	Lead Wipe Test for Laboratory Contamination	MET	1	09/12/04	C	SOP\MET\OLD\WIPETESTR-1.pdf	SOP\Word\Archived SOPs\WIPETESTR-1.doc
MET 20.4	WIPETEST	Lead Wipe Test for Laboratory Contamination	MET	2	04/16/08	C	SOP\MET\WIPETEST.pdf	SOP\Word\WIPETEST.doc
	ZHETCLP	Zero Headspace Extraction of TCLP	MET	3	01/30/08	C	SOP\MET\ZHETCLP.pdf	SOP\Word\ZHETCLP.doc
MET 24.2		Trace Metal Digestion for Aqueous Samples for ICPMS	MET			P		DRAFT\METALH20PREPICPMS.doc
PCM 1.1	NON-PERMPCM	Non-permanent Mounting of Filters for Fiber Concentration Determination by PCM	MICRO	0	10/14/04	C	SOP\MICRO\PCM\NONPERMPCM.pdf	SOP\MICRO\PCM\NONPERMPCM.doc
PCM 2.1	PERMMOUNTPCM	Permanent Mounting of Filters for Fiber Concentration Determination by PCM	MICRO	0	10/14/04	C	SOP\MICRO\PCM\PERMPCM.pdf	SOP\MICRO\PCM\PERMPCM.doc
NUT 0215.7	LACHATNH3350.1	Ammonia-Nitrogen Run on the Lachat QuickChem: 8000	NUT	0	10/11/06	C	SOP\NUT\LACHATNH3350.1.pdf	SOP\Word\lachatNH3350.1.doc
NUT 7772.6	LACHATOP365.1	Ortho-Phosporus on the Lachat QuickChem 8000	NUT	0	10/11/06	C	SOP\NUT\LACHATOP365.2.pdf	SOP\Word\lachatOP365.2.doc
NUT 0302.5	LACHATTKN351.2	TKN analyzed by the Lachat QuickChem 8000	NUT	0	10/11/06	C	SOP\NUT\LACHATTKN351.2.pdf	SOP\Word\lachatTKN351.2.doc
NUT 0875.8	LACHATTP365.2	Total Phosphorus Analysis using the Lachat QuickChem 8000	NUT	0	10/11/06	C	SOP\NUT\LACHATTP365.2.pdf	SOP\Word\lachatTP365.2.doc
	NITRATE-NITRITE353.2	Nitrate-Nitrite on the Westco	NUT	0	02/28/07	C	SOP\NUT\NITRATE-NITRITE353.2.pdf	SOP\Word\NITRATE-NITRITE353.2.doc
NUT 5769.4	TKNDIGESTION	TKN Digestion for aqueous samples on Lachat QuickChem 8000	NUT			P		DRAFT\TKNDIGESTION.doc
	TOTPHENOL420.2	Total Phenols on the Westco	NUT	0	02/28/07	C	SOP\NUT\TOTPHENOL420.2.pdf	SOP\Word\TOTPHENOL420.2.doc
	WESTCO	Operation Instructions for the Westco	NUT	0	02/28/07	C	SOP\NUT\WESTCO.pdf	SOP\Word\Westco.doc
	WESTCO	Operation Instructions for the Westco	NUT	1	~~~~~~~~	P		SOP\Word\Westco (revised 2006 draft).doc
ORG 36.4	DROH2OPREP	Extraction of Diesel Range Organics in Water	ORG	1	04/16/07	C	SOP\ORG\DROH20PREP.pdf	SOP\Word\DROH2OPREP.doc
ORG 36.4	DROSOILPREP	Extraction of Diesel Range Organics in Soil	ORG	1	04/16/07	C	SOP\ORG\DROSOILPREP.pdf	SOP\Word\DROSOILPREP.doc
ORG 5380.8	GCMS6258270C	Determination of Extractable Semivolatiles (BNA) Organic Compounds by GC/MS from Aqueous and Solic	ORG	1	04/22/07	C	SOP\ORG\GCMS6258270C.pdf	SOP\Word\GCMS6258270C.doc
ORG 9070.7	GCMS8260624VOC	Determination of Purgeable Organic Comopunds by GC/MS in Liquid and Solid Samples	ORG	0	02/28/07	C	SOP\ORG\GCMS8260624VOC.pdf	SOP\Word\GCMS8260624VOC.doc
ORG 0319.1	GCMS8270MDAL1	Analysis of Organo-Phosphorus, Organo-Chlorine, Nitrogen and Triazine Pesticides in Aqueous and Solid	ORG	1	03/01/07	C	SOP\ORG\GCMS8270MDAL1.pdf	SOP\Word\GCMS8270MDAL1.doc
ORG 5312.3	GCMS8270MDAL2	Analysis of MDA List 2 Pesticides in Aqueous and Solid Samples by GC/MS	ORG	0	03/01/06	C	SOP\ORG\GCMS8270MDAL2.pdf	SOP\Word\GCMS8270MDAL2.doc
	GCMS8270SIM1	Selective Ion Monitoring GC/MS for Low Level PAH Testing	ORG	2	09/20/07	C	SOP\ORG\GCMS8270SIM.pdf	
ORG	GCMSAIRTO-15	The Analysis of Volatile Organic Compounds in Ambient Air by Gas Chromatography/Mass Spectrometric	ORG	1	06/14/07	C	SOP\ORG\GCMSAIRTO-15.pdf	SOP\Word\GCMSAIRTO-15_Rev1.doc
ORG 3991.11	GCOCPEST8081A608	Determination of Pesticides by GC with Dual ECD	ORG	0	04/24/07	C	SOP\ORG\GCOCPEST8081608.pdf	SOP\Word\GCOCPEST8081608.doc
ORG 8685.3	GCPCB8082608	Determination of PCBs in Waters, Soils, Industrial Wastes, and Oils by GC/ECD	ORG	0	04/24/07	C	SOP\ORG\GCPCBs8082608.pdf	SOP\Word\GCPCB8082608.doc
ORG 0612.10	GCWIDRO	Method for the Determination of Diesel Range Organics in Water and Soil	ORG	1	03/13/07	C	SOP\ORG\GCWIDRO.pdf	SOP\Word\GCWIDRO.doc
ORG 6521.4	GCWIGRO	Method for the Determination of Gasoline Range Organics and PVOCs in Water and Soil	ORG	0	11/08/06	C	SOP\ORG\GCWIGRO.pdf	SOP\Word\GCWIGRO.doc
ORG	MDA1H2OPREP	Extraction of MDA list 1, OP Pesticides and Nitrizine pesticides from Water samples	ORG	1	01/11/07	C	SOP\ORG\MDA1H2OPREP.pdf	SOP\Word\MDA1H2OPREP.doc
ORG	MDA1SOILPREP	Extraction of MDA list 1, OP Pesticides and Nitrizine pesticides from Solid samples	ORG	1	01/11/07	C	SOP\ORG\MDA1SOILPREP.pdf	SOP\Word\MDA1SOILPREP.doc
ORG 05.6	MDA2H2OPREP	Extraction of Chlorinated Acid Herbicides (MDA List 2) from Groundwater	ORG	1	12/06/06	C	SOP\ORG\OLD\MDA2H2OPREPR-1.pdf	SOP\Word\Archived SOPs\MDA2H2OPREPR-1.doc
ORG 05.6	MDA2H2OPREP	Extraction of Chlorinated Acid Herbicides (MDA List 2) from Groundwater	ORG	2	03/06/08	C	SOP\ORG\MDA2H2OPREP.pdf	SOP\Word\MDA2H2OPREP.doc
ORG 34.1	MDA2SOILPREP	Extraction of Chlorinated Acid Herbicides (MDA List 2) from Soil	ORG	1	12/06/06	C	SOP\ORG\MDA2SOILPREP.pdf	SOP\Word\MDA2SOILPREP.doc
ORG 1350.1	METHOD5	Method 5 Sample Extraction and Analysis	ORG			P		DRAFT\METHOD5.doc
ORG	OCPESTH2OPREP	Extraction of Organo Chlorine Pesticides from Aqueous Samples using Sep Funnel Extraction Extraction	ORG	1	11/15/06	C	SOP\ORG\OCPESTH2OPREP.pdf	SOP\Word\OCPestH2OPREP.doc
ORG	OCPESTSOILPREP	Extraction of Organo Chlorine Pesticides from Solid Samples using Accelerated Solvent Extraction	ORG	0	04/17/07	C	SOP\ORG\OCPESTSOILPREP.pdf	SOP\Word\OCPESTSOILPREP.doc
ORG 37.2	PCBOILPREP	Extraction of PCBs from Oil	ORG	0	10/24/06	C	SOP\ORG\PCBOILPREP.pdf	SOP\Word\PCBOILPREP.doc
ORG	PCBSOILPREP	Extraction of PCBs from Solid Samples using Accelerated Solven Extraction	ORG	2	04/24/07	C	SOP\ORG\PCBSOILPREP.pdf	SOP\Word\PCBSOILPREP.doc
ORG 10.5	PCBWIPEPREP	Extraction of PCBs from Wipes	ORG	0	11/01/06	C	SOP\ORG\PCBWIPEPREP.pdf	SOP\Word\PCBWIPEPREP.doc
ORG	SIMPAHH20PREP	Extraction of cPAH and SIM Organic Compounds from Aqueous Samples using Continuous Liquid-Liquid.	ORG	1	04/02/08	C	SOP\ORG\SIMPAHH2OPREP.pdf	SOP\Word\SIMPAHH2OPREP.doc
ORG	SVOCH2OPREPSEP	Extraction of Semi-Volatile (BNA) Organic Compounds from Aqueous using Separatory Funnel.	ORG	1	03/13/07	C	SOP\ORG\SVOCH20PREPSEP.pdf	SOP\Word\SVOCH2OPREPSEP.doc

ORG 17D.1	SVOCSOILPREP	Extraction of Semi-Volatile (BNA) Organic Compounds from Aqueous and Solid Samples	ORG	1	12/06/06	C	SOP\ORG\SVOCSOILPREP.pdf	SOP\Word\SVOCSOILPREP.doc
	GCPBBPBDE	The sample preparation and determination of PBBs and PBDBs in various materials by GC	ORG	0	05/22/08	C	SOP\ORG\GCPBBPBDE.pdf	SOP\Word\GCPBBPBDE.doc
GEN	ETHICS	Ethics in the Analytical Laboratory	QC	0	09/01/06	C	SOP\QC\ETHICS.pdf	SOP\Word\ETHICS.doc
GEN 26.3	SOPGENERAL1	Writing General SOPs	QC	0	11/01/02	C	SOP\sopgeneral1.pdf	SOP\SOPGEN1.doc
GEN 32.2	SOPTECH1	Writing Technical SOPs	QC	0	11/01/02	C	SOP\soptech1.pdf	SOP\SOPTECH1.doc
SAF 08.1	PERSPROTECT1	Personnel Protective Equipment	SAF	0	03/04/03	C	SOP\SAF\PERSPROTECT1.pdf	SOP\Word\persprotect1.doc
SAF 07.1	SPILLKITS1	Spill Kits	SAF	0	03/04/03	C	SOP\SAF\SPILLKITS1.pdf	SOP\Word\spillkits1.doc
SC 06.2	COMPOSITING	Sample Compositing	SC			N		
SC 30.1	SAMPLERECEIVING1	Sample Receiving	SC	1	04/22/07	C	SOP\SC\samplereceiving.pdf	SOP\Word\Sample Receiving.doc
SC 26.3	SHIPPING1	Shipping by UPS, Fed EX and Road Runner Courier	SC	0	02/26/03	C	SOP\SC\SHIPPING.pdf	SOP\Word\SHIPPING.doc
IH	LACHATFORM	The analysis of formaldehyde on 3M badges.				P		DRAFT\lachatFORM.doc

MICROSCOPY

BIO 01.1	FUNGALAOC	Quantitative Analysis of Funal Spores using Air-O Cell Cassette	BIO			N		
BIO 02-0	ROTOROD	Analysis of Rotorod Samples for Pollen/Fungal Content	BIO			N		
BIO 03.2		Media Preparation - Solid Agar media in Petri Plates	BIO			N		
BIO 04.1		Protocol for Preparation, Field use and Laboratory evaluation of Sterile Swab Samples	BIO			N		
BIO 05.1		Preparation and Laboratory Analysis of Fungal Bulk Samples	BIO			N		
BIO 06.1		Preparation and Laboratory Analysis of Fungal Tape Samples	BIO			N		
BIO 07.1		Preparation and Laboratory Analysis for Fungal Colonies on Andersen Sampler Media Plates	BIO			N		
BIO 08.1		Prepration and Laboratory Analysis for Fungal Colonies on Contact Media Plates	BIO			N		
BIO 10.0		Maintenance of Fungal Culture Collection Using the Oil Overlay Method	BIO			N		
BIO 11.0		Preparation of 0.1% Peptone with 0.01 Tween 80 Media	BIO			N		
BIO 12.0		Characteristics for Fungal Identification	BIO			N		
MGEN 01.1		Microscopy Department Sample Receiving	MICRO			N		
MGEN 03.1		Asbestos Analysis Report Generation	MICRO			N		
MGEN 07.1		Asbestos Contamination Sampling and Control	MICRO			N		
MGEN 10.1		Gravimetric Analysis of Particulates	MICRO			N		
PCM 3.1		Filter Mounting Solution for Fiber Concentation Determination by PCM	MICRO			N		
PCM 4.1		Calibration and Alignment of PCM for Fiber Concentration Determination	MICRO			N		
PCM 5.1		Determinatino of Fiber Concentration	MICRO			N		
PCM 6.1		Storage and Disposal of Air Samples	MICRO			N		
PCM 7.1		PCM Air Sample Quality Control	MICRO			N		
PLM 1.1		Calibration and Alignment of PLC for Bulk Asbestos Analysis	MICRO			N		
PLM 2.1		Calibration of Refractive Index Liquids	MICRO			N		
PLM 3.1		Operation and Maintenance of the NUAire NU-119-600 Asbestogard Vertical Laminar Flow Containment C	MICRO			N		
PLM 4.1		Perparation and Analysis of Bulk Asbestos-Containing Materials using PLM	MICRO			N		
PLM 6.1		Preparation for and Analysis of Friable Bulk Asbestos-Containing Materials by Point Counting	MICRO			N		
PLM 7.1		Storage and Disposal of Bulk Asbestos Samples	MICRO			N		
TEM 01.1		Operation of VAP 100 Acetone Vaporizer	MICRO			N		
TEM 02.1		Operation of the Denton Vacuum PE-120 RF Low Temperature Asher	MICRO			N		
TEM 03.1		Denton Vacuum PE 120 RF Low temperature Asher Calibration	MICRO			N		
TEM 04.1		Operation of Denton DV 502A High Vacuum Carbon Evaporator	MICRO			N		
TEM 05.1		Condensation Washer Oepration	MICRO			N		
TEM 06.1		Glassware Cleaning	MICRO			N		
TEM 07.1		Carbon Rod Sharpening	MICRO			N		
TEM 08.1		Use of Sartorius BP210D Semi Micro Balance	MICRO			N		
TEM 09.1		Measuring Grid Size Openings	MICRO			N		
TEM 10.1		Storage and Disposal of TEM Air Samples	MICRO			N		
TEM 11.1		Preparation of Mixed Cellulose Ester Filters for TEM Asbestos Analysis	MICRO			N		
TEM 12.1		Preparation of Polycarbonate Filters for TEM Asbestos Analysis	MICRO			N		
TEM 13.1		TEM Gun Cap Changing, Cleaning and Remounting	MICRO			N		
TEM 14.1		JEOL 1200 EXII Transmission Electron Microscope Alignment Procedure	MICRO			N		
TEM 15.1		Verified Analysis and interpretation	MICRO			N		
TEM 16.1		TEM Asbestos Air Quality Control	MICRO			N		
TEM 17.1		Photographic Procedures for the TEM	MICRO			N		
TEM 18.1		TEM magnification Calibration and Camera Constant Determination	MICRO			N		
TEM 19.1		Acquistion and Measurement of SAED Data for Asbestos Analysis by TEM	MICRO			N		
TEM 20.1	TEM 20	Operation of the Kevex Delta Class Analyzer	MICRO	0	03/16/07	C	SOP\MICRO\TEM\TEM 20.pdf	SOP\Word\tem20.doc
TEM 21.1		TEM Asbestos Analysis Procedure using AHERA Regulations	MICRO			N		
TEM 22.1		TEM Asbestos analysis Procedure using EPA Level II Regulations	MICRO			N		

TEM 23.1		Counting Guidelines for TEM Asbestos Analysis Modified NIOSH 7402-PCM Equivalent	MICRO			N		
TEM 24.1		Transmission Electron Microscopy Analysis Procedure using MN Department of Health Asbestos Abatem	MICRO			N		
TEM 26.1		Transmission Electron Microscopy Analysis of Floor Tile	MICRO			N		
TEM 27.1		Transmission Electron Microscopy Analysis of Asbestos in Drinking Water	MICRO			N		
TEM 28.1		Collecton and Analysis of Dust Samples for Asbestos by TEM	MICRO			N		
TEM 29.1		Determination of K-Values using the Kevex Energy Dispersive X-Ray (EDX) System	MICRO			N		
TEM 30.1		Operation and Maintenance of the Hamilton Fume Hood in the TEM Air Sample Prep Lab	MICRO			N		
TEM 33 MDH		Transmission Electron Microscopy Analysis for Mineral Fibers Bulk Material	MICRO	0	01/16/08	C	SOP\MICRO\TEM\TEM-33 MDH.pdf	SOP\Word\TEM-33 MDH.doc
XRD 01.1		Preparation of respirable Dust and Bulk Samples for XRD Analysis	MICRO			N		
XRD 02.1		Setup and Operation of the Rigaku Mini Flex X-Ray Diffractometer	MICRO			N		
XRD 03.1		Analysis of Respirable Silica by X-Ray Diffraction	MICRO			N		
XRD 04.1		Calibration of the Rigaku Miniflex X-Ray Diffractometer	MICRO			N		
XRD 05.1		Analysis of Respirable Silica by X-Ray Diffraction	MICRO			N		

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NUT 3147.6	LACHATNO32353.2	Nitrate-Nitrite on the Lachat QuickChem 8000	NUT			A		SOP\Word\Archived SOPs\lachatNO32353.2.doc
MET 10.5	HARDNESS	Hardness by Calculation	MET			A		DRAFT\HARDNESS.doc
INO 6553.4	LACHATCL325.2	Chloride	INO			A		SOP\Word\Archived SOPs\lachatcl325.2.doc
INO 3485.6	LACHATTOTPHENOL420.2	Total Phenol Distillation and Analysis using the Lachat QuickChem 8000	INO			A		SOP\Word\Archived SOPs\lachattotphenol420.2.doc
INO 1830.6	LACHATSO4375.2	Sulfate analysis using Lachat QuickChem 8000	INO			A		SOP\Word\Archived SOPs\lachatSO4375.2.doc
INO 1697.3	LACHATSIO2370.1	Total Reactive Silica	INO			A		SOP\Word\Archived SOPs\lachatsio2370.1.doc
GEN 03.6	Archived	Manual preparation and Cleaning of Nutrient glassware	GEN			A		
GEN 05.4	Archived	Reagent Water Specifications	GEN			A		
GEN 06.6	Archived	Use of Automatic Dishwasher in the Laboratory	GEN			A		
GEN 07.3	Archived	Equipment Maintenance Logbooks	GEN			A		
GEN 08.5	Archived	Calibration and Use of Mettler AE Electronic Balance	GEN			A		
GEN 17.3	Archived	Monitoring for Sample and Laboratory Contamination	GEN			A		
GEN 20.4	Archived	Technical and Managerial Review of Data	GEN			A		
GEN 22.4	Archived	Walk-in Cooler, Refrigeration and Freezer Failure Protocol	GEN			A		
GEN 39.3	Archived	Client Complaints Resolution	GEN			A		
IH 4019.2	Archived	The Determination of N-Methyl Carbamates in Soils and Waters by Reverse Pahse HPLC/FL and Post Co	IH			A		
IH 4015.3	archived	The Determination of Polynuclear Aromatic Hydrocarbons by Reverse Phase HPLC/UV&FL	IH			A		
MET 22.5	Archived	Trace metal Digestion for Silver of Aqueous Samples	MET			A		
MET 2371.5	Archived	Analysis of Dust Wipes for Lead	MET			A		
MET 3159.8	Archived	Analysis of Metals by ICP	MET			A		
MET 4830.6	Archived	Analysis of Paint for Lead	MET			A		
MET 5322.5	Archived	Analysis of Soil for Lead	MET			A		
NUT 6536.2	Archived	Ortho-Phosporus Manual Method	NUT			A		
ORG 06.7	Archived	Esterification of Chlorinated Herbicides and Phenols	ORG			A		
	Archived	Sulfate by turbidimetric technique using the WestCo SmartChem analyzer	INO	0		A		
SC 27.3	Archived	Purchasing	SC			A		
SC 29.2	Archived	Computer Data Entry and Reporting Using the LIMS	SC			A		
ORG 30.5	Archived	Operation of the TurboVap 2 Concentration Work Station	ORG			A		
ORG 32.6	Archived	Separatory Funnel Liquid/Liquid Extraction	ORG			A		
ORG 33.2	Archived	Extraction of BNA, PAH, PCB/PEST, and MDA List 1 from solids by Soxhlet	ORG			A		
INO 1409.1	Archived	Nitrite - Spectrophotometric	INO			A		
INO 9252.4	Archived	Low Level Sulfate	INO			A		
SC 11.4	Archived	Collection, storage and Disposal of Sample and Chemical Wastes.	SC			A		
ORG 6717.4	Archived	The Determination of PCBs in Transformer Fluid and Waste Oils	ORG			A		
ORG 40.2	Archived	Solid Extraction by Accelerated Solvent Extractor	ORG			A		
ORG 39.2	Archived	The Extraction of Formaldehyde from Water and Solids	ORG			A		
ORG 35.3	Archived	Continous Liquid/Liquid Extraction	ORG			A		
INO 6985.6	Archived	Sulfide	INO			A		
INO 1074.4	Archived	Sulfate Turbidimetric	INO			A		
INO 8439.6	ALKLACHAT	Alkalinity using the Lachat	INO			A		SOP\Word\Archived SOPs\lachatalk310.2.doc
INO 1415.1	Archived	Spectrophotometric Total Phosphorus	INO			A		
INO 2629.2	Archived	Method for High Level Sulfate	INO			A		
ORG 45.2	FLORISILCLEANUP	Florisil Cleanup Procedure	ORG			A		DRAFT\FLORISILCLEANUP.doc
	SVOCH2OPREP	Extraction of Semi-Volatile (BNA) Organic Compounds from Aqueous using Continuous Liquid-Liquid.	ORG			A		

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Form ID	Description	Func Group	Rev #	Effective Date	Status	Link to Word/Excel Doc
BIO 01	Fungal Case Narrative	Microbiology	0	5/6/2002	A	
BIO 01	Fungal Case Narrative	Microbiology	1	11/7/2002	C	FORMS\Bio\FUNGALCASE.XLS
BIO 02	Fungal Sampling Sheet	Microbiology	0	11/7/2002	C	FORMS\Bio\Fungal sampling sheet.xls
BIO 03	Fungal Sample Data	Microbiology	0	11/7/2002	C	FORMS\Bio\SAMPDATA.XLS
BIO 04	Fungal Surface Data	Microbiology	0	11/7/2002	C	FORMS\Bio\surfacedata.xls
BIO 05	Lab Duties - Microbiology	Microbiology	0	11/12/2002	C	..\LabDepartments\Micro\Documents\Microbiology lab Duties.xls
CS 01	Conditions upon receipt	CS	0	1/21/2003	C	FORMS\Client Services\Conditions upon receipt -CS01.xls
CS 02	Chain of Custody - Analytical (CS02)	CS	1	7/22/2005	A	
CS 02	Chain of Custody - Analytical (CS02)	CS	2	11/17/2006	A	
CS 02	Chain of Custody - Analytical (CS02)	CS	3	10/10/2007	C	
CS 03	Sample Tracking	CS	1	2/20/2003	A	
CS 03	Sample Tracking	CS	2	6/1/2006	C	FORMS\Client Services\sampletracking1.xls
CS 04	Metals Preservation	CS	0	11/24/2003	C	
CS 05	Sampling Requirements	CS	0	12/14/2006	A	FORMS\Client Services\Preservation.doc
CS 05	Sampling Requirements/Holding Times	CS	1	10/10/2007	C	FORMS\Client Services\CS05.01.doc
CS 06	3M Prepaid Sample Submittal Form	CS	0	12/11/2007	C	
CS 10	Chain of Custody - Air Canister (CS10)	CS	1	11/15/2006	C	
eCS 01	Chain of Custody - Analytical (eCS01)	CS	0	1/16/2007	A	FORMS\Client Services\COC-eCS01.00.doc
eCS 01	Chain of Custody - Analytical (eCS01)	CS	1	2/5/2008	C	FORMS\Client Services\COC-eCS01.01.doc
eCS 02	Chain of Custody - Air Canister (eCS02)	CS	0	1/16/2007	A	FORMS\Sample Control\COC-eCS02.00.doc
eCS 02	Chain of Custody - Air Canister (eCS02)	CS	1	2/5/2008	C	FORMS\Sample Control\COC-eCS02.01.doc
GEN 01	AnLab Equipment List	QC	1	11/14/2006	A	
GEN 01	AnLab Equipment List	QC	2	7/25/2007	A	
GEN 01	AnLab Equipment List	QC	3	9/14/2007	A	
GEN 02	PIT Form	QC	0	9/12/2002	C	FORMS\GEN\pit.doc.doc
GEN 03	Process Tracking Form	QC	0	11/1/2002	C	FORMS\GEN\process tracking.xls
GEN 04	Technical SOP Template	QC	0	10/31/2002	C	FORMS\GEN\SOPTECH_TEMP.doc
GEN 05	General SOP Template	QC	0	10/31/2002	C	FORMS\GEN\SOPGEN_TEMP.doc
GEN 06	Statement of Capability Form	QC	0			
GEN 07	Morning Metrology	QC	0	11/13/2002	A	FORMS\GEN\Metrology\metrology.xls
GEN 07	Morning Metrology	QC	1	5/10/2006	A	FORMS\GEN\Metrology\metrologyR-1.xls
GEN 07	Morning Metrology	QC	2	9/26/2007	A	FORMS\GEN\Metrology\metrologyR-2.xls
GEN 07	Morning Metrology	QC	3	11/29/2007	C	FORMS\GEN\Metrology\metrologyR-3.xls
GEN 08	General Lab orientation form	QC	0			
GEN 09	Vendor Registration	QC	0	11/13/2002	C	FORMS\GEN\Vendor Registration.doc
GEN 10	Pipet Calibration	QC	0	11/26/2002	C	FORMS\MET\PIPETCAL.doc
GEN 11	Curriculum Vitae	QC	0			FORMS\GEN\GEN11 CV.doc
GEN 12	Single Component Standards Log	QC	0	7/2/2003	P	
GEN 13	Standards Preparation Log	QC	0	7/2/2003	C	FORMS\GEN\Standard Preparation.doc
GEN 14	SSV Log	QC	0	11/11/2003	C	
GEN 15	General Maintenance / Calibration	QC	0	11/13/2003	C	

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GEN 16	Vacation Request	QC	1	6/8/2005	C	FORMS\GEN\VACATION16.1.doc
GEN 17	Hazardous Waste Training Form	QC	0		A	
GEN 17	Hazardous Waste Training Form	QC	1	3/29/2005	C	FORMS\GEN\Haztraining.doc
GEN 18	AnLab Quarterly Report Form	GEN	0	9/12/2007	C	FORMS\GEN\AnLab Quarterly Report Form Gen 18.0.doc
GEN 19	Purchase Order Form	GEN	0	5/29/2008	A	
GEN 19	Purchase Order Form	GEN	1	7/20/2008	C	FORMS\GEN\POGEN19.xlsx
IH 01	IH Case Narrative	IH	0	12/10/2002	A	FORMS\IH\EXCEL\IH01-Narr.XLS
IH 02	ETO Case Narrative	IH	0	12/11/2002	A	FORMS\IH\ETONARR.XLS
IH 03	HPLC Air Case Narrative	IH	0	12/11/2002	A	FORMS\IH\HPLCAIRNARR.XLS
IH 04	IH standards log	IH	0	4/16/2003	C	FORMS\IH\STANDARD.LOG.doc
IH 21	Routine Analysis Run Log	IH	0	3/25/2003	A	FORMS\IH\RoutineOVM Log.DOC
IH 21	Routine Analysis Run Log	IH	1	9/16/2003	C	FORMS\IH\RoutineOVM Log.1.DOC
IH 22	Passive Monitor/ETO Run Log	IH	0	9/24/2003	C	FORMS\IH\IHV16302.DOC
INO 01	Specific Conductance Run Log	INO	0	3/26/2003	C	
INO 02	Inorganic Case Narrative	INO	0	3/26/2003	A	
INO 03	IC Runlog	INO	0		P	
INO 04	TSS Data Sheet	INO	0	11/17/2003	C	
INO 05	Westco Maintenance Log	INO	0	2/15/2005	C	FORMS\NUT\WestcoMaint.doc
INO 06	pH meter Calibration log	INO	0	3/6/2007	C	FORMS\INO\pH calibration.doc
INO 07	IC Maintenance Log	INO	0	4/3/2008	C	
MAINT 01	Barrel Inspection	QC	0	11/12/2002	C	FORMS\MAINT\Barrel Inspection.doc
MET 01	Hg Digestion Log	MET	0	3/17/2003	A	
MET 01	Hg Prep Log - Aqueous	MET	1	8/11/2003	C	FORMS\MET\hgpreplog.doc
MET 02	Hg Run Log	MET	0	3/17/2003	A	
MET 02	Hg Run Log	MET	1	8/11/2003	C	FORMS\MET\hgrunlog.doc
MET 03	Hg Prep Log - solids	MET	0	8/11/2003	C	FORMS\MET\hgpreplogs.doc
MET 04	Hg Case Narrative	MET	0	8/11/2003	A	FORMS\MET\hgcase.xls
MET 05	TCLP Logbook	MET	0	8/21/2003	A	FORMS\MET\TCLPLOGBOOK.doc
MET 05	TCLP Logbook	MET	1	11/24/2003	C	FORMS\MET\TCLPLOGBOOKR1.doc
MET 06	Soil Digestion Log	MET	0	9/9/2004	C	
MET 07	ICP Maintenance Log	MET	0	9/9/2004	A	FORMS\MET\ARCHIVE\ICPMAINT.doc
MET 07	ICP Maintenance Log	MET	1	12/20/2007	C	FORMS\MET\ICPMAINTR-1.doc
MET 08	ICPMS Maintenance Log	MET	0	2/19/2008	C	
MICRO 01	XRD Case Narrative	MICRO	0	8/11/2003	A	FORMS\Micro\XRDCase.doc
MICRO 01	XRD Case Narrative	MICRO	1	10/13/2004	C	FORMS\Micro\XRDCase1.doc
MICRO 02	XRD QC Log	MICRO	0	8/11/2004	C	FORMS\Micro\XRD QC - MICRO 02.00.doc
NUT 01	Lachat Maintenance Runlog	NUT	0	5/12/2003	C	
NUT 02	Maintenance Logbook	NUT	0	3/21/2007	C	
ORG 01	BNA/L1/PPT Extraction Logbook	ORG	0	1/22/2003	A	
ORG 01	BNA/L1/PPT Extraction Logbook	ORG	1	5/20/2003	C	
ORG 04	OC Pesticide Bench Sheet	ORG	1	2/18/2002	A	
ORG 04	OC Pesticide Bench Sheet	ORG	2	3/11/2003	C	
ORG 07	L2/PAHLC Extraction Logbook	ORG	0	3/26/2003	C	FORMS\OP\EXTRACT\L2pahlc.doc

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ORG 08	PCB-PEST extraction Logbook	ORG	0	4/1/2003	C	FORMS\OP\PCBPEST\pcb-pestextraction.doc
ORG 09	GC/MS VOC Runlog	ORG	0	4/29/2003	A	FORMS\GCMS\MSVOCRUN.2.doc
ORG 09	GC/MS VOC Runlog	ORG	1	10/18/2005	A	FORMS\GCMS\vocrunlogR2.doc
ORG 09	GC/MS VOC Runlog	ORG	2	1/4/2007	C	
ORG 10	GRO Runlog	ORG	0	6/16/2003	A	FORMS\GRO_DRO\GRO Runlog.doc
ORG 10	GRO Runlog	ORG	1	11/10/2004	C	FORMS\GRO_DRO\GROrunlog1.doc
ORG 11	Organic Aqueous Extraction Form	ORG	0	7/14/2003	C	FORMS\OP\Organic Aqueous Ext.doc
ORG 12	Organic Solid Extraction Form	ORG	0	7/14/2003	C	FORMS\OP\Organic Solid Ext.doc
ORG 13	DRO Solid Extraction Form	ORG	0	7/14/2003	A	FORMS\OP\DRO Solid Ext.doc
ORG 13	DRO Solid Extraction Form	ORG	1	10/23/2003	A	FORMS\OP\DRO Solid ExtR1.doc
ORG 13	DRO Solid Extraction Form	ORG	2	2/10/2004	C	FORMS\OP\DRO Solid ExtR2.doc
ORG 14	DRO Aqueous Extraction Form	ORG	0	7/14/2003	C	FORMS\OP\DRO Aqueous Ext.doc
ORG 15	PCB Wipe and Oil Extraction and Analysis	ORG	0	9/30/2003	P	
ORG 16	MDA List 2 AQ Extraction Sheet	ORG	0	10/15/2003	P	
ORG 17	SVOC AQ Extraction Sheet	ORG	0	10/20/2003	C	FORMS\OP\SVOC Aqueous Ext.doc
ORG 18	GRO-PVOC Soil Prep Log	ORG	0	11/24/2003	C	FORMS\GRO_DRO\GRO-PVOC Soil Prep.doc
ORG 19	GRO-PVOC Water Prep Log	ORG	0	11/24/2003	C	FORMS\GRO_DRO\GRO-PVOC Water Prepr.doc
ORG 20	GRO-PVOC Run Log	ORG	0	11/24/2003	C	FORMS\GRO_DRO\GROPVOC runlog.doc
ORG 21	GC/MS VOC Soil Prep					
ORG 22	GC/MS VOC Water Prep					
ORG 23	PCB PEST RUNLOG	ORG	0	12/31/2003	A	FORMS\OP\PCBPEST\PCBrunlog.doc
ORG 23	PCB PEST RUNLOG	ORG	1	2/20/2008	C	FORMS\OP\PCBPEST\PCBrunlog.doc
ORG 24	GC/MS SVOC Run Log	ORG	0	7/14/2003	C	FORMS\GCMS\svocrunlogd.doc
ORG 25	DRO RUNLOG	ORG	0	11/10/2004	A	FORMS\GRO_DRO\DROrunlog.doc
ORG 25	DRO RUNLOG	ORG	1	9/19/2005	C	
ORG 26	GRO Soil Weight and Preservation	ORG	0	11/10/2004	C	
ORG 27	DRO Soil Weight	ORG	0	11/10/2004	C	
ORG 28	TO-15 Runlog	ORG	0	1/30/2007	P	
ORG 29	URS PPT Extractables & MEM Preparation	ORG	0	4/8/2008	C	FORMS\ORG\ORG29.00.doc
ORG 30	URS Salem SVOC Extractables & MEM Preparation	ORG	0	4/8/2008	C	FORMS\ORG\ORG30.00.doc
QC 01	QC Orientation	QC	0		P	
QC 02	IDC summary	QC	0	6/18/2003	A	FORMS\QC\QC02.00 (IDC).doc
QC 02	IDC summary	QC	1	7/26/2003	A	FORMS\QC\QC02.01 (IDC).doc
QC 02	IDC summary	QC	2	8/22/2005	C	FORMS\QC\QC02.02 (IDC).doc
QC 03	QAM document sign off	QC	0	9/12/2007	A	FORMS\QC\QC 03.00.doc
QC 03	QAM document sign off	QC	1	1/30/2008	C	FORMS\QC\QC 03.01.doc
QC 04	Training Documentation Checklist	QC	0	5/12/2003	C	FORMS\QC\QC 04.doc
QC 05	Special Circumstance Proficiency Checklist	QC	0	5/12/2003	C	FORMS\QC\QC 05.doc
QC 06	Employee Laboratory Orientation Form	QC	0		P	
QC 07	Laboratory Personnel Signature/Initials	QC	0		A	FORMS\QC\QC 07.00.doc
QC 07	Laboratory Personnel Signature/Initials	QC	1	10/28/2004	C	FORMS\QC\QC 07.01.doc
QC 07	Laboratory Personnel Signature/Initials	QC	2		P	
QC 08	Non-conformance Form	QC	0	5/6/2003	A	FORMS\QC\Nonconformance.doc

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QC 08	Non-conformance Form	QC	1	11/12/2003	A	FORMS\QC\Nonconformance.R1.doc
QC 09	Performance Testing Summary	QC	0	5/12/2003	C	FORMS\QC\PT Summary.xls
QC 10	Facility Audit Checklist	QC	0	6/2/2003	C	FORMS\QC\QC10.doc
QC 11	Document Audit Checklist	QC	0	6/2/2003	C	FORMS\QC\QC11.doc
QC 12	Data Audit Checklist	QC	0	6/2/2003	C	FORMS\QC\QC12.doc
QC 13	Personnel Audit Checklist	QC	0	6/2/2003	C	FORMS\QC\QC13.doc
QC 14	Data Packet Review Form	QC	0	5/16/2005	C	FORMS\QC\QC14.00.doc
QC 15	MDL Completion Form	QC	0	4/10/2006	C	FORMS\QC\QC-15.00 (MDL).doc
QC 16	Code of Ethics	QC	0	9/5/2006	C	FORMS\QC\QC-16.00 Code of Ethics.doc
QC 17	General Process Compliance Audit Form	QC	0	12/14/2006	C	FORMS\QC\QC17.doc
QC 18	Continuing Demonstration of Capabilities CDC	QC	0	3/6/2008	C	FORMS\QC\QC18.00(CDC).doc
SAF 01	Monthly Spill Kit Check	SAFETY	0	3/4/2003	C	FORMS\SAFETY\spillkitcheck.xls
SAF 02	Laboratory Shower and Eye Wash Check	SAFETY	0	3/4/2003	C	FORMS\SAFETY\showereyewashcheck.xls
SAF 03	Lab Emergency Light and Fire Extingisher Check	SAFETY	0	3/4/2003	C	FORMS\SAFETY\emerglightcheck.xls
SAF 04	Lab Fume Hood Semi Annual Check	SAFETY	0	3/4/2003	C	FORMS\SAFETY\fumehoodcheck.xls
SAF 05	Employee Safety Orientation Form	SAFETY	0		P	

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BIODOC 01	Fungal Culture Collection	BIO	1	11/18/2002	A	..\LabDepartments\Micro\Documents\Fungal culture collection.xls	
BIODOC 01	Fungal Culture Collection	BIO	2	10/6/2004	C	DOCS\BIO\Fungal culture collection.xls	
CSDOC01	Instructions for Integrated Air Canister Sampling	CS	1	3/15/2007	C	DOCS\CS\Integratedsampling01.01.doc	DOCS\CS\Integratedsampling01.01.pdf
CSDOC02	Instructions for Air Canister Grab Sampling	CS	1	3/15/2007	A	DOCS\CS\Grabsampling02.01.doc	DOCS\CS\Grabsampling02.01.pdf
CSDOC02	Instructions for Air Canister Grab Sampling	CS	2	7/7/2008	C	DOCS\CS\Grabsampling02.02.doc	DOCS\CS\Grabsampling02.02.pdf
CSDOC03	Calibration of the Restek Veriflow 423XL Flow Controller	CS	1	3/15/2007	C	DOCS\CS\Flowcontrollercalibration03.01.doc	DOCS\CS\Flowcontrollercalibration03.01.pdf
GENDOC01	AnLab Equipment List 01.01	GEN	1	11/14/2006	A	DOCS\Equipment List\Equipment List 01.01.doc	DOCS\Equipment List\Equipment List 01.01.pdf
GENDOC01	AnLab Equipment List 01.02	GEN	2	7/25/2007	A	DOCS\Equipment List\Equipment List 01.02.doc	DOCS\Equipment List\Equipment List 01.02.pdf
GENDOC01	AnLab Equipment List 01.03	GEN	3	9/26/2007	C	DOCS\Equipment List\Equipment List 01.03.doc	DOCS\Equipment List\Equipment List 01.03.pdf
GENDOC01	AnLab Equipment List 01.04	GEN	4	xx/xx/2008	P	DOCS\Equipment List\Equipment List 01.04.doc	
GENDOC02	Approved Vendor List	GEN	1	9/11/2007	A	FORMS\GEN\GenDoc 02.01 ApprovedVendors.doc	DOCS\GEN\GenDoc 02.01.pdf
GENDOC02	Approved Vendor List	GEN	2	11/7/2007	A	FORMS\GEN\GenDoc 02.02 ApprovedVendors.doc	DOCS\GEN\GenDoc 02.02 ApprovedVendors.pdf
GENDOC02	Approved Vendor List	GEN	3	6/1/2008	C	FORMS\GEN\GenDoc 02.03 ApprovedVendors.doc	FORMS\GEN\GenDoc 02.03 ApprovedVendors.pdf
GENDOC03	AnLab Schedule of Charges	GEN	0	1/1/2008	C	DOCS\GEN\GenDoc 03.00 (draft).doc	DOCS\GEN\GenDoc 03.00.pdf
GENDOC04	AnLab Tier I prices 2008	GEN	0	1/1/2008	C	DOCS\GEN\GenDoc 04.00.doc	DOCS\GEN\GenDoc 04.00.pdf
ORGDOC01	URS PPT Extractables & MEM Procedure	ORG	0	4/8/2008	C	DOCS\ORG\ORGDOC01.00.doc	DOCS\ORG\ORGDOC01.00.pdf
ORGDOC02	URS Salem SVOC Extractables & MEM Procedure	ORG	0	4/8/2008	C	DOCS\ORG\ORGDOC02.00.doc	DOCS\ORG\ORGDOC02.00.pdf

Doc ID	Description	Func Group	Rev #	Effective Date	Archive Date	Status	Current Location of Document
	ANALYSIS INFORMATION FORMATS						
AXI 01	Default Analysis Information format	GEN	0	12/31/2007	12/31/2007	A	LIMS Documents\Analysis information\AXI 01.00.rpt
AXI 01	Default Analysis Information format	GEN	1	12/31/2007	02/11/2008	A	LIMS Documents\Analysis information\AXI 01.01.rpt
AXI 01	Default Analysis Information format	GEN	2	02/11/2008		C	LIMS Documents\Analysis information\AXI 01.02.rpt
AXI 02	IH Analysis Information format	IH	0	12/31/2007	12/31/2007	A	LIMS Documents\Analysis information\AXI 02.00.rpt
AXI 02	IH Analysis Information format	IH	1	12/31/2007		C	LIMS Documents\Analysis information\AXI 02.01.rpt
AXI 03	Analysis Information Validation format	GEN	0	12/31/2007	12/31/2007	A	LIMS Documents\Analysis information\AXI 03.00.rpt
AXI 03	Analysis Information Validation format	GEN	1	12/31/2007		C	LIMS Documents\Analysis information\AXI 03.01.rpt
	BENCH SHEET FORMATS						
BCH 01	DRO Blank format	ORG	0	01/14/2008		C	LIMS Documents\Bench sheets\BCH 01.00.rpt
BCH 02	GRO format	ORG	0	01/14/2008		C	LIMS Documents\Bench sheets\BCH 02.00.rpt
BCH 03	GRO Blank format	ORG	0	01/14/2008		C	LIMS Documents\Bench sheets\BCH 03.00.rpt
BCH 04	IH format	IH	0	01/14/2008		C	LIMS Documents\Bench sheets\BCH 04.00.rpt
BCH 05	IH Inorganic format	IH	0	01/14/2008		C	LIMS Documents\Bench sheets\BCH 05.00.rpt
BCH 06	Standard format	GEN	0	01/14/2008		C	LIMS Documents\Bench sheets\BCH 06.00.rpt
BCH 07	Standard Blank format	GEN	0	01/14/2008		C	LIMS Documents\Bench sheets\BCH 07.00.rpt
BCH 07	Standard Blank format	GEN	1	03/14/2008		C	LIMS Documents\Bench sheets\BCH 07.01.rpt
BCH 08	VOC Soil format	ORG	0	01/14/2008	02/15/2008	A	LIMS Documents\Bench sheets\BCH 08.00.rpt
BCH 08	VOC Soil format	ORG	1	02/15/2008		C	LIMS Documents\Bench sheets\BCH 08.01.rpt
BCH 09	VOC Soil Blank format	ORG	0	01/14/2008	02/15/2008	A	LIMS Documents\Bench sheets\BCH 09.00.rpt
BCH 09	VOC Soil Blank format	ORG	1	02/15/2008		C	LIMS Documents\Bench sheets\BCH 09.01.rpt
BCH 10	TO-15 format	ORG	0			P	
BCH 11	TO-15 Blank format	ORG	0			P	
BCH 12	Default format (Modified)	GEN	0	02/04/2008	6/23/2008	A	LIMS Documents\Bench sheets\BCH 12.00.rpt
BCH 12	Default format (Modified)	GEN	1	6/23/2008		C	LIMS Documents\Bench sheets\BCH 12.01.rpt
	BID REPORT FORMATS						
BID 01	Standard (AnLab) Bid report format	GEN	0	02/06/2008		C	LIMS Documents\Bids\BID 01.00.rpt
BID 02	Lite (AnLab Lite) Bid report format	GEN	0	02/06/2008		C	LIMS Documents\Bids\BID 02.00.rpt
	CLIENT REPORT FORMATS						
RPT 01	3M PrePaid report format	IH	0	12/8/2007	12/27/2007	A	LIMS Documents\Reports\RPT 01.00.rpt
RPT 01	3M PrePaid report format	IH	1	12/27/2007	5/14/2008	A	LIMS Documents\Reports\RPT 01.01.rpt
RPT 01	3M PrePaid report format	IH	2	5/14/2008		C	LIMS Documents\Reports\RPT 01.02.rpt
RPT 02	3M PrePaid Calc report format	IH	0	12/8/2007	12/27/2007	A	LIMS Documents\Reports\RPT 02.00.rpt
RPT 02	3M PrePaid Calc report format	IH	1	12/27/2007	5/14/2008	A	LIMS Documents\Reports\RPT 02.01.rpt
RPT 02	3M PrePaid Calc report format	IH	2	5/14/2008		C	LIMS Documents\Reports\RPT 02.02.rpt
RPT 03	3M PrePaid Sub report format	IH	0	12/8/2007	12/27/2007	A	LIMS Documents\Reports\RPT 03.00.rpt
RPT 03	3M PrePaid Sub report format	IH	1	12/27/2007	5/14/2008	A	LIMS Documents\Reports\RPT 03.01.rpt
RPT 03	3M PrePaid Sub report format	IH	2	5/14/2008		C	LIMS Documents\Reports\RPT 03.02.rpt
RPT 04	IH Std report format	IH	0	12/8/2007	12/13/2007	A	LIMS Documents\Reports\RPT 04.00.rpt
RPT 04	IH Std report format	IH	1	12/13/2007	2/13/2008	A	LIMS Documents\Reports\RPT 04.01.rpt
RPT 04	IH Std report format	IH	2	2/13/2008		C	LIMS Documents\Reports\RPT 04.02.rpt
RPT 04	IH Std report format	IH	3			C	LIMS Documents\Reports\RPT 04.03.rpt
RPT 05	TO-15 report format	GEN	0	12/12/2007	12/13/2007	A	LIMS Documents\Reports\RPT 05.00.rpt

RPT 05	TO-15 report format	GEN	1	12/13/2007	5/16/2008	A	LIMS Documents\Reports\RPT 05.01.rpt
RPT 05	TO-15 report format	GEN	2	12/27/2007		C	LIMS Documents\Reports\RPT 05.02.rpt
RPT 06	MDL_MRL_QC report format	GEN	0	1/18/2008		C	LIMS Documents\Reports\RPT 06.00.rpt
RPT 06	MDL_MRL_QC report format	GEN	1			P	
RPT 07	Mold Std report format	MICRO	0	12/28/2007		C	LIMS Documents\Reports\RPT 07.00.rpt
RPT 08	Mold Tape report format	MICRO	0	12/28/2007		C	LIMS Documents\Reports\RPT 08.00.rpt
RPT 09	MDL_QC report format	GEN	0	01/17/2008		C	LIMS Documents\Reports\RPT 09.00.rpt
RPT 09	MDL_QC report format	GEN	1	6/17/2008		C	LIMS Documents\Reports\RPT 09.01.rpt
RPT 09	MDL_QC report format	GEN	2			P	
RPT 10	Ltr-General 851 report format	MICRO	0	01/22/2008	01/23/2008	A	LIMS Documents\Reports\RPT 10.00.rpt
RPT 10	Ltr-General 851 report format	MICRO	1	01/23/2008	02/04/2008	A	LIMS Documents\Reports\RPT 10.01.rpt
RPT 10	Ltr-General 851 report format	MICRO	2	02/04/2008		C	LIMS Documents\Reports\RPT 10.02.rpt
RPT 11	Ltr-General 852 report format	MICRO	0	01/22/2008	01/23/2008	A	LIMS Documents\Reports\RPT 11.00.rpt
RPT 11	Ltr-General 852 report format	MICRO	1	01/23/2008	02/04/2008	A	LIMS Documents\Reports\RPT 11.01.rpt
RPT 11	Ltr-General 852 report format	MICRO	2	02/04/2008		C	LIMS Documents\Reports\RPT 11.02.rpt
RPT 12	Ltr-MDH 851 report format	MICRO	0	02/03/2008	02/04/2008	A	LIMS Documents\Reports\RPT 12.00.rpt
RPT 12	Ltr-MDH 851 report format	MICRO	1	02/04/2008		C	LIMS Documents\Reports\RPT 12.01.rpt
RPT 13	Ltr-MDH 852 report format	MICRO	0	02/03/2008	02/04/2008	A	LIMS Documents\Reports\RPT 13.00.rpt
RPT 13	Ltr-MDH 852 report format	MICRO	1	02/04/2008		C	LIMS Documents\Reports\RPT 13.01.rpt
RPT 14	Ltr-MDH Bulk report format	MICRO	0	02/03/2008	02/04/2008	A	LIMS Documents\Reports\RPT 14.00.rpt
RPT 14	Ltr-MDH Bulk report format	MICRO	1	02/04/2008		C	LIMS Documents\Reports\RPT 14.01.rpt
RPT 15	Mold (Exponents) report format	MICRO	0	02/03/2008		C	LIMS Documents\Reports\RPT 15.00.rpt
RPT 16	PCM report format	MICRO	0	02/04/2008	05/01/2008	A	LIMS Documents\Reports\RPT 16.00.rpt
RPT 16	PCM report format	MICRO	1	05/01/2008		C	LIMS Documents\Reports\RPT 16.01.rpt
RPT 17	PLM Dust Asbestos report format	MICRO	0	02/03/2008		C	LIMS Documents\Reports\RPT 17.00.rpt
RPT 17	PLM Dust Asbestos report format	MICRO	1				
RPT 18	PLM Dust Composition report format	MICRO	0	02/03/2008	02/15/2008	A	LIMS Documents\Reports\RPT 18.00.rpt
RPT 18	PLM Dust Composition report format	MICRO	1	02/15/2008		C	LIMS Documents\Reports\RPT 18.01.rpt
RPT 19	PLM ND Tile report format	MICRO	0	02/03/2008		C	LIMS Documents\Reports\RPT 19.00.rpt
RPT 19	PLM ND Tile report format	MICRO	1				
RPT 20	PLM PC Stnd report format	MICRO	0	02/03/2008		C	LIMS Documents\Reports\RPT 20.00.rpt
RPT 20	PLM PC Stnd report format	MICRO	1				
RPT 21	PLM Stnd report format	MICRO	0	02/03/2008		C	LIMS Documents\Reports\RPT 21.00.rpt
RPT 21	PLM Stnd report format	MICRO	1				
RPT 22	Pollen report format	MICRO	0	02/04/2008	02/04/2008	A	LIMS Documents\Reports\RPT 22.00.rpt
RPT 23	Sawdust Comp. Report format	MICRO	0	02/04/2008		C	LIMS Documents\Reports\RPT 23.00.rpt
RPT 24	TEM EPA Level II report format	MICRO	0	09/27/2006		P	LIMS Documents\Reports\RPT 24.00.rpt
RPT 25	TEM NIOSH 7402 report format	MICRO	0	07/12/2006		P	LIMS Documents\Reports\RPT 25.00.rpt
RPT 26	TEM Quantitative Bulk report format	MICRO	0	07/12/2006		P	LIMS Documents\Reports\RPT 26.00.rpt
RPT 27	TEM EPA Water report format	MICRO	0	02/11/2008		C	LIMS Documents\Reports\RPT 27.00.rpt
RPT 28	TEM M_A report format	MICRO	0	02/11/2008		C	LIMS Documents\Reports\RPT 28.00.rpt
RPT 29	MRL Lite report format	GEN	0	09/07/2007		C	LIMS Documents\Reports\RPT 29.00.rpt
RPT 29	MRL Lite report format	GEN	1				
RPT 30	MRL Multi Lite report format	GEN	0	09/07/2007		C	LIMS Documents\Reports\RPT 30.00.rpt
RPT 30	MRL Multi Lite report format	GEN	1				
RPT 31	MRL Multi QC report format	GEN	0	08/24/2007		C	LIMS Documents\Reports\RPT 31.00.rpt
RPT 31	MRL Multi QC report format	GEN	1				
RPT 32	MRL Multi Std report format	GEN	0	03/04/2007		C	LIMS Documents\Reports\RPT 32.00.rpt
RPT 32	MRL Multi Std report format	GEN	1				
RPT 33	MRL QC report format	GEN	0	10/04/2007		C	LIMS Documents\Reports\RPT 33.00.rpt
RPT 33	MRL QC report format	GEN	1				
RPT 34	MRL Std report format	GEN	0	09/10/2007		C	LIMS Documents\Reports\RPT 34.00.rpt
RPT 34	MRL Std report format	GEN	1				

RPT 35	MRL Std QC report format	GEN	0	02/18/2008		C	LIMS Documents\Reports\RPT 35.00.rpt
RPT 35	MRL Std QC report format	GEN	1				
RPT 37			0				
RPT 38			0				
RPT 39			0				
RPT 40			0				
RPT 41			0				
RPT 42			0				
RPT 43			0				
RPT 44			0				
RPT 45			0				
RPT 46			0				
RPT 47			0				
RPT 48			0				

DATA REVIEW REPORT FORMATS

REV 01	Data Review Report (all data)	GEN	0	12/31/2007	01/11/2008	A	LIMS Documents\Data Review\REV 01.00.rpt
REV 01	Data Review Report (all data)	GEN	1	01/11/2008	04/26/2008	A	LIMS Documents\Data Review\REV 01.01.rpt
REV 01	Data Review Report (all data)	GEN	2	04/26/2008		C	LIMS Documents\Data Review\REV 01.02.rpt
REV 02	Data Review Report (reportable data only)	GEN	0	12/31/2007	01/11/2008	A	LIMS Documents\Data Review\REV 02.00.rpt
REV 02	Data Review Report (reportable data only)	GEN	1	01/11/2008	04/26/2008	A	LIMS Documents\Data Review\REV 02.01.rpt
REV 02	Data Review Report (reportable data only)	GEN	2	04/26/2008		C	LIMS Documents\Data Review\REV 02.02.rpt

INVOICE REPORT FORMATS

INV 01	AnLab Invoice format	GEN	0	12/31/2007		C	LIMS Documents\Invoice\INV 01.00.rpt
INV 01	AnLab Invoice format	GEN	1	12/31/2007	02/14/2008	A	LIMS Documents\Invoice\INV 01.01.rpt
INV 01	AnLab Invoice format	GEN	2	01/14/2008	02/14/2008	A	LIMS Documents\Invoice\INV 01.02.rpt
INV 01	AnLab Invoice format	GEN	3	01/16/2008	02/14/2008	A	LIMS Documents\Invoice\INV 01.03.rpt
INV 01	AnLab Invoice format	GEN	4	01/18/2008	02/14/2008	A	LIMS Documents\Invoice\INV 01.04.rpt
INV 01	AnLab Invoice format	GEN	5	01/28/2008	02/21/2008	A	LIMS Documents\Invoice\INV 01.05.rpt
INV 01	AnLab Invoice format	GEN	6	02/14/2008	02/20/2008	A	LIMS Documents\Invoice\INV 01.06.rpt
INV 01	AnLab Invoice format	GEN	7	02/20/2008		C	LIMS Documents\Invoice\INV 01.07.rpt

LABEL PRINT FORMATS

SEQUENCE REPORT FORMATS

STANDARDS REPORT FORMATS

SUBCONTRACT FORM FORMATS

WORK ORDER FORMATS

WORKLIST FORMATS

Master Index - Documents

Doc ID	Description	Func Group	Rev #	Effective Date	Archive Date	Status	Current Location of Document	Latest Changes to Document
XLS 01	Element LIMS qualifiers	GEN	0	1/29/2008	2/14/2008	A	Excel Spreadsheets\XLS 01.00.xls	Corrected a few format flaws in the spreadsheet. This spreadsheet includes the recently added "gh", "sur", "vc", and "ve" qualifiers.
XLS 01	Element LIMS qualifiers	GEN	1	2/14/2008		C	Excel Spreadsheets\XLS 01.01.xls	This spreadsheet includes the recently added "dp" qualifier.
XLS 02	MDL Template	QA	0	3/5/2008		C	Excel Spreadsheets\XLS 02.00.xls	
XLS 03	NOX Tube	IH	0	4/2/2008		C	Excel Spreadsheets\XLS 03.00 NOX Tubes.xls	

Master Index - Documents

Doc ID	Description	Rev #	Effective Date	Archive Date	Status	Current Location of Document	Latest Changes to Document
xSampletech	Sample Tech Custom EDD	0	7/2/2008	7/9/2008	A	EDDs\xSampleTechR-0.mdb	
xSampletech	Sample Tech Custom EDD	1	7/9/2008		C	EDDs\xSampleTech.mdb	Updated Units Cross Table and Analysis Cross Table.
SampletechEDD.EXE	Sample Tech Custom Code	0	3/20/2008		C	EDDs\SampleTechEDD.exe	
xBarr	Barr Engineering Custom EDD	0	7/2/2008		C	EDDs\XBARR.mdb	
xService	Service Custom EDD	0	7/2/2008		C	EDDs\xService.mdb	
xflint	Flint Hills Custom EDD	0	7/2/2008		C	EDDs\xFlint.mdb	
xWeston	Weston Custom EDD	0	12/17/2008		C	EDDs\xWeston.mdb	
x3M	3M Cottage Grove Custom EDD	0	7/2/2008		C	EDDs\x3M.mdb	
xEquis	Custom Equis EDD	0	7/2/2008		C	EDDs\XEQuIS.mdb	
CustomCode.dll	Custom Code	0	11/20/2007		C	EDDs\CustomCode.dll	
3m.exe	3M Cottage Grove Exe	0	3/20/2008		C	EDDs\3m.exe	
CustomEDD.exe	Custom code Exe	0	11/20/2007		C	EDDs\CustomEDD.exe	
EDDEC.exe	Braun ENCON Exe	0	4/2/2008		C	EDDs\EDDEC.exe	
EDDEC-J.exe	Braun ENCON Exe for J flag reporting	0	4/2/2008		C	EDDs\EDDEC-J.exe	
EnconR-0.xls	Braun ENCON Look up table	0	10/9/2007		A	EDDs\Enconr-0.xls	
Encon.xls	Braun ENCON Look up table	1	3/30/2008		C	EDDs\Encon.xls	
ServiceEDD.exe	Service Custom exe	0	11/20/2007		C	EDDs\ServiceEDD.exe	

Master Index - Documents

Description	Func Group	Overdue?	Tentative Date	Actual Audit Date	Status	Link to PDF File of Document
Solvent/reagent traceability on bench sheets	GEN	**Completed**	3/14/2008	6/20/2008	C	Audits\Internal\2008\Standards and Reagents Traceability.pdf
Ammonia analysis	INO				P	
IC Hexavalent Chromium in Air - Personnel	IH	**Completed**	4/9/2008	4/9/2008	C	Audits\Internal\2008\Brezina Hexa Chrom in Air - Personnel Audit.pdf
IC Hexavalent Chromium in Air - Data Packet	IH	**Completed**	4/9/2008	4/9/2008	C	Audits\Internal\2008\Brezina Hexa Chrom in Air - Data Packet Audit.pdf
MDA List 1 water prep	ORG	**Completed**	4/10/2008	4/10/08-4/11/08	C	Audits\Internal\2008\MDA L1 Water Prep.pdf
MDA List 1 analysis	ORG	**Completed**	4/11/2008	4/14/08-4/15/08	C	Audits\Internal\2008\MDA L1 Analysis.pdf
VOC/PVOC/GRO soil data dilution factors	ORG	**Completed**	5/14/2008	5/19/2008	C	Audits\Internal\2008\Soil Dilution Factors for P&T.pdf
IH GC prep and analysis	ORG	**Completed**	6/16/2008	6/26/08-6/27/08	C	Audits\Internal\2008\IH GC prep and analysis.pdf
IH LC prep	ORG	**Completed**	7/15/2008	7/24/08-7/25/08	C	Audits\Internal\2008\IH LC prep.pdf
IH LC analysis	ORG	**Completed**	7/15/2008	7/28/08-7/29/08	C	Audits\Internal\2008\IH LC analysis.pdf
Standards traceability in runlogs	GEN		8/8/2008		P	
IH Metals ICP (Filters, wipes, paints, soils)	MET		8/20/2008		P	
IH Formaldehyde	INO		9/17/2008		P	
IH Silica	CMT		10/15/2008		P	
Facilities	QC		11/10/2008		P	
Bulk Asbestos/NIST Handbook 150-3 Checklist	MICRO		11/11/2008		P	
Airborne Asbestos/NIST Handbook 150-13 Checklist	MICRO		11/12/2008		P	
Asbestos/NIST Handbook 150 Checklist	MICRO		11/13/2008		P	
IH PCM	MICRO		12/15/2008		P	
QA Systems	QC		12/3/2008		P	

Description	Func Group	Rev #	Effective Date	Link to reference
ISO Guide 17025	QC		2005	ISO 17025.pdf
EPA SW 846 Methods	QC			http://www.epa.gov/sw-846/main.htm
NIOSH Methods	QC			http://www.cdc.gov/niosh/nmam/
OSHA Methods	QC			http://www.osha.gov/dts/sltc/methods/toc.html
EPA CWA Methods	QC			http://www.epa.gov/waterscience/methods/
Standard Methods for the Examination of Water and Wastewater	QC	20	1998	Located in Quality Assurance Officer Cube
EPA 40 CFR Part 136	QC			http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=a6c0b518ea13246f08248b303e19fcf2&rgn=div5&view=text&node=40:22.0.1.1.1&idno=40
MDH Rules 4740	QC		2006	http://www.health.state.mn.us/divs/phl/cert/docs/rule.pdf
3M 3550/3551	QC		1997	http://multimedia.3m.com/mws/mediawebserver?66666UuZjcFSLXTtlXMyMxM2EVuQEcuZgVs6EVs6E666666--
3M Organic Vapor Monitor Sampling and Analysis guide	QC			http://multimedia.3m.com/mws/mediawebserver?66666UuZjcFSLXTtlX&6OXMtEVuQEcuZgVs6EVs6E666666--
3M 3500/3520	QC		2002	http://multimedia.3m.com/mws/mediawebserver?66666UuZjcFSLXTtlXMyMxMaEVuQEcuZgVs6EVs6E666666--
3M 3721	QC			http://www.osha.gov/dts/sltc/methods/inorganic/id205/id205.html

Appendix L-1

Example: QC Checklist Form

Revision 3.1
Effective 07/31/08

QC CHECKLIST

? YES ? NO ? NA - Were all samples prepared and analyzed within the method specified holding time?
? YES ? NO ? NA - Were all instrument initial calibration results within specification?
? YES ? NO ? NA - Were all second-source standard criteria within specification?
? YES ? NO ? NA - Were all instrument continuing calibration results within specification?
? YES ? NO ? NA - Were all instrument blank results within specification?
? YES ? NO ? NA - Were all instrument tuning criteria within specification?
? YES ? NO ? NA - Were all instrument internal standard criteria within specification?
? YES ? NO ? NA - Were all instrument interference check sample criteria within specification?
? YES ? NO ? NA - Were all method blank results within laboratory acceptance limits?
? YES ? NO ? NA - Were all LCS/LCSD results within laboratory acceptance limits?
? YES ? NO ? NA - Were all SRM results within laboratory acceptance limits?
? YES ? NO ? NA - Were all MS/MSD results within laboratory control limits?
? YES ? NO ? NA - Were all Surrogate results within laboratory control limits?
? YES ? NO ? NA - Were all MRLs verified as meeting the +/-40% criteria within the required frequency?
? YES ? NO ? NA - Are there any additional anomalies to report for this data packet?

Provide a list of non-conformance references below:

Data Processed by _____ Date _____

Data Reviewed by _____ Date _____

Data Verified by _____ Date _____

Appendix L-2

Example: Analytical Report

Revision 3.1
Effective 07/31/08

BRAUN
INTERTEC

Braun Intertec Corporation
11001 Hampshire Avenue S.
Minneapolis, MN 55438

Phone: 952.995.2000
Fax: 952.995.2020
Web: braunintertec.com

Ms. Micky Hubanks
Braun Quality Assurance Program
11001 Hampshire Avenue South
Bloomington, MN 55438

July 30, 2008

Work Order #: 0704491

RE: Refrigerator Blanks July 07

Dear Micky Hubanks:

Braun Intertec Corporation received samples for the project identified above on July 25, 2007. Analytical results are summarized in the following report.

All routine quality assurance procedures were followed, unless otherwise noted.

Analytical results are reported on an "as received" basis unless otherwise noted. Where possible, the samples will be retained by the laboratory for 14 days following issuance of the initial final report. The samples will be disposed of or returned at that time. Arrangements can be made for extended storage by contacting me at this time.

We appreciate your decision to use Braun Intertec Corporation for this project. We are committed to being your vendor of choice to meet your analytical chemistry needs.

If you have any questions please contact me at the above phone number.

Sincerely,

Michelle M. Hubanks
Quality Assurance Officer

BRAUN
INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Braun Quality Assurance Program	Client Ref: Refrigerator Blanks July 07	Work Order #: 0704491
11001 Hampshire Avenue South	Client Contact: Ms. Micky Hubanks	Project Mgr: Michelle M. Hubanks
Bloomington, MN 55438	PO Number:	Account ID: CVXX-01-F012

Qualifiers and Abbreviations

qn	The spike recovery is outside of laboratory control limits for the matrix spike (MS) and/or the matrix spike duplicate (MSD).
COC	Chain of Custody
dry	Sample results reported on a dry weight basis
MRL	Method Reporting Limit
NA	Not Applicable
ND	Analyte NOT DETECTED
NR	Not Reported
%Rec	Percent Recovery
RPD	Relative Percent Difference
VOC	Volatile Organic Compound

BRAUN
INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Braun Quality Assurance Program	Client Ref: Refrigerator Blanks July 07	Work Order #: 0704491
11001 Hampshire Avenue South	Client Contact: Ms. Micky Hubanks	Project Mgr: Michelle M. Hubanks
Bloomington, MN 55438	PO Number:	Account ID: CVXX-01-F012

Conditions Upon Receipt

Cooler: Cooler #1

Temperature:	22.0 °C	**Received on Ice:**	No	**Preservation Confirmed:**	No
COC Included:	Yes	**Hand Delivered by Sampler:**	No	**Temperature Blank:**	No
Custody Seals Used:	No	**Sufficient Sample Provided:**	Yes	**COC Complete:**	Yes
Custody Seals Intact:	No	**Headspace Present (VOC):**	No	**COC & Labels Agree:**	Yes

BRAUN INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Braun Quality Assurance Program 11001 Hampshire Avenue South Bloomington, MN 55438	Client Ref: Refrigerator Blanks July 07 Client Contact: Ms. Micky Hubanks PO Number:	Work Order #: 0704491 Project Mgr: Michelle M. Hubanks Account ID: CVXX-01-F012

Soil Refrigerator

0704491-01 (Water)

7/24/07 0:00

Volatile Organic Compounds

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,1,1,2-Tetrachloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1,1-Trichloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1,2,2-Tetrachloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1,2-Trichloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1,2-Trichlorotrifluoroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1-Dichloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1-Dichloroethene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1-Dichloropropene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2,3-Trichlorobenzene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2,3-Trichloropropane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2,4-Trichlorobenzene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2,4-Trimethylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2-Dibromo-3-chloropropane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2-Dibromoethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2-Dichlorobenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2-Dichloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2-Dichloropropane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,3,5-Trimethylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,3-Dichlorobenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,3-Dichloropropane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,4-Dichlorobenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
2,2-Dichloropropane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
2-Butanone (MEK)	< 10	10	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
2-Chlorotoluene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
4-Chlorotoluene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
4-Isopropyltoluene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Acetone	**36**	20	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	qn
Allyl Chloride	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Benzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Bromobenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Bromochloromethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Bromodichloromethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Bromoform	< 5.0	5.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Bromomethane	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Carbon Tetrachloride	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Chlorobenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	

BRAUN INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Braun Quality Assurance Program	Client Ref: Refrigerator Blanks July 07	Work Order #: 0704491
11001 Hampshire Avenue South	Client Contact: Ms. Micky Hubanks	Project Mgr: Michelle M. Hubanks
Bloomington, MN 55438	PO Number:	Account ID: CVXX-01-F012

Soil Refrigerator

0704491-01 (Water)

7/24/07 0:00

Volatile Organic Compounds

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chlorodibromomethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Chloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Chloroform	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Chloromethane	**1.0**	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
cis-1,2-Dichloroethene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
cis-1,3-Dichloropropene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Dibromomethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Dichlorodifluoromethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Dichlorofluoromethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Ethyl Ether	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Ethylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Hexachlorobutadiene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Isopropylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
m,p-Xylenes	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	qn
Methyl Isobutyl Ketone	< 5.0	5.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Methylene chloride	< 5.0	5.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Methyl-t-butyl ether	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Naphthalene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	qn
n-Butylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
n-Propylbenzene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
o-Xylene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
sec-Butylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Styrene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
tert-Butylbenzene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Tetrachloroethene	< 2.0	2.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Tetrahydrofuran	< 10	10	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Toluene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
trans-1,2-Dichloroethene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
trans-1,3-Dichloropropene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Trichloroethene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Trichlorofluoromethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Vinyl chloride	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Surrogate: 1,2-Dichloroethane-d4	*110 %*	*Limits: 80-120%*			*B7H0077*	*8/2/07*	*8/2/07*	*EPA 8260B*	
Surrogate: 4-Bromofluorobenzene	*97.2 %*	*Limits: 80-120%*			*B7H0077*	*8/2/07*	*8/2/07*	*EPA 8260B*	
Surrogate: Dibromofluoromethane	*99.6 %*	*Limits: 80-120%*			*B7H0077*	*8/2/07*	*8/2/07*	*EPA 8260B*	
Surrogate: Toluene-d8	*104 %*	*Limits: 80-120%*			*B7H0077*	*8/2/07*	*8/2/07*	*EPA 8260B*	

EPA Lab ID: MN00063

The results in this report apply only to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

BRAUN INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Braun Quality Assurance Program	Client Ref: Refrigerator Blanks July 07	Work Order #: 0704491
11001 Hampshire Avenue South	Client Contact: Ms. Micky Hubanks	Project Mgr: Michelle M. Hubanks
Bloomington, MN 55438	PO Number:	Account ID: CVXX-01-F012

Water Refrigerator

0704491-02 (Water)

7/24/07 0:00

Volatile Organic Compounds

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,1,1,2-Tetrachloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1,1-Trichloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1,2,2-Tetrachloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1,2-Trichloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1,2-Trichlorotrifluoroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1-Dichloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1-Dichloroethene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,1-Dichloropropene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2,3-Trichlorobenzene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2,3-Trichloropropane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2,4-Trichlorobenzene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2,4-Trimethylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2-Dibromo-3-chloropropane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2-Dibromoethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2-Dichlorobenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2-Dichloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,2-Dichloropropane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,3,5-Trimethylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,3-Dichlorobenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,3-Dichloropropane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
1,4-Dichlorobenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
2,2-Dichloropropane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
2-Butanone (MEK)	< 10	10	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
2-Chlorotoluene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
4-Chlorotoluene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
4-Isopropyltoluene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Acetone	**37**	20	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	qn
Allyl Chloride	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Benzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Bromobenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Bromochloromethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Bromodichloromethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Bromoform	< 5.0	5.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Bromomethane	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Carbon Tetrachloride	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Chlorobenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	

BRAUN INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Braun Quality Assurance Program	Client Ref: Refrigerator Blanks July 07	Work Order #: 0704491
11001 Hampshire Avenue South	Client Contact: Ms. Micky Hubanks	Project Mgr: Michelle M. Hubanks
Bloomington, MN 55438	PO Number:	Account ID: CVXX-01-F012

Water Refrigerator

0704491-02 (Water)

7/24/07 0:00

Volatile Organic Compounds

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chlorodibromomethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Chloroethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Chloroform	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Chloromethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
cis-1,2-Dichloroethene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
cis-1,3-Dichloropropene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Dibromomethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Dichlorodifluoromethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Dichlorofluoromethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Ethyl Ether	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Ethylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Hexachlorobutadiene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Isopropylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
m,p-Xylenes	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	qn
Methyl Isobutyl Ketone	< 5.0	5.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Methylene chloride	< 5.0	5.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Methyl-t-butyl ether	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Naphthalene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	qn
n-Butylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
n-Propylbenzene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
o-Xylene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
sec-Butylbenzene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Styrene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
tert-Butylbenzene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Tetrachloroethene	< 2.0	2.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Tetrahydrofuran	< 10	10	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Toluene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
trans-1,2-Dichloroethene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
trans-1,3-Dichloropropene	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Trichloroethene	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Trichlorofluoromethane	< 1.0	1.0	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Vinyl chloride	< 2.5	2.5	ug/L	1	B7H0077	8/2/07	8/2/07	EPA 8260B	
Surrogate: 1,2-Dichloroethane-d4	*109 %*	*Limits: 80-120%*			*B7H0077*	*8/2/07*	*8/2/07*	*EPA 8260B*	
Surrogate: 4-Bromofluorobenzene	*94.8 %*	*Limits: 80-120%*			*B7H0077*	*8/2/07*	*8/2/07*	*EPA 8260B*	
Surrogate: Dibromofluoromethane	*97.2 %*	*Limits: 80-120%*			*B7H0077*	*8/2/07*	*8/2/07*	*EPA 8260B*	
Surrogate: Toluene-d8	*104 %*	*Limits: 80-120%*			*B7H0077*	*8/2/07*	*8/2/07*	*EPA 8260B*	

EPA Lab ID: MN00063

The results in this report apply only to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

BRAUN INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Braun Quality Assurance Program 11001 Hampshire Avenue South Bloomington, MN 55438	Client Ref: Refrigerator Blanks July 07 Client Contact: Ms. Micky Hubanks PO Number:	Work Order #: 0704491 Project Mgr: Michelle M. Hubanks Account ID: CVXX-01-F012

For Braun Intertec Use Only — Laboratory Work Order No.: 0704491

BRAUN INTERTEC
Braun Intertec Corporation
11001 Hampshire Ave. S
Minneapolis, MN 55438

REQUEST FOR LABORATORY ANALYTICAL SERVICES

Bottle orders and sampling inquiries:
labservices@brauninterteC.com
Phone: 952-995-2600 Fax: 952-995-2601

IMPORTANT
Date Results Requested:
Time
Rush Charges Authorized? ____ Yes ____ No
Rush / Quote #

Page 1 of 1

REPORT RESULTS TO
Contact Name: Micky Hubanks
Company: Braun Intertec QA Program
Mailing Address:
City, State, Zip:
Telephone #: Fax #:
E-mail:

Project ID/Name:
P.O. #/Project #: July/August Refrigerator Blank

SEND INVOICE TO
Contact Name: Micky Company:
Address:
City, State, Zip:
Telephone # Fax #

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, perchlorate, reporting units)

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request)

	CLIENT SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	MATRIX/ MEDIA	AIR VOLUME (specify units)	Number of Containers	Metals Field Filtered Y/N	8260 VOC	FOR LAB USE ONLY
1	Std Refrigerator	7/24/07		80				X	0704491-01
2	Water Regenerator	↓		↓				X	-02
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

CHAIN OF CUSTODY
Collected by: (Print)
Relinquished by: Date/Time 7/24/07 7:00
Relinquished by: Date/Time

Collector's Signature:
Received by: Date/Time 7/24/07 10:07
Received Contents Not Verified: Date/Time
Received Contents Verified: Date/Time
Comments:

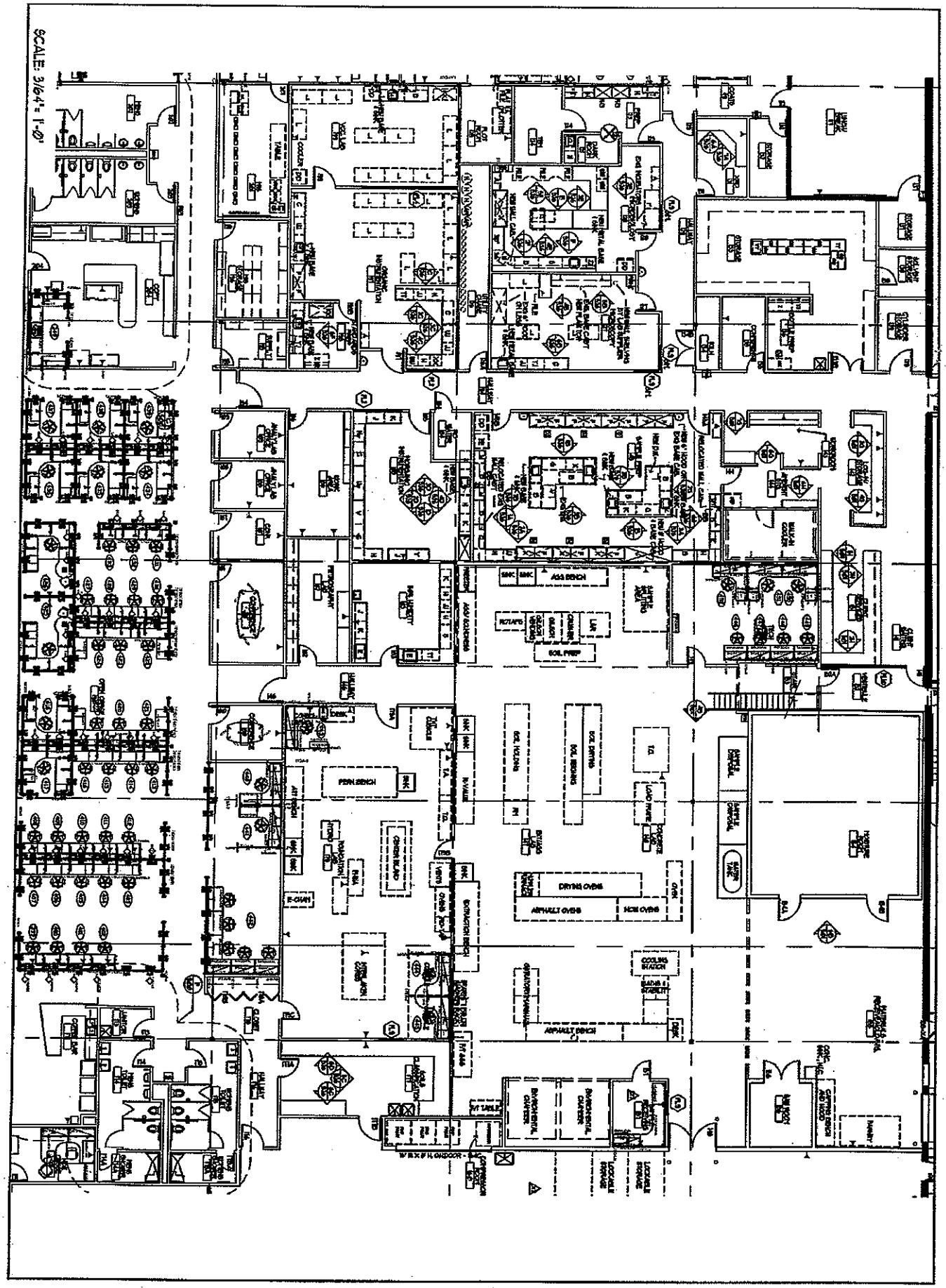
Custody Seal Intact ☐ Yes ☐ No ☒ N/A
On Ice ☐ Yes ☒ No
Temp Blank ☐ Yes ☒ No
Temp: room °C

Form # CS02.02 P:\Groups\QA\QC Forms\Customer Kits\COC-CS02 Effective Date: 11/17/06

Appendix M-1

Analytical Laboratory Floor Plan

Revision 3.1
Effective 07/31/08


SCALE: 3/64" = 1'-0"

Appendix M-2

Chain of Custody Forms

Revision 3.1
Effective 07/31/08

For Braun Intertec Use Only
Laboratory Work Order No.

BRAUN INTERTEC

Braun Intertec Corporation
11001 Hampshire Ave. S
Minneapolis, MN 55438

REQUEST FOR LABORATORY ANALYTICAL SERVICES

Bottle orders and sampling inquires:
labservices@braunintertec.com
Phone: 952-995-2600 Fax: 952-995-2601

IMPORTANT
Date Results Requested: _____
Time _____
Rush Charges Authorized? ____ Yes ____ No
Rush / Quote # _____

REPORT RESULTS TO
Contact Name | Project ID/Name | P.O. #/Project #
Company
Mailing Address
City, State, Zip
Telephone # | Fax #
E-mail

SEND INVOICE TO
Contact Name | Company
Address
City, State, Zip
Telephone # | Fax #

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, petrofund, reporting units)

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request)

Site Location (State) _____

LAB ID#	CLIENT SAMPLE IDENTIFICATION (IDs must be unique)	DATE SAMPLED	TIME SAMPLED	MATRIX/ MEDIA	VOLUME/AREA (specify units)	Number of Containers	Metals Field Filtered Y/N											FOR LAB USE ONLY

CHAIN OF CUSTODY

Collected by: *(Print)*		Collector's Signature:	
Relinquished by:	Date/Time	Received by:	Date/Time
Relinquished by:	Date/Time	Received Contents Not Verified:	Date/Time
Custody Seal Intact ☐ Yes ☐ No ☐ N/A ☐ Hand Delivered by Client		Received Contents Verified:	Date/Time
On Ice ☐ Yes ☐ No		Comments:	
Temp Blank ☐ Yes ☐ No			
Temp:_____°C			

Form # CS02.03 F:\Groups\QA-QC\Forms\clientservices\COC-CS02 Effective Date: 10/10/07

UMP006154

Braun Intertec CS02.03 - Rev 10/10/07 Chain of Custody Form 100% 11" x 8.5" BLACK

For Braun Intertec Use Only
Laboratory Work Order No.

BRAUN INTERTEC

Braun Intertec Corporation
11001 Hampshire Ave. S
Minneapolis, MN 55438

REQUEST FOR AIR CANISTER ANALYTICAL SERVICES

Canister orders and sampling inquiries:
labservices@braunintertec.com
Phone: 952-995-2600 Fax: 952-995-2601

IMPORTANT
Date Results Requested: _____
Time _____
Rush Charges Authorized? ____ Yes ____ No
Rush / Quote # _____

REPORT RESULTS TO

Contact Name | Project ID/Name | P.O. #/Project #
Company
Mailing Address
City, State, Zip
Telephone # | Fax #
E-mail

SEND INVOICE TO

Contact Name | Company
Address
City, State, Zip
Telephone # | Fax #

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, reporting units)

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request)

SAMPLE TYPES:
A = Ambient Air
I = Indoor Air
L = Landfill Gas
S = Soil Gas

	CLIENT SAMPLE IDENTIFICATION	Canister ID Number	Flow Contr. ID Number	Max. PID (ppm)	Date(s) Sampled	Start Time	Stop Time	Temp Range (°F)	Canister Vacuum Start (in "Hg)	Canister Vacuum Stop (in "Hg)							FOR LAB USE ONLY
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

CHAIN OF CUSTODY

Collected by: *(Print)* | Collector's Signature:
Relinquished by: | Date/Time | Received by: | Date/Time
Relinquished by: | Date/Time | Received Contents Not Verified: | Date/Time
Custody Seal Intact ☐ Yes ☐ No ☐ N/A | Received Contents Verified: | Date/Time
Sample Kit Equipment Returned ☐ Yes ☐ No ☐ N/A

Comments:

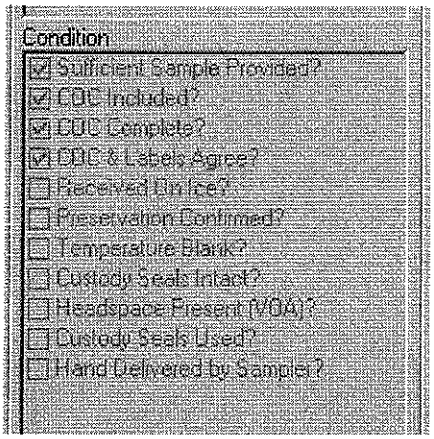
UMP006155

Form # CS10.01 F:\Groups\QA-QC\Forms\sample control\COC-CS10 Effective 11/15/06

Appendix M-3

Conditions Upon Receipt Checklist

Revision 3.1
Effective 07/31/08


Condition
Sufficient Sample Provided?
COC Included?
COC Complete?
COC & Labels Agree?
Received On Ice?
Preservation Confirmed?
Temperature Blank?
Custody Seals Intact?
Headspace Present (VOA)?
Custody Seals Used?
Hand Delivered by Sampler?

Appendix M-4

Sample Storage Logbook Form

Revision 3.1
Effective 07/31/08

Receipt Date/Location ____________

Login ID	Company	Matrix	Preservative	Bottle	Quantity	Size	OUT	OUT	OUT	OUT	OUT
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							
		L S	U S H N X O	G P							

L=Liquid, S=Solid; U=Unpreserved, S=H2SO4, H=HCl, N=HNO3, X=NaOH, O=Other; G=Glass, P=Plastic

Appendix N-1

Equipment List

Revision 3.1
Effective 07/31/08

BRAUN INTERTEC

AnLab Equipment List

Miscellaneous

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Muffle Furnace	Thermolyne	Type 6028C Furnace	539920915963	V16365	N/A	Sample Preparation Lab
Muffle Furnace	Thermolyne	Type 6010 Furnace	1060980696850	V16366	N/A	**Out of Service**
Muffle Furnace	Thermolyne	Type 6000	1060990324882	V23002	N/A	Sample Preparation L:ab
Drying Oven	Isotemp	650	204N 0055	V16262	N/A	Sample Receiving
Oven	Fisher – Isotemp 100 series	116G	00972	V16385	N/A	Organic Analysis – VOC Lab
Balance	Mettler	AJ100	K68707	V16266	N/A	Sample Receiving
Balance	Mettler	AE100	L03818	V16264	N/A	Bottle Prep
Balance	Mettler	BB2440	K26313	V16263	N/A	**Out of Service**
Balance	Mettler	PB 3002	1117372853	V16269	N/A	Sample Preparation Lab
Balance	Mettler	AE100	C92900	V16265	N/A	Sample Preparation Lab
Balance (Top Loading pan)	Acculab	V-3000	51710085	V16391	N/A	Petrography Lab – **Transferred to CMT Group**
SemiMicro Balance	Sartorius	BP210D	50408310	V16390	N/A	Sample Preparation Lab
Walk-in Cooler	---	---	R-1 (Braun)	V16389	N/A	Walk-in Cooler
Refrigerator	Kenmore	106	E92316197	V16386	N/A	Organic Analysis – VOC Lab
Deli Cooler	Britz	---	R-10 (Braun)	V16312		**Out of Service**
Refrigerator	White Westinghouse	---	R-13 (Braun)	V16313	N/A	**Out of Service**

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Refrigerator	Kenmore	106.9608281	AB81206133	V16362	N/A	Petrography Lab – **Transferred to CMT Group**
Freezer	SPT USA	UF-160	A051000350	V16808	N/A	Organic Analysis – VOC Lab
Balance	A&D	EK-2000i	P1828234	V16798	N/A	Organic Analysis – VOC Lab
Freezer	Kenmore	---	F-14 (Braun)	V16315	N/A	Bottle Prep
Refrigerator	Kenmore	---	R-11 (Braun)	V16317	N/A	**Out of Service**
Refrigerator	Absocold	---	R-15 (Braun)	V16387	N/A	**Out of Service**
Refrigerator	Woods	---	1008871	V16388	N/A	Bottle Prep
Refrigerator	Haier	---	---	V16797	N/A	Organic Analysis
UPDI Water System	---	---	---	V16396	UPDI Water System	UPDI water system closet
Refrigerator	Frigidaire	---	---	V16779	N/A	**Out of Service**
Refrigerator	Magic Chef	18EYW-2	010432472	V16799	NA	Sample Receiving Area
Refrigerator	GE	SMR04DAMWW	4ACX703298	V16800	NA	Sample Receiving Area
Ice Maker	Manitowac	115V	110118647	V16805	Ice Maker	Bottle Prep
Ice Storage Bin	Manitowac	Slimline S420	110114463	V16806	Ice Maker	Bottle Prep
Temp Gun	Control Company	15-077-57	61659029	V16807	N/A	Sample Receiving
Refrigerator	Wood's	R17FREC	40034430HN	V16809	N/A	Organic Analyses – VOC Lab
Incubator, Isotemp	Fisher	255D	583	V16363	N/A	Sample Receiving
Incubator	GCA Precision	2EG	---	V16814	N/A	IH Extraction Lab
Turbidity meter	Hach	2100P	940100004458	V23001	N/A	Sample Preparation Lab
Refrigerator	Frigidaire	FRT8G7HW0	BA72845548	V16825	N/A	Sample Preparation Lab

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Flow Meter	Bios International	DCL-ML	103626	V16791	N/A	Sample Receiving
Flow Meter	A.P. Buck	Mini Buck Calibrator	M-30	V16792	N/A	Sample Receiving
Freezer	Capri 13	---	F-9 (Braun)	V16314	N/A	**Out of Service**
Pump with low flow	Gilian	Gil Air 5	Not able to read	V16787	N/A	Sample Receiving
Pump with low flow	Gilian	Gil Air 5	Not able to read	V16785	N/A	Sample Receiving
Pump with low flow	Gilian	Gil Air 5	Not able to read	V16784	N/A	Sample Receiving
Pump with low flow	Gilian	Gil Air 5	14487	V16828	N/A	Sample Receiving
Pump with low flow	Gilian	Gil Air 5	20040102015	V16829	N/A	Sample Receiving
Pump with low flow	Gilian	Gil Air 5	Not able to read	V16830	N/A	Sample Receiving
Pump	Gilian	Gil Air 5	14662	V16826	N/A	Sample Receiving
Pump	Gilian	Gil Air 5	14488	V16827	N/A	Sample Receiving
Temp Gun	Control Company	15-077-57	230114904	V16782	N/A	Sample Receiving
10mg – 100g weight set	Fisher	Class 1	1120	V16831	N/A	Sample Preparation Lab
1kg weight	Rice Lake Weighing Systems	Class 1	S1903	V16832	N/A	Sample Preparation Lab
10mg – 100g weight set	Rice Lake Weighing Systems	Class 1	122107	V16833	N/A	Sample Preparation Lab
1kg weight	Rice Lake Weighing Systems	Class 1	122107-1	V16834	N/A	Sample Preparation Lab

Inorganics

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
pH Meter	Orion	Expandable Ion AE 940	1343	V16268	N/A	Sample Preparation Lab
Spectrophotometer	Spectronic	Genesys 2	3W2B083001	V16379	N/A	Sample Preparation Lab
Flash Point	GCA/Precision	---	10AS-8	V16701	N/A	**Out of Service**
Conductance Meter	YSI Incorp	YSI Model 32	09007799	V16267	N/A	**Out of Service**
Dynac Centrifuge	Clay Adams	---	126248	V16261	N/A	Sample Preparation Lab
Lachat Quikchem 8000	Lachat	8000	---	V16380	Lachat System	Inorganic Laboratory
Cetac Autosampler	Cetac	610	129823ASX	V16383	Lachat System	Inorganic Laboratory
Vortex Mixer	Scientific Industries	G-560	2-208707	V16382	N/A	Inorganic Laboratory
Auto Dilutor	Lachat	---	A89000-317	V16381	N/A	Inorganic Laboratory
Stirrer	Corning	PC 353	---	V16384	N/A	Inorganic Laboratory
Heater Blocks	Technicon	Not able to read	Not able to read	V16702	N/A	Inorganic Laboratory
Heater Blocks	Technicon	Not able to read	Not able to read	V16703	N/A	Inorganic Laboratory
Heater Control Units	Technicon	BD 20/40	GG0078618	V16704	N/A	Inorganic Laboratory
Heater Control Units	Technicon	BD 20/40	GG050	V16705	N/A	Inorganic Laboratory
ICP-OES	Thermo Jarrell Ash	ICAP61E	95090	V16274	ICP	**Out of Service**
ICP Autosampler	Thermo Jarrell Ash	AS300	0393	V16395	ICP	**Out of Service**
ICP-OES	Varian	Vista Pro	EL01124983	V16763	ICP	Inorganic Laboratory
ICP Autosampler	Varian	SPS5	EL02066090	V16764	ICP	Inorganic Laboratory
Atomic Absorption Spec	Varian	SPECTRAA-20	7092031	---	AA	**Out of Service**
Flash Point	Koehler	K16200	R02291741	V16836	N/A	Sample Preparation Lab
Conductance Meter	Oakton	S10 Series	1-292223	V16835	N/A	Sample Preparation Lab

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Vapor Generation Accessory	Varian	VGA-76	---	---	AA	**Out of Service**
Hg Analyzer	Perkin Elmer	FIMA 100	101S2090401	V16714	Hg Analyzer	Inorganic Laboratory
Hg Autosampler	Perkin Elmer	AS 90	904S2090108	V16713	Hg Analyzer	Inorganic Laboratory
Hot Block – Digestion Block	Environmental Express	45C10007	1576	V16706	N/A	Sample Preparation Laboratory
Hot Block – Digestion Block #2	Environmental Express	Not able to read	Not able to read	V16707	N/A	Sample Preparation Laboratory
TCLP Rotator	Environmental Express	LE1002	Not able to read	V16708	N/A	Hall Closet
ZHE TCLP Rotator	Analytical Testing Corp	DC-20	Not able to read	V16709	N/A	Hall Closet
Wooden TCLP Rotator	---	---	---	V16780	Used as a backup	Hall Closet
4 Vessels	Millipore	---	---	---	N/A	Hall Closet
7 Vessels	Analytical Testing and Consulting	---	---	---	N/A	Sample Preparation
Pressure Filtration Apparatus –TCLP	Victor	VTS 450D	VT5450D	V16781	N/A	Hall Closet
ICP-MS	Hewlett Packard (Agilent)	HP 4500	3528J00235	V16271	ICP-MS	**Out of Service**
Autosampler for ICP-MS	Cetac	ASX-500	039604ASX	V16272	ICP-MS	**Out of Service**
Water Bath	Fisher	220	809N0456	V16273	N/A	Sample Preparation
Microwave Digestion System	Milestone	Ethos Plus	124819	V16270	N/A	Sample Preparation Lab
Ion Chromatograph	Dionex	LC20	03020010	V16710	IC	IH Extraction Lab

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Conductivity Detector	Dionex	CD25	03020241	V16711	IC	IH Extraction Lab
Automated Sampler	Dionex	AS40	03030602	V16712	IC	IH Extraction Lab
Westco Smart chem.	Westco Scientific, Inc.	Smart Chem	W0407060	V16795	Westco	Inorganic Laboratory
Autosampler	Perkin Elmer	200 Series	293N7062803A	V16818	ICP-MS	ICP-MS Room
LC Pump	Perkin Elmer	200 Series	29IN7061101A	V16819	ICP-MS	ICP-MS Room
Peltier Column oven	Perkin Elmer	200 Series	OUP070615182 9	V16820	ICP-MS	ICP-MS Room
Autosampler	Perkin Elmer	AS 93 Plus	93357053405	V16821	ICP-MS	ICP-MS Room
Elan DRC-e ICP-MS	Perkin Elmer	DRC-e	AH12510706	V16822	ICP-MS	ICP-MS Room
2-position, 6-port Injector/Switching module	Rheodyne	EV750-100-S2	63193	V16823	ICP-MS	ICP-MS Room
5-channel Vacuum degasser	Perkin Elmer	200 Series	1000174	V16824	ICP-MS	ICP-MS Room

Organic Prep

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
ASE	Dionex	ASE 200	98120500	V16322	ASE	Sample Preparation Lab
ASE Solvent Controller	Dionex	---	98100566	V16323	ASE	Sample Preparation Lab
Ultrasonic Cleaner	Fisher Scientific	FS 60	RUA09003179 1	V16324	N/A	Sample Preparation Lab
Ultrasonic Cleaner	American Scientific Products	ME	102M15444	V16325	N/A	Sample Preparation Lab
Corning Hotplate	Corning	PC 500	440895	V16377	N/A	Sample Preparation Lab
Thermolyne Hotplate	Thermolyne	HP-A1915B	---	V16321	N/A	Sample Preparation Lab
Thermolyne Hotplate	Thermolyne	5P46925	640910786923	V16371	N/A	Sample Preparation Lab
Corning Stirrer/ Hotplate	Corning	PC 320	---	V16370	N/A	Sample Preparation Lab
Corning Hotplate	Corning	PC-35	---	V16372	N/A	Sample Preparation Lab
Corning Hotplate	Corning	PC-300	---	V16374	N/A	Sample Preparation Lab
Corning Hotplate	Corning	PC-500	---	V16375	N/A	Sample Preparation Lab
Corning Hotplate	Corning	PC-500	---	V16376	N/A	**Out of Service**
Corning Hotplate	Corning	324-0	---	V16373	N/A	**Out of Service**
Corning Hotplate	Corning	PC-300	---	V16378	N/A	Sample Preparation Lab
TurboVap II	Zymark	TurboVap II	TV9609N6688	V23003	N/A	Sample Preparation Lab
Corning Hot Plate	Corning	PC-35	---	V23004	N/A	Sample Preparation Lab

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
TurboVap II	Zymark	TurboVap II	TV9608N6672	V23005	N/A	Sample Preparation Lab
TurboVap II	Zymark	TurboVap II	04007	V23006	N/A	Sample Preparation Lab
ROT-X-TRACT	Organomation	12169	15091	V16318	Continuous Liq-Liq	Sample Preparation Lab
ROT-X-TRACT	Organomation	12169	15092	V16319	Continuous Liq-Liq	Sample Preparation Lab
Dishwasher	Miele	TypeG7783	NR.16/18334930	V16320	N/A	**Out of Service**
Dishwasher	Miele Professional	G7804		V23007	N/A	Sample Preparation Lab

Organic Instrumentation

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
GC-Dual FID, Single Injection	Hewlett Packard	5890A Series II	3240618319	V16282	Column Conditioning	Organic Analysis Lab
GC Autosampler 7673A	Hewlett Packard	7673A	2837A10818	V16364	DRO	Organic Analysis Lab
Autosampler Tray	Hewlett Packard	7673A #18596A	2546A00842	V16284	DRO	Organic Analysis Lab
Autosampler Controller	Hewlett Packard	7673A #18594A	2636A04356	V16285	IH-GC #1	Organic Analysis Lab
PE Acquisitions Box 900 Series	PE Nelson	970	9205571179	V16281	IH-GC #1	Organic Analysis Lab
GC Dual FID, Single Injector	Hewlett Packard	5890A Series II	3140A38434	V16277	IH-GC #1	Organic Analysis Lab
GC Autosampler	Hewlett Packard	7673 #185938	3318A34897	V16280	Old PCB	Organic Analysis Lab
GC Autosampler Tray	Hewlett Packard	#185968	3137A26504	V16275	Not in Use	Organic Analysis Lab
Autosampler Controller	Hewlett Packard	#185948	3138A27079	V16278	IH-GC #2	Organic Analysis Lab
EPC Pressure Controller	Alltech	EPA 1000	9506395B	V16279	IH-GC #1	Organic Analysis Lab
PE Acquisitions Box 900 Series	PE Nelson	970	1051573133	V16276	IH-GC #2	Organic Analysis Lab
PE Acquisitions Box 900 Series	PE Nelson	970A	4061270497	V16286	Extra Box for IC	Organic Analysis Lab
Hydrogen Generator	Whatman	75-34	75340143A	V16287	N/A	**Out of Service**

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Hydrogen Generator	Whatman	75-34	75340943C	V16288	N/A	**Out of Service**
HPLC Autosampler	Waters	700 Satellite WISP	715-000645	V16289	HPLC	**Out of Service**
HPLC System Controller	Waters	600E	05475RP	V16290	HPLC	**Out of Service**
Waters Carbamate Analysis System	Waters	Waters Carbamate	05473RP	V16291	HPLC	**Out of Service**
LC Spectrophotometer	Waters	Lambda Max Model 481	481-10-7337	V16294	HPLC	**Out of Service**
Fluorescence Detector	Waters	420-AC	05467RP	V16295	HPLC	**Out of Service**
Fluorescence Detector	Waters	420	05467RP	V16296	HPLC	**Out of Service**
Waters Pump	Waters	Waters Pump	05472RP	V16293	HPLC	**Out of Service**
PE 900 Series Interface Acquisition Box	PE Nelson	970A	4336272224	V16292	N/A	Organic Analysis Lab
GC Single FID, Single injection	Hewlett Packard	5890 A Series II	3203A41092	V16307	DRO	Organic Analysis Lab
GC Autosampler 7673A	Hewlett Packard	18593A	2704A08540	V16308	Old ETO	Organic Analysis Lab
Autosampler Tray	Hewlett Packard	18596A	2920A10736	V16309	Not In Use	Organic Analysis Lab
Autosampler Controller	Hewlett Packard	18594A	2607A02520	V16310	DRO	Organic Analysis Lab
PE 900 Series Interface Acquisition Box	Hewlett Packard	970	8220921225	V16311	DRO	Organic Analysis Lab
GC Single FID, Single injection	Hewlett Packard	5890E	3336AS6520	V16299	PCB/OC-PEST	Organic Analysis Lab
GC Autosampler 7673A	Hewlett Packard	18593B	3120A28327	V16298	PCB/OC-PEST	Organic Analysis Lab

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Autosampler Tray	Hewlett Packard	18596A	2718A07299	V16297	IH #1	Organic Analysis Lab
Autosampler Controller	Hewlett Packard	18594B	2803A10433	V16300	IH #1	Organic Analysis Lab
PE 900 Series Interface Acquisition Box	Hewlett Packard	970	0310572801	V16301	Not in Use	Organic Analysis Lab
GC Single FID/ECD, Single	Hewlett Packard	5890F	3310A48976	V16302	Old ETO Instrument	Organic Analysis Lab
GC Autosampler 7673A	Hewlett Packard	18593B	3120A28330	V16303	Old PCB	Organic Analysis Lab
Autosampler Tray	Hewlett Packard	18596B	3327A32494	V16304	Old PCB	Organic Analysis Lab
Autosampler Controller	Hewlett Packard	18594B	3327A32588	V16305		**Out of Service**
Autosampler Controller	Hewlett Packard	18594B	3247A30553	V16700	Old ETO Instrument	Organic Analysis Lab
PE 900 Series Interface Acquisition Box	Hewlett Packard	970	2072574588	V16306	Old PCB	Organic Analysis Lab
TurboChrom Interface Box	PE Nelson	900 Series	9205571178	V16326	HP1	Organic Analysis – VOC Lab
PID Lamp Supply	OIC	4430	A231119	-----	HP1	Organic Analysis – VOC Lab
Purge and trap Concentrator	Tekmar	LSL2000	89142021	V16332	HP1	Organic Analysis – VOC Lab
P&T Autosampler	Tekmar	ALS2050	88277001	V16329	V2	Organic Analysis – VOC Lab
Varian Gas Chromatograph	Varian	3400	3123	V16330	V2	**Out of Service**

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Cooling Recirculator	Tekmar	2065	2100-01	V16331	HP1	Organic Analysis – VOC Lab
P&T Autosampler	Tekmar	Aquatek50	94312025	V16333	HP2	Organic Analysis – VOC Lab
P&T Concentrator	Tekmar	LSL2000	89227008	V16332	HP2	Organic Analysis – VOC Lab
PID Lamp Supply	Tracor	703	83076	V16334	HP2	Organic Analysis – VOC Lab
Turbochrom Interface	PE Nelson	900 Series	1158573729	V16335	HP2	Organic Analysis – VOC Lab
Gas Chromatograph	Varian	3400	20404 (5429 on old door)	V16336	V3	**Out of Service**
Cooling Recirculator	VWR Scientific	1141	304344	V16337	HP2	Organic Analysis – VOC Lab
Smart UPS	American Power Conversion	3000	S95060104858	V16338	V3	Organic Analysis – VOC Lab
Hydrogen Generator	Whatman	75-34	75340514B	V16339	N/A	**Out of Service**
P&T Autosampler	Varian	Archon	012056	V16340	VOC-GCMS#1	Organic Analysis – VOC Lab
P&T Concentrator	Tekmar	3000	95093011	V16341	VOC-GCMS System D	Organic Analysis – VOC Lab
MSD	Hewlett Packard	5973	US71420704	V16342	VOC-GCMS System D	Organic Analysis – VOC Lab
Gas Chromatograph	Hewlett Packard	6890	US00008183	V16343	VOC-GCMS System D	Organic Analysis – VOC Lab
Chiller	Thermo NESLAB	RTE-7	106357002	----	VOC-GCMS System D	Organic Analysis – VOC Lab
P&T Autosampler	Varian	Archon	12970	V16345	VOC-GCMS System E	Organic Analysis – VOC Lab
Hydrogen Generator	Whatman	75-34	75340374A	---	N/A	**Out of Service**

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
P&T Concentrator	Tekmar	3000	98327005	V16346	VOC-GCMS System E	Organic Analysis – VOC Lab
Gas Chromatograph	Hewlett Packard	6890 (G1530A)	US00006288	V16399	MSD-C	Organic Analysis
Autosampler Controller	Hewlett Packard	G1512A	US65000499	V16400	MSD-C	Organic Analysis
Autosampler Tower	Hewlett Packard	6890 (G1513A)	US10512270	V16401	MSD-C	Organic Analysis
Autosampler Tray	Hewlett Packard	18596M	3643A43317	V16402	MSD-C	Organic Analysis
MSD	Hewlett Packard	5973 (G1098A)	US63810194	V16403	MSD-B	Organic Analysis
Ion Guage	Hewlett Packard	59864B	US60100254	V16404	MSD-B	Organic Analysis
Gas Chromatograph	Hewlett Packard	5890 Series II	3336A56431	V16693	MSD-A	Organic Analysis
Autosampler Tower	Hewlett Packard	18593B	3445A40831	V16694	MSD-A	Organic Analysis
Auto sampler Tray	Hewlett Packard	18596M	3311A31587	-----	MSD-A	Organic Analysis
Autosampler Controller	Hewlett Packard	G1512A	3446A00268	V16696	MSD-A	Organic Analysis
MSD	Hewlett Packard	5972A	3435A01900	V16697	MSD-A	Organic Analysis
Ion Gauge	Hewlett Packard	5982B	8941	V16698	MSD-A	Organic Analysis
Vacuum pump	Edwards	E2M2	66734	V16699	N/A	Organic Analysis
Gas Chromatograph	Hewlett Packard	6890	US00025032	V16769	MSD-B	Organic Analysis

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
MSD	Hewlett Packard	5973	US82311330	V16768	MSD-C	Organic Analysis
Autosampler Controller	Hewlett Packard	G1512A	CN00003762	V16772	MSD-B	Organic Analysis
Autosampler Tower	Hewlett Packard	G1513A	US64500134	V16770	MSD-B	Organic Analysis
Autosampler Tray	Hewlett Packard	18596C	US11207088	V16771	MSD-B	Organic Analysis
Gas Chromatograph	Hewlett Packard	6890	CN10427049	V16794	MSD-E	Organic Analysis - VOC Lab
MSD	Hewlett Packard	5973	US40620426	V16793	MSD-E	Organic Analysis – VOC Lab
Gas Chromatograph	Agilent	6890N	CN10549041	V16801	GC-Dual micro ECD	Organic Analysis
Autosampler Tray	Agilent	7683	CN54637399	V16802	GC-Dual micro ECD	Organic Analysis
Injector Tower Back	Agilent	7683B	CN54128246	V16803	GC-Dual micro ECD	Organic Analysis
Injector Tower Front	Agilent	7683B	CN54128244	V16804	GC-Dual micro ECD	Organic Analysis
Gas Chromatograph	Varian	3800	13069	V16810	TO-15	Organic Analysis – VOC Lab
MSD	Varian	2200 Saturn MS	06057	V16811	TO-15	Organic Analysis – VOC Lab
Canister Cleaner	Lotus Consulting	---	---	V16812	TO-15	Organic Analysis – VOC Lab
Pressure Station	Lotus Consulting	---	---	V16813	TO-15	Organic Analysis – VOC Lab
Air Canisters	Restek	various 3L and 6L sizes	See F:/Labdata/ GCMS/IonTrap /spreadsheets/ Can_Inventory. xls	hyperlink	TO-15	Organic Analysis – VOC Lab

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Gas Chromatograph	Agilent	7890A	CN10715068	V16815	7890A #1	Organic Analysis
Autosampler Tray	Agilent	7683	CN70743029	V16816	7890A #1	Organic Analysis
Autosampler Injector (Front)	Agilent	7683B	CN71139462	V16817	7890A #1	Organic Analysis

Microscopy

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Polarized Light Microscope	Olympus	BX60	5K00169	V16348	N/A	Microscopy Lab
Polarized Light Microscope	Olympus	BHTP	219954	V16347	N/A	Microscopy Lab
Polarized Light Microscope	Olympus	BHTS	232524	V16358	N/A	Microscopy Lab
Brightfield Microscope	Olympus	BX41	OB13643	V16357	N/A	Microscopy Lab
Phase Contrast Microscope	Olympus	BHTU	225799	V16351	N/A	Microscopy Lab
Stereo Microscope	Olympus	VMS	279573	V16350	N/A	Microscopy Lab
Stereo Microscope	Olympus	SZ	SZ3060	V16349	N/A	Microscopy Lab
Stereo Microscope w/Boom Stand	Olympus	SZ	8-C18317	V16359	N/A	**Transferred to CMT Group**
Biological Safety Cabinet	NuAire	ClassII Type A/B3	20817 VQ	V16355	N/A	**Transferred to CMT Group**
"Refrigerator" Incubator (for BODs)	Hotpack	352620	64446	V16397	N/A	**Transferred to CMT Group**
Drytype Bacteriological Incubator	Blue M	POM200A	P18-136	V16361	N/A	???
Incubator, Isotemp	Fisher	255D	583	V16363	N/A	???
Autoclave	Pelton & Crane	Validator 10	---	V16352	N/A	**Transferred to CMT Group**
Steam Sterilizer	All American	25x	---	V16353	N/A	**Transferred to CMT Group**

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Water Bath	Lab-line	3005-7	563	V16360	N/A	???
Stirrer/hotplate	Corning	PC-420	3705500239499	V16393	N/A	???
Colony Counter, Quebec Darkfield	Leica	3325	00023483RV0023	V16356	N/A	Microscopy Lab
Dissolved Oxygen Meter	Accumet	AB40	---	V16392	N/A	???
Microwave	Samsung	MW5592W	71TN312991M	V16354	N/A	???
Fiberlite	Dola-Jenner Industries, Inc.	180	EEG2823	V16394	N/A	Petrography Lab
Pipet	Eppendorf	Series 2000	1517992	V16398	N/A	???
FTIR	BioRad	FTS 175	1850690	V16722	FTIR	**Transferred to CMT Group**
FTIR Microscope	BioRad	UMA 500	01001700	V16721	FTIR	**Transferred to CMT Group**
XRD	Rigaku	Miniflex	UDO3513	V16790	XRD	**Transferred to CMT Group**
Transmission Electron Microscope (TEM)	JEOL	1200 EXII	EM15A020-66		N/A	TEM Lab
Energy Dispersive X-Ray Spectrometry System (EDS)	Kevex	Delta Class	501107-7A-888		N/A	TEM Lab

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	Label ID Number	System (If Applicable)	Current Location
Free Lens Control	JEOL	FLC-20	---		N/A	TEM Lab
Double Tilt Sample Holder	JEOL	EMSTH10	---		N/A	TEM Lab
Thermal Vacuum Evaporator	Denton	DV 502A	0058-082-083-2		N/A	TEM Lab
Plasma Asher	Denton	PE 120	9414		N/A	TEM Lab
Clean Bench, Class 100	Dexon	830	25513		N/A	TEM Lab
Condensation washers (3)	Fullam	---	---		N/A	TEM Lab
Acetone Vaporizer	BGI	VAP 100	---		N/A	TEM Lab
Carbon Rod Sharpener	Ladd	30285	---		N/A	TEM Lab
Vacuum Coater	Edwards	E306A	1787		N/A	XRD Lab
Plasma Asher	March	Plasmod GCM200	1426		N/A	XRD Lab

Appendix O-1

Example: Maintenance Form

Revision 3.1
Effective 07/31/08

		Routine Maintenace							
Date	Analyst	Clean Cones	Replace pump tubing	Change oil	Clean lens	Other	Lens voltage		

Appendix P-1

Example: Metrology Logbook Forms

Revision 3.1
Effective 07/31/08

September 2008

V16389 - Walk-in Cooler

Walk-in Cooler Acceptance Limits: 2 °C - 4 °C

Day	Reading °C	IR Gun °C	Time	Initials	Corrective Action/Comments	Reading °C	IR Gun °C	Time	Initials
1									
2									
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UMP006182

September 2008

V16799 - Sub Contracting Cooler

Acceptance Limits: 2 °C - 4 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
1							
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September 2008 V16800 - Sample Receiving VOC Cooler Acceptance Limits: 2 °C - 4 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
1							
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3							
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September 2008

V16262 - Wet Chem Drying Oven

Acceptance Limits: 103 °C - 105 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
1							
2							
3							
4							
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UMP006185

September 2008

V16266 - Analytical Balance 3 - Sample Log-in

			Readings - Pre-Calibration				Readings - Post-Calibration			
Day	Time	Initials	0.1 g wt. +/- 0.0001 g	1.0 g wt. +/- 0.001 g	10 g wt. +/- 0.01 g	100 g wt. +/- 0.1 g	0.1 g wt. +/- 0.0001 g	1.0 g wt. +/- 0.001 g	10 g wt. +/- 0.01 g	100 g wt. +/- 0.1 g
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UMP006186

September 2008

V16363 - Incubator 35 - Sample Login

Acceptance Limits: 33 °C - 37 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
1							
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UMP006187

September 2008

V16315 - Tall Freezer - Bottle Prep

Acceptance Limits: < -10 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
1							
2							
3							
4							
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31							

September 2008 V16388 - Short Freezer - Bottle Prep Acceptance Limits: < -10 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
1							
2							
3							
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31							

UMP006189

September 2008

V16264 - Analytical Balance 1 - Bottle Prep

			Readings - Pre-Calibration				Readings - Post-Calibration			
Day	Time	Initials	0.1 g wt. +/- 0.0001 g	1.0 g wt. +/- 0.001 g	10 g wt. +/- 0.01 g	100 g wt. +/- 0.1 g	0.1 g wt. +/- 0.0001 g	1.0 g wt. +/- 0.001 g	10 g wt. +/- 0.01 g	100 g wt. +/- 0.1 g
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UMP006190

September 2008 V16396 - UPDI Water System Acceptance: > 17 Megaohm

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
1							
2							
3							
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UMP006191

September 2008

V16825 - Prep Lab Cooler

Acceptance Limits: 2 °C - 4 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
1							
2							
3							
4							
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September 2008 V16825 - Prep Lab Freezer Acceptance Limits: < -10 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
1							
2							
3							
4							
5							
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September 2008

V16265 - Analytical Balance 4 - Prep Lab

			Readings - Pre-Calibration				Readings - Post-Calibration			
Day	Time	Initials	0.1 g wt. +/- 0.0001 g	1.0 g wt. +/- 0.001 g	10 g wt. +/- 0.01 g	100 g wt. +/- 0.1 g	0.1 g wt. +/- 0.0001 g	1.0 g wt. +/- 0.001 g	10 g wt. +/- 0.01 g	100 g wt. +/- 0.1 g
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UMP006194

September 2008

V16390 - Analytical Balance 2 - Prep Lab

			Readings - Pre-Calibration				Readings - Post-Calibration			
Day	Time	Initials	0.01 g wt. * +/- 0.00001 g	0.1 g +/- 0.0001 g	1 g wt. +/- 0.001 g	20 g wt. +/- 0.02 g	0.01 g wt. +/- 0.00001 g	0.1 g +/- 0.0001 g	1 g wt. +/- 0.001 g	20 g wt. +/- 0.02 g
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* Only necessary if weighing samples < 0.1 g

UMP006195

September 2008

V16269 - Top Loader 2 - Prep Lab

Day	Time	Initials	Readings - Pre-Calibration				Readings - Post-Calibration			
			10 g wt. +/- 0.01 g	20 g wt. +/- 0.02 g	100 g wt. +/- 0.1 g	1000 g wt. +/- 1 g	10 g wt. +/- 0.01 g	20 g wt. +/- 0.02 g	100 g wt. +/- 0.1 g	1000 g wt. +/- 1 g
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September 2008 V16814-Oven-IC Room Acceptance Limits: 33 °C - 37 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
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3							
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September 2008

V16797 - SVOC Cooler

Acceptance Limits: 2 °C - 4 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
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September 2008

V16798 - Top Loader 3 - VOC Lab

Day	Time	Initials	Readings - Pre-Calibration				Readings - Post-Calibration			
			10 g wt. +/- 0.1 g	20 g wt. +/- 0.2 g	100 g wt. +/- 0.1 g	1000 g wt. +/- 1 g	10 g wt. +/- 0.1 g	20 g wt. +/- 0.2 g	100 g wt. +/- 0.1 g	1000 g wt. +/- 1 g
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UMP006199

September 2008 V16808 - VOC Freezer 1 Acceptance Limits: < -10 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
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September 2008 V16386 - VOC Freezer 2 (Soils) Acceptance Limits: < -10 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
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September 2008

V16386 - VOC Soils Cooler

Acceptance Limits: 2 °C - 4 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
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2							
3							
4							
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UMP006202

September 2008 V16809 - VOCs Waters Cooler Acceptance Limits: 2 °C - 4 °C

Day	Reading °C	Time	Initials	Corrective Action/Comments	Reading °C	Time	Initials
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Appendix Q-1

Example: Subcontract Chain of Custody

Revision 3.1
Effective 07/31/08

SUBCONTRACT ORDER

Braun Intertec Corporation

0800247

SENDING LABORATORY:

Braun Intertec Corporation
11001 Hampshire Avenue South
Bloomington, MN 55438
Phone: 952 995-2600
Fax: 952 995-2601
Project Manager: Steven J. Albrecht

RECEIVING LABORATORY:

ERA Laboratories, Inc. [1]
4730 Oneota Street
Duluth, MN 55807
Phone :218 727 6380
Fax: 218 727 3049

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: 0800247-01	**Water**	**Sampled:02/06/08 00:00**		
SUB (ERA) SM4500CN-E TOTAL CYANIDE WATER	02/20/08 00:00	02/20/08 00:00		
Containers Supplied:				
Sample ID: 0800247-02	**Water**	**Sampled:02/07/08 00:00**		**vial -02C is bad, do not use for analysis**
SUB (ERA) SM4500CN-E TOTAL CYANIDE WATER	02/20/08 00:00	02/21/08 00:00		
Containers Supplied:				
Sample ID: 0800247-03	**Water**	**Sampled:02/06/08 00:00**		
SUB (ERA) SM4500CN-E TOTAL CYANIDE WATER	02/20/08 00:00	02/20/08 00:00		
Containers Supplied:				

Released By	Date	Received By	Date
Released By	Date	Received By	Date

SUBCONTRACT ORDER

Braun Intertec Corporation

0800247

SENDING LABORATORY:

Braun Intertec Corporation
11001 Hampshire Avenue South
Bloomington, MN 55438
Phone: 952 995-2600
Fax: 952 995-2601
Project Manager: Steven J. Albrecht

RECEIVING LABORATORY:

Test America, Inc.-Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone :(800) 765-0980
Fax: (615) 726-3404

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: 0800247-01	**Water**	**Sampled:02/06/08 00:00**		
SUB (TA) 8015 METHANOL WATER	02/22/08 00:00	02/20/08 00:00		
Containers Supplied:				
Sample ID: 0800247-02	**Water**	**Sampled:02/07/08 00:00**		**vial -02C is bad, do not use for analysis**
SUB (TA) 8315A FORMALDEHYDE WATER	02/22/08 00:00	02/10/08 00:00		
SUB (TA) 8015 METHANOL WATER	02/22/08 00:00	02/21/08 00:00		
Containers Supplied:				
Sample ID: 0800247-03	**Water**	**Sampled:02/06/08 00:00**		
SUB (TA) 8315A FORMALDEHYDE WATER	02/22/08 00:00	02/09/08 00:00		
SUB (TA) 8015 METHANOL WATER	02/22/08 00:00	02/20/08 00:00		
Containers Supplied:				
Sample ID: 0800247-06	**Water**	**Sampled:02/19/08 00:00**		
SUB (TA) 8315A FORMALDEHYDE WATER	02/22/08 00:00	02/22/08 00:00		
Containers Supplied:				

Released By	Date	Received By	Date
Released By	Date	Received By	Date

SUBCONTRACT ORDER

Braun Intertec Corporation

0800247

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: 0800247-07	**Water**	**Sampled:02/20/08 00:00**		
SUB (TA) 8315A FORMALDEHYDE WATER	02/22/08 00:00	02/23/08 00:00		
Containers Supplied:				
Sample ID: 0800247-08	**Water**	**Sampled:02/19/08 00:00**		
SUB (TA) 8315A FORMALDEHYDE WATER	02/22/08 00:00	02/22/08 00:00		
Containers Supplied:				

Released By	Date	Received By	Date
Released By	Date	Received By	Date

Appendix Q-2

Approved Vendors List

Revision 3.1
Effective 07/31/08

Approved Vendor List

- Minneapolis Oxygen Company
- Fisher Scientific
- VWR
- Phenomenex
- Restek
- Agilent
- SKC, Inc.
- Perkin Elmer
- CPI International
- Dickson
- Elvin Safety
- Environmental Consulting and Supplies
- Environmental Express
- Environmental Resource Associates
- Gellar MicroAnalytical
- Glass Expansion
- Heubsch
- InnovaTech
- Inorganic Ventures
- Leeds Precision Instruments
- Miele
- MN Fluid Systems (Swagelok)
- NSI Solutions
- NuAire, Inc.
- Nuclear Scanning Services
- Safety Kleen
- Siemens
- Spectra Gases
- Systems Consulting Group
- Tamarack Materials, Inc.
- Ultra Scientific
- Westco
- WN Technical
- AccuStandard
- Absolute Standards
- Chem Service
- Sigma/Aldrich/Supelco
- Dionex
- Milestone
- Analytical Products Group

- Special Waste Disposal, Inc.
- Bay West
- Zefon International
- SCP Science
- Lab Safety Supply
- Varian, Inc.
- Hach Company
- Bruker
- Tursso Companies
- Quality Environmental Containers, Inc. (QEC)
- Jesco
- LabelMaster
- Quantum Analytics
- SPI
- Swagelok
- SWDI
- EST Analytical
- Professional Technical Services (PTS)
- Scientific Instrument Services
- Lotus Consulting
- Tekmar
- OI Analytical
- LakeView Associates
- Northern Balance & Scale
- Acros Organics
- AIHA
- Air Quality Engineering
- Air & Waste Management Assoc.
- Alfa Aesar
- Bernies Photo Center
- Caliper Life Sciences
- Cargille Laboratories
- ChemSamp Co.
- Chrom Tech
- Spee-Dee
- Dynamex
- Fed-Ex
- UPS

Approved Subcontract Laboratory List

- Wisconsin Occupational Health Lab
- Lancaster Laboratories, Inc.
- Test America
- Instrumental Research Incorporated
- En Chem
- Pace Analytical
- Huffman Laboratories
- Era Labs
- RMB Environmental
- Legend Technical Services
- Columbia Analytical Services
- Minnesota Valley Testing Laboratories
- MPI Research (Exygen)
- Northeast Technical Services
- Florida Radiochemistry Services
- Hazen Research
- Staveley Services
- Bureau Veritas North America
- EMSL Analytical, Inc.
- Innovatech Labs, LLC
- P&K Microbiology Services, Inc.
- Wiss, Janney, Elstner Associates, Inc.

Appendix Q-3

Purchase Order Form

Revision 3.1
Effective 07/31/08

BRAUN
INTERTEC

PURCHASE ORDER

11001 Hampshire Ave. S.
Bloomington, MN 55438

Phone: 952-995-2600
Fax: 952-995-2601
Email:

The following number must appear on all related correspondence,
Shipping papers, and invoices:

P.O. Number: _____ Supplier Ref. #: _____

To: (vendor)	Ship To:
	Braun Intertec Corporation
	11001 Hampshire Ave S.
	Bloomington, MN 55438

Qty.	Cat. #	Description	Unit $	Total $

Sub-total	
Sales Tax	
S&H	
Trade-in Discount	
Total	

Please notify us immediately of you are unable to
send as specified.

Send all correspondence to:
Name
Company Braun Intertec Corporation
Street 11001 Hampshire Ave. S.
City Bloomington, MN 55438
Phone: 952-995-2600
Fax: 952-995-2601

Requester Date

Conditions upon Receipt Approval Date

Comments : _____

Appendix R-1

Audit Checklists

Revision 3.1
Effective 07/31/08

Facilities Audit Checklist

Date		Facility	
Auditor		Time	

1 = Fully Compliant 2 = Mostly Compliant 3 = Numerous Deviations 4 = Does Not Comply

Is the facility properly configured to carry out the required testing? List deviations:
Are reagents & standards properly labeled? List deviations:

Document Audit Checklist

Date		Document ID	
Auditor		Revision	

1 = Fully Compliant 2 = Mostly Compliant 3 = Numerous Deviations 4 = Does Not Comply

Does the document comply with the reference method (if applicable)? List deviations:
Does the document follow the proper format? List deviations:

Data Audit Checklist

Date		Technique	
Auditor		SOP	
Data ID		Data Type	

1 = Fully Compliant 2 = Mostly Compliant 3 = Numerous Deviations 4 = Does Not Comply

Does the data comply with the relevant SOP used to generate it? List deviations:
Is the documentation complete? List deviations:

Personnel Audit Checklist

Date		Technique	
Auditor		SOP	
Personnel			

1 = Fully Compliant 2 = Mostly Compliant 3 = Numerous Deviations 4 = Does Not Comply

Are the analysts following the SOP and established QC procedures? List deviations:
Is the training documentation complete for analysts involved in the testing? List deviations:

General Process Compliance Audit Form

Process			
Auditor		Analysis	
Audit Date		Analyst	

Possible items to consider when auditing a general process:

Is the process being performed correctly and completely according to laboratory and/or regulatory requirements?
Is the documentation complete and correct?
Is there full traceability of standards, reagents, and/or equipment (if applicable)?

List observations and deviations:

Required corrective actions and recommendations for improvement:

Analyst:_____ Date:_____

Auditor:_____ Date:_____

Quality Assurance Manual

TestAmerica West Sacramento
880 Riverside Parkway
West Sacramento, Ca 95605
Phone No. 916.373.5600
Fax No. 916.372.1059

www.testamericainc.com

Karla J Buechler
Laboratory Director – Karla Buechler

6/25/09
Date

Douglas W
Quality Manager - Douglas Weir

06/25/09
Date

Facility Distribution No. UNCONTROLLED **Distributed To:** UNCONTROLLED

SECTION 2

TABLE OF CONTENTS

LIST OF TABLES

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LIST OF APPENDICES

REFERENCED CORPORATE SOPs AND POLICIES

SOP / Policy Reference	Title
CA-Q-S-001	Solvent and Acid Lot Testing and Approval
CA-Q-S-002	Acceptable Manual Integration Practices
CA-Q-S-004	Method Compliance & Data Authenticity Audits
CA-Q-S-006	Detection Limits
CW-Q-S-001	Corporate Document Control and Archiving
CW-Q-S-002	Writing a Standard Operating Procedure (SOPs)
CA-L-S-001	Internal Investigation of Potential Data Discrepancies and Determination for Data Recall
CA-L-S-002	Subcontracting Procedures
CA-L-P-001	Ethics Policy
CA-L-P-002	Contract Compliance Policy
CW-F-P-002	Authorization Matrix
CW-F-P-004	Procurement and Contracts Policy
CA-C-S-001	Work Sharing Process
CA-T-P-001	Qualified Products List
CW-F-S-007	Controlled Purchases Policy
CW-F-S-018	Vendor Selection
CA-Q-M-002	Corporate Quality Management Plan
CW-E-M-001	Corporate Environmental Health & Safety Manual

REFERENCED LABORATORY SOPs

SOP Reference	Title
WS-PEHS-001	Respiratory Protection Plan
WS-PM-0003	Program Setup and Distillation
WS-PQA-0011	Manual Integration Documentation Procedures
WS-PQA-003	Quality Control Program
WS-PQA-012	Technical Data Review Requirements
WS-PQA-013	Procedures to Address Customer Complaints
WS-QA-0003	Sample Receipt and Procedures
WS-QA-0004	Maintenance and Calibration Check of Fixed and Adjustable Volume Autopipettors, Autodispensers and Volumetric Containers
WS-QA-0005	Temperature Monitoring and Corrective Actions for Refrigerators and Freezers
WS-QA-0006	Method Detection Limits (MDL) and Instrument Detection Limits (IDL)
WS-QA-0016	Thermometer Calibration
WS-QA-0017	Standards and Reagents Preparation and Quality Control Check Procedure [Quality Assurance Procedure]
WS-QA-0018	Subsampling and Compositing of Samples
WS-QA-0021	Preparation and Management of Standard Operating Procedures
WS-QA-0022	Employee Orientation and Training
WS-QA-0023	Nonconformance and Corrective Action System
WS-QA-0028	Multi-Incremental Subsampling of Soils and Sediments
WS-QA-0041	Calibration and Calibration Check of Balances

SECTION 3

INTRODUCTION *(NELAC 5.1 - 5.3)*

3.1 INTRODUCTION AND COMPLIANCE REFERENCES

TestAmerica West Sacramento's Quality Assurance Manual (QAM) is a document prepared to define the overall policies, organization objectives and functional responsibilities for achieving TestAmerica's data quality goals. The laboratory maintains a local perspective in its scope of services and client relations and maintains a national perspective in terms of quality.

The QAM has been prepared to assure compliance with the 2003 National Environmental Laboratory Accreditation Conference (NELAC) standards and ISO/IEC Guide 17025 (1999). In addition, the policies and procedures outlined in this manual are compliant with TestAmerica's Corporate Quality Management Plan (CQMP) and the various accreditation and certification programs listed in Appendix 3. The CQMP provides a summary of TestAmerica's quality and data integrity system. It contains requirements and general guidelines under which all TestAmerica facilities shall conduct their operations.

The QAM has been prepared to be consistent with the requirements of the following documents:

- EPA 600/4-88/039, *Methods for the Determination of Organic Compounds in Drinking Water,* EPA, Revised July 1991.
- EPA 600/R-95/131, *Methods for the Determination of Organic Compounds in Drinking Water,* Supplement III, EPA, August 1995.
- EPA 600/4-79-019, *Handbook for Analytical Quality Control in Water and Wastewater Laboratories,* EPA, March 1979.
- EPA SW-846, *Test Methods for the Evaluation of Solid Waste, 3rd Edition,* September 1986; Update I, July 1992; Update II, September 1994; Update III, December 1996, and Update IV, February 2007.
- Federal Register, 40 CFR Parts 136, 141, 172, 173, 178, 179 and 261.
- USEPA Contract Laboratory Program. *Statement of Work for Inorganics Analysis. Multi-Media, Multi-Concentration*. Document ILM04.0.
- USEPA Contract Laboratory Program. *Statement of Work for Organics Analysis. Multi-Media, Multi-Concentration.* Document Number OLMO3.1, August 1994.
- APHA, *Standard Methods for the Examination of Water and Wastewater,* 18th Edition, 19th, 20th and 21st Edition.
- U.S. Department of Defense, *Quality Systems Manual for Environmental Laboratories*, Final Version 3, January 2006.
- U.S. Department of Defense, *Quality Systems Manual for Environmental Laboratories*, Final Version 4.1, April 2009.
- U.S. Department of Defense, *Air Force Center for Environmental Excellence Quality Assurance Project Plan (QAPP),* Version 4.0.02, May 2006.
- Toxic Substances Control Act (TSCA).

3.2 TERMS AND DEFINITIONS

A Quality Assurance Program is a company-wide system designed to ensure that data produced by the laboratory conforms to the standards set by state and/or federal regulations. The program functions at the management level through company goals and management policies, and at the analytical level through Standard Operating Procedures (SOPs) and quality control. The TestAmerica program is designed to minimize systematic error, encourage constructive, documented problem solving, and provide a framework for continuous improvement within the organization.

Refer to Appendix 2 for the Glossary/Acronyms.

3.3 SCOPE / FIELDS OF TESTING

The laboratory analyzes a broad range of environmental and industrial samples every month. Sample matrices vary among air, drinking water, effluent water, groundwater, hazardous waste, sludge and soils. The Quality Assurance Program contains specific procedures and methods to test samples of differing matrices for chemical, physical and biological parameters. The Program also contains guidelines on maintaining documentation of analytical process, reviewing results, servicing clients and tracking samples through the laboratory. The technical and service requirements of all requests to provide analyses are thoroughly evaluated before commitments are made to accept the work. Measurements are made using published reference methods or methods developed and validated by the laboratory.

The methods covered by this manual include the most frequently requested methodologies needed to provide analytical services in the United States and its territories. The specific list of test methods used by the laboratory can be found in Appendix 4. The approach of this manual is to define the minimum level of quality assurance and quality control necessary to meet requirements. All methods performed by the laboratory shall meet these criteria as appropriate. In some instances, quality assurance project plans (QAPPs), project specific data quality objectives (DQOs) or local regulations may require criteria other than those contained in this manual. In these cases, the laboratory will abide by the requested criteria following review and acceptance of the requirements by the Laboratory Director and the Quality Assurance (QA) Manager. In some cases, QAPPs and DQOs may specify less stringent requirements. The Laboratory Director and the QA Manager must determine if it is in the lab's best interest to follow the less stringent requirements.

3.4 MANAGEMENT OF THE MANUAL

3.4.1 Review Process

This manual is reviewed annually by senior laboratory management to assure that it reflects current practices and meets the requirements of the laboratory's clients and regulators as well as the CQMP. Occasionally, the manual may need changes in order to meet new or changing regulations and operations. The QA Manager will review the changes in the normal course of business and incorporate changes into revised sections of the document. All updates will be reviewed by the senior laboratory management staff. The laboratory updates and approves such changes according to our SOP "Preparation and Management of Standard Operating Procedures" (refer to SOP No. WS-QA-0021).

SECTION 4

ORGANIZATION AND MANAGEMENT *(NELAC 5.4.1)*

4.1 OVERVIEW

TestAmerica West Sacramento is a local operating unit of TestAmerica Laboratories, Inc. The organizational structure, responsibilities and authorities of the corporate staff of TestAmerica Laboratories, Inc. are presented in the CQMP. The laboratory has day-to-day independent operational authority overseen by corporate officers (e.g., President, Chief Operating Officer, Corporate Quality Assurance, etc.). The laboratory operational and support staff work under the direction of the Laboratory Director. The organizational structure for both Corporate & TestAmerica West Sacramento is presented in Figure 4-1.

4.2 ROLES AND RESPONSIBILITIES

In order for the Quality Assurance Program to function properly, all members of the staff must clearly understand and meet their individual responsibilities as they relate to the quality program. The following descriptions briefly define each role in its relationship to the Quality Assurance Program.

4.2.1 Quality Assurance Program

The responsibility for quality lies with every employee of the laboratory. All employees have access to the QAM, are trained to this manual, and are responsible for upholding the standards therein. Each person carries out his/her daily tasks in a manner consistent with the goals and in accordance with the procedures in this manual and the laboratory's SOPs. Role descriptions for corporate personnel are defined in the CQMP. This manual is specific to the operations of TestAmerica's West Sacramento laboratory.

4.2.2 Laboratory Director / Technical Director

TestAmerica West Sacramento's Laboratory Director is responsible for the overall quality, safety, financial, technical, human resource and service performance of the whole laboratory and reports to their respective GM. The Laboratory Director provides the resources necessary to implement and maintain an effective and comprehensive Quality Assurance and Data Integrity Program.

4.2.3 Quality Assurance (QA) Manager

The QA Manager has responsibility and authority to ensure the continuous implementation of the quality system based on ISO 17025.

The QA Manager reports directly to the Laboratory Director and has access to Corporate QA for advice and resources. This position is able to evaluate data objectively and perform assessments without outside (i.e., managerial) influence. Corporate QA may be used as a resource in dealing with regulatory requirements, certifications and other quality assurance related items. The QA Manager directs the activities of the QA department to accomplish its mission.

4.2.4 Operations Manager/Technical Director

The Operations Manager has the responsibility for the day to day operations of the analytical staff within the laboratory. The Operations Manager reports directly to the Laboratory Director. The Operations Manager schedules analytical operations, ensures that the laboratory meets quality requirements, investigates technical issues as they arise, and performs other tasks as required by the NELAC standards.

4.2.5 Manager of Customer Services

The Manager of Customer Services has the responsibility for the day to day operations of the client services staff, which includes the Project Management and other administrative groups within the laboratory. The Manager of Customer Services reports directly to the Laboratory Director. The Manager of Customer Services has signature authority for contracts for laboratory services (as detailed in TestAmerica policy), and for laboratory reports.

4.2.6 Project Manager

Project Managers are a liaison between the laboratory's clients and the analytical staff. They report directly to the Manager of Customer Service. The Project Managers have signature authority for final reports, and review project data packages for completeness and compliance with client needs and quality requirements.

4.2.7 Project Administrator

Project Administrators are a liaison between the laboratory's clients and the analytical staff. They report directly to the Manager of Customer Service. The Project Administrators review project data packages for completeness and compliance with client needs and quality requirements.

4.2.8 Department Manager, Team Leader, or Supervisor

Department Managers report directly to the Operations Manager. They supervise the daily activities of analysis with a given laboratory area, and either oversee the review and approval, or perform the review and approval of all analytical data within that area.

4.2.9 Analyst

Analysts report to their respective Department Managers. They perform sample analyses and generate analytical data in accordance with documented procedures.

4.2.10 Sample Custodian

The Sample Custodian ensures the implementation of proper sample receipt procedures, including maintaining chain-of-custody. The Sample Custodian logs samples into the LIMS and ensures that all samples are stored appropriately.

4.2.11 Report Production Staff

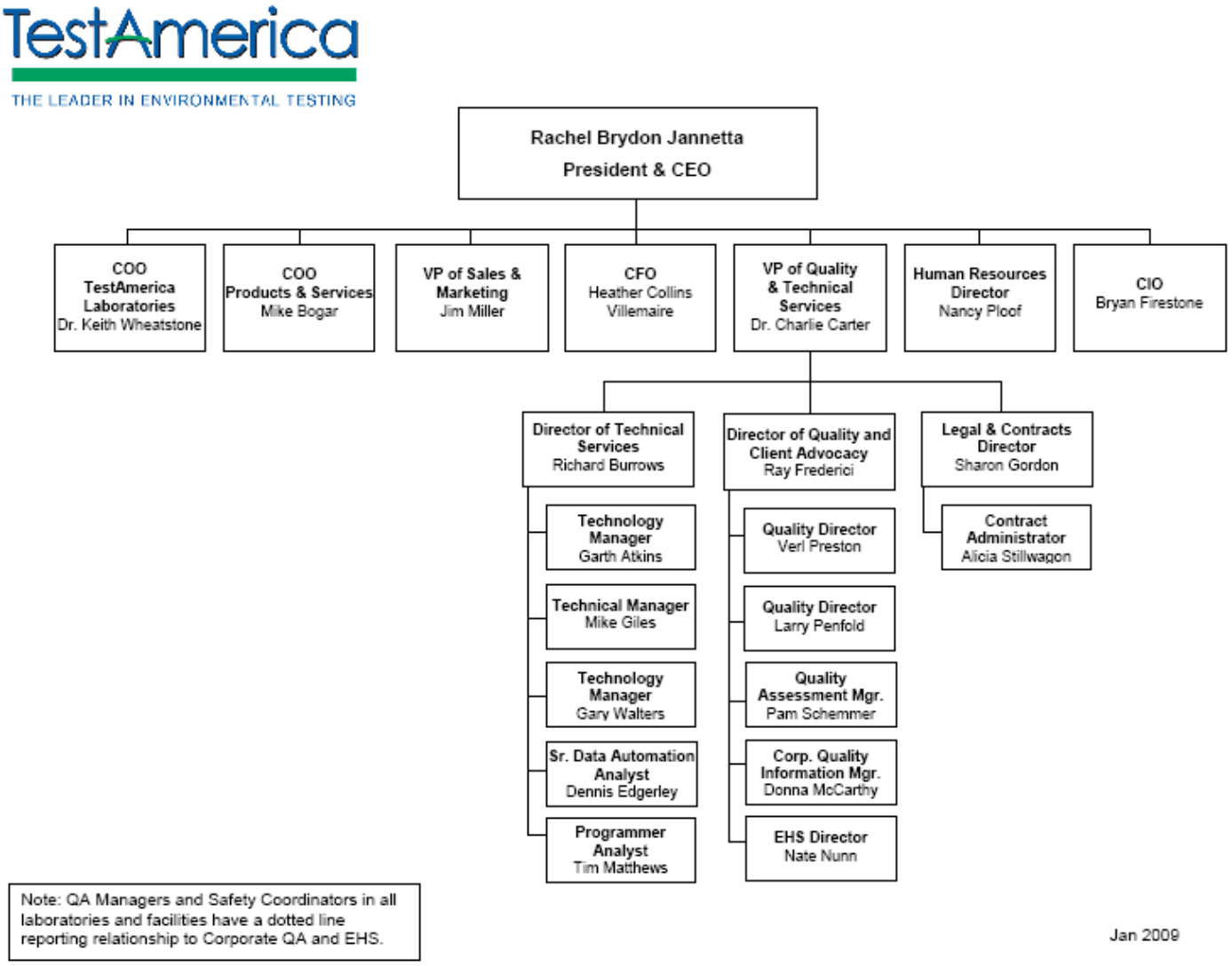
The Report Production Staff accurately generates and compiles analytical reports and the associated deliverables as required by the client.

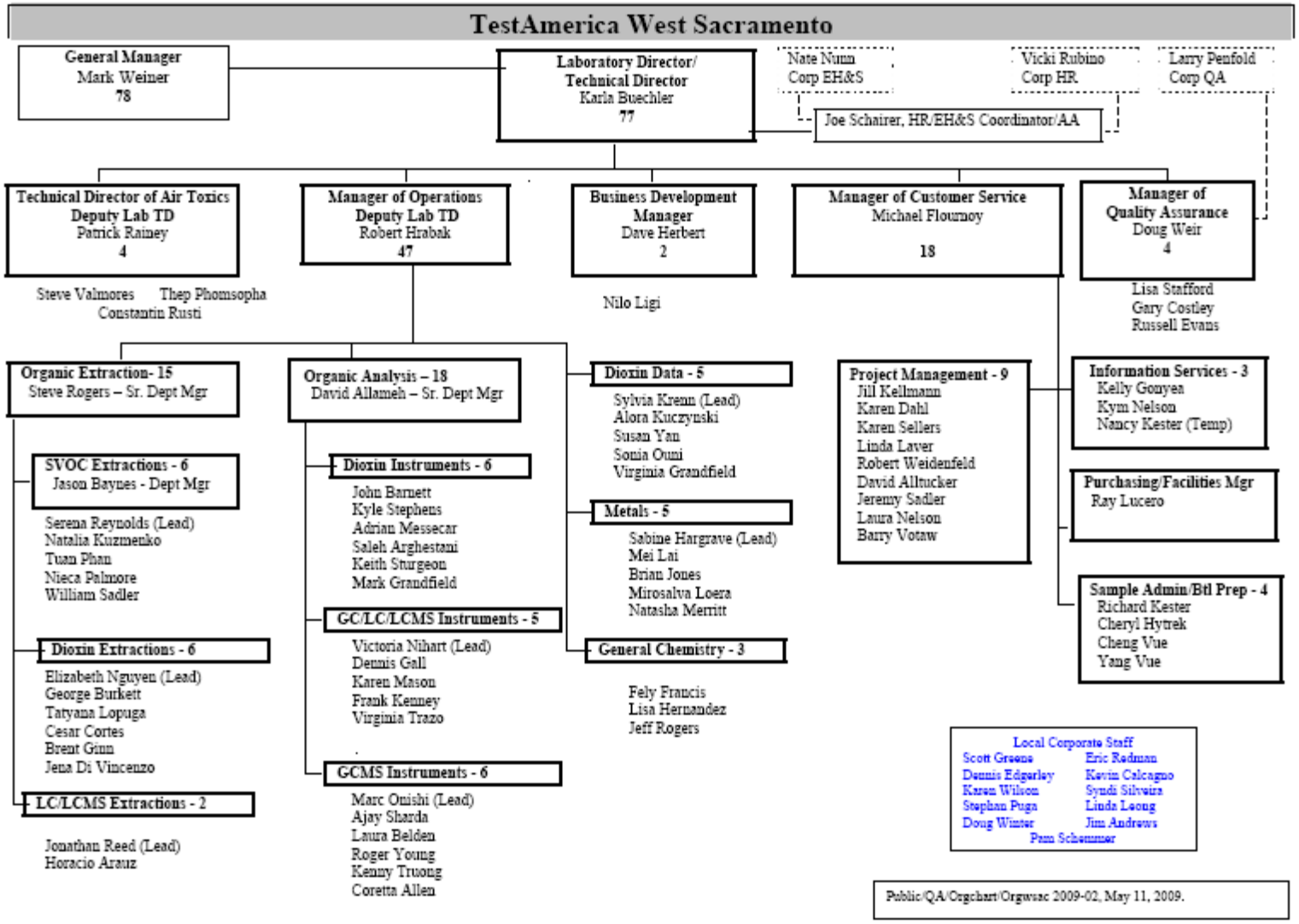
4.3 DEPUTIES

The following table defines who assumes the responsibilities of key personnel in their absence:

Title	Key Personnel	Deputy
Laboratory Director	Karla Buechler	Dave Herbert
QA Manager	Douglas Weir	Lisa Stafford
Technical Director	Karla Buechler	Michael Flournoy Robert Hrabak
Operations Manager	Robert Hrabak	David Allameh
Customer Services Manager	Michael Flournoy	Dave Herbert
Business Development Manager	Dave Herbert	Michael Flournoy
EHS Coordinator	Joe Schairer	Richard Kester

Figure 4-1. Corporate and Laboratory Organization Chart




TestAmerica West Sacramento
General Manager
Mark Weiner
78
Laboratory Director/
Technical Director
Karla Buechler
77
Nate Nunn
Corp EH&S
Vicki Rubino
Corp HR
Larry Penfold
Corp QA
Joe Schairer, HR/EH&S Coordinator/AA
Technical Director of Air Toxics
Deputy Lab TD
Patrick Rainey
4
Steve Valmores
Thep Phomsopha
Constantin Rusti
Manager of Operations
Deputy Lab TD
Robert Hrabak
47
Business Development
Manager
Dave Herbert
2
Nilo Ligi
Manager of Customer Service
Michael Flournoy
18
Manager of
Quality Assurance
Doug Weir
4
Lisa Stafford
Gary Costley
Russell Evans
Organic Extraction- 15
Steve Rogers – Sr. Dept Mgr
Organic Analysis – 18
David Allameh – Sr. Dept Mgr
Dioxin Data - 5
Sylvia Krenn (Lead)
Alora Kuczynski
Susan Yan
Sonia Ouni
Virginia Grandfield
Project Management - 9
Jill Kellmann
Karen Dahl
Karen Sellers
Linda Laver
Robert Weidenfeld
David Alltucker
Jeremy Sadler
Laura Nelson
Barry Votaw
Information Services - 3
Kelly Gonyea
Kym Nelson
Nancy Kester (Temp)
SVOC Extractions - 6
Jason Baynes - Dept Mgr
Serena Reynolds (Lead)
Natalia Kuzmenko
Tuan Phan
Nieca Palmore
William Sadler
Dioxin Instruments - 6
John Barnett
Kyle Stephens
Adrian Messecar
Saleh Arghestani
Keith Sturgeon
Mark Grandfield
Metals - 5
Sabine Hargrave (Lead)
Mei Lai
Brian Jones
Mirosalva Loera
Natasha Merritt
Purchasing/Facilities Mgr
Ray Lucero
Dioxin Extractions - 6
Elizabeth Nguyen (Lead)
George Burkett
Tatyana Lopuga
Cesar Cortes
Brent Ginn
Jena Di Vincenzo
GC/LC/LCMS Instruments - 5
Victoria Nihart (Lead)
Dennis Gall
Karen Mason
Frank Kenney
Virginia Trazo
General Chemistry - 3
Fely Francis
Lisa Hernandez
Jeff Rogers
Sample Admin/Btl Prep - 4
Richard Kester
Cheryl Hytrek
Cheng Vue
Yang Vue
LC/LCMS Extractions - 2
Jonathan Reed (Lead)
Horacio Arauz
GCMS Instruments - 6
Marc Onishi (Lead)
Ajay Sharda
Laura Belden
Roger Young
Kenny Truong
Coretta Allen
Local Corporate Staff
Scott Greene
Eric Redman
Dennis Edgerley
Kevin Calcagno
Karen Wilson
Syndi Silveira
Stephan Puga
Linda Leong
Doug Winter
Jim Andrews
Pam Schemmer
Public/QA/Orgchart/Orgwsac 2009-02, May 11, 2009.

SECTION 5

QUALITY SYSTEM *(NELAC 5.4.2)*

5.1 QUALITY POLICY STATEMENT

It is TestAmerica's Policy to:

- ❖ Provide data of known quality to its clients by adhering to approved methodologies, regulatory requirements and the QA/QC protocols.
- ❖ Effectively manage all aspects of the laboratory and business operations by the highest ethical standards.
- ❖ Continually improve systems and provide support to quality improvement efforts in laboratory, administrative and managerial activities. TestAmerica recognizes that the implementation of a quality assurance program requires management's commitment and support as well as the involvement of the entire staff.
- ❖ Provide clients with the highest level of professionalism and the best service practices in the industry.

Every staff member at the laboratory plays an integral part in quality assurance and is held responsible and accountable for the quality of their work. It is, therefore, required that all laboratory personnel are trained and agree to comply with applicable procedures and requirements established by this document.

5.2 ETHICS AND DATA INTEGRITY

TestAmerica is committed to ensuring the integrity of its data and meeting the quality needs of its clients. The elements of TestAmerica's Ethics and Data Integrity Program include:

- An Ethics Policy (Corporate Policy No. CA-L-P-001) and Employee Ethics Statements.
- Ethics and Compliance Officers (ECOs).
- A Training Program.
- Self-governance through disciplinary action for violations.
- A Confidential mechanism for anonymously reporting alleged misconduct and a means for conducting internal investigations of all alleged misconduct. (Corporate SOP No. CA-L-S-001.)
- Procedures and guidance for recalling data if necessary (Corporate SOP No. CA-L-S-001).
- Effective external and internal monitoring system that includes procedures for internal audits (Section 15).
- Produce results, which are accurate and include QA/QC information that meets client pre-defined Data Quality Objectives (DQOs).
- Present services in a confidential, honest and forthright manner.

- Provide employees with guidelines and an understanding of the Ethical and Quality Standards of our Industry.
- Operate our facilities in a manner that protects the environment and the health and safety of employees and the public.
- Obey all pertinent federal, state and local laws and regulations and encourage other members of our industry to do the same.
- Educate clients as to the extent and kinds of services available.
- Assert competency only for work for which adequate personnel and equipment are available and for which adequate preparation has been made.
- Promote the status of environmental laboratories, their employees, and the value of services rendered by them.

5.3 QUALITY SYSTEM DOCUMENTATION

The laboratory's Quality System is communicated through a variety of documents.

- Quality Assurance Manual – Each laboratory has a lab specific quality assurance manual.
- Corporate SOPs and Policies - Corporate SOPs and Policies are developed for use by all relevant laboratories. They are incorporated into the laboratory's normal SOP distribution, training and tracking system. Corporate SOPs may be general or technical.
- Work Instructions - A subset of procedural steps, tasks or forms associated with an operation of a management system (e.g., checklists, preformatted bench sheets, forms).
- Laboratory SOPs – General and Technical
- Corporate Quality Policy Memorandums
- Laboratory QA/QC Policy Memorandums

5.3.1 Order of Precedence

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

- Corporate Quality Policy Memorandum
- Corporate Quality Management Plan (CQMP)
- Corporate SOPs and Policies
- Laboratory QA/QC Policy Memorandum
- Laboratory Quality Assurance Manual (QAM)
- Laboratory SOPs and Policies
- Other (Work Instructions (WI), memos, flow charts, etc.)

Note: The laboratory's has the responsibility and authority to operate in compliance with regulatory requirements of the jurisdiction in which the work is performed. Where the CQMP conflicts with those regulatory requirements, the regulatory requirements of the jurisdiction shall hold primacy. The laboratory's (QAM) shall take precedence over the CQMP in those cases.

5.4 QA/QC OBJECTIVES FOR THE MEASUREMENT OF DATA

Quality Assurance (QA) and Quality Control (QC) are activities undertaken to achieve the goal of producing data that accurately characterize the sites or materials that have been sampled. Quality Assurance is generally understood to be more comprehensive than Quality Control. Quality Assurance can be defined as the integrated system of activities that ensures that a product or service meets defined standards.

Quality Control is generally understood to be limited to the analyses of samples and to be synonymous with the term *"analytical quality control"*. QC refers to the routine application of statistically based procedures to evaluate and control the accuracy of results from analytical measurements. The QC program includes procedures for estimating and controlling precision and bias and for determining reporting limits.

Request for Proposals (RFPs) and Quality Assurance Project Plans (QAPP) provide a mechanism for the client and the laboratory to discuss the data quality objectives in order to ensure that analytical services closely correspond to client needs. The client is responsible for developing the QAPP. In order to ensure the ability of the laboratory to meet the Data Quality Objectives (DQOs) specified in the QAPP, clients are advised to allow time for the laboratory to review the QAPP before being finalized. Additionally, the laboratory will provide support to the client for developing the sections of the QAPP that concern laboratory activities.

Historically, laboratories have described their QC objectives in terms of precision, accuracy, representativeness, comparability, completeness, selectivity and sensitivity (PARCCSS).

5.4.1 Precision

The laboratory objective for precision is to meet the performance for precision demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Precision is defined as the degree of reproducibility of measurements under a given set of analytical conditions (exclusive of field sampling variability). Precision is documented on the basis of replicate analysis, usually duplicate or matrix spike (MS) duplicate samples.

5.4.2 Accuracy

The laboratory objective for accuracy is to meet the performance for accuracy demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Accuracy is defined as the degree of bias in a measurement system. Accuracy may be documented through the use of laboratory control samples (LCS) and/or MS. A statement of accuracy is expressed as an interval of acceptance recovery about the mean recovery.

5.4.3 Representativeness

The laboratory objective for representativeness is to provide data which is representative of the sampled medium. Representativeness is defined as the degree to which data represent a characteristic of a population or set of samples and is a measurement of both analytical and field sampling precision. The representativeness of the analytical data is a function of the procedures used in procuring and processing the samples. The representativeness can be

documented by the relative percent difference between separately procured, but otherwise identical samples or sample aliquots.

The representativeness of the data from the sampling sites depends on both the sampling procedures and the analytical procedures. The laboratory may provide guidance to the client regarding proper sampling and handling methods in order to assure the integrity of the samples.

5.4.4 Comparability

The comparability objective is to provide analytical data for which the accuracy, precision, representativeness and reporting limit statistics are similar to these quality indicators generated by other laboratories for similar samples, and data generated by the laboratory over time.

The comparability objective is documented by inter-laboratory studies carried out by regulatory agencies or carried out for specific projects or contracts, by comparison of periodically generated statements of accuracy, precision and reporting limits with those of other laboratories.

5.4.5 Completeness

The completeness objective for data is 90% (or as specified by a particular project), expressed as the ratio of the valid data to the total data over the course of the project. Data will be considered valid if they are adequate for their intended use. Data usability will be defined in a QAPP, project scope or regulatory requirement. Data validation is the process for reviewing data to determine its usability and completeness. If the completeness objective is not met, actions will be taken internally and with the data user to improve performance. This may take the form of an audit to evaluate the methodology and procedures as possible sources for the difficulty or may result in a recommendation to use a different method.

5.4.6 Selectivity

Selectivity is defined as: The capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. Target analytes are separated from non-target constituents and subsequently identified/detected through one or more of the following, depending on the analytical method: extractions (separation), digestions (separation), interelement corrections (separation), use of matrix modifiers (separation), specific retention times (separation and identification), confirmations with different columns or detectors (separation and identification), specific wavelengths (identification), specific mass spectra (identification), specific electrodes (separation and identification), etc.

5.4.7 Sensitivity

Sensitivity refers to the amount of analyte necessary to produce a detector response that can be reliably detected (Method Detection Limit) or quantified (Reporting Limit).

5.5 CRITERIA FOR QUALITY INDICATORS

The laboratory maintains a Reference Data Summary from the LIMS that summarize the precision and accuracy acceptability limits for performed analyses. This summary includes an

effective date, is updated each time new limits are generated and is managed by the laboratory's QA department. Unless otherwise noted, limits within these tables are laboratory generated. Some acceptability limits are derived from US EPA methods when they are required. Where US EPA method limits are not required, the laboratory has developed limits from evaluation of data from similar matrices. Criteria for development of control limits are contained in "Quality Control Program" Policy WS-PQA-003 and Section 24.

5.6 STATISTICAL QUALITY CONTROL

Statistically-derived precision and accuracy limits are required by selected methods (such as SW-846) and programs [such as the Ohio Voluntary Action Plan (VAP)]. The laboratory routinely utilizes statistically-derived limits to evaluate method performance and determine when corrective action is appropriate. The analysts are instructed to use the current limits in the laboratory (dated and approved by the Technical Director and QA Manager) and entered into the Laboratory Information Management System (LIMS). The Quality Assurance department maintains an archive of all limits used within the laboratory. If a method defines the QC limits, the method limits are used.

If a method requires the generation of historical limits, the lab develops such limits from recent data in the QC database of the LIMS following the guidelines described in "Quality Control Program" Policy WS-PQA-003 and Section 24. All calculations and limits are documented and dated when approved and effective. On occasion, a client requests contract-specified limits for a specific project.

Surrogate recoveries are determined for a specific time period as defined above. The resulting ranges are entered in LIMS.

Current QC limits are entered and maintained in the LIMS analyte database. As sample results and the related QC are entered into LIMS, the sample QC values are compared with the limits in LIMS to determine if they are within the acceptable range. The analyst then evaluates if the sample needs to be rerun or re-extracted/rerun or if a comment should be added to the report explaining the reason for the QC outlier.

5.6.1 QC Charts

As the QC limits are calculated, QC charts are generated showing warning and control limits for the purpose of evaluating trends. The QA Manager evaluates these to determine if adjustments need to be made or for corrective actions to methods. All findings are documented and kept on file. Control charts are generated according to laboratory SOP No. WS-PQA-003, "Quality Control Program".

5.7 QUALITY SYSTEM METRICS

In addition to the QC parameters discussed above, the entire Quality System is evaluated on a monthly basis through the use of specific metrics (refer to Section 16). These metrics are used to drive continuous improvement in the laboratory's Quality System.

SECTION 6

DOCUMENT CONTROL *(NELAC 5.4.3)*

6.1 OVERVIEW

The QA Department is responsible for the control of documents used in the laboratory to ensure that approved, up-to-date documents are in circulation and out-of-date (obsolete) documents are archived or destroyed. The following documents, at a minimum, must be controlled:

- Laboratory Quality Assurance Manual
- Laboratory Standard Operating Procedures (SOP)
- Laboratory Policies
- Work Instructions and Forms
- Corporate Policies and Procedures distributed outside the intranet

Corporate Quality posts Corporate Manuals, SOPs, Policies, Work Instructions, White Papers and Training Materials on the company intranet site. These Corporate documents are only considered controlled when they are read on the intranet site. Printed copies are considered uncontrolled unless the laboratory physically distributes them as controlled documents. A detailed description of the procedure for issuing, authorizing, controlling, distributing, and archiving Corporate documents is found in Corporate SOP No. CW-Q-S-001, Corporate Document Control and Archiving. The laboratory's internal document control procedure is defined in SOP No. WS-QA-0021, "Preparation and Management of Standard Operating Procedures".

The laboratory QA Department also maintains access to various references and document sources integral to the operation of the laboratory. This includes reference methods and regulations. Instrument manuals (hard or electronic copies) are also maintained by the laboratory.

The laboratory maintains control of records for raw analytical data and supporting records such as audit reports and responses, logbooks, standard logs, training files, MDL studies, Proficiency Testing (PT) studies, certifications and related correspondence, and corrective action reports. Raw analytical data consists of bound logbooks, instrument printouts, any other notes, magnetic media, electronic data and final reports.

6.2 DOCUMENT APPROVAL AND ISSUE

The pertinent elements of a document control system for each document include a unique document title and number, the number of pages of the item, the effective date, revision number and the laboratory's name. The QA personnel are responsible for the maintenance of this system.

Controlled documents are authorized by the QA Department. In order to develop a new document, a manager submits an electronic draft to the QA Department for suggestions and approval before use. Upon approval, QA personnel add the identifying version information to

the document and retain the official document on file. The official document is provided to all applicable operational units (may include electronic access). Controlled documents are identified as such and records of their distribution are kept by the QA Department. Document control may be achieved by either electronic or hardcopy distribution.

The QA Department maintains a list of the official versions of controlled documents.

Quality System Policies and Procedures will be reviewed at a minimum of every year and revised as appropriate. Changes to documents occur when a procedural change warrants.

6.3 PROCEDURES FOR DOCUMENT CONTROL POLICY

For changes to the QA Manual, refer to SOP No. WS-QA-0021, "Preparation and Management of Standard Operating Procedures". Uncontrolled copies must not be used within the laboratory. Previous revisions and back-up data are stored by the QA department. Electronic copies are stored on the Public server in the QA folder for the applicable revision, and are accessible using the laboratory's Intranet.

For changes to SOPs, refer to SOP No. CW-Q-S-002, Writing a Standard Operating Procedure SOP and SOP No. WS-QA-0021, "Preparation and Management of Standard Operating Procedures". The SOP identified above also defines the process of changes to SOPs.

Forms, worksheets, work instructions and information are organized in the QA office. There is a database tracking forms. Electronic versions are kept on a hard drive in the QA department. The procedure for the care of these documents is in SOP No. WS-QA-0021, "Preparation and Management of Standard Operating Procedures".

6.4 OBSOLETE DOCUMENTS

All invalid or obsolete documents are removed, or otherwise prevented from unintended use. The laboratory has specific procedures as described above to accomplish this. In general, obsolete documents are collected from employees according to distribution lists and are marked obsolete on the cover or destroyed. At least one copy of the obsolete document is archived according to SOP No. WS-QA-0021, "Preparation and Management of Standard Operating Procedures".

SECTION 7

SERVICE TO THE CLIENT *(NELAC 5.4.7)*

7.1 OVERVIEW

The laboratory has established procedures for the review of work requests and contracts, oral or written. The procedures include evaluation of the laboratory's capability and resources to meet the contract's requirements within the requested time period. All requirements, including the methods to be used, must be adequately defined, documented and understood. For many environmental sampling and analysis programs, testing design is site or program specific and does not necessarily "fit" into a standard laboratory service or product. It is the laboratory's intent to provide both standard and customized environmental laboratory services to our clients.

A thorough review of technical and QC requirements contained in contracts is performed to ensure project success. The appropriateness of requested methods, and the lab's capability to perform them must be established. Projects, proposals and contracts are reviewed for adequately defined requirements and the laboratory's capability to meet those requirements. Alternate test methods that are capable of meeting the clients' requirements may be proposed by the lab. A review of the lab's capability to analyze non-routine analytes is also part of this review process.

All projects, proposals and contracts are reviewed for the client's requirements in terms of compound lists, test methodology requested, sensitivity (detection and reporting levels), accuracy, and precision requirements (% Recovery and RPD). The reviewer ensures that the laboratory's test methods are suitable to achieve these regulatory and client requirements and that the laboratory holds the appropriate certifications and approvals to perform the work. The laboratory and any potential subcontract laboratories must be certified, as required, for all proposed tests.

The laboratory must determine if it has the necessary physical, personnel and information resources to meet the contract, and if the personnel have the expertise needed to perform the testing requested. Each proposal is checked for its impact on the capacity of the laboratory's equipment and personnel. As part of the review, the proposed turnaround time will be checked for feasibility.

Electronic or hard copy deliverable requirements are evaluated against the lab's capacity for production of the documentation.

If the laboratory cannot provide all services but intends to subcontract such services, whether to another TestAmerica facility or to an outside firm, this will be documented and discussed with the client prior to contract approval. (Refer to Section 8 for Subcontracting Procedures.)

The laboratory informs the client of the results of the review if it indicates any potential conflict, deficiency, lack of accreditation, or inability of the lab to complete the work satisfactorily. Any discrepancy between the client's requirements and the laboratory's capability to meet those requirements is resolved in writing before acceptance of the contract. It is necessary that the contract be acceptable to both the laboratory and the client. Amendments initiated by the client and/or TestAmerica, are documented in writing.

All contracts, QAPPs, Sampling and Analysis Plans (SAPs), contract amendments, and documented communications become part of the project record.

The same contract review process used for the initial review is repeated when there are amendments to the original contract by the client, and the participating personnel are informed of the changes.

7.2 REVIEW SEQUENCE AND KEY PERSONNEL

Appropriate personnel will review the work request at each stage of evaluation.

For routine projects and other simple tasks, a review by the Project Manager (PM) is considered adequate. The PM confirms that the laboratory has all required certifications, and can meet the clients' data quality and reporting requirements. The PM will also get approval by the Laboratory Director to commit to delivery schedules that are shorter than the published standard TATs. The Laboratory Director updates these TATs on a routine basis, and it is the responsibility of CSMs and PMs to review them prior to making commitments for the laboratory.

It is recommended that, where there is a sales person assigned to the account, an attempt should be made to contact that sales person to inform them of the incoming samples.

If the project is an air, drinking water, or high resolution opportunity, a message describing the opportunity will be immediately sent to the appropriate specialty market distribution list.

New opportunities with an estimated value greater than $100K are passed to the laboratory CSM or BDM, and a message regarding the project details is immediately forwarded to the Large Opportunity Tracking (LOT) distribution list. Specialty market distribution will be included in this notification as appropriate, as well as the associated sales person.

The contract review process is outlined in TestAmerica's Corporate SOP No. CA-L-P-002, Contract Compliance Policy.

This review encompasses all facets of the operation. The scope of work is distributed to the appropriate personnel, as needed based on scope of contract, to evaluate all of the requirements shown above (not necessarily in the order below.)

- Legal & Contracts Director
- General Manager
- The Customer Service Manager
- The Business Development Manager
- Laboratory and/or Corporate Technical Directors
- Laboratory and/or Corporate Information Technology Managers/Directors
- Regional and/or National Account representatives
- Laboratory and/or Corporate Quality
- Laboratory and/or Corporate Environmental Health and Safety Managers/Directors

- The Laboratory Director reviews the formal laboratory quote and makes final acceptance for their facility.

The National Account Director, Legal Contracts Director, or local account representative then submits the final proposal to the client.

In the event that one of the above personnel is not available to review the contract, his or her back-up will fulfill the review requirements.

The Legal & Contracts Director maintains copies of all signed contracts, as does the local Business Development Manager.

7.3 DOCUMENTATION

Appropriate records are maintained for every contract or work request. All stages of the contract review process are documented and include records of any significant changes. Contract negotiations and finalization is the responsibility of the Business Development Manager. These records are archived by client and project in a restricted network folder accessible to laboratory department managers, project managers, and senior managers.

Records are maintained of pertinent discussions with a client relating to the client's requirements or the results of the work during the period of execution of the contract. Each Laboratory Project Manager keeps a phone log of conversations with the client. In addition, all conversations involving notification of important information, or actions directed by the client are documented with a follow up e-mail and archived in the contracts folder or the SDG documentation and case narrative. Instances include change in scope, alterations to the requests listed on a chain of custody, directions to proceed in the event of a non-conformance, and any other conversation that changes the direction of a COC or contract.

7.3.1 Project-Specific Quality Planning

Communication of contract specific technical and QC criteria is an essential activity in ensuring the success of site specific testing programs. To achieve this goal, the laboratory assigns a PM to each client. It is the PM's responsibility to ensure that project-specific technical and QC requirements are effectively evaluated and communicated to the laboratory personnel before and during the project. QA department involvement may be needed to assist in the evaluation of custom QC requirements.

PM's are the primary client contact and they ensure resources are available to meet project requirements. Although PM's do not have direct reports or staff in production, they coordinate opportunities and work with laboratory management and supervisory staff to ensure available resources are sufficient to perform work for the client's project. Project management is positioned between the client and laboratory resources.

Prior to work on a new project, the dissemination of project information and/or project opening meetings may occur to discuss schedules and unique aspects of the project. Items to be discussed may include the project technical profile, turnaround times, holding times, methods, analyte lists, reporting limits, deliverables, sample hazards, or other special requirements. The PM introduces new projects to the laboratory staff through project kick-off meetings or to the

supervisory staff during production meetings. These meetings provide direction to the laboratory staff in order to maximize production and client satisfaction, while maintaining quality. In addition, project notes may be associated with each sample batch as a reminder upon sample receipt and analytical processing.

During the project, any change that may occur within an active project is agreed upon between the client/regulatory agency and the PM/laboratory. These changes (e.g., use of a non-standard method or modification of a method) and approvals must be documented prior to implementation. Documentation pertains to any document, e.g., letter, e-mail, variance, contract addendum, which has been signed by both parties.

Such changes are updated to the QAS and introduced to the managers at these meetings. The laboratory staff is then introduced to the modified requirements via the PM or the individual laboratory Department Manager. After the modification is implemented into the laboratory process, documentation of the modification is made in the case narrative of the data report(s).

The laboratory strongly encourages client visits to the laboratory and for formal/informal information sharing session with employees in order to effectively communicate ongoing client needs as well as project specific details for customized testing programs.

7.4 SPECIAL SERVICES

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. It is the laboratory's goal to meet all client requirements in addition to statutory and regulatory requirements. The laboratory has procedures to ensure confidentiality to clients (Section 15 and 25).

Note: ISO 17025/NELAC 2003 states that a laboratory "shall afford clients or their representatives cooperation to clarify the client's request". This topic is discussed in Section 7.

The laboratory's standard procedures for reporting data are described in Section 25. Special services are also available and provided upon request. These services include:

- Reasonable access for our clients or their representatives to the relevant areas of the laboratory for the witnessing of tests performed for the client.
- Assist client-specified third party data validators as specified in the client's contract.
- Supplemental information pertaining to the analysis of their samples. Note: An additional charge may apply for additional data/information that was not requested prior to the time of sample analysis or previously agreed upon.

7.5 CLIENT COMMUNICATION

Project managers are the primary communication link to the clients. They shall inform their clients of any delays in project completion as well as any non-conformances in either sample receipt or sample analysis. Project management will maintain ongoing client communication throughout the entire client project.

Any member of senior staff or technical experts is available to discuss any technical questions or concerns that the client may have.

7.6 REPORTING

The laboratory works with our clients to produce any special communication reports required by the contract.

7.7 CLIENT SURVEYS

The laboratory assesses both positive and negative client feedback. The results are used to improve overall laboratory quality and client service.

TestAmerica's Sales and Marketing teams periodically develops lab and client specific surveys to assess client satisfaction.

SECTION 8

SUBCONTRACTING OF TESTS *(NELAC 5.4.5)*

8.1 OVERVIEW

For the purpose of this quality manual, the phrase “subcontract laboratory” refers to a laboratory external to the TestAmerica laboratories. The phrase “work sharing” refers to internal transfers of samples between the TestAmerica laboratories. The term outsourcing refers to the act of subcontracting tests.

When contracting with our clients, the laboratory makes commitments regarding the services to be performed and the data quality for the results to be generated. When the need arises to outsource testing for our clients due to project scope, changes in laboratory capabilities, capacity or unforeseen circumstances, we must be assured that the subcontractors or work sharing laboratories understand the requirements and will meet the same commitments we have made to the client. Refer to TestAmerica’s Corporate SOPs on Subcontracting Procedures (CA-L-S-002) and the Work Sharing Process (CA-C-S-001).

When outsourcing analytical services, the laboratory will assure, to the extent necessary, that the subcontract or work sharing laboratory maintains a program consistent with the requirements of this document, the requirements specified in NELAC/ISO 17025 and/or the client’s Quality Assurance Project Plan (QAPP). All QC guidelines specific to the client’s analytical program are transmitted to the subcontractor and agreed upon before sending the samples to the subcontract facility. Additionally, work requiring accreditation will be placed with an appropriately accredited laboratory. The laboratory performing the subcontracted work will be identified in the final report, as will non-NELAC accredited work where required.

Project Managers (PMs), Customer Service Managers (CSM), or Regional Account Executives (RAE) for the Export Lab are responsible for obtaining client approval prior to outsourcing any samples. The laboratory will advise the client of a subcontract or work sharing arrangement in writing and when possible approval from the client shall be retained in the project folder.

Note: In addition to the client, some regulating agencies, such as the US Army Corps of Engineers and the USDA, require notification prior to placing such work. Documentation of approval is stored electronically in the QBIS folder on the “world” share on the laboratory’s server.

8.2 QUALIFYING AND MONITORING SUBCONTRACTORS

Whenever a PM or Customer Service Manager (CSM) becomes aware of a client requirement or laboratory need where samples must be outsourced to another laboratory, the other laboratory(s) shall be selected based on the following:

- The first priority is to attempt to place the work in a qualified TestAmerica laboratory;
- Firms specified by the client for the task (Documentation that a subcontractor was designated by the client must be maintained with the project file. This documentation can be as simple as placing a copy of an e-mail from the client in the project folder);

- Firms listed as pre-qualified and currently under a subcontract with TestAmerica: A listing of all approved subcontracting laboratories and supporting documentation is available on the TestAmerica intranet site. Verify necessary accreditation, where applicable, (e.g., on the subcontractors NELAC, A2LA accreditation or State Certification).
- Firms identified in accordance with the company's Small Business Subcontracting program as small, women-owned, veteran-owned and/or minority-owned businesses;
- NELAC or A2LA accredited laboratories.
- In addition, the firm must hold the appropriate certification to perform the work required.

All TestAmerica laboratories are pre-qualified for work sharing provided they hold the appropriate accreditations, can adhere to the project/program requirements, and the client approved sending samples to that laboratory. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented). The originating laboratory is responsible for communicating all technical, quality, and deliverable requirements as well as other contract needs. (Corporate SOP No. CA-C-S-001, Work Sharing Process).

When the potential sub-contract laboratory has not been previously approved, PMs or CSMs may nominate a laboratory as a subcontractor based on need. The decision to nominate a laboratory must be approved by the Laboratory Director/Manager. The Laboratory Director/Manager requests that the QA Manager begin the process of approving the subcontract laboratory as outlined in Corporate SOP No. CA-L-S-002, Subcontracting Procedures. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented).

8.2.1 Once the appropriate accreditation and legal information is received by the laboratory, it is evaluated for acceptability (where applicable) and forwarded to Corporate Contracts for formal contracting with the laboratory. They will add the lab to the approved list on the intranet site along with the associate documentation and notify the finance group for JD Edwards.

8.2.2 The client will assume responsibility for the quality of the data generated from the use of a subcontractor they have requested the lab to use. The qualified subcontractors on the intranet site are known to meet minimal standards. TestAmerica does not certify laboratories. The subcontractor is on our approved list and can only be recommended to the extent that we would use them.

8.2.3 The status and performance of qualified subcontractors will be monitored periodically by the Corporate Contracts and/or Quality Departments. Any problems identified will be brought to the attention of TestAmerica's Corporate Finance or Corporate Quality personnel.

- Complaints shall be investigated. Documentation of the complaint, investigation and corrective action will be maintained in the subcontractor's file on the intranet site. Complaints are posted using the Vendor Performance Report.
- Information shall be updated on the intranet when new information is received from the subcontracted laboratories.

- Subcontractors in good standing will be retained on the intranet listing. The QA Manager will notify all TestAmerica laboratories, Corporate Quality and Corporate Contracts if any laboratory requires removal from the intranet site. This notification will be posted on the intranet site and e-mailed to all Lab Directors/Managers, QA Managers and Sales Personnel.

8.3 OVERSIGHT AND REPORTING

The PM must request that the selected subcontractor be presented with a subcontract, if one is not already executed between the laboratory and the subcontractor. The subcontract must include terms which flow down the requirements of our clients, either in the subcontract itself or through the mechanism of work orders relating to individual projects. A standard subcontract and the Lab Subcontractor Vendor Package (posted on the intranet) can be used to accomplish this, and the Legal & Contracts Director can tailor the document or assist with negotiations, if needed. The PM (or CSM) responsible for the project must advise and obtain client consent to the subcontract as appropriate, and provide the scope of work to ensure that the proper requirements are made a part of the subcontract and are made known to the subcontractor.

Prior to sending samples to the subcontracted laboratory, the PM confirms their certification status to determine if it is current and scope-inclusive. The information is documented in the QBIS directory in the project folder, and is retained in the Quality Assurance office. For TestAmerica laboratories, certifications can be viewed on the company's TotalAccess Database.

The Sample Control department is responsible for ensuring compliance with QA requirements and applicable shipping regulations when shipping samples to a subcontracted laboratory.

All subcontracted samples must be accompanied by a Chain of Custody (COC). A copy of the original COC sent by the client must be included with all samples subbed within TestAmerica.

Through communication with the subcontracted laboratory, the PM monitors the status of the subcontracted analyses, facilitates successful execution of the work, and ensures the timeliness and completeness of the analytical report.

Non-NELAC accredited work must be identified in the subcontractor's report as appropriate. If NELAC accreditation is not required, the report does not need to include this information.

Reports submitted from subcontractor laboratories are not altered and are included in their original form in the final project report. This clearly identifies the data as being produced by a subcontractor facility. Results submitted by a network work-sharing laboratory on the same LIMS will be designated in the case narrative.

Note: The results submitted by a TestAmerica work sharing laboratory may be transferred electronically and the results reported by the TestAmerica work sharing lab are identified on the final report. The report must explicitly indicate which lab produced the data for which methods and samples. The final report must include a copy of the completed COC for all work sharing reports.

8.4 CONTINGENCY PLANNING

The Laboratory Director may waive the full qualification of a subcontractor process temporarily to meet emergency needs. In the event this provision is utilized, the QA Manager will be required to verify certifications. The comprehensive approval process must then be initiated within 30 calendar days of subcontracting.

SECTION 9

PURCHASING SERVICES AND SUPPLIES *(NELAC 5.4.6)*

9.1 OVERVIEW

Evaluation and selection of suppliers and vendors is performed, in part, on the basis of the quality of their products, their ability to meet the demand for their products on a continuous and short term basis, the overall quality of their services, their past history, and competitive pricing. This is achieved through evaluation of objective evidence of quality furnished by the supplier, which can include certificates of analysis, recommendations, and proof of historical compliance with similar programs for other clients. To ensure that quality critical consumables and equipment conform to specified requirements, all purchases from specific vendors are approved by a member of the supervisory or management staff. Capital expenditures are made in accordance with TestAmerica's Corporate Controlled Purchases Procedure, SOP No. CW-F-S-007.

Contracts will be signed in accordance with TestAmerica's Corporate Authorization Matrix Policy, Policy No. CW-F-P-002. Request for Proposals (RFP's) will be issued where more information is required from the potential vendors than just price. Process details are available in TestAmerica's Corporate Procurement and Contracts Policy (Policy No. CW-F-P-004). RFP's allow TestAmerica to determine if a vendor is capable of meeting requirements such as supplying all of the TestAmerica facilities, meeting required quality standards and adhering to necessary ethical and environmental standards. The RFP process also allows potential vendors to outline any additional capabilities they may offer.

9.2 GLASSWARE

Glassware used for volumetric measurements must be Class A or verified for accuracy according to laboratory procedure. Pyrex (or equivalent) glass should be used where possible. For safety purposes, thick-wall glassware should be used where available.

9.3 REAGENTS, STANDARDS & SUPPLIES

Purchasing guidelines for equipment and reagents must meet the requirements of the specific method and testing procedures for which they are being purchased. Solvents and acids are pre-tested in accordance with TestAmerica's Corporate SOP on Solvent & Acid Lot Testing & Approval, SOP No. CA-Q-S-001.

9.3.1 Purchasing

Chemical reagents, solvents, glassware, and general supplies are ordered as needed to maintain sufficient quantities on hand. Materials used in the analytical process must be of a known quality. The wide variety of materials and reagents available makes it advisable to specify recommendations for the name, brand, and grade of materials to be used in any determination. This information is contained in the method SOP.

Only personnel trained in the ordering program JDE may place orders using the program. All relevant information, including quantity, must be entered. Only approved vendors may be used.

A vendor must be approved by corporate to be on the approved vendor list in JDE. The Laboratory Director or designee approves all orders placed in JDE.

9.3.2 Receiving

It is the responsibility of the facilities manager to receive the shipment. It is the responsibility of the analyst who ordered the materials to date the material when received. Once the ordered reagents or materials are received, the analyst compares the information on the label or packaging to the original order to ensure that the purchase meets the quality level specified. Material Safety Data Sheets (MSDSs) are available online through the Company's intranet website. Anyone may review these for relevant information on the safe handling and emergency precautions of on-site chemicals.

9.3.3 Specifications

All methods in use in the laboratory specify the grade of reagent that must be used in the procedure. If the quality of the reagent is not specified, it may be assumed that it is not significant in that procedure and, therefore, any grade reagent may be used. It is the responsibility of the analyst to check the procedure carefully for the suitability of grade of reagent.

Chemicals must not be used past the manufacturer's expiration date and must not be used past the expiration time noted in a method SOP. If expiration dates are not provided, the laboratory may contact the manufacturer to determine an expiration date.

The laboratory assumes a five year expiration date on inorganic dry chemicals unless noted otherwise by the manufacturer or by the reference source method. Chemicals should not be used past the manufacturer's or SOP's expiration date unless 'verified'. See laboratory SOP No. WS-QA-0017, "Standards and Reagent Preparation and Quality Control Check Procedures", for standard verification procedures.

Wherever possible, standards must be traceable to national or international standards of measurement or to national or international reference materials. Records to that effect are available to the user.

Compressed gases in use are checked for pressure and secure positioning every other day. The minimum total pressure must be 250 psig for the automatic bank of gas tanks before the system switches to the next bank of tanks. No individual compressed gas tanks are used at the instrument benches at the laboratory. The quality of the gases must meet method or manufacturer specification or be of a grade that does not cause any analytical interference.

Water used in the preparation of standards or reagents must have a specific conductivity of less than 1- mmho/cm (or specific resistivity of greater than 1.0 megaohm-cm) at 25^{o}C. The specific conductivity is checked and recorded daily. If the water's specific conductivity is greater than the specified limit, the Facility Manager and appropriate Department Managers must be notified immediately in order to notify all departments, decide on cessation (based on intended use) of activities, and make arrangements for correction.

The laboratory may purchase reagent grade (or other similar quality) water for use in the laboratory. This water must be certified "clean" by the supplier for all target analytes or otherwise verified by the laboratory prior to use. This verification is documented.

Standard lots are verified before first time use if the laboratory switches manufacturers or has historically had a problem with the type of standard. See laboratory SOP No. WS-QA-0017, "Standards and Reagent Preparation and Quality Control Check Procedures", for standard QC procedures.

Purchased VOA vials must be certified clean and the certificates must be maintained. If uncertified VOA vials are purchased, all lots must be verified clean prior to use. This verification must be maintained.

Records of manufacturer's certification and traceability statements are maintained in files or binders in each laboratory section. These records include date of receipt, lot number (when applicable), and expiration date (when applicable).

9.3.4 Storage

Reagent and chemical storage is important from the aspects of both integrity and safety. Light-sensitive reagents may be stored in brown-glass containers. Storage conditions are per the Corporate Environmental Health & Safety Manual (Corp. Doc. No. CW-E-M-001) and method SOPs or manufacturer instructions.

9.4 PURCHASE OF EQUIPMENT/INSTRUMENTS/SOFTWARE

When a new piece of equipment is needed, either for additional capacity or for replacing inoperable equipment, the analyst or supervisor makes a supply request to the Technical Director and/or the Laboratory Director. If they agree with the request, the procedures outlined in TestAmerica's Corporate Policy No. CA-T-P-001, Qualified Products List are followed. A decision is made as to which piece of equipment can best satisfy the requirements. The appropriate written requests are completed and purchasing places the order.

Upon receipt of a new or used piece of equipment, an identification name is assigned and added to the equipment list. IT must also be notified so that they can synchronize the instrument for back-ups. Its capability is assessed to determine if it is adequate or not for the specific application. For instruments, a calibration curve is generated, followed by MDLs, Demonstration of Capabilities (DOCs), and other relevant criteria (refer to Section 19). For software, its operation must be deemed reliable and evidence of instrument verification must be retained by the IT Department or QA Department. Software certificates supplied by the vendors are filed with the LIMS Administrator. The manufacturer's operation manual is retained at the bench.

9.5 SERVICES

Service to analytical instruments (except analytical balances) is performed on an as needed basis. Routine preventative maintenance is discussed in Section 20. The need for service is determined by analysts and/or Department Managers. The service providers that perform the services are approved by the Department Managers/Technical Director.

9.6 SUPPLIERS

TestAmerica selects vendors through a competitive proposal / bid process, strategic business alliances or negotiated vendor partnerships (contracts). This process is defined in the Corporate Finance documents on Vendor Selection (SOP No. CW-F-S-018) and Procurement & Contracts Policy (Policy No. CW-F-P-004). The level of control used in the selection process is dependent on the anticipated spending amount and the potential impact on TestAmerica business. Vendors that provide test and measuring equipment, solvents, standards, certified containers, instrument related service contracts or subcontract laboratory services shall be subject to more rigorous controls than vendors that provide off-the-shelf items of defined quality that meet the end use requirements. The JD Edwards purchasing system includes all suppliers/vendors that have been approved for use.

Evaluation of suppliers is accomplished by ensuring the supplier ships the product or material ordered and that the material is of the appropriate quality. This is documented by signing off on packing slips or other supply receipt documents. The purchasing documents contain the data that adequately describe the services and supplies ordered.

Any issues of vendor performance are to be reported immediately by the laboratory staff to the Corporate Purchasing Group by completing a Vendor Performance Report.

The Corporate Purchasing Group will work through the appropriate channels to gather the information required to clearly identify the problem and will contact the vendor to report the problem and to make any necessary arrangements for exchange, return authorization, credit, etc.

As deemed appropriate, the Vendor Performance Reports will be summarized and reviewed to determine corrective action necessary, or service improvements required by vendors

The laboratory has access to a listing of all approved suppliers of critical consumables, supplies and services. This information is provided through the JD Edwards purchasing system.

9.6.1 New Vendor Procedure

TestAmerica employees who wish to request the addition of a new vendor must complete a J.D. Edwards Vendor Add Request Form.

New vendors are evaluated based upon criteria appropriate to the products or services provided as well as their ability to provide those products and services at a competitive cost. Vendors are also evaluated to determine if there are ethical reasons or potential conflicts of interest with TestAmerica employees that would make it prohibitive to do business with them as well as their financial stability. The QA Department and/or the Technology Director are consulted with vendor and product selection that have an impact on quality.

SECTION 10

COMPLAINTS *(NELAC 5.4.8)*

10.1 OVERVIEW

The laboratory considers an effective client complaint handling processes to be of significant business and strategic value. Listening to and documenting client concerns captures 'client knowledge' that enables our operations to continually improve processes and client satisfaction. An effective client complaint handling process also provides assurance to the data user that the laboratory will stand behind its data, service obligations and products.

A client complaint is any expression of dissatisfaction with any aspect of our business services (e.g., communications, responsiveness, data, reports, invoicing and other functions) expressed by any party, whether received verbally or in written form. Client inquiries, complaints or noted discrepancies are documented, communicated to management, and addressed promptly and thoroughly.

The laboratory has procedures for addressing both external and internal complaints with the goal of providing satisfactory resolution to complaints in a timely and professional manner.

The nature of the complaint is identified, documented and investigated, and an appropriate action is determined and taken. In cases where a client complaint indicates that an established policy or procedure was not followed, the QA Department must evaluate whether a special audit must be conducted to assist in resolving the issue. A written confirmation or letter to the client, outlining the issue and response taken is recommended as part of the overall action taken.

The process of complaint resolution and documentation utilizes the procedures outlined in Section 12 (Corrective Actions) and is documented following laboratory policy WS-PQA-013 "Procedure to Address Customer Complaints".

10.2 EXTERNAL COMPLAINTS

An employee that receives a complaint initiates the complaint resolution process by first documenting the complaint according to laboratory policy WS-PQA-013 "Procedure to Address Customer Complaints".

Complaints fall into two categories: correctable and non-correctable. An example of a correctable complaint would be one where a report re-issue would resolve the complaint. An example of a non-correctable complaint would be one where a client complains that their data was repeatedly late. Non-correctable complaints should be reviewed for preventive action measures to reduce the likelihood of future occurrence and mitigation of client impact.

The general steps in the complaint handling process are:

- Receiving and Documenting Complaints
- Complaint Investigation and Service Recovery
- Process Improvement

The laboratory shall inform the initiator of the complaint of the results of the investigation and the corrective action taken, if any.

10.3 INTERNAL COMPLAINTS

Internal complaints include, but are not limited to: errors and non-conformances, training issues, internal audit findings, and deviations from methods. Corrective actions may be initiated by any staff member who observes a nonconformance and shall follow the procedures outlined in Section 12. In addition, Corporate Management, Sales and Marketing and IT may initiate a complaint by contacting the laboratory or through the corrective action system described in Section 12.

10.4 MANAGEMENT REVIEW

The number and nature of client complaints is reported by the QA Manager to the laboratory and QA Director in the QA Monthly report. Monitoring and addressing the overall level and nature of client complaints and the effectiveness of the solutions is part of the Annual Management Review (Section 16).

SECTION 11

CONTROL OF NON-CONFORMING WORK *(NELAC 5.4.9)*

11.1 OVERVIEW

When data discrepancies are discovered or deviations and departures from laboratory SOPs, policies and/or client requests have occurred, corrective action is taken immediately. First, the laboratory evaluates the significance of the nonconforming work. Then, a corrective action plan is initiated based on the outcome of the evaluation. If it is determined that the nonconforming work is an isolated incident, the plan could be as simple as adding a qualifier to the final results and/or making a notation in the case narrative. If it is determined that the nonconforming work is a systematic or improper practices issue, the corrective action plan could include a more in depth investigation and a possible suspension of an analytical method. In all cases, the actions taken are documented using the laboratory's corrective action system (refer to Section 12).

Due to the frequently unique nature of environmental samples, sometimes departures from documented policies and procedures are needed. When an analyst encounters such a situation, the problem is presented to the Department Manager for resolution. The Department Manager may elect to discuss it with the Operations Manager or QA Manager or have a representative contact the client to decide on a logical course of action. Once an approach is agreed upon, the analyst documents it using the laboratories corrective action system described in Section 12. This information can then be supplied to the client in the form of a footnote or a case narrative with the report.

Project Management may encounter situations where a client may request that a special procedure be applied to a sample that is not standard lab practice. Based on a technical evaluation, the lab may accept or opt to reject the request based on technical or ethical merit. An example might be the need to report a compound that the lab does not normally report. The lab would not have validated the method for this compound following the procedures in Section 19. The client may request that the compound be reported based only on the calibration. Such a request would need to be approved by the Laboratory Director and QA Manager, documented and included in the project folder. Deviations must also be noted on the final report with a statement that the compound is not reported in compliance with NELAC (or the analytical method) requirements and the reason. Data being reported to a non-NELAC state would need to note the change made to how the method is normally run.

11.2 RESPONSIBILITIES AND AUTHORITIES

TestAmerica's Corporate SOP entitled *Internal Investigation of Potential Data Discrepancies and Determination for Data Recall* (SOP No. CA-L-S-001) outlines the general procedures for the reporting and investigation of data discrepancies and alleged incidents of misconduct or violations of TestAmerica's data integrity policies as well as the policies and procedures related to the determination of the potential need to recall data.

Under certain circumstances, the Laboratory Director/Manager, a Lab Supervisor, or a member of the QA team may authorize departures from documented procedures or policies. The departures may be a result of procedural changes due to the nature of the sample; a one-time procedure for a client; QC failures with insufficient sample to reanalyze, etc. In most cases, the

client will be informed of the departure prior to the reporting of the data. Any departures must be well documented using the laboratory's corrective action procedures. This information may also be documented in logbooks and/or data review checklists as appropriate. Any impacted data must be referenced in a case narrative and/or flagged with an appropriate data qualifier.

Any misrepresentation or possible misrepresentation of analytical data discovered by any laboratory staff member must be reported to facility Senior Management within 24 hours. The Senior Management staff is comprised of the Laboratory Director, the QA Manager, the Operations Manager, the Manager of Project Management, and the Business Development Manager. The reporting of issues involving alleged violations of the company's Data Integrity or Manual Integration procedures must be conveyed to an Ethics and Compliance Officer (ECO), Director of Quality & Client Advocacy and the laboratory's Quality Director within 24 hours of discovery.

Whether an inaccurate result was reported due to calculation or quantitation errors, data entry errors, improper practices, or failure to follow SOPs, the data must be evaluated to determine the possible effect.

The Laboratory Director/Manager, QA Manager, ECOs, Corporate Quality, the COO, General Managers and the Quality Directors have the authority and responsibility to halt work, withhold final reports, or suspend an analysis for due cause as well as authorize the resumption of work.

11.3 EVALUATION OF SIGNIFICANCE AND ACTIONS TAKEN

For each nonconforming issue reported, an evaluation of its significance and the level of management involvement needed is made. This includes reviewing its impact on the final data, whether or not it is an isolated or systematic issue, and how it relates to any special client requirements.

TestAmerica's Corporate Data Investigation & Recall Procedure (SOP No. CA-L-S-001) distinguishes between situations when it would be appropriate for laboratory management to make the decision on the need for client notification (written or verbal) and data recall (report revision) and when the decision must be made with the assistance of the ECOs and Corporate Management. Laboratory level decisions are documented and approved using the laboratory's standard nonconformance/corrective action reporting in lieu of the data recall determination form contained in TestAmerica's Corporate SOP No. CA-L-S-001.

11.4 PREVENTION OF NONCONFORMING WORK

If it is determined that the nonconforming work could recur, further corrective actions must be made following the laboratory's corrective action system. On a monthly basis, the QA Department evaluates non-conformances to determine if any nonconforming work has been repeated multiple times. If so, the laboratory's corrective action process may be followed.

11.5 METHOD SUSPENSION/RESTRICTION (STOP WORK PROCEDURES)

In some cases, it may be necessary to suspend/restrict the use of a method or target compound which constitutes significant risk and/or liability to the laboratory. Suspension/restriction procedures can be initiated by any of the persons noted in Section 11.2, Paragraph 5.

Prior to suspension/restriction, confidentiality will be respected, and the problem with the required corrective and preventive action will be stated in writing and presented to the Laboratory Director.

The Laboratory Director shall arrange for the appropriate personnel to meet with the QA Manager as needed. This meeting shall be held to confirm that there is a problem, that suspension/restriction of the method is required and will be concluded with a discussion of the steps necessary to bring the method/target or test fully back on line. In some cases, that may not be necessary if all appropriate personnel have already agreed there is a problem and there is agreement on the steps needed to bring the method, target or test fully back on line.

The QA Manager will also initiate a corrective action report as described in Section 12 if one has not already been started. A copy of any meeting notes and agreed upon steps should be faxed or e-mailed by the laboratory to the appropriate General Manager and member of Corporate QA. This fax/e-mail acts as notification of the incident.

After suspension/restriction, the lab will hold all reports to clients pending review. No faxing, mailing or distributing through electronic means may occur. The report must not be posted for viewing on the internet. It is the responsibility of the Laboratory Director to hold all reporting and to notify all relevant laboratory personnel regarding the suspension/restriction (e.g., Project Management, Log-in, etc…). Clients will NOT generally be notified at this time. Analysis may proceed in some instances depending on the non-conformance issue.

Within 72 hours, the QA Manager will determine if compliance is now met and reports can be released, OR determine the plan of action to bring work into compliance, and release work. A team, with all principals involved (Laboratory Director, Technical Director, QA Manager, Supervisor) can devise a start-up plan to cover all steps from client notification through compliance and release of reports. Project Management and the Directors of Client Services and Sales and Marketing must be notified if clients must be notified or if the suspension/restriction affects the laboratory's ability to accept work. The QA Manager must approve start-up or elimination of any restrictions after all corrective action is complete. This approval is given by final signature on the completed corrective action report.

SECTION 12

CORRECTIVE ACTION *(NELAC 5.4.10)*

12.1 OVERVIEW

A major component of TestAmerica's Quality Assurance (QA) Program is the problem investigation and feedback mechanism designed to keep the laboratory staff informed on quality related issues and to provide insight to problem resolution. When nonconforming work or departures from policies and procedures in the quality system or technical operations are identified, the corrective action procedure provides a systematic approach to assess the issues, restore the laboratory's system integrity, and prevent reoccurrence. Corrective actions are documented using Non-Conformance Memos (NCM) (refer to Figure 12-1).

12.2 GENERAL

Problems within the quality system or within analytical operations may be discovered in a variety of ways, such as QC sample failures, internal or external audits, proficiency testing (PT) performance, client complaints, staff observation, etc.

The purpose of a corrective action system is to:

- Identify non-conformance events and assign responsibility(s) for investigating.
- Resolve non-conformance events and assign responsibility for any required corrective action.
- Identify Systematic Problems before they become serious.
- Identify and track client complaints and provide resolution.

12.2.1 Non-Conformance Memo (NCM) - is used to document the following types of corrective actions:

- Deviations from an established procedure or SOP
- QC outside of limits (non matrix related)
- Isolated Reporting / Calculation Errors
- Failed or Unacceptable PT results.

12.2.2 Corrective Action Report (CAR) - is used to document the following types of corrective actions:

- Issues found while reviewing NCMs that warrant further investigation.
- Internal and external audit findings.
- Corrective actions that cross multiple departments in the laboratory.
- Systematic reporting / calculation errors.

12.3 CLOSED LOOP CORRECTIVE ACTION PROCESS

Any employee in the company can initiate a corrective action. There are four main components to a closed-loop corrective action process once an issue has been identified: Cause Analysis, Selection and Implementation of Corrective Actions (both short and long term), Monitoring of the Corrective Actions, and Follow-up.

12.3.1 Cause Analysis

- Upon discovery of a non-conformance event, the event must be defined and documented. An NCM or CAR must be initiated, someone is assigned to investigate the issue and the event is investigated for cause. Laboratory SOP No. WS-QA-0023, "Nonconformance and Corrective Action System", provides some general guidelines on determining responsibility for assessment.
- The cause analysis step is the key to the process as a long term corrective action cannot be determined until the cause is determined.
- If the cause is not readily obvious, the Department Manager or QA Manager (or QA designee) is consulted.

12.3.2 Selection and Implementation of Corrective Actions

- Where corrective action is needed, the laboratory shall identify potential corrective actions. The action(s) most likely to eliminate the problem and prevent recurrence are selected and implemented. Responsibility for implementation is assigned.
- Corrective actions shall be to a degree appropriate to the magnitude of the problem identified through the cause analysis.
- Whatever corrective action is determined to be appropriate, the laboratory shall document and implement the changes. The NCM or CAR is used for this documentation.

12.3.3 Monitoring of the Corrective Actions

- The Department Manager and QA Manager are responsible to ensure that the corrective action taken was effective.
- Ineffective actions are documented and re-evaluated until acceptable resolution is achieved. Department Managers are accountable to the Laboratory Director to ensure final acceptable resolution is achieved and documented appropriately.
- Each NCM and CAR is entered into a database for tracking purposes and reviewed to ensure that the corrective actions have taken effect.
- The QA Manager reviews monthly NCMs and CARs for trends. Highlights are included in the QA monthly report (refer to Section 16). If a significant trend develops that adversely affects quality, an audit of the area is performed and corrective action implemented.
- Any out-of-control situations that are not addressed acceptably at the laboratory level may be reported to the Corporate Quality Director by the QA Manager, indicating the nature of the out-of-control situation and problems encountered in solving the situation.

12.3.4 Follow-up Audits

- Follow-up audits may be initiated by the QA Manager and shall be performed as soon as possible when the identification of a nonconformance casts doubt on the laboratory's compliance with its own policies and procedures, or on its compliance with state or federal requirements.
- These audits often follow the implementation of the corrective actions to verify effectiveness. An additional audit would only be necessary when a critical issue or risk to business is discovered.

(Also refer to Section 15.2.4, Special Audits.)

12.4 TECHNICAL CORRECTIVE ACTIONS

In addition to providing acceptance criteria and specific protocols for technical corrective actions in the method SOPs, the laboratory has general procedures to be followed to determine when departures from the documented policies and procedures and quality control have occurred (refer to Section 11). The documentation of these procedures is through the use of an NCM or CAR.

Laboratory SOP No. WS-QA-0023, "Nonconformance and Corrective Action System" includes examples of general technical corrective actions. For specific criteria and corrective actions, refer to the analytical methods or specific method SOPs. The laboratory may also maintain Work Instructions on these items that are available upon request.

Laboratory SOP No. WS-QA-0023, "Nonconformance and Corrective Action System" provides some general guidelines for identifying the individual(s) responsible for assessing each QC type and initiating corrective action. The SOP also provides general guidance on how a data set should be treated if associated QC measurements are unacceptable. Specific procedures are included in Method SOPs, Work Instructions, QAM Sections 19 and 20. All corrective actions are reviewed monthly, at a minimum, by the QA Manager and highlights are included in the QA monthly report.

To the extent possible, samples shall be reported only if all quality control measures are acceptable. If the deficiency does not impair the usability of the results, data will be reported with an appropriate data qualifier and/or the deficiency will be noted in the case narrative. Where sample results may be impaired, the Project Manager is notified by an NCM and appropriate corrective action (e.g., reanalysis) is taken and documented.

12.5 BASIC CORRECTIONS

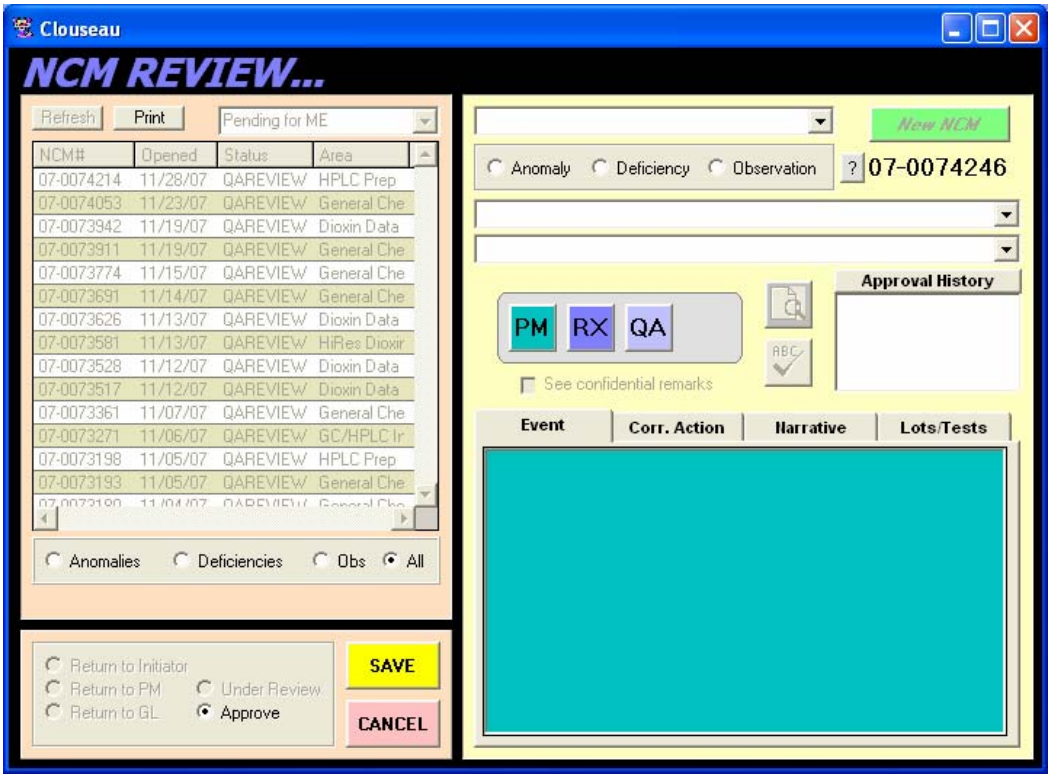
When mistakes occur in records, each mistake shall be crossed-out, [not obliterated (e.g. no white-out)], and the correct value entered alongside. All such corrections shall be initialed (or signed) and dated by the person making the correction. In the case of records stored electronically, the original "uncorrected" file must be maintained intact and a second "corrected" file is created.

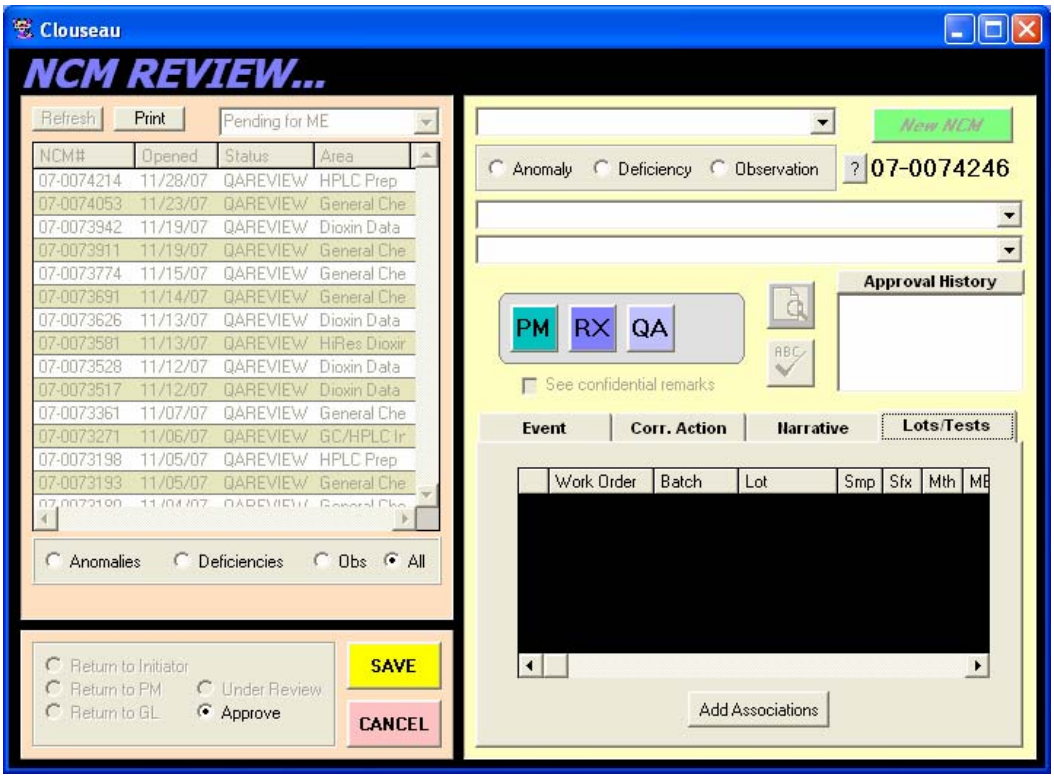
This same process applies to adding additional information to a record. All additions made later than the initial must also be initialed (or signed) and dated.

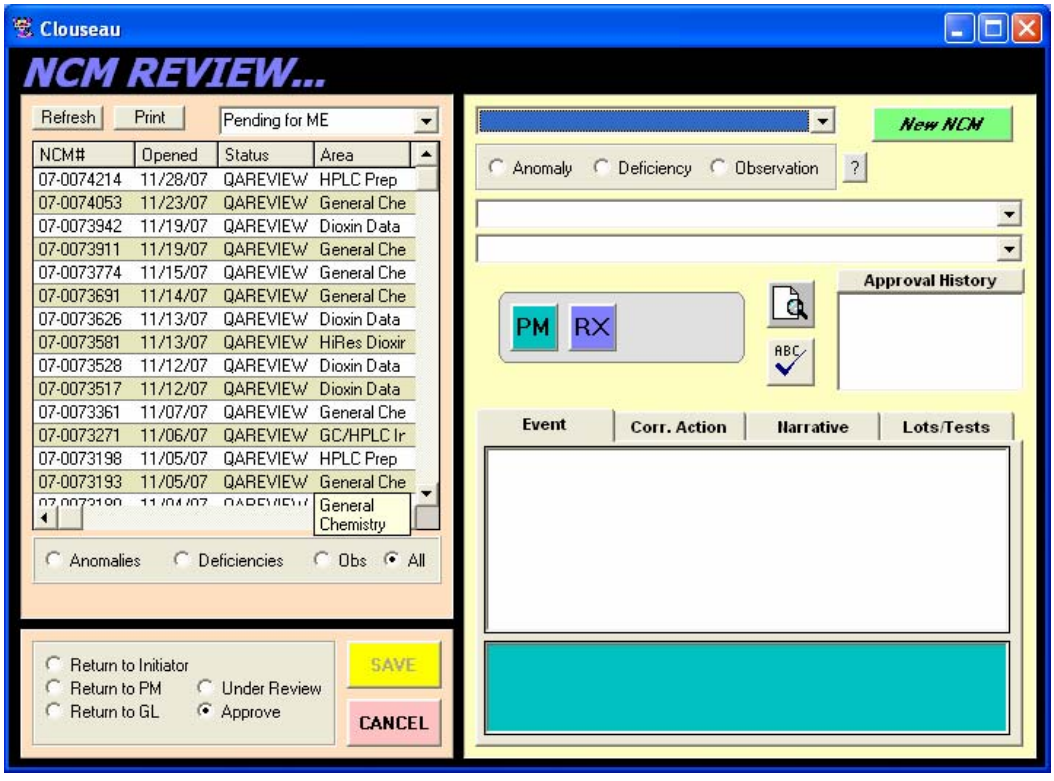
When corrections are due to reasons other than obvious transcription errors, the reason for the corrections (or additions) shall also be documented.

Figure 12-1.
Example – Non Conformance Memo

Example Screens:




Clouseau
NCM REVIEW...
Refresh
Print
Pending for ME
NCM# Opened Status Area
07-0074214 11/28/07 QAREVIEW HPLC Prep
07-0074053 11/23/07 QAREVIEW General Che
07-0073942 11/19/07 QAREVIEW Dioxin Data
07-0073911 11/19/07 QAREVIEW General Che
07-0073774 11/15/07 QAREVIEW General Che
07-0073691 11/14/07 QAREVIEW General Che
07-0073626 11/13/07 QAREVIEW Dioxin Data
07-0073581 11/13/07 QAREVIEW HiRes Dioxir
07-0073528 11/12/07 QAREVIEW Dioxin Data
07-0073517 11/12/07 QAREVIEW Dioxin Data
07-0073361 11/07/07 QAREVIEW General Che
07-0073271 11/06/07 QAREVIEW GC/HPLC Ir
07-0073198 11/05/07 QAREVIEW HPLC Prep
07-0073193 11/05/07 QAREVIEW General Che
Anomalies Deficiencies Obs All
Return to Initiator
Return to PM
Return to GL
Under Review
Approve
SAVE
CANCEL
New NCM
Anomaly Deficiency Observation
07-0074246
PM RX QA
See confidential remarks
Approval History
Event Corr. Action Narrative Lots/Tests
Work Order Batch Lot Smp Sfx Mth
Add Associations


Clouseau
NCM REVIEW...
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Pending for ME
NCM# Opened Status Area
07-0074214 11/28/07 QAREVIEW HPLC Prep
07-0074053 11/23/07 QAREVIEW General Che
07-0073942 11/19/07 QAREVIEW Dioxin Data
07-0073911 11/19/07 QAREVIEW General Che
07-0073774 11/15/07 QAREVIEW General Che
07-0073691 11/14/07 QAREVIEW General Che
07-0073626 11/13/07 QAREVIEW Dioxin Data
07-0073581 11/13/07 QAREVIEW HiRes Dioxir
07-0073528 11/12/07 QAREVIEW Dioxin Data
07-0073517 11/12/07 QAREVIEW Dioxin Data
07-0073361 11/07/07 QAREVIEW General Che
07-0073271 11/06/07 QAREVIEW GC/HPLC Ir
07-0073198 11/05/07 QAREVIEW HPLC Prep
07-0073193 11/05/07 QAREVIEW General Che
General Chemistry
Anomalies Deficiencies Obs All
Return to Initiator
Return to PM
Return to GL
Under Review
Approve
SAVE
CANCEL
New NCM
Anomaly Deficiency Observation
PM RX
Approval History
Event Corr. Action Narrative Lots/Tests

SECTION 13

PREVENTIVE ACTION *(NELAC 5.4.11)*

13.1 OVERVIEW

The laboratory's preventive action programs improve, or eliminate potential causes of nonconforming product and/or nonconformance to the quality system. This preventive action process is a proactive continuous process improvement activity that can be initiated through feedback from clients, employees, business providers, and affiliates. The QA Department has the overall responsibility to ensure that the preventive action process is in place, and that relevant information on actions is submitted for management review.

Dedicating resources to an effective preventive action system emphasizes the laboratory's commitment to its Quality Program. It is beneficial to identify and address negative trends before they develop into complaints, problems and corrective actions. Additionally, customer service and satisfaction can be improved through continuous improvements to laboratory systems.

Opportunities for improvement may be discovered during management reviews, the QA Metrics Report, internal or external audits, proficiency testing performance, client complaints, staff observation, etc.

The monthly QA Metrics Report shows performance indicators in all areas of the quality system. These areas include revised reports, corrective actions, audit findings, internal auditing and data authenticity audits, client complaints, PT samples, holding time violations, SOPs, ethics training, etc. These metrics are used to help evaluate quality system performance on an ongoing basis and provide a tool for identifying areas for improvement.

The laboratory's corrective action process is integral to implementation of preventive actions. A critical piece of the corrective action process is the implementation of actions to prevent further occurrence of a non-compliance event. Historical review of corrective action provides a valuable mechanism for identifying preventive action opportunities.

13.1.1 The following elements are part of a preventive action system:

- Identification of an opportunity for preventive action.
- Process for the preventive action.
- Define the measurements of the effectiveness of the process once undertaken.
- Execution of the preventive action.
- Evaluation of the plan using the defined measurements.
- Verification of the effectiveness of the preventive action.
- Close-Out by documenting any permanent changes to the Quality System as a result of the Preventive Action. Documentation of Preventive Action is incorporated into the monthly QA reports, corrective action process and management review.

13.1.2 Any Preventive Actions undertaken or attempted shall be taken into account during the Annual Management Review (Section 16). A highly detailed recap is not required; a simple recount of success and failure within the preventive action program will provide management a measure for evaluation.

13.2 MANAGEMENT OF CHANGE

The Management of Change process is designed to manage significant events and changes that occur within the laboratory. Through these various tracking indicators, the potential risks inherent with a new event or change are identified and evaluated. The risks are minimized or eliminated through pre-planning and the development of preventive measures. The types of indicators monitored under this collective system include:

- SOP Tracking
  - Current Revisions w/ Effective Dates
  - Required Annual/Biennial Revisions w/ Due Date
- Proficiency Testing (PT) Sample Tracking
  - Pass / Fail – most current 2 out of 3 studies.
- Instrument / Equipment List
  - Current / Location
- Accreditations
  - New / Expiring
- Method Capabilities
  - Current Listing by program (e.g., Potable Water, Soils, etc.)
- Key Personnel
  - Technical Managers, Department Supervisors, etc...

These items are maintained on TestAmerica's Intranet (Proposal Library) or on our internal database (TotalAccess) which uploads to our company internet site.

SECTION 14

CONTROL OF RECORDS *(NELAC 5.4.12)*

The laboratory maintains a record system appropriate to its needs and that complies with applicable standards or regulations as required. The system produces unequivocal, accurate records that document all laboratory activities. The laboratory retains all original observations, calculations and derived data, calibration records and a copy of the analytical report for a minimum of five years after it has been issued.

14.1 OVERVIEW

The laboratory has established procedures for identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records. A record index is listed in Table 14-1. Quality records are maintained by the QA department in a database, which is backed up as part of the regular laboratory backup. Records are of two types; either electronic or hard copy paper formats depending on whether the record is computer or hand generated (some records may be in both formats). Technical records are maintained by *Department Managers.*

Table 14-1. Record Index[1]

	Record Types [1]:	**Retention Time:**
Technical Records	- Raw Data - Logbooks[2] - Standards - Certificates - Analytical Records - Lab Reports	5 Years from analytical report issue*
Official Documents	- Quality Assurance Manual (QAM) - Work Instructions - Policies - SOPs - Manuals	5 Years from document retirement date*
QA Records	- Internal & External Audits/Responses - Certifications - Corrective/Preventive Actions - Management Reviews - Method & Software Validation / Verification Data - Data Investigation	5 Years from archival* **Data Investigation:** 5 years or the life of the affected raw data storage whichever is greater (beyond 5 years if ongoing project or pending investigation)
Project Records	- Sample Receipt & COC Documentation - Contracts and Amendments - Correspondence - QAPP - SAP - Telephone Logbooks - Lab Reports	5 Years from analytical report issue*

	Record Types [1]:	Retention Time:
Administrative Records	Finance and Accounting	10 years
	EH&S Manual, Permits, Disposal Records	7 years
	Employee Handbook	Indefinitely
	Personnel files, Employee Signature & Initials, Administrative Training Records (e.g., Ethics)	7 Years (HR Personnel Files must be maintained indefinitely)
	Administrative Policies Technical Training Records	7 years

[1] Record Types encompass hardcopy and electronic records.
[2] Examples of Logbook types: Maintenance, Instrument Run, Preparation (standard and samples), Standard and Reagent Receipt, Archiving, Balance Calibration, Temperature (hardcopy or electronic records).
* Exceptions listed in Table 14-2.

14.1.1 All records are stored and retained in such a way that they are secure and readily retrievable at the laboratory facility or the Iron Mountain data storage facility that provides a suitable environment to prevent damage or deterioration and to prevent loss**.** All records shall be protected against fire, theft, loss, environmental deterioration, and vermin. In the case of electronic records, electronic or magnetic sources, storage media are protected from deterioration caused by magnetic fields and/or electronic deterioration.

Access to the data is limited to laboratory and company employees. Records archived off-site are stored in a secure location where a record is maintained of any entry into the storage facility. Whether on-site or off-site storage is used, logs are maintained in each storage box to note removal and return of records. Records are maintained on-site at the laboratory for at least 1 month after their generation and moved offsite for the remainder of the required storage time. Records are maintained for a minimum of five years unless otherwise specified by a client or regulatory requirement.

For raw data and project records, record retention shall be calculated from the date the project report is issued. For other records, such as Controlled Documents, QA, or Administrative Records, the retention time is calculated from the date the record is formally retired. Records related to the programs listed in Table 14-2 have lengthier retention requirements and are subject to the requirements in Section 14.1.3.

14.1.2 Programs with Longer Retention Requirements

Some regulatory programs have longer record retention requirements than the standard record retention time. These are detailed in Table 14-2 with their retention requirements. In these cases, the longer retention requirement is enacted. If special instructions exist such that client data cannot be destroyed prior to notification of the client, the container or box containing that data is marked as to who to contact for authorization prior to destroying the data.

Table 14-2. Example: Special Record Retention Requirements

Program	[1]Retention Requirement
Drinking Water – All States	10 years (project records)
Drinking Water Lead and Copper Rule	12 years (project records)
Commonwealth of MA – All environmental data 310 CMR 42.14	10 years
FIFRA – 40 CFR Part 160	Retain for life of research or marketing permit for pesticides regulated by EPA
Housing and Urban Development (HUD) Environmental Lead Testing	10 years
Alaska	10 years
Louisiana – All	10 years
Michigan Department of Environmental Quality – all environmental data	10 years
Navy Facilities Engineering Service Center (NFESC)	10 years
NY Potable Water NYCRR Part 55-2	10 years
Ohio VAP	10 years and State contacted prior to disposal
TSCA - 40 CFR Part 792	10 years after publication of final test rule or negotiated test agreement

[1]Note: Extended retention requirements must be noted with the archive documents or addressed in facility-specific records retention procedures.

14.1.3 The laboratory has procedures to protect and back-up records stored electronically and to prevent unauthorized access to or amendment of these records. All analytical data is maintained as hard copy or in a secure readable electronic format. For analytical reports that are maintained as copies in PDF format, refer to Section 19.12.1 for more information

14.1.4 The record keeping system allows for historical reconstruction of all laboratory activities that produced the analytical data, as well as rapid recovery of historical data (records stored off site should be accessible within 2 days of a request for such records). The history of the sample from when the laboratory took possession of the samples must be readily understood through the documentation. This shall include inter-laboratory transfers of samples and/or extracts.

- The records include the identity of personnel involved in sampling, sample receipt, preparation, or testing. All analytical work contains the initials (at least) of the personnel involved. The laboratory's copy of the COC is stored with the invoice and the work order sheet generated by the LIMS. The chain of custody would indicate the name of the sampler. If any sampling notes are provided with a work order, they are kept with this package.
- All information relating to the laboratory facilities equipment, analytical test methods, and related laboratory activities, such as sample receipt, sample preparation, or data verification are documented.

- The record keeping system facilitates the retrieval of all working files and archived records for inspection and verification purposes (e.g., set format for naming electronic files, set format for what is included with a given analytical data set. Refer to SOP WS-QA-0009, "Document Archiving". Instrument data is stored by project, except for inorganics and calibration data. Inorganics and calibration data is stored sequentially by instrument as appropriate. Run logs are maintained for each instrument or method; a copy of each day's run long or instrument sequence is stored with the data to aid in re-constructing an analytical sequence. Where an analysis is performed without an instrument, bound logbooks or bench sheets are used to record and file data. Standard and reagent information is recorded in logbooks or entered into the LIMS for each method as required.
- Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.
- The reason for a signature or initials on a document is clearly indicated in the records such as "sampled by," "prepared by," "reviewed by", or "analyzed by".
- All generated data except those that are generated by automated data collection systems, are recorded directly, promptly and legibly in permanent dark ink.
- Hard copy data may be scanned into PDF format for record storage as long as the scanning process can be verified in order to ensure that no data is lost and the data files and storage media must be tested to verify the laboratory's ability to retrieve the information prior to the destruction of the hard copy that was scanned.
- Also refer to Section 19.13.1 'Computer and Electronic Data Related Requirements'.

14.2 TECHNICAL AND ANALYTICAL RECORDS

14.2.1 The laboratory retains records of original observations, derived data and sufficient information to establish an audit trail, calibration records, staff records and a copy of each analytical report issued, for a minimum of five years unless otherwise specified by a client or regulatory requirement. The records for each analysis shall contain sufficient information to enable the analysis to be repeated under conditions as close as possible to the original. The records shall include the identity of laboratory personnel responsible for the sampling, performance of each analysis and reviewing results.

14.2.2 Observations, data and calculations are recorded real-time and are identifiable to the specific task.

14.2.3 Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

The essential information to be associated with analysis, such as strip charts, tabular printouts, computer data files, analytical notebooks, and run logs, include:

- laboratory sample ID code;
- Date of analysis; Time of Analysis is also required if the holding time is seventy-two (72) hours or less, or when time critical steps are included in the analysis (e.g., drying times, incubations, etc.); instrumental analyses have the date and time of analysis recorded as part of their general operations. Where a time critical step exists in an analysis, location for such

a time is included as part of the documentation in a specific logbook or on a benchsheet or in the LIMs.

- Instrumentation identification and instrument operating conditions/parameters. Operating conditions/parameters are typically recorded in instrument maintenance logs where available.
- analysis type;
- all manual calculations and manual integrations;
- analyst's or operator's initials/signature;
- sample preparation including cleanup, separation protocols, ID codes, volumes, weights, instrument printouts, meter readings, calculations, reagents;
- test results;
- standard and reagent origin, receipt, preparation, and use;
- calibration criteria, frequency and acceptance criteria;
- data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions;
- quality control protocols and assessment;
- electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries; and
- Method performance criteria including expected quality control requirements. These are indicated both in the LIMS and on specific analytical report formats.

14.3 LABORATORY SUPPORT ACTIVITIES

In addition to documenting all the above-mentioned activities, the following are retained QA records and project records (previous discussions in this section relate where and how these data are stored):

- all original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts' work sheets and data output records (chromatograms, strip charts, and other instrument response readout records);
- a written description or reference to the specific test method used which includes a description of the specific computational steps used to translate parametric observations into a reportable analytical value;
- copies of final reports;
- archived SOPs;
- correspondence relating to laboratory activities for a specific project;
- all corrective action reports, audits and audit responses;
- proficiency test results and raw data; and
- results of data review, verification, and crosschecking procedures

14.3.1 Sample Handling Records

Records of all procedures to which a sample is subjected while in the possession of the laboratory are maintained. These include but are not limited to records pertaining to:

- sample preservation including appropriateness of sample container and compliance with holding time requirement;
- sample identification, receipt, acceptance or rejection and login;
- sample storage and tracking including shipping receipts, sample transmittal / COC forms; and
- procedures for the receipt and retention of samples, including all provisions necessary to protect the integrity of samples.

14.4 ADMINISTRATIVE RECORDS

The laboratory also maintains the administrative records in either electronic or hard copy form. Refer to Table 14-1.

14.5 RECORDS MANAGEMENT, STORAGE AND DISPOSAL

14.5.1 All records (including those pertaining to test equipment), certificates and reports are safely stored, held secure and in confidence to the client. Certification related records are available upon request.

14.5.2 All information necessary for the historical reconstruction of data is maintained by the laboratory. Records that are stored only on electronic media must be supported by the hardware and software necessary for their retrieval.

14.5.3 Records that are stored or generated by computers or personal computers have hard copy, write-protected backup copies, or an electronic audit trail controlling access**.**

14.5.4 The laboratory has a record management system for control of laboratory notebooks, instrument logbooks, standards logbooks, and records for data reduction, validation, storage and reporting. Laboratory notebooks are issued on a per analysis basis, and are numbered sequentially. All data are recorded sequentially within a series of sequential notebooks. Bench sheets are filed sequentially. Standards are maintained in a logbook or using the Veritas Electronic Standards Logbook**.** Records are considered archived when noted as such in the records management system.

14.5.5 Transfer of Ownership

In the event that the laboratory transfers ownership or goes out of business, the laboratory shall ensure that the records are maintained or transferred according to client's instructions. Upon ownership transfer, record retention requirements shall be addressed in the ownership transfer agreement and the responsibility for maintaining archives is clearly established. In addition, in cases of bankruptcy, appropriate regulatory and state legal requirements concerning laboratory records must be followed. In the event of the closure of the laboratory, all records will revert to the control of the corporate headquarters. Should the entire company cease to exist, as much

notice as possible will be given to clients and the accrediting bodies who have worked with the laboratory during the previous 5 years of such action.

14.5.6 Records Disposal

14.5.6.1 Records are removed from the archive and destroyed after 5 years unless otherwise specified by a client or regulatory requirement. On a project specific or program basis, clients may need to be notified prior to record destruction. Records are destroyed in a manner that ensures their confidentiality such as shredding, mutilation or incineration. (Refer to Tables 14-1 and 14-2).

14.5.6.2 Electronic copies of records must be destroyed by erasure or physically damaging off-line storage media so no records can be read.

14.5.6.3 If a third party records management company is hired to dispose of records, a "Certificate of Destruction" is required.

SECTION 15

AUDITS *(NELAC 5.4.13)*

15.1 INTERNAL AUDITS

Internal audits are performed to verify that laboratory operations comply with the requirements of the lab's quality system and with the external quality programs under which the laboratory operates. Audits are planned and organized by the QA staff. Personnel conducting the audits should be independent of the area being evaluated. Auditors will have sufficient authority, access to work areas, and organizational freedom necessary to observe all activities affecting quality and to report the assessments to laboratory management and when requested to corporate management.

Audits are conducted and documented as described in the TestAmerica Corporate SOP on performing Internal Audits, SOP No. CA-Q-S-004. The types and frequency of routine internal audits are shown in Table 16-1. Special or ad hoc assessments may be conducted as needed under the direction of the QA staff.

Table 15-1. Types of Internal Audits and Frequency

Description	Performed by	Frequency
Quality Systems	QA Department or Designee	All areas of the laboratory annually
QA Technical Audits - Evaluate raw data versus final reports - Analyst integrity - Data authenticity	QA Department or Designee	All methods within a 2-year period, with at least 15% of methods every quarter
SOP Method Compliance	Technical Director	- All SOPs within a 2-year period - All new analysts or new analyst/methods within 3 months of IDOC
Special	QA Department or Designee	Surveillance or spot checks performed as needed
Performance Testing	Analysts with QA oversight	Two successful per year for each NELAC field of testing or as dictated by regulatory requirements

15.1.1 Annual Quality Systems Audit

An annual quality systems audit is required to ensure compliance to analytical methods and SOPs, the laboratory's Data Integrity and Ethics Policies, NELAC quality systems, client and state requirements, and the effectiveness of the internal controls of the analytical process, including but not limited to data review, quality controls, preventive action and corrective action. The completeness of earlier corrective actions is assessed. The audit is divided into modules for each operating or support area of the lab, and each module is comprehensive for a given

area. The area audits may be done on a rotating schedule throughout the year to ensure adequate coverage of all areas. This schedule may change as situations in the laboratory warrant.

15.1.2 QA Technical Audits

QA technical audits are based on client projects, associated sample delivery groups, and the methods performed. Reported results are compared to raw data to verify the authenticity of results. The validity of calibrations and QC results are compared to data qualifiers, footnotes, and case narratives. Documentation is assessed by examining run logs and records of manual integrations. Manual calculations are checked. Where possible, MintMiner is used to identify unusual manipulations of the data deserving closer scrutiny. QA technical audits will include all methods within a two-year period.

15.1.3 SOP Method Compliance

Compliance of all SOPs with the source methods and compliance of the operational groups with the SOPs will be assessed by the Technical Director at least every two years. The work of each newly hired analyst is assessed within 3 months of working independently, (e.g., completion of method IDOC). In addition, as analysts add methods to their capabilities, (new IDOC) reviews of the analyst work products will be performed within 3 months of completing the documented training.

15.1.4 Special Audits

Special audits are conducted on an as needed basis, generally as a follow up to specific issues such as client complaints, corrective actions, PT results, data audits, system audits, validation comments, regulatory audits or suspected ethical improprieties. Special audits are focused on a specific issue, and report format, distribution, and timeframes are designed to address the nature of the issue.

15.1.5 Performance Testing

The laboratory participates semi-annually in performance audits conducted through the analysis of PT samples provided by a third party. The laboratory generally participates in the following types of PT studies: Soil, Water Supply, Water Pollution, Air, and round-robin studies for sediments and biological materials.

It is TestAmerica's policy that PT samples be treated as typical samples in the production process. Furthermore, where PT samples present special or unique problems, in the regular production process they may need to be treated differently, as would any special or unique request submitted by any client. The QA Manager must be consulted and in agreement with any decisions made to treat a PT sample differently due to some special circumstance.

Written responses to unacceptable PT results are required. In some cases it may be necessary for blind QC samples to be submitted to the laboratory to show a return to control.

15.2 EXTERNAL AUDITS

External audits are performed when certifying agencies or clients conduct on-site inspections or submit performance testing samples for analysis. It is TestAmerica's policy to cooperate fully with regulatory authorities and clients. The laboratory makes every effort to provide the auditors with access to personnel, documentation, and assistance. Laboratory supervisors are responsible for providing corrective actions to the QA Manager who coordinates the response for any deficiencies discovered during an external audit. Audit responses are due in the time allotted by the client or agency performing the audit. A copy of the audit report and the labs corrective action plan will be forwarded to Corporate Quality.

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. The client may only view data and systems related directly to the client's work. All efforts are made to keep other client information confidential.

15.2.1 Confidential Business Information (CBI) Considerations

During on-site audits, auditors may come into possession of information claimed as business confidential. A business confidentiality claim is defined as "a claim or allegation that business information is entitled to confidential treatment for reasons of business confidentiality or a request for a determination that such information is entitled to such treatment." When information is claimed as business confidential, the laboratory must place on (or attach to) the information at the time it is submitted to the auditor, a cover sheet, stamped or typed legend or other suitable form of notice, employing language such as "trade secret", "proprietary" or "company confidential". Confidential portions of documents otherwise non-confidential must be clearly identified. CBI may be purged of references to client identity by the responsible laboratory official at the time of removal from the laboratory. However, sample identifiers may not be obscured from the information. Additional information regarding CBI can be found in within the 2003 NELAC standards.

15.3 AUDIT FINDINGS

Audit findings are documented using the corrective action process and database. The laboratory's corrective action responses for both types of audits may include action plans that could not be completed within a predefined timeframe. In these instances, a completion date must set and agreed to by operations management and the QA Manager.

Developing and implementing corrective actions to findings is the responsibility of the Department Manager where the finding originated. Findings that are not corrected by specified due dates are reported monthly to management in the QA monthly report. A copy of the audit report and the labs corrective action plan will be forwarded to Corporate Quality.

If any audit finding casts doubt on the effectiveness of the operations or on the correctness or validity of the laboratory's test results, the laboratory shall take timely corrective action, and shall notify clients in writing if the investigations show that the laboratory results have been affected. Once corrective action is implemented, a follow-up audit is scheduled to ensure that the problem has been corrected.

Clients must be notified promptly in writing, of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any test report or amendment to a test report. The investigation must begin within 24-hours of discovery of the problem and all efforts are made to notify the client within two weeks after the completion of the investigation.

SECTION 16

MANAGEMENT REVIEWS *(NELAC 5.4.14)*

16.1 QUALITY ASSURANCE REPORT

A comprehensive QA Report shall be prepared each month by the laboratory's QA Department and forwarded to the Laboratory Director, Technical Directors, Operation Manager, laboratory senior management, their Quality Director as well as the General Manager. All aspects of the QA system are reviewed to evaluate the suitability of policies and procedures. During the course of the year, the Laboratory Director, General Manager or Corporate QA may request that additional information be added to the report.

On a monthly basis, Corporate QA compiles information from all the monthly laboratory reports. The Corporate Quality Directors prepare a report that includes a compilation of all metrics and notable information and concerns regarding the QA programs within the laboratories. The report also includes a listing of new regulations that may potentially impact the laboratories. This report is presented to the Senior Management Team and General Managers.

16.2 ANNUAL MANAGEMENT REVIEW

The senior lab management team (Laboratory Director, Technical Directors, Operations Manager, Customer Service Manager, Business Development Manager, and QA Manager) conducts a review annually of its quality systems and LIMS to ensure its continuing suitability and effectiveness in meeting client and regulatory requirements and to introduce any necessary changes or improvements. It will also provide a platform for defining quality goals & objectives. Corporate Operations and Corporate QA personnel is be included in this meeting at the discretion of the Laboratory Director. The LIMS review consists of examining any audits, complaints or concerns that have been raised through the year that are related to the LIMS. The laboratory will summarize any critical findings that can not be solved by the lab and report them to Corporate IT.

This management review (Corporate Work Instruction No. CA-Q-WI-020) uses information generated during the preceding year to assess the "big picture" by ensuring that routine actions taken and reviewed on a monthly basis are not components of larger systematic concerns. The monthly review should keep the quality systems current and effective; therefore, the annual review is a formal senior management process to review specific existing documentation. Significant issues from the following documentation are compiled or summarized by the QA Manager prior to the review meeting:

- Matters arising from the previous annual review.
- Prior Monthly QA Reports issues.
- Laboratory QA Metrics.
- Review of report reissue requests.
- Review of client feedback and complaints.
- Issues arising from any prior management or staff meetings.

- Minutes from prior senior lab management meetings. Issues that may be raised from these meetings include:
    - Adequacy of staff, equipment and facility resources.
    - Adequacy of policies and procedures.
    - Future plans for resources and testing capability and capacity.
- The annual internal double blind PT program sample performance (if performed),
- Compliance to the Ethics Policy and Data Integrity Plan. Including any evidence/incidents of inappropriate actions or vulnerabilities related to data Integrity.

A report is generated by the QA Manager and management. The report is distributed to the appropriate General Manager and the Quality Director. The report includes, but is not limited to:

- The date of the review and the names and titles of participants.
- A reference to the existing data quality related documents and topics that were reviewed.
- Quality system or operational changes or improvements that will be made as a result of the review [e.g., an implementation schedule including assigned responsibilities for the changes (Action Table)].

Changes to the quality systems requiring update to the laboratory QA Manual shall be included in the next revision of the QA Manual.

16.3 POTENTIAL INTEGRITY RELATED MANAGERIAL REVIEWS

Potential integrity issues (data or business related) must be handled and reviewed in a confidential manner until such time as a follow-up evaluation, full investigation, or other appropriate actions have been completed and issues clarified. TestAmerica's Corporate Data Investigation/Recall SOP shall be followed (SOP No. CA-L-S-001). All investigations that result in finding of inappropriate activity are documented and include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients.

TestAmerica's COO, VP of Client & Technical Services, General Managers and Quality Directors receive a monthly report from the Director of Quality & Client Advocacy summarizing any current data integrity or data recall investigations. The General Manager's are also made aware of progress on these issues for their specific labs.

SECTION 17

PERSONNEL *(NELAC 5.5.2)*

17.1 OVERVIEW

The laboratory's management believes that its highly qualified and professional staff is the single most important aspect in assuring a high level of data quality and service. The staff consists of professionals and support personnel as outlined in the organization chart in Figure 4-1.

All personnel must demonstrate competence in the areas where they have responsibility. Any staff that is undergoing training shall have appropriate supervision until they have demonstrated their ability to perform their job function on their own. Staff shall be qualified for their tasks based on appropriate education, training, experience and/or demonstrated skills as required.

The laboratory employs sufficient personnel with the necessary education, training, technical knowledge and experience for their assigned responsibilities.

All personnel are responsible for complying with all QA/QC requirements that pertain to the laboratory and their area of responsibility. Each staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular area of responsibility. Technical staff must also have a general knowledge of lab operations, test methods, QA/QC procedures and records management.

Laboratory management is responsible for formulating goals for lab staff with respect to education, training and skills and ensuring that the laboratory has a policy and procedures for identifying training needs and providing training of personnel. The training shall be relevant to the present and anticipated responsibilities of the lab staff.

The laboratory only uses personnel that are employed by or under contract to, the laboratory. Contracted personnel, when used, must meet competency standards of the laboratory and work in accordance to the laboratory's quality system.

17.2 EDUCATION AND EXPERIENCE REQUIREMENTS FOR TECHNICAL PERSONNEL

The laboratory makes every effort to hire analytical staff that possesses a college degree (AA, BA, BS) in an applied science with some chemistry in the curriculum. Exceptions can be made based upon the individual's experience and ability to learn. Selection of qualified candidates for laboratory employment begins with documentation of minimum education, training, and experience prerequisites needed to perform the prescribed task. Minimum education and training requirements for TestAmerica employees are outlined in job descriptions and are generally summarized for analytical staff in the table below.

The laboratory maintains job descriptions for all personnel who manage, perform or verify work affecting the quality of the environmental testing the laboratory performs. Job Descriptions are located on the TestAmerica intranet site's Human Resources web-page (Also see Section 4 for position descriptions/responsibilities).

Experience and specialized training are occasionally accepted in lieu of a college degree (basic lab skills such as using a balance, colony counting, aseptic or quantitation techniques, etc., are also considered).

As a general rule for analytical staff:

Specialty	Education	Experience
Extractions, Digestions, some electrode methods (pH, DO, Redox, etc.), or Titrimetric and Gravimetric Analyses	H.S. Diploma	On the job training (OJT)
GFAA, CVAA, FLAA, Single component or short list Chromatography (e.g., Fuels, BTEX-GC, IC	A college degree in an applied science or 2 years of college and at least 1 year of college chemistry	Or 2 years prior analytical experience is required
ICP, ICPMS, Long List or complex chromatography (e.g., Pesticides, PCB, Herbicides, HPLC, etc.), GCMS	A college degree in an applied science or 2 years of college chemistry	or 5 years of prior analytical experience
Spectra Interpretation	A college degree in an applied science or 2 years of college chemistry	And 2 years relevant experience Or 5 years of prior analytical experience
Technical Directors/Department Managers – **General**	Bachelors Degree in an applied science or engineering with 24 semester hours in chemistry An advanced (MS, PhD.) degree may substitute for one year of experience	And 2 years experience in environmental analysis of representative analytes for which they will oversee
Technical Director – **Wet Chem** only (no advanced instrumentation)	Associates degree in an applied science or engineering or 2 years of college with 16 semester hours in chemistry	And 2 years relevant experience

When an analyst does not meet these requirements, they can perform a task under the direct supervision of a qualified analyst, peer reviewer or Department Manager, and are considered an analyst in training. The person supervising an analyst in training is accountable for the quality of the analytical data and must review and approve data and associated corrective actions.

17.3 TRAINING

The laboratory is committed to furthering the professional and technical development of employees at all levels.

Orientation to the laboratory's policies and procedures, in-house method training, and employee attendance at outside training courses and conferences all contribute toward employee proficiency. Below are examples of various areas of required employee training:

Required Training	Time Frame	Employee Type
Environmental Health & Safety	Prior to lab work	All
Ethics – New Hires	1 week of hire	All
Ethics – Comprehensive	90 days of hire	All
Data Integrity	30 days of hire	Technical and PMs
Quality Assurance	90 days of hire	All
Ethics – Comprehensive Refresher	Annually	All
Initial Demonstration of Capability (DOC)	Prior to unsupervised method performance	Technical

The laboratory maintains records of relevant authorization/competence, education, professional qualifications, training, skills and experience of technical personnel (including contracted personnel) as well as the date that approval/authorization was given. These records are kept on file at the laboratory. Also refer to "Demonstration of Capability" in Section 19.

The training of technical staff is kept up to date by:

- Each employee must have documentation in their training file that they have read, understood and agreed to follow the most recent version of the laboratory QA Manual and SOPs in their area of responsibility. This documentation is updated as SOPs are updated.
- Documentation from any training courses or workshops on specific equipment, analytical techniques or other relevant topics is maintained in their training file.
- Documentation of proficiency (refer to Section 19).
- An Ethics Agreement signed by each staff member (renewed each year) and evidence of annual ethics training.
- A Confidentiality Agreement signed by each staff member signed at the time of employment.
- Human Resources maintains documentation and attestation forms on employment status & records; benefit programs; timekeeping/payroll; and employee conduct (e.g., ethics). This information is maintained in the employee's secured personnel file.

Further details of the laboratory's training program are described in the Laboratory Training SOP WS-QA-0022, "Employee Orientation and Training".

17.4 DATA INTEGRITY AND ETHICS TRAINING PROGRAM

Establishing and maintaining a high ethical standard is an important element of a Quality System. Ethics and data integrity training is integral to the success of TestAmerica and is provided for each employee at TestAmerica. It is a formal part of the initial employee orientation within 1 week of hire, comprehensive training within 90 days, and an annual refresher for all employees. Senior management at each facility performs the ethics training for their staff.

In order to ensure that all personnel understand the importance TestAmerica places on maintaining high ethical standards at all times; TestAmerica has established a Corporate Ethics Policy (Policy No. CA-L-P-001) and an Ethics Statement. All initial and annual training is documented by signature on the signed Ethics Statement demonstrating that the employee has participated in the training and understands their obligations related to ethical behavior and data integrity.

Violations of this Ethics Policy will not be tolerated. Employees who violate this policy will be subject to disciplinary actions up to and including termination. Criminal violations may also be referred to the Government for prosecution. In addition, such actions could jeopardize TestAmerica's ability to do work on Government contracts, and for that reason, TestAmerica has a Zero Tolerance approach to such violations.

Employees are trained as to the legal and environmental repercussions that result from data misrepresentation. Key topics covered in the presentation include:

- Organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting.
- Ethics Policy
- How and when to report ethical/data integrity issues. Confidential reporting.
- Record keeping.
- Discussion regarding data integrity procedures.
- Specific examples of breaches of ethical behavior (e.g. peak shaving, altering data or computer clocks, improper macros, etc., accepting/offering kickbacks, illegal accounting practices, unfair competition/collusion)
- Internal monitoring. Investigations and data recalls.
- Consequences for infractions including potential for immediate termination, debarment, or criminal prosecution.
- Importance of proper written narration / data qualification by the analyst and project manager with respect to those cases where the data may still be usable but are in one sense or another partially deficient.

Additionally, a data integrity hotline (1-800-736-9407) is maintained by TestAmerica and administered by the Corporate Quality Department.

SECTION 18

ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS *(NELAC 5.5.3)*

18.1 OVERVIEW

The laboratory is a 66,000 ft^2 secure laboratory facility with controlled access and designed to accommodate an efficient workflow and to provide a safe and comfortable work environment for employees. All visitors sign in and are escorted by laboratory personnel. Access is controlled by various measures.

The laboratory is equipped with structural safety features. Each employee is familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. The laboratory provides and requires the use of protective equipment including safety glasses, protective clothing, gloves, etc., OSHA and other regulatory agency guidelines regarding required amounts of bench and fume hood space, lighting, ventilation (temperature and humidity controlled), access, and safety equipment are met or exceeded.

Traffic flow through sample preparation and analysis areas is minimized to reduce the likelihood of contamination. Adequate floor space and bench top area is provided to allow unencumbered sample preparation and analysis space. Sufficient space is also provided for storage of reagents and media, glassware, and portable equipment. Ample space is also provided for refrigerated sample storage before analysis and archival storage of samples after analysis. Laboratory HVAC and deionized water systems are designed to minimize potential trace contaminants.

The laboratory is separated into specific areas for sample receiving, sample preparation, volatile organic sample analysis, non-volatile organic sample analysis, inorganic sample analysis, and administrative functions.

18.2 ENVIRONMENT

Laboratory accommodation, test areas, energy sources, lighting are adequate to facilitate proper performance of tests. The facility is equipped with heating, ventilation, and air conditioning (HVAC) systems appropriate to the needs of environmental testing performed at this laboratory.

The environment in which these activities are undertaken does not invalidate the results or adversely affect the required accuracy of any measurements.

The laboratory provides for the effective monitoring, control and recording of environmental conditions that may affect the results of environmental tests as required by the relevant specifications, methods, and procedures. Such environmental conditions include humidity, voltage, and temperature in the laboratory. In the event of a power outage, the laboratory can be equipped with a back up power supply for sample storage, as detailed in SOP No. WS-QA-0005, “Temperature Monitoring and Corrective Action for Refrigerators and Freezers”.

When any of the method or regulatory required environmental conditions change to a point where they may adversely affect test results, analytical testing will be discontinued until the environmental conditions are returned to the required levels.

Environmental conditions of the facility housing the computer network and LIMS are regulated to protect against raw data loss.

18.3 WORK AREAS

There is effective separation between neighboring areas when the activities therein are incompatible with each other. Examples include:

- Volatile organic chemical handling areas, including sample preparation and waste disposal, and volatile organic chemical analysis areas.

Access to and use of all areas affecting the quality of analytical testing is defined and controlled by secure access to the laboratory building as described below in the Building Security section.

Adequate measures are taken to ensure good housekeeping in the laboratory and to ensure that any contamination does not adversely affect data quality. These measures include regular cleaning to control dirt and dust within the laboratory.

Work areas are available to ensure an unencumbered work area. Work areas include:

- Access and entryways to the laboratory.
- Sample receipt areas.
- Sample storage areas.
- Chemical and waste storage areas.
- Data handling and storage areas.
- Sample processing areas.
- Sample analysis areas.

18.4 FLOOR PLAN

A floor plan can be found in Appendix 1.

18.5 BUILDING SECURITY

Building keys and alarm codes are distributed to employees as necessary.

Employees wear photographic identification name cards while on the premises.

Visitors to the laboratory sign in and out in a visitor's logbook. A visitor is defined as any person who visits the laboratory who is not an employee of the laboratory. In addition to signing into the laboratory, the Environmental, Health and Safety Manual contains requirements for visitors and vendors. There are specific safety forms that must be reviewed and signed.

Visitors (with the exception of company employees) are escorted by laboratory personnel at all times, or the location of the visitor is noted in the visitor's logbook.

SECTION 19

TEST METHODS AND METHOD VALIDATION *(NELAC 5.5.4)*

19.1 OVERVIEW

The laboratory uses methods that are appropriate to meet our clients' requirements and that are within the scope of the laboratory's capabilities. These include sampling, handling, transport, storage and preparation of samples, and, where appropriate, an estimation of the measurement of uncertainty as well as statistical techniques for analysis of environmental data.

Instructions are available in the laboratory for the operation of equipment as well as for the handling and preparation of samples. All instructions, Standard Operating Procedures (SOPs), reference methods and manuals relevant to the working of the laboratory are readily available to all staff. Deviations from published methods are documented (with justification) in the laboratory's approved SOPs. SOPs are submitted to clients for review at their request. Significant deviations from published methods require client approval and regulatory approval where applicable.

19.2 STANDARD OPERATING PROCEDURES (SOPS)

The laboratory maintains SOPs that accurately reflect all phases of the laboratory such as assessing data integrity, corrective actions, handling customer complaints as well as all analytical methods and sampling procedures. The method SOPs are derived from the most recently promulgated/approved, published methods and are specifically adapted to the laboratory facility. Modifications or clarifications to published methods are clearly noted in the SOPs. All SOPs are controlled in the laboratory.

- All SOPs contain a revision number, effective date, and appropriate approval signatures. Controlled copies are available to all staff.
- Procedures for writing an SOP are incorporated by reference to TestAmerica's Corporate SOP entitled 'Writing a Standard Operating Procedure', No. CW-Q-S-002 or the laboratory's SOP WS-QA-0021 (Preparation and Management of Standard Operating Procedures).
- SOPs are reviewed at a minimum of every 2 years (annually for Drinking Water and DoD SOPs), and where necessary, revised to ensure continuing suitability and compliance with applicable requirements.

19.3 LABORATORY METHODS MANUAL

For each test method, the laboratory shall have available the published referenced method as well as the laboratory developed SOP.

Note: If more stringent standards or requirements are included in a mandated test method or regulation than those specified in this manual, the laboratory shall demonstrate that such requirements are met. If it is not clear which requirements are more stringent, the standard from the method or regulation is to be followed. Any exceptions or deviations from the referenced methods or regulations are noted in the specific analytical SOP.

The laboratory maintains an SOP Index for both technical and non-technical SOPs. Technical SOPs are maintained to describe a specific test method. Non-technical SOPs are maintained to describe functions and processes not related to a specific test method.

19.4 SELECTION OF METHODS

Since numerous methods and analytical techniques are available, continued communication between the client and laboratory is imperative to assure the correct methods are utilized. Once client methodology requirements are established, this and other pertinent information is summarized by the Project Manager. These mechanisms ensure that the proper analytical methods are applied when the samples arrive for log-in. For non-routine analytical services (e.g., special matrices, non-routine compound lists), the method of choice is selected based on client needs and available technology. The methods selected should be capable of measuring the specific parameter of interest, in the concentration range of interest, and with the required precision and accuracy.

19.4.1 Sources of Methods

Routine analytical services are performed using standard EPA-approved methodology. In some cases, modification of standard approved methods may be necessary to provide accurate analyses of particularly complex matrices. When the use of specific methods for sample analysis is mandated through project or regulatory requirements, only those methods shall be used.

When clients do not specify the method to be used or methods are not required, the methods used will be clearly validated and documented in an SOP and available to clients and/or the end user of the data.

The analytical methods used by the laboratory are those currently accepted and approved by the U. S. EPA and the state or territory from which the samples were collected. Reference methods include:

- *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, US EPA, January 1996.*
- *Guidelines Establishing Test Procedures for the Analysis of Pollutants under the Clean Water Act, and Appendix A-C; 40 CFR Part 136, USEPA Office of Water. Revised as of July 1, 1995, Appendix A to Part 136 - Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (EPA 600 Series)*
- *Methods for Chemical Analysis of Water and Wastes, EPA 600 (4-79-020), 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. Supplement I: EPA-600/R-94/111, May 1994.*
- *Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88-039, December 1988, Revised, July 1991, Supplement I, EPA-600-4-90-020, July 1990, Supplement II, EPA-600/R-92-129, August 1992. Supplement III EPA/600/R-95/131 - August 1995 (EPA 500 Series) (EPA 500 Series methods)*
- *Technical Notes on Drinking Water Methods, EPA-600/R94-173, October 1994*

- *NIOSH Manual of Analytical Methods, 4th ed., August 1994.*
- *Statement of Work for Inorganics Analysis, ILM04.1, USEPA Contract Laboratory Program Multi-media, Multi-concentration.*
- *Statement of Work for Organics Analysis, OLM04.2, USEPA Contract Laboratory Program, Multi-media, Multi-concentration.*
- *Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, OLMO4.1, USEPA Contract Laboratory Program, September 1998.*
- *Standard Methods for the Examination of Water and Wastewater, 18th/19th /20th edition; Eaton, A.D. Clesceri, L.S. Greenberg, A.E. Eds; American Water Works Association, Water Pollution Control Federation, American Public Health Association: Washington, D.C.*
- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996, Update IVA, IVB February 2007.*
- *Annual Book of ASTM Standards, American Society for Testing & Materials (ASTM), Philadelphia, PA.*
- *National Status and Trends Program, National Oceanographic and Atmospheric Administration, Volume I-IV, 1985-1994.*
- *Manual for the Certification of Laboratories Analyzing Drinking Water (EPA 815-R-05-004, January 2005)*
- *Code of Federal Regulations (CFR) 40, Parts 136, 141, 172, 173, 178, 179 and 261*
- *Underground Storage Tanks Procedures Manual, State of Alaska Department of Environmental Conservation, Division of Spill Prevention and Response Contaminated Sites Program, November 7, 2002*
- *Tri-Regional Board Staff Recommendations for Preliminary Investigation and Evaluation of Underground Tank Sites, North Coast Regional Water Quality Control Board, San Francisco Bay Regional Water Quality Control Board and Central Valley Regional Water Quality Control Board, August 10, 1990*
- *Analytical Methods for Petroleum Hydrocarbons, Washington State Department of Ecology, June 1997*
- *Compendium of Methods for the Determination of Air Pollutants in Indoor Air, (EPA 600/4-90-10, April 1990)*
- *Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air, (EPA 625/R-96/010a, June 1999*
- *Methods for Determining Emissions of Toxic Air Contaminants from Stationary Sources, Stationary Source Test Methods, Volume 3, California Air Resources Board*

The laboratory reviews updated versions to all the aforementioned references for adaptation based upon capabilities, instrumentation, etc., and implements them as appropriate. As such, the laboratory strives to perform only the latest versions of each approved method as regulations allow or require.

Other reference procedures for non-routine analyses may include methods established by specific states (e.g., Underground Storage Tank methods), ASTM or equipment manufacturers. Sample type, source, and the governing regulatory agency requiring the analysis will determine the method utilized.

The laboratory shall inform the client when a method proposed by the client may be inappropriate or out of date. After the client has been informed, and they wish to proceed contrary to the laboratory's recommendation, it will be documented.

19.4.2 Demonstration of Capability

Before the laboratory may institute a new method and begin reporting results, the laboratory shall confirm that it can properly operate the method. In general, this demonstration does not test the performance of the method in real world samples, but in an applicable and available clean matrix sample. If the method is for the testing of analytes that are not conducive to spiking, demonstration of capability may be performed on quality control samples.

19.4.2.1 A demonstration of capability (DOC, Lab SOP WS-QA-0022) is performed whenever there is a change in instrument type (e.g., new instrumentation), method or personnel.

19.4.2.2 The initial demonstration of capability must be thoroughly documented and approved by the Technical Director and QA Manager prior to independently analyzing client samples. All associated documentation must be retained in accordance with the laboratories archiving procedures.

19.4.2.3 The laboratory must have an approved SOP, demonstrate satisfactory performance, and conduct an MDL study (when applicable). There may be other requirements as stated within the published method or regulations (i.e., retention time window study).

Note: In some instances, a situation may arise where a client requests that an unusual analyte be reported using a method where this analyte is not normally reported. If the analyte is being reported for regulatory purposes, the method must meet all procedures outlined within this QA Manual (SOP, MDL, and Demonstration of Capability). If the client states that the information is not for regulatory purposes, the result may be reported as long as the following criteria are met:

- The instrument is calibrated for the analyte to be reported using the criteria for the method and ICV/CCV criteria are met (unless an ICV/CCV is not required by the method or criteria are per project DQOs).
- The laboratory's nominal or default reporting limit (RL) is equal to the quantitation limit (QL), must be at or above the lowest non-zero standard in the calibration curve and must be reliably determined. Project RLs are client specified reporting levels which may be higher than the QL. Results reported below the QL must be qualified as estimated values. Also see Section 19.6.1.3, Relationship of Limit of Detection (LOD) to Quantitation Limit (QL).
- The client request is documented and the lab informs the client of its procedure for working with unusual compounds. The final report must be footnoted: Reporting Limit based on the low standard of the calibration curve.

19.4.3 Initial Demonstration of Capability (IDOC) Procedures

19.4.3.1 The spiking standard used must be prepared independently from those used in instrument calibration.

19.4.3.2 The analyte(s) shall be diluted in a volume of clean matrix sufficient to prepare four aliquots at the concentration specified by a method or the laboratory SOP.

19.4.3.3 At least four aliquots shall be prepared (including any applicable clean-up procedures) and analyzed according to the test method (either concurrently or over a period of days).

19.4.3.4 Using all of the results, calculate the mean recovery in the appropriate reporting units and the standard deviations for each parameter of interest.

19.4.3.5 When it is not possible to determine the mean and standard deviations, such as for presence, absence and logarithmic values, the laboratory will assess performance against criteria described in the Method SOP.

19.4.3.6 Compare the information obtained above to the corresponding acceptance criteria for precision and accuracy in the test method (if applicable) or in laboratory generated acceptance criteria (LCS or interim criteria) if there is no mandatory criteria established. If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter.

19.4.3.7 When one or more of the tested parameters fail at least one of the acceptance criteria, the analyst must proceed according to either option listed below:

- Locate and correct the source of the problem and repeat the test for all parameters of interest beginning with 19.4.3.3 above.
- Beginning with 19.4.3.3 above, repeat the test for all parameters that failed to meet criteria. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with 19.4.3.1 above.

Note: Results of successive LCS analyses can be used to fulfill the DOC requirement.
A certification statement (refer to SOP WS-QA-0022 as an example) shall be used to document the completion of each initial demonstration of capability. A copy of the certification is archived in the analyst's training folder.

19.5 LABORATORY DEVELOPED METHODS AND NON-STANDARD METHODS

Any new method developed by the laboratory must be fully defined in an SOP and validated by qualified personnel with adequate resources to perform the method. Method specifications and the relation to client requirements must be clearly conveyed to the client if the method is a non-standard method (not a published or routinely accepted method). The client must also be in agreement to the use of the non-standard method.

19.6 VALIDATION OF METHODS

Validation is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

All non-standard methods, laboratory designed/developed methods, standard methods used outside of their scope, and major modifications to published methods must be validated to confirm they are fit for their intended use. The validation will be as extensive as necessary to meet the needs of the given application. The results are documented with the validation procedure used and contain a statement as to the fitness for use.

19.6.1 Method Validation and Verification Activities for All New Methods

While method validation can take various courses, the following activities can be required as part of method validation. Method validation records are designated QC records and are archived accordingly.

19.6.1.1 Determination of Method Selectivity

Method selectivity is the demonstrated ability to discriminate the analyte(s) of interest from other compounds in the specific matrix or matrices from other analytes or interference. In some cases to achieve the required selectivity for an analyte, a confirmation analysis is required as part of the method.

19.6.1.2 Determination of Method Sensitivity

Sensitivity can be both estimated and demonstrated. Whether a study is required to estimate sensitivity depends on the level of method development required when applying a particular measurement system to a specific set of samples. Where estimations and/or demonstrations of sensitivity are required by regulation or client agreement, such as the procedure in 40 CFR Part 136 Appendix B, under the Clean Water Act, these shall be followed.

19.6.1.3 Relationship of Limit of Detection (LOD) to the Quantitation Limit (QL)

An important characteristic of expression of sensitivity is the difference in the LOD and the QL. The LOD is the minimum level at which the presence of an analyte can be reliably concluded. The QL is the minimum concentration of analyte that can be quantitatively determined with acceptable precision and bias. For DoD QSM 4.1 projects the QL is referred to as the LOQ. For most instrumental measurement systems, there is a region where semi-quantitative data is generated around the LOD (both above and below the estimated MDL or LOD) and below the QL. In this region, detection of an analyte may be confirmed but quantification of the analyte is unreliable within the accuracy and precision guidelines of the measurement system. When an analyte is detected below the QL, and the presence of the analyte is confirmed by meeting the qualitative identification criteria for the analyte, the analyte can be reliably reported, but the amount of the analyte can only be estimated. If data is to be reported in this region, it must be done so with a qualification that denotes the semi-quantitative nature of the result.

19.6.1.4 Determination of Interferences

A determination that the method is free from interferences in a blank matrix is performed.

19.6.1.5 Determination of Range

Where appropriate to the method, the quantitation range is determined by comparison of the response of an analyte in a curve to established or targeted criteria. Generally the upper quantitation limit is defined by highest acceptable calibration concentration. The lower quantitation limit or QL cannot be lower than the lowest non-zero calibration level, and can be constrained by required levels of bias and precision.

19.6.1.6 Determination of Accuracy and Precision

Accuracy and precision studies are generally performed using replicate analyses, with a resulting percent recovery and measure of reproducibility (standard deviation, relative standard deviation) calculated and measured against a set of target criteria.

19.6.1.7 Documentation of Method

The method is formally documented in an SOP. If the method is a minor modification of a standard laboratory method that is already documented in an SOP, an SOP Attachment describing the specific differences in the new method is acceptable in place of a separate SOP.

19.6.1.8 Continued Demonstration of Method Performance

Continued demonstration of Method Performance is addressed in the SOP. Continued demonstration of method performance is generally accomplished by batch specific QC samples such as LCS, method blanks or PT samples.

19.7 METHOD DETECTION LIMITS (MDL)/ LIMITS OF DETECTION (LOD)

Method detection limits (MDL) are initially determined in accordance with 40 CFR Part 136, Appendix B or alternatively by other technically acceptable practices that have been accepted by regulators. MDL is also sometimes referred to as Limit of Detection (LOD). The MDL theoretically represents the concentration level for each analyte within a method at which the Analyst is 99% confident that the true value is not zero. The MDL is determined for each analyte initially during the method validation process and updated as required in the analytical methods, whenever there is a significant change in the procedure or equipment, or based on project specific requirements (refer to 19.7.10). Generally, the analyst prepares at least seven replicates of solution spiked at one to five times the estimated method detection limit (most often at the lowest standard in the calibration curve) into the applicable matrix with all the analytes of interest. Each of these aliquots is extracted (including any applicable clean-up procedures) and analyzed in the same manner as the samples. Where possible, the seven replicates should be analyzed over 2-4 days to provide a more realistic MDL. Alternatively, the MDL may be determined using a series (ideally 50-100) of method blanks for “uncensored” methods which always return a signal (i.e., ICP).

Refer to the Corporate SOP No. CA-Q-S-006 or the laboratory’s SOP No. WS-QA-0006, for details on the laboratory’s MDL process.

19.8 INSTRUMENT DETECTION LIMITS (IDL)

19.8.1 The IDL is sometimes used to assess the reasonableness of the MDLs or in some cases required by the analytical method or program requirements. IDLs are most used in metals analyses but may be useful in demonstration of instrument performance in other areas.

19.8.2 IDLs are calculated to determine an instrument's sensitivity independent of any preparation method. IDLs are calculated either using 7 replicate spike analyses, like MDL but without sample preparation, or by the analysis of 10 instrument blanks and calculating 3 x the absolute value of the standard deviation.

19.8.3 If IDL is > than the MDL, it may be used as the reported MDL.

19.9 VERIFICATION OF DETECTION AND REPORTING LIMITS

19.9.1 Once an MDL is established, it must be verified, on each instrument, by analyzing a quality control sample (prepared as a sample) at approximately 2-3 times the calculated MDL. The analytes must be qualitatively identified. This verification does not apply to methods that are not readily spiked (e.g. pH, turbidity, etc.) or where the lab does not report to the MDL. The analytes must be qualitatively identified or see SOP No. WS-QA-0006 for other options. If the MDL does not verify, then the lab will not report to the MDL, or redevelop their MDL or use the level where qualitative identification is established. MDLs must be verified at least annually.

19.9.2 When the laboratory establishes a quantitation limit, it must be initially verified by the analysis of a low level standard or QC sample at 1-2 the reporting limit and annually thereafter. The annual requirement is waved for methods that have an annually verified MDL. The laboratory will comply with any regulatory requirements.

19.10 RETENTION TIME WINDOWS

Most organic analyses and some inorganic analyses use chromatography techniques for qualitative and quantitative determinations. For every chromatography analysis or as specific in the reference method, each analyte will have a specific time of elution from the column to the detector. This is known as the analyte's retention time. The variance in the expected time of elution is defined as the retention time window. As the key to analyte identification in chromatography, retention time windows must be established on every column for every analyte used for that method. These records are kept with the files associated with an instrument for later quantitation of the analytes. Complete details are available in the laboratory SOPs.

19.11 EVALUATION OF SELECTIVITY

The laboratory evaluates selectivity by following the checks within the applicable analytical methods, which include mass spectral tuning, second column confirmation, ICP interelement interference checks, chromatography retention time windows, sample blanks, spectrochemical, atomic absorption or fluorescence profiles, co-precipitation evaluations and specific electrode response factors.

19.12 ESTIMATION OF UNCERTAINTY OF MEASUREMENT

19.12.1 Uncertainty is "a parameter associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand" (as defined by the International Vocabulary of Basic and General Terms in Metrology, ISO Geneva, 1993, ISBN 92-67-10175-1). Knowledge of the uncertainty of a measurement provides additional confidence in a result's validity. Its value accounts for all the factors which could possibly affect the result, such as adequacy of analyte definition, sampling, matrix effects and interferences, climatic conditions, variances in weights, volumes, and standards, analytical procedure, and random variation. Some national accreditation organizations require the use of an "expanded uncertainty": the range within which the value of the measurand is believed to lie within at least a 95% confidence level with the coverage factor k=2.

19.12.2 Uncertainty is not error. Error is a single value, the difference between the true result and the measured result. On environmental samples, the true result is never known. The measurement is the sum of the unknown true value and the unknown error. Unknown error is a combination of systematic error, or bias, and random error. Bias varies predictably, constantly, and independently from the number of measurements. Random error is unpredictable, assumed to be Gaussian in distribution, and reducible by increasing the number of measurements.

19.12.3 The minimum uncertainty associated with results generated by the laboratory can be determined by using the Laboratory Control Sample (LCS) accuracy range for a given analyte. The LCS limits are used to assess the performance of the measurement system since they take into consideration all of the laboratory variables associated with a given test over time (except for variability associated with the sampling and the variability due to matrix effects). The percent recovery of the LCS is compared either to the method-required LCS accuracy limits or to the statistical, historical, in-house LCS accuracy limits.

19.12.4 To calculate the uncertainty for the specific result reported, multiply the result by the decimal of the lower end of the LCS range percent value for the lower end of the uncertainty range, and multiply the result by the decimal of the upper end of the LCS range percent value for the upper end of the uncertainty range. These calculated values represent a 99%-certain range for the reported result. As an example, suppose that the result reported is 1.0 mg/l, and the LCS percent recovery range is 50 to 150%. The uncertainty range would be 0.5 to 1.5 mg/l, which could also be written as 1.0 +/- 0.5 mg/l.

19.12.5 In the case where a well recognized test method specifies limits to the values of major sources of uncertainty of measurement (e.g., 524.2, 525, etc.) and specifies the form of presentation of calculated results, no further discussion of uncertainty is required.

19.13 SAMPLE REANALYSIS GUIDELINES

Because there is a certain level of uncertainty with any analytical measurement, a sample reanalysis may result in either a higher or lower value from an initial sample analysis. There are also variables that may be present (e.g., sample homogeneity, analyte precipitation over time, etc.) that may affect the results of a reanalysis. Based on the above comments, the laboratory will reanalyze samples at a client's request with the following caveats. **Client specific Contractual Terms & Conditions for reanalysis protocols may supersede the following items.**

- Homogenous samples: If a reanalysis agrees with the original result to within the RPD limits for MS/MSD or Duplicate analyses, or within ± 1 reporting limit for samples ≤ 5x the reporting limit, the original analysis will be reported. At the client's request, both results may be reported on the same report but not on two separate reports.
- If the reanalysis does not agree (as defined above) with the original result, then the laboratory will investigate the discrepancy and reanalyze the sample a third time for confirmation if sufficient sample is available.
- Any potential charges related to reanalysis are discussed in the contract terms and conditions or discussed at the time of the request. The client will typically be charged for reanalysis unless it is determined that the lab was in error.
- Due to the potential for increased variability, reanalysis may not be applicable to Non-homogenous, Encore, and Sodium Bisulfate preserved samples. See the Department Manager or Laboratory Director if unsure.

19.14 CONTROL OF DATA

The laboratory has policies and procedures in place to ensure the authenticity, integrity, and accuracy of the analytical data generated by the laboratory.

19.14.1 Computer and Electronic Data Related Requirements

The three basic objectives of our computer security procedures and policies are shown below. More detail is outlined in SOP Nos. S-ITQ-005, "QuantIMS/JDE user Profile Setup and Maintenance", and S-ITQ-007, "Software Testing, Validation and Verification. The laboratory is currently running the QuantIMS which is a custom in-house developed LIMS system that has been highly customized to meet the needs of the laboratory. It is referred to as LIMS for the remainder of this section. The LIMS utilizes DB2 which is an industry standard relational database platform. It is referred to as Database for the remainder of this section.

19.14.1.1 Maintain the Database Integrity: Assurance that data is reliable and accurate through data verification (review) procedures, password-protecting access, anti-virus protection, data change requirements, as well as an internal LIMS permissions procedure.

- LIMS Database Integrity is achieved through data input validation, internal user controls, and data change requirements.
- Spreadsheets and other software developed in-house must be verified with documentation through hand calculations prior to use.

19.14.1.2 Ensure Information Availability: Protection against loss of information or service is ensured through scheduled back-ups, stable file server network architecture, secure storage of media, line filter, Uninterruptible Power Supply (UPS), and maintaining older versions of software as revisions are implemented.

19.14.1.3 Maintain Confidentiality: Ensure data confidentiality through physical access controls, and encryption of when electronically transmitting data.

19.14.2 Data Reduction

The complexity of the data reduction depends on the analytical method and the number of discrete operations involved (e.g., extractions, dilutions, instrument readings and concentrations). The analyst calculates the final results from the raw data or uses appropriate computer programs to assist in the calculation of final reportable values.

For manual data entry, e.g., Wet Chemistry, the data is reduced by the analyst and then verified by the Department Manager or alternate analyst prior to updating the data in LIMS. The data review checklists are signed by both the analyst and alternate reviewer to confirm the accuracy of the manual entry(s).

Manual integration of peaks will be documented and reviewed and the raw data will be flagged in accordance with the TestAmerica Corporate SOP No. CA-Q-S-002, *Acceptable Manual Integration Practices and WS-PQA-0011*.

Analytical results are reduced to appropriate concentration units specified by the analytical method, taking into account factors such as dilution, sample weight or volume, etc. Blank correction will be applied only when required by the method or per manufacturer's indication; otherwise, it should not be performed. Calculations are independently verified by appropriate laboratory staff. Calculations and data reduction steps for various methods are summarized in the respective analytical SOPs or program requirements.

19.14.2.1 All raw data must be retained in the worklist folder, computer file (if appropriate), and/or runlog. All criteria pertinent to the method must be recorded. The documentation is recorded at the time observations or calculations are made and must be signed or initialed/dated (month/day/year). It must be easily identifiable who performed which tasks if multiple people were involved.

19.14.2.2 In general, concentration results are reported in milligrams per liter (mg/l) or micrograms per liter (µg/l) for liquids and milligrams per kilogram (mg/kg) or micrograms per kilogram (µg/kg) for solids. For values greater than 10,000 mg/l, results can be reported in percent, i.e., 10,000 mg/l = 1%. Units are defined in each lab SOP.

19.14.2.3 In reporting, the analyst or the instrument output records the raw data result using values of known certainty plus one uncertain digit. If final calculations are performed external to LIMS, the results should be entered in LIMS with at least three significant figures. In general, results are reported to 2 significant figures on the final report.

19.14.2.4 For those methods that do not have an instrument printout or an instrumental output compatible with the LIMS System, the raw results and dilution factors are entered directly into LIMS by the analyst, and the software calculates the final result for the analytical report. LIMS has a defined significant figure criterion for each analyte.

19.14.2.5 The laboratory strives to import data directly from instruments or calculation spreadsheets to ensure that the reported data are free from transcription and calculation errors. For those analyses with an instrumental output compatible with the LIMS, the raw results and dilution factors are transferred into LIMS electronically after reviewing the quantitation report, and removing unrequested or poor spectrally-

matched compounds. The analyst prints a copy of what has been entered to check for errors. This printout and the instrument's printout of calibrations, concentrations, retention times, chromatograms, and mass spectra, if applicable, are retained with the data file. The data file is stored in a monthly folder on the instrument computer; periodically, this file is transferred to the server and, eventually, to a tape file.

19.14.3 Logbook / Worksheet Use Guidelines

Logbooks and worksheets are filled out 'real time' and have enough information on them to trace the events of the applicable analysis/task. (e.g. calibrations, standards, analyst, sample ID, date, time on short holding time tests, temperatures when applicable, calculations are traceable, etc.)

- Corrections are made following the procedures outlined in Section 12.
- Logbooks are controlled by the QA department. A record is maintained of all logbooks in the lab.
- Unused portions of pages must be "Z"'d out, signed and dated.
- Worksheets are created with the approval of the Technical Director/QA Manager at the facility. The QA Manager controls all worksheets following the procedures in Section 6.

19.14.4 Review / Verification Procedures

Review procedures are out lined in several SOPs (WS-PQA-003, "Quality Control Program", WS-PQA-012, "Technical Data Review Requirements", WS-PM-0004, "Final Report Assembly and Third Level Data Review") to ensure that reported data are free from calculation and transcription errors, and that QC parameters have been reviewed and evaluated before data is reported. The laboratory also has an SOP discussing Manual Integrations to ensure the authenticity of the data (WS-PQA-0011, "Manual Integration Documentation and Practices"). The general review concepts are discussed below, more specific information can be found in the SOPs.

19.14.4.1 The data review process at the laboratory starts at the Sample Control level. Sample Control personnel review chain-of-custody forms and input the sample information and required analyses into a computer LIMS. The Sample Control Supervisor reviews the transaction of the chain-of-custody forms and the inputted information. The Project Managers perform final review of the chain-of-custody forms and inputted information.

19.14.4.2 The next level of data review occurs with the analysts. As results are generated, analysts review their work to ensure that the results generated meet QC requirements and relevant EPA methodologies. The analysts transfer the data into the LIMS and add data qualifiers if applicable. To ensure data compliance, a different analyst performs a second level of review. Second level review is accomplished by checking reported results against raw data and evaluating the results for accuracy. During the second level review, blank runs, QA/QC check results, continuing calibration results, laboratory control samples, sample data, qualifiers and spike information are evaluated. One hundred percent of all sample data from manual methods and from automated methods, all GC/MS spectra and all manual integrations are reviewed. Manual integrations are also electronically reviewed utilizing auditing software to help

ensure compliance to ethics and manual integration policies. Issues that deem further review include the following:

- QC data are outside the specified control limits for accuracy and precision
- Reviewed sample data does not match with reported results
- Unusual detection limit changes are observed
- Samples having unusually high results
- Samples exceeding a known regulatory limit
- Raw data indicating some type of contamination or poor technique
- Inconsistent peak integration
- Transcription errors
- Results outside of calibration range

19.14.4.3 Unacceptable analytical results may require reanalysis of the samples. Any problems are brought to the attention of the Laboratory Director, Project Manager, Quality Assurance Manager, Operations Manager, or Department Manager for further investigation. Corrective action is initiated whenever necessary.

19.14.4.4 The results are then entered or directly transferred into the computer database and a hard copy (or .pdf) is printed for the client.

19.14.4.5 As a final review prior to the release of the report, the Project Manager reviews the results for appropriateness and completeness. This review and approval ensures that client requirements have been met and that the final report has been properly completed. The process includes, but is not limited to, verifying that chemical relationships are evaluated, COC is followed, cover letters/ narratives are present, flags are appropriate, and project specific requirements are met.

19.14.4.6 Any project that requires a data package is subject to a tertiary data review for transcription errors and acceptable quality control requirements. The Project Manager then signs the final report. The accounting personnel also check the report for any clerical or invoicing errors. When complete, the report is sent out to the client.

19.14.4.7 A visual summary of the flow of samples and information through the laboratory, as well as data review and validation, is presented in Figure 19-2.

19.14.5 Manual Integrations

Computerized data systems provide the analyst with the ability to re-integrate raw instrument data in order to optimize the interpretation of the data. Though manual integration of data is an invaluable tool for resolving variations in instrument performance and some sample matrix problems, when used improperly, this technique would make unacceptable data appear to meet quality control acceptance limits. Improper re-integrations lead to legally indefensible data, a poor reputation, or possible laboratory decertification. Because guidelines for re-integration of

data are not provided in the methods and most methods were written prior to widespread implementation of computerized data systems, the laboratory trains all analytical staff on proper manual integration techniques using TestAmerica's Corporate SOP (CA-Q-S-002) as the guideline for our internal SOP No. WS-PQA-0011, "Manual Integration Documentation and Practices".

19.14.5.1 The analyst must adjust baseline or the area of a peak in some situations, for example when two compounds are not adequately resolved or when a peak shoulder needs to be separated from the peak of interest. The analyst must use professional judgment and common sense to determine when manual integrating is required. Analysts are encouraged to ask for assistance from a senior analyst or manager when in doubt.

19.14.5.2 Analysts shall not increase or decrease peak areas to for the sole purpose of achieving acceptable QC recoveries that would have otherwise been unacceptable. The intentional recording or reporting of incorrect information (or the intentional omission of correct information) is against company principals and policy and is grounds for immediate termination.

19.14.5.3 Client samples, performance evaluation samples, and quality control samples are all treated equally when determining whether or not a peak area or baseline should be manually adjusted.

19.14.5.4 All manual integrations receive a second level review. Manual integrations must be indicated on an expanded scale "after" chromatograms such that the integration performed can be easily evaluated during data review. Expanded scale "before" chromatograms are also required for all manual integrations on QC parameters (calibrations, calibration verifications, laboratory control samples, internal standards, surrogates, etc.) unless the laboratory has another documented corporate approved procedure in place that can demonstrate an active process for detection and deterrence of improper integration practices.

Figure 19-1
Example: Demonstration of Capability Documentation

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Demonstration of Capability
Certification Statement

TestAmerica West Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
(916) 373-5600

Date:
Method:
Matrix: Aqueous
SOP:

Analyst(s):

We, the undersigned, CERTIFY that:

1: The analyst(s) identified above, using the cited test method, with the specifications in the cited SOP, which is in use at the facility for the analysis of samples under the TestAmerica West Sacramento Quality Assurance Manual, has met the Demonstration of Capability.

2: The test method was performed by the analyst(s) identified on this certification following the TestAmerica West Sacramento SOP.

3: A copy of the laboratory-specific SOP is available for all personnel on-site.

4: The data associated with the demonstration of capability are true, accurate, complete and self-explanatory (*). These data are attached to this certification statement.

5: All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well organized and available for review by authorized inspectors.

Comments/ Observations:

Karla Buechler _____ _____
Technical Director Technical Director Signature Date

Douglas Weir _____ _____
QA Manager QA Manager Signature Date

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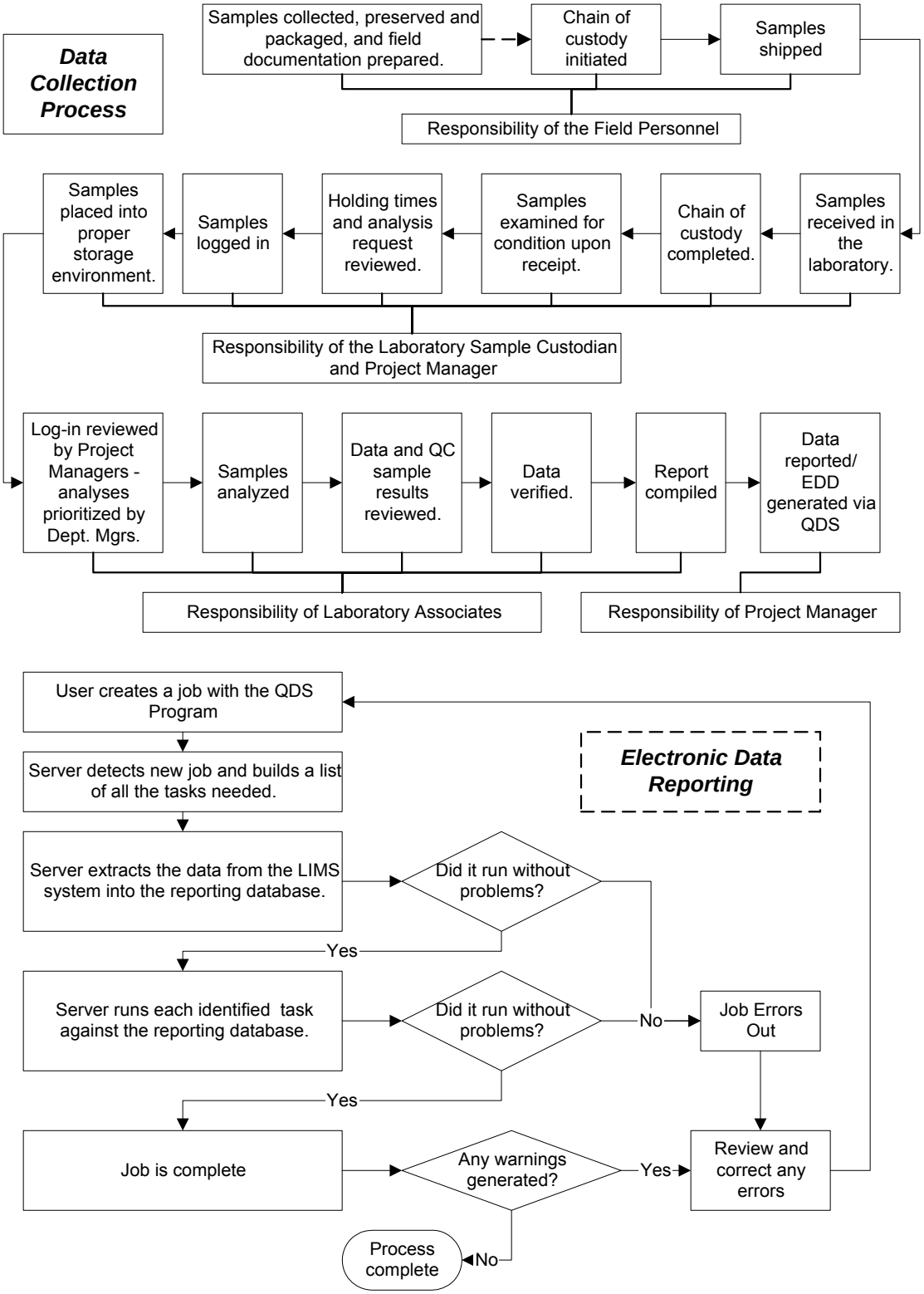
Figure 19-2
Example: Work Flow



SECTION 20

EQUIPMENT (AND CALIBRATIONS) *(NELAC 5.5.5)*

20.2 OVERVIEW

The laboratory purchases the most technically advanced analytical instrumentation for sample analyses. Instrumentation is purchased on the basis of accuracy, dependability, efficiency and sensitivity. Each laboratory is furnished with all items of sampling, preparation, analytical testing and measurement equipment necessary to correctly perform the tests for which the laboratory has capabilities. Each piece of equipment is capable of achieving the required accuracy and complies with specifications relevant to the method being performed. Before being placed into use, the equipment (including sampling equipment) is calibrated and checked to establish that it meets its intended specification. The calibration routines for analytical instruments establish the range of quantitation. Calibration procedures are specified in laboratory SOPs. A list of laboratory instrumentation is presented in Table 20-1.

Equipment is only operated by authorized and trained personnel. Manufacturers' instructions for equipment use are readily accessible to all appropriate laboratory personnel.

20.3 PREVENTIVE MAINTENANCE

20.3.1 The laboratory follows a well-defined maintenance program to ensure proper equipment operation and to prevent the failure of laboratory equipment or instrumentation during use. This program of preventive maintenance helps to avoid delays due to instrument failure.

20.3.2 Routine preventive maintenance procedures and frequency, such as cleaning and replacements, should be performed according to the procedures outlined in the manufacturer's manual. Qualified personnel must also perform maintenance when there is evidence of degradation of peak resolution, a shift in the calibration curve, loss of sensitivity, or failure to continually meet one of the quality control criteria.

20.3.3 Table 20-2 lists examples of scheduled routine maintenance. It is the responsibility of each Department Manager to ensure that instrument maintenance logs are kept for all equipment in his/her department. Preventative maintenance procedures may be also outlined in analytical SOPs or instrument manuals. (Note: for some equipment, the log used to monitor performance is also the maintenance log. Multiple pieces of equipment may share the same log as long as it is clear as to which instrument is associated with an entry.)

20.3.4 Instrument maintenance logs are controlled and are used to document instrument problems, instrument repair and maintenance activities. Maintenance logs shall be kept for all major pieces of equipment. Instrument maintenance logs may also be used to specify instrument parameters.

20.3.4.1 Documentation must include all major maintenance activities such as contracted preventive maintenance and service and in-house activities such as the replacement of electrical components, lamps, tubing, valves, columns, detectors, cleaning and adjustments.

20.3.4.2 Each entry in the instrument log includes the Analyst's initials, the date, a detailed description of the problem (or maintenance needed/scheduled), a detailed explanation of the solution or maintenance performed, and a verification that the equipment is functioning properly (state what was used to determine a return to control. e.g. CCV run on *'date'* was acceptable, or instrument recalibrated on 'date' with acceptable verification, etc.) must also be documented in the instrument records.

20.3.4.3 When maintenance or repair is performed by an outside agency, service receipts detailing the service performed can be affixed into the logbooks adjacent to pages describing the maintenance performed. This stapled in page must be signed across the page entered and the logbook so that it is clear that a page is missing if only half a signature is found in the logbook.

20.3.5 If an instrument requires repair (subjected to overloading or mishandling, gives suspect results, or otherwise has shown to be defective or outside of specified limits) it shall be taken out of operation and tagged as out-of-service or otherwise isolated until such a time as the repairs have been made and the instrument can be demonstrated as operational by calibration and/or verification or other test to demonstrate acceptable performance. The laboratory shall examine the effect of this defect on previous analyses.

20.3.6 In the event of equipment malfunction that cannot be resolved, service shall be obtained from the instrument vendor manufacturer, or qualified service technician, if such a service can be tendered. If on-site service is unavailable, arrangements shall be made to have the instrument shipped back to the manufacturer for repair. Back up instruments, which have been approved, for the analysis shall perform the analysis normally carried out by the malfunctioning instrument. If the back up is not available and the analysis cannot be carried out within the needed timeframe, the samples shall be subcontracted.

20.3.7 If an instrument is sent out for service or transferred to another facility, it must be recalibrated and verified (including new initial MDL study) prior to return to lab operations.

20.4 SUPPORT EQUIPMENT

This section applies to all devices that may not be the actual test instrument, but are necessary to support laboratory operations. These include but are not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, temperature measuring devices, thermal/pressure sample preparation devices and volumetric dispensing devices if quantitative results are dependent on their accuracy, as in standard preparation and dispensing or dilution into a specified volume. All raw data records associated with the support equipment are retained to document instrument performance.

20.4.1 Weights and Balances

The accuracy of the balances used in the laboratory is checked every working day, before use. All balances are placed on stable counter tops.

Each balance is checked prior to initial serviceable use with at least two certified ASTM type 1 weights spanning its range of use (weights that have been calibrated to ASTM type 1 weights may also be used for daily verification). ASTM type 1 weights used only for calibration of other weights (and no other purpose) are inspected for corrosion, damage or nicks at least annually

and if no damage is observed, they are calibrated at least every 5 years by an outside calibration laboratory. Any weights (including ASTM Type 1) used for daily balance checks or other purposes are recalibrated/recertified annually to NIST standards (this may be done internally if laboratory maintains "calibration only" ASTM type 1 weights).

All balances are serviced annually by a qualified service representative, who supplies the laboratory with a certificate that identifies traceability of the calibration to the NIST standards.

All of this information is recorded in logs, and the recalibration/recertification certificates are kept on file. See SOP No. WS-QA-0041, "Calibration and Calibration Check of Balances" for more details.

20.4.2 pH, Conductivity, and Turbidity Meters

The pH meters used in the laboratory are accurate to ± 0.1 pH units, and have a scale readability of at least 0.05 pH units. The meters automatically compensate for the temperature, and are calibrated with at least two working range buffer solutions before each use.

Conductivity meters are also calibrated before each use with a known standard to demonstrate the meters do not exceed an error of 1% or one umhos/cm.

Turbidity meters are also calibrated before each use. All of this information is documented in logs.

Consult pH and Conductivity, and Turbidity SOPs for further information.

20.4.3 Thermometers

All thermometers are calibrated on an annual basis with a NIST-traceable thermometer. IR thermometers, digital probes and thermocouples are calibrated quarterly.

The NIST thermometer is recalibrated every five years (unless thermometer has been exposed to temperature extremes or apparent separation of internal liquid) by an approved outside service and the provided certificate of traceability is kept on file. The NIST thermometer(s) have increments of at least 1 degree (0.5 degree or less increments are required for drinking water microbiological laboratories), and have ranges applicable to method and certification requirements. The NIST traceable thermometer is used for no other purpose than to calibrate other thermometers.

All of this information is documented in logbooks. Monitoring method-specific temperatures, including incubators, heating blocks, water baths, and ovens, is documented in method-specific logbooks. More information on this subject can be found in the SOP No. WS-QA-0016, "Thermometer Calibration."

20.4.4 Refrigerators/Freezer Units, Waterbaths, Ovens and Incubators

The temperatures of all refrigerator units and freezers used for sample storage are monitored 7 days a week; and each working day for units used for standard storage.

Ovens, waterbaths and incubators are monitored on days of use. Drying oven temperature must be recorded before and at the end of use. For example, an oven used for moisture determination must have its temperature recorded at the start and end of the drying process. Temperature must be ± 5% of set temperature for DoD work.

All of this equipment has a unique identification number, and is assigned a unique thermometer for monitoring.

Sample storage refrigerator temperatures are kept between > 0ºC and ≤ 6 ºC.

Specific temperature settings/ranges for other refrigerators, ovens waterbaths, and incubators can be found in method specific SOPs.

All of this information is documented in Daily Temperature Logbooks and method-specific logbooks.

20.4.5 Autopipettors, Dilutors, and Syringes

Mechanical volumetric dispensing devices including burettes (except Class A Glassware) are given unique identification numbers and the delivery volumes are verified gravimetrically, at a minimum, on a quarterly basis. Glass micro-syringes are considered the same as Class A glassware.

For those dispensers that are not used for analytical measurements, a label can be applied to the device stating that it is not calibrated. Any device not regularly verified can not be used for any quantitative measurements. See SOP WS-QA-0004, “Maintenance and Calibration Check of Fixed and Adjustable Volume Autopipettors, Autodispensers and Volumetric Containers”.

Micro-syringes are purchased from Hamilton Company. Each syringe is traceable to NIST. The laboratory keeps on file an “Accuracy and Precision Statement of Conformance” from Hamilton attesting established accuracy.

20.4.6 Autoclaves

Autoclaves used for sample digestion are capable of maintaining conditions of 15 psi at 120ºC for 15 minutes. The temperature of the autoclave is verified quarterly.

20.5 INSTRUMENT CALIBRATIONS

Calibration of analytical instrumentation is essential to the production of quality data. Strict calibration procedures are followed for each method. These procedures are designed to determine and document the method detection limits, the working range of the analytical instrumentation and any fluctuations that may occur from day to day. Further details regarding the calculations involved are present in SOP No. CA-Q-S-005, “Calibration Curves (General).”

Sufficient raw data records are retained to allow an outside party to reconstruct all facets of the initial calibration. Records contain, but are not limited to, the following: calibration date, method, instrument, analyst(s) initials or signatures, analysis date, analytes, concentration, response, type of calibration (Average RF, curve, or other calculations that may be used to reduce instrument responses to concentration.)

Sample results must be quantitated from the initial calibration and may not be quantitated from any continuing instrument calibration verification unless otherwise required by regulation, method or program.

If the initial calibration results are outside of the acceptance criteria, corrective action is performed and any affected samples are reanalyzed if possible. If the reanalysis is not possible, any data associated with an unacceptable initial calibration will be reported with appropriate data qualifiers (refer to Section 12).

Note: Instruments are calibrated initially and as needed after that and at least annually, however, the annual requirement does not apply to Isotope dilution.

20.5.1 CALIBRATION STANDARDS

20.5.1.1 Calibration standards are prepared using the procedures indicated in the Reagents and Standards section of the determinative method SOP.

20.5.1.2 Standards for instrument calibration are obtained from a variety of sources. All standards are traceable to national or international standards of measurement, or to national or international standard reference materials.

20.5.1.3 The lowest concentration calibration standard that is analyzed during an initial calibration must be at or below the stated reporting limit for the method based on the final volume of extract (or sample).

20.5.1.4 All initial calibrations are verified with a standard obtained from a second source and traceable to a national standard, when available (or vendor certified different lot if a second source is not available). For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst would be considered a second source. This verification occurs immediately after the calibration curve has been analyzed, and before the analysis of any samples.

20.5.2 Calibration Verification

The calibration relationship established during the initial calibration must be verified at least daily as specified in the laboratory method SOPs in accordance with the referenced analytical methods and NELAC (2003) standard, Section 5.5.5.10. The process of calibration verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models.

Note: The process of calibration verification referred to is fundamentally different from the approach called "calibration" in some methods. As described in those methods, the calibration factors or response factors calculated during calibration are used to update the calibration

factors or response factors used for sample quantitation. This approach, while employed in other EPA programs, amounts to a daily single-point calibration.
All target analytes and surrogates, including those reported as non-detects, must be included in periodic calibration verifications for purposes of retention time confirmation and to demonstrate that calibration verification criteria are being met.

All samples must be bracketed by periodic analyses of standards that meet the QC acceptance criteria (e.g., calibration and retention time). The frequency is found in the determinative methods or SOPs.

Note: If an internal standard calibration is being used (basically GCMS) then bracketing standards are not required, only daily verifications are needed. The results from these verification standards must meet the calibration verification criteria and the retention time criteria (if applicable).

20.5.2.1 Verification of Linear Calibrations

Calibration verification for calibrations involves the calculation of the percent drift or the percent difference of the instrument response between the initial calibration and each subsequent analysis of the verification standard. (These calculations are available in the laboratory method SOPs.) Verification standards are evaluated based on the % Difference from the average CF or RF of the initial calibration or based on % Drift or % Recovery if a linear or quadratic curve is used.

20.5.2.2 Verification of a Non-Linear Calibration

Calibration verification of a non-linear calibration is performed using the percent drift or percent recovery calculations.

Regardless of whether a linear or non-linear calibration model is used, if initial verification criterion is not met, then no sample analyses may take place until the calibration has been verified or a new initial calibration is performed that meets the specifications listed in the method SOPs. If the calibration cannot be verified after the analysis of a single verification standard, then adjust the instrument operating conditions and/or perform instrument maintenance, and analyze another aliquot of the verification standard. If the calibration cannot be verified with the second standard, then a new initial calibration is performed.

20.6 TENTATIVELY IDENTIFIED COMPOUNDS (TICS) – GC/MS ANALYSIS

For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. Data system library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other.

Note: If the TIC compound is not part of the client target analyte list but is calibrated by the laboratory and is both qualitatively and/or quantitatively identifiable, it should not be reported as a TIC. If the compound is reported on the same form as true TICs, it should be qualified and/or narrated that the reported compound is qualitatively and quantitatively (if verification in control) reported compared to a known standard that is in control (where applicable).

For example, the RCRA permit or waste delisting requirements may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches may the analyst assign a tentative identification.

20.7 GC/MS TUNING

Prior to any GCMS analytical sequence, including calibration, the instrument parameters for the tune and subsequent sample analyses within that sequence must be set.

Prior to tuning/auto-tuning the mass spec, the parameters may be adjusted within the specifications set by the manufacturer or the analytical method. These generally don't need any adjustment but it may be required based on the current instrument performance. If the tune verification does not pass it may be necessary to clean the source or perform additional maintenance. Any maintenance is documented in the maintenance log.

Table 20-1. - Laboratory Equipment and Instrumentation

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
GC	Agilent	6890N	CN10543080	2005	New
	Hewlett-Packard	6890	US00001087	1997	New
	Hewlett-Packard	6890	US00006442	1997	New
	Hewlett-Packard	6890	US00006441	1997	New
	Hewlett-Packard	6890	US00006438	1997	New
	Agilent	6890N	CN10521082	2005	New
	Hewlett-Packard	6890	US00000311	1997	Used
	Hewlett-Packard	6890	US00006455	1997	New
	Agilent	6890N	CN10521015	2005	New

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
HPLC	Varian	ProstarV 9065-01384	000498	1998	New
	Waters	2695	B02SM4 915M B02487 788M C02475 452N	2002	New
	Agilent	1100	DE43631861 DE43607107 DE33229050	2005	New
	Agilent	1100	DE43633762 DE43603468 DE43630549	2005	New
	Agilent	1200	DE62961719 JP62360107 DE64762303 DE63055783 DE63064176	2007	New
LCMS	Micromass	Quattro	9319	2000	New
	Micromass	Quattro Premier XE	VAB 452	2006	New
	Agilent	6410A Triple Quad	US64810220	2006	New
	Waters	Quattro Premier XE	VAB 1006	2009	New
HIRES	Fisons	VG70	7054	1988	New
	Fisons	VG70	7083	1989	New
	Fisons	Ultima	S176U	1992	New
	Micromass	Ultima	M421	1998	New
	VG Analytical	VG70	US82321724	2001	New
	Micromass	Ultima	M637	2004	New
	Waters	Ultima	M318	2008	Used
	Waters	Ultima Premier	P741	2008	New
METALS	Leeman	PS200 II	HG-8008	1998	New
	Leeman	PS200 II	HA-3027	2004	New
	Perkin-Elmer	Optima 4300DV	077N3022401	2003	New
	Perkin-Elmer	ELAN 6000	51950460	1994	New
	Perkin-Elmer	ELAN 6000	4719801	1998	New
	Perkin-Elmer	ELAN 9000 DRC-e	W0170304	2005	Used

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
GCMS Semivolatiles	Hewlett-Packard	HP 5973	US80221476	1998	New
	Hewlett-Packard	HP 5973	US80321345	1998	New
	Hewlett-Packard	HP 5973	US80221400	1998	New
	Hewlett-Packard	HP 5975	US61633479	2007	New
	Hewlett-Packard	HP 5973	US00023149	1999	New
	Hewlett-Packard	HP 5973	US00023182	1999	New
	Varian	Saturn 2200	06370 13651 CP8400-6358	2007	New
Volatiles	Hewlett-Packard	HP 5973	US800020780	1998	New
	Hewlett-Packard	HP 5973	US10227041	2002	New
	Hewlett-Packard	HP 5973	US10214090	2002	New
	Hewlett-Packard	HP 5973	US53931405	2005	New
General Chemistry	Man-Tech Associates	PC-Titrate	190H0238 2330 MS-0L0-477 MS-0C1-471 MS-0B1-276 MS-0E1-579	2001	New
	OI Corp	Flow System	20850488	2000	New
	Systea	EasyChem Plus	2006E1001205	2006	New
	Mettler-Toledo S/N	MC126 / 225646	225646	2004	New
	Dionex	DX500	99120668	1999	New
	Dionex	ICS-2000	3040054	2003	New
	Dionex	ICS-1000	4010013	2004	New
	Accumet	AB15	AB92321437	2005	New
	Thermo	Genesis 20	3SGH080004	2005	New
	OI Corp	Model 1010 Solids Module	J245710347 C247776181	2003	New
	HF Scientific	Micro 100	402223	2004	New

Table 20-2. Schedule of Routine Maintenance

INSTRUMENT	MAINTENANCE	FREQUENCY
APCI/ESI LC/MS/MS	Change pump seals. Change in-line filters in autosampler (HPLC). Check/replace in-line frit if excessive pressure or poor performance. Replace column if no change following in-line frit change. Clean corona needle. Replace sample inlet tube in APCI (10.1 cm). Replace fused silica tube in ESI interface. Clean lenses. Clean skimmer. Ballast rough pump 30 minutes.	As Needed
	Check solvent reservoirs for sufficient level of solvent. Verify that pump is primed, operating pulse free. Check needle wash reservoir for sufficient solvent. Verify capillary heater temperature functioning. Verify vaporizer heater temperature. Verify rough pump oil levels. Verify turbo-pump functioning. Verify nitrogen pressure for auxiliary and sheath gasses. Verify that corona and multiplier are functioning.	Daily(2)
	Replace rough-pump oil (4-6 months). Replace oil mist and odor elements. Replace activated alumina filter if applicable.	Semi-Annually
	Vacuum system components including fans and fan covers. Clean/replace fan filters, if applicable.	Annually
HIGH PRESSURE LIQUID CHROMATOGRAPH(1)	Replace columns when peak shape and resolution indicate that chromatographic performance of column is below method requirements. Rinse flow cell with 1N nitric acid if dirty flow cell. Change pump seals when flow becomes inconsistent. Backflush column if applicable. Change in-line filters for solvents.	As Needed
	Check level of solution in reservoirs. If adding, verify that solvent is from the same source. If changing, rinse delivery lines to prevent contamination of the new solvent. Check gas supply if applicable. Flush with an appropriate solvent to remove all bubbles. Pre-filter all samples.	Daily(2)
	Change pump seals.	Every 6-9 Months

INSTRUMENT	MAINTENANCE	FREQUENCY
GAS CHROMATOGRAPH(1)	Replace septum. Clean injector port Cut off front portion of capillary columns. Replace column if this fails to restore column performance or when column performance (e.g. peak tailing, poor resolution, high backgrounds, etc.) indicates it is required. Change glass wool plug in injection port and/or replace injection port liner when front portion of capillary column is removed. Replace or repair flow controller if constant gas flow cannot be maintained. Detectors: clean when baseline indicates contamination or when response is low. FID: clean/replace jet, replace ignitor. ECD: follow manufacturers suggested maintenance schedule Replace fuse. Reactivate external carrier gas dryers. HP 7673 Autosampler: replace syringe, fill wash bottle, dispose of waste bottle contents. Check inlets, septa.	As Needed
	Check for sufficient supply of carrier and detector gases. Check for correct column flow and/or inlet pressures. Check temperatures of injectors and detectors. Verify temperature programs. Check baseline level. Inspect chromatogram to verify symmetrical peak shape and adequate resolution between closely eluting peaks.	Daily(2)
	ECD: perform wipe test.	Semi-Annually
PURGE AND TRAP SYSTEMS	Change trap. Check purge flow. Flush lines (after foaming sample). Periodic leak checks (when replace traps/spargers) Replace/condition traps and/or spargers (when poor response or disappearance of reactive or poorly trapped compounds), clean sample lines, valves (if they become contaminated), and clean or replace glassware/spargers. Bake trap as needed to correct for high background. Change trap whenever loss of sensitivity, or erratic response or failing resolution is observed. Purge & trap autosamplers: leak check system, clean sample lines, valves.	As Needed
	Bake out trap & analyze primers (as needed) prior to commencing analysis.	Daily(2)
GAS CHROMATOGRAPHY/LOW-RESOLUTION MASS SPECTROMETER(1)	Replace septum. Clean injector port. Cut off front portion of capillary columns. Replace column if this fails to restore column performance or when column performance (e.g. peak tailing, poor resolution, high backgrounds, etc.) indicates it is required. Replace injection port liner when front portion of capillary column is removed. Check level of oil in mechanical pumps and diffusion pump if vacuum is insufficient. Add oil if needed. Replace electron multiplier when the tuning voltage approaches the maximum and/or when sensitivity falls below required levels.	As Needed

INSTRUMENT	MAINTENANCE	FREQUENCY
	Clean Source, including all ceramics and lenses - the source cleaning is indicated by a variety of symptoms including inability of the analyst to tune the instrument to specifications, poor response, and high background contamination. Replace filaments when both filaments burn out or performance indicates need for replacement. Check mass calibration (PFTBA or FC-43). Check ion source and analyzer (clean, replace parts as needed). Check vacuum, relays, gas pressures and flows. Change oil in the mechanical rough pump. Relubricate the turbomolecular pump-bearing wick. HP 7673 Autosampler: Replace syringe.	
	Check for sufficient gas supply. Check for correct column flow and/or inlet pressure. Check temperatures of injector, detector. Verify temperature programs. Check inlets, septa. Check baseline level. Check values of lens voltages, electron multiplier, and relative abundance and mass assignments of the calibration compounds. Inspect chromatogram to verify symmetrical peak shape and adequate resolution between closely eluting peaks. Autosampler: fill wash bottle, dispose of waste bottle contents.	Daily(2)
	Replace the exhaust filters on the mechanical rough pump every 1-2 years.	Annually
GAS CHROMATOGRAPHY/HIGH-RESOLUTION MASS SPECTROMETER(1)	Full Bake-Out. Change oil in rotary pump. Change oil in diffusion pump. Replace o-rings. Solvent rinse the flight tube. Clean the first field free region. Check detector voltages. Clean and dust connectors, etc on the outside of the instrument. Check the vacuum: ~5 x. 10^{-7} MBAR on both analyzer ion gauges, and ~5 x 10^{-6} MBAR on the source, with no helium flowing. Check isolation valve for leaks, correct if needed. Check for thermal trip by taking the magnet to maximum current, and verify that the coolant flow is acceptable. Replace septum. Clean injector port. Cut off front portion of capillary columns. Replace column if this fails to restore column performance or when column performance (e.g. peak tailing, poor resolution, high backgrounds, etc.) indicates it is required. Replace injection port liner when front portion of capillary column is removed. Clean Source, including all ceramics and lenses - the source cleaning is indicated by a variety of symptoms including inability of the analyst to tune the instrument to specifications, poor response, and high background contamination. Replace filaments when performance indicates need for replacement.	As Needed

INSTRUMENT	MAINTENANCE	FREQUENCY
	Check resolution sensitivity. Check stability. Check for sufficient gas supply. Check for correct column flow and/or inlet pressure. Check temperatures of injector, detector. Verify temperature programs. Check inlets, septa. Check baseline level. Check values of lens voltages, electron multiplier, and relative abundance and mass assignments of the calibration compounds. Inspect chromatogram to verify symmetrical peak shape and adequate resolution between closely eluting peaks.	Daily[2]
COLD VAPOR ATOMIC ABSORPTION (LEEMAN PS 200) [1]	Change pump tubing. Check/change Hg lamp. Clean optical cell. Change drying tube. Grease pump.	As Needed
	Check sample tip for clogs. Check drying tube. Check pump tubing/drain tubing. Check gas pressure. Check liquid/gas separator. Check tubing.	Daily[2]
INDUCTIVELY COUPLED ARGON PLASMA/MASS SPECTROMETRY (ICAP/MS)[1]	Check electronic settings for optimum sensitivity: resolution, mass calibration, ion optics. Measure quartz torch for proper alignment when removed and cleaned. Clean spray chamber and nebulizer. Clean all filters and fans. Check chiller coolant level. Check and drain oil mist eliminator on roughing pumps.	As Needed
	Check sample waste container level. Check quartz torch condition. Check RF coil. Check peristaltic pump: proper roller pressure, sample introduction tubing, correct pump rotation, condition of drain tubing. Check condition of sampler and skimmer cones. Check oil level of roughing pumps.	Daily[2]
	Replace oil in roughing pumps.	Every 2-3 Months
ICP[1]	Check that argon feed pressure is 80-120 psi. Check that chiller coolant pressure is 45-80 psig, no leaks. Check purge and shear gasses. Nitrogen purge gas pressure 40-120 psig, compressed air shear gas pressure 80-120 psig. Check radial purge and axial windows for deposits. Check that nebulizer is not clogged. Check that capillary tubing is clean and in good condition. Check that peristaltic pump windings are secure. Check that exhaust vent is operational Check that torch, glassware, aerosol injector tube are clean.	Daily[2]
	Clean plasma torch assembly to remove accumulated deposits. Check RF coil. Clean nebulizer and drain chamber; keep free flowing to maintain optimum performance.	Monthly or As Needed

INSTRUMENT	MAINTENANCE	FREQUENCY
	Clean filters on back of power unit to remove dust. Replace when needed: peristaltic pump tubing. sample capillary tubing. autosampler sipper probe. Check performance with manganese. Check O-rings. Clean/lubricate pump rollers	
	Check chiller coolant filter. (may require more or less frequently)	Semi-Annually
	Notify manufacturer service engineer for scheduled preventive maintenance service.	Annually
ION CHROMATOGRAPH(1)	Clean micromembrane suppressor when decreases in sensitivity are observed. Check fuses when power problems occur. Change column when peak shape and resolution deteriorate or when retention time shortening indicates that exchange sites have become deactivated. De-gas pump head when flow is erratic. Check all air and liquid lines for discoloration and crimping, if indicated. Check/change bed supports guard and analytical columns, if indicated.	As Needed
	Check plumbing/leaks. Check eluent level. Check gases. Check pump pressure. Check conductivity meter.	Daily(2)
	Check pump heads for leaks. Check filter (inlet).	Weekly
	Change pump seals. Change injection valve. Clean conductivity cell. Check conductivity cell for calibration.	Annually
ALPKEM COLORIMETRIC AUTO ANALYZER(1)	Prepare fresh reagents. Replace tubing. (About every 100 hours of use)	As Needed
	Check detector. Make sure there are no trapped bubbles in detector cell. Check Valves Check peristaltic tubing. Check sampler.	Daily(2)
	Clean pump, and XYZ Sampler.	Weekly
	Lubricate pump roller.	Monthly
	Clean pump rollers with steel wool and lubricate.	Semi-Annually
SYSTEA COLORIMETRIC AUTO ANALYZER(1)	Prepare fresh reagents. Replace waste tubing. Replace probes. Replace lamp	As Needed
	Perform washes. Perform filters autozero. Check temperatures.	Daily(2)
CHEMICAL OXYGEN DEMAND (COD) REACTOR(1)	Electronics serviced.	As Needed
	Check temperature with NIST reference thermometer.	Annually

INSTRUMENT	MAINTENANCE	FREQUENCY
AUTO TITRATOR[1]	Electronics serviced.	As Needed
	Calibrate with check standards. Inspect electrodes daily, clean as needed. Inspect electrode proper levels of filling solutions daily, fill as needed. Clean probe, each use. Prime buret Check rinse water reservoir.	Daily[2] (When Used)
CONDUCTANCE METER[1]	Electronics serviced. Replace batteries	As Needed
SPECTROPHOTOMETER[1]	Replace lamp. Replace fuse.	As Needed
	Check instrument manual. Perform wavelength calibration. Replace lamp annually or when erratic response is observed.	Annually
PH METER[1]	Clean electrode. Refill reference electrode.	As Needed
	Inspect electrode. Verify electrodes are properly connected and filled. Inspect electrode proper levels of filling solutions. Make sure electrode is stored in buffer.	Daily[2]
TOTAL ORGANIC CARBON ANALYZER (OI 1010 AND SOLIDS)	Check injection port septum after 50-200 runs. Perform leak test. Calibrate reagent pumps. Change sample loops. Adjust flow. Indicating drying tube. NDIR zero, after 100 hours of use. Sample pump, after 2000 hours for use. Digestion vessel/condensation chamber. Permeation tube, after 2000 hours of use. NDIR cell, after 2000 hours of use.	As Needed
	Check: Nitrogen supply, (oxygen supply for solids). Persulfate supply (1010 unit). Acid supply (1010 unit). Rinse water reservoir supply (1010 unit). IR millivolts for stability (after 30 min. warm-up).	Daily[2]
TURBIDIMETER[1]	Electronics serviced.	As Needed
	Clean instrument housing.	Monthly
DIGESTION BLOCK	Check temperature with NIST thermometer.	Annually
SONICATOR [1]	Replace probe tip. Disassemble and clean sonicator probe tips. Tune sonicator assembly.	As Needed
	Inspect probe tips for inconsistencies (etching/pitting).	Daily[2] (When Used)
ANALYTICAL/TOP LOADING BALANCES[1]	Check using ASTM Class 3 weights once daily or before use. Clean pan and weighing compartment.	Daily[2]
REFRIGERATORS/WALK-IN COOLERS[1]	Manufacturer cleaning and calibration.	Annually
	Refrigerant system and electronics serviced.	As Needed
	Temperatures checked and logged.	Daily[2]

INSTRUMENT	MAINTENANCE	FREQUENCY
OVENS[1]	Electronics serviced.	As Needed
	Temperatures checked and logged.	Daily[2]
ZYMARK PE WORKSTATION	Change O-rings whenever there are visible leaks or poor sealing on the SPE columns. Sample lines are clean after samples have been extracted by SPE with a program "Clean Sample Lines" with methanol followed by water. Occasionally for a more rigorous cleaning, or after a highly contaminated sample, a mixture of methanol/DCM at 50:50 may be used in place of methanol, follow by methanol, then water (never use acetone). Syringe pump may be primed using a program "Prime Solvent Lines" whenever air bubbles are suspected in the lines from running out of solvents and whenever solvents are changed. Syringe pump in good condition – replace if showing signs of wear or suspected of poor performance. Sample pumps may be re-calibrated whenever major repairs are performed, or whenever the pumps are suspected to be out of calibration. Follow manufacturer's procedure for re-calibrating the sample pumps. For method 8330, the pump loads 1050 mL of sample on the SPE. It should used up the whole sample bottle (quart bottles and 1-L bottles).	As Needed
SONICATION WATER BATH[1]	If the water bath is dirty, empty and refill with tap water. A couple drops of anti-bacterial solution may be added to inhibit the growth of bacteria in the water. The water level in the sonication batch should be about 1.2 to 1 inch from the top while in operation. Do not allow sonication batch to operate with water bath at lower levels. If the level is low, add more water, if the levels is too high, remove water to the proper level.	As Needed

Footnotes to Preventive Maintenance Tables

(1) Refer to manufacturer's instructions for each instrument to identify and perform maintenance operations.

(2) Daily checks and verifications are performed prior to instrument startup and are not documented in maintenance logs unless problems are noted.

SECTION 21

MEASUREMENT TRACEABILITY *(NELAC 5.5.6)*

21.1 OVERVIEW

Traceability of measurements shall be assured using a system of documentation, calibration, and analysis of reference standards. Laboratory equipment that are peripheral to analysis and whose calibration is not necessarily documented in a test method analysis or by analysis of a reference standard shall be subject to ongoing certifications of accuracy. At a minimum, these must include procedures for checking specifications of ancillary equipment: balances, thermometers, temperature, Deionized (DI) and Reverse Osmosis (RO) water systems, automatic pipettes and other volumetric measuring devices. (Refer to Section 20.3). With the exception of Class A Glassware (including glass microliter syringes that have a certificate of accuracy), quarterly accuracy checks are performed for all mechanical volumetric devices. Wherever possible, subsidiary or peripheral equipment is checked against standard equipment or standards that are traceable to national or international standards. Class A Glassware should be routinely inspected for chips, acid etching or deformity. If the Class A glassware is suspect, the accuracy of the glassware will be assessed prior to use.

21.2 NIST-TRACEABLE WEIGHTS AND THERMOMETERS

Reference standards of measurement shall be used for calibration only and for no other purpose, unless it can be shown that their performance as reference standards would not be invalidated.

For NIST-traceable weights and thermometers, the laboratory requires that all calibrations be conducted by a calibration laboratory accredited by A2LA, NVLAP (National Voluntary Laboratory Accreditation Program), APLAC (Asia-Pacific Laboratory Accreditation Cooperation), or EA (European Cooperation for Accreditation). A certificate and scope of accreditation is kept on file at the laboratory.

21.3 REFERENCE STANDARDS / MATERIALS

Reference standards/materials, where commercially available, are traceable to certified reference materials. Commercially prepared standard materials are purchased from vendors accredited by A2LA or NVLAP, with an accompanying Certificate of Analysis that documents the standard purity. If a standard cannot be purchased from a vendor that supplies a Certificate of Analysis, the purity of the standard is documented by analysis. The receipt of all reference standards must be documented. Reference standards are labeled with a unique Standard Identification Number and expiration date. All documentation received with the reference standard is retained as a QC record and references the Standard Identification Number.

All reference, primary and working standards/materials, whether commercially purchased or laboratory prepared, must be checked regularly to ensure that the variability of the standard or material from the 'true' value does not exceed method requirements. The accuracy of calibration standards is checked by comparison with a standard from a second source. In cases where a second standard manufacturer is not available, a vendor certified different lot is acceptable for use as a second source. For unique situations, such as air analysis where no

other source or lot is available, a standard made by a different analyst would be considered a second source. The appropriate Quality Control (QC) criteria for specific standards are defined in laboratory SOPs. In most cases, the analysis of an Initial Calibration Verification (ICV) or LCS (where there is no sample preparation) is used as the second source confirmation. These checks are generally performed as an integral part of the analysis method (e.g. calibration checks, laboratory control samples).

All standards and materials must be stored and handled according to method or manufacturer's requirements in order to prevent contamination or deterioration. Refer to the Corporate Environmental Health & Safety Manual or laboratory SOPs. For safety requirements, please refer to method SOPs and the laboratory Environmental Health and Safety Manual.

21.4 DOCUMENTATION AND LABELING OF STANDARDS, REAGENTS, AND REFERENCE MATERIALS

Reagents must be at a minimum the purity required in the test method. The date of reagent receipt and the expiration date are documented. The lots for most of the common solvents and acids are tested for acceptability prior to company wide purchase. (Refer to TestAmerica's Corporate SOP (CA-Q-S-001), Solvent and Acid Lot Testing and Approval.)

All manufacturer or vendor supplied Certificate of Analysis or Purity must be retained, stored appropriately, and readily available for use and inspection. These records are maintained ***in the departments, and online***. Records must be kept of the date of receipt and date of expiration of standards, reagents and reference materials. In addition, records of preparation of laboratory standards, reagents, and reference materials must be retained, stored appropriately, and be readily available for use and inspection. For detailed information on documentation and labeling, please refer to method specific SOPs and SOP No. WS-QA-0017, "Standards and Reagent Preparation and Quality Control Check Procedures".

Commercial materials purchased for preparation of calibration solutions, spike solutions, etc., are usually accompanied with an assay certificate or the purity is noted on the label. If the assay purity is 96% or better, the weight provided by the vendor may be used without correction. If the assay purity is less than 96% a correction will be made to concentrations applied to solutions prepared from the stock commercial material (for 1613B dioxin/furan analyses the purity must be 98% or corrections must be made).

21.4.1 All standards, reagents, and reference materials must be labeled in an unambiguous manner. Standards are logged into the laboratory's LIMS system, and are assigned a unique identification number. The following information is typically recorded in the electronic database or standards logbook.

- Standard ID
- Description of Standard
- Preparer's name
- Final volume and number of vials prepared
- Solvent type and lot number
- Preparation Date

- Expiration Date
- Standard source type (stock or daughter)
- Standard type (spike, surrogate, other)
- Parent standard ID (if applicable)
- Parent Standard Analyte Concentration (if applicable)
- Parent Standard Amount used (if applicable)
- Component Analytes
- Final concentration of each analyte
- Comment box (text field)

Records are maintained electronically for standard and reference material preparation. These records show the traceability to purchased stocks or neat compounds. These records also include method of preparation, date of preparation, expiration date and preparer's name or initials. Preparation procedures are provided in the Method SOPs.

21.4.2 All standards, reagents, and reference materials must be clearly labeled with a minimum of the following information:

- Expiration Date (include prep date for reagents)
- Standard ID
- Special Health/Safety warnings if applicable

21.4.3 In addition, the following information may be helpful:

- Date of receipt for commercially purchased items or date of preparation for laboratory prepared items
- Date opened (for multi-use containers, if applicable)
- Description of standard (if different from manufacturer's label or if standard was prepared in the laboratory)
- Concentration (if applicable)
- Initials of analyst preparing standard or opening container

All containers of prepared reagents must include a preparation date, expiration date and an ID number to trace back to preparation.

Procedures for preparation of reagents can be found in the Method SOPs.

Standard ID numbers must be traceable through associated logbooks, worksheets and raw data.

All reagents and standards must be stored in accordance to the following priority: 1) with the manufacturer's recommendations; 2) with requirements in the specific analytical methods as specified in the laboratory SOP.

SECTION 22

SAMPLING *(NELAC 5.5.7)*

22.1 OVERVIEW

The laboratory does not provide sampling services. The laboratory's responsibility in the sample collection process lies in supplying the sampler with the necessary coolers, reagent water, sample containers, preservatives, sample labels, custody seals, COC forms, ice, and packing materials required to properly preserve, pack, and ship samples to the laboratory

22.2 SAMPLING CONTAINERS

The laboratory offers clean sampling containers for use by clients. These containers are obtained from reputable container manufacturers and meet EPA specifications as required. Any certificates of cleanliness that are provided by the supplier are maintained at the laboratory.

22.2.1 Preservatives

Upon request, preservatives are provided to the client in pre-cleaned sampling containers. In some cases containers may be purchased pre-preserved from the container supplier. Whether prepared by the laboratory or bought pre-preserved, the grades of the preservatives are at a minimum:

- Hydrochloric Acid – Reagent ACS (Certified VOA Free) or equivalent
- Methanol – Purge and Trap grade
- Nitric Acid – Instra-Analyzed or equivalent
- Sodium Bisulfate – ACS Grade or equivalent
- Sodium Hydroxide – Instra-Analyzed or equivalent
- Sulfuric Acid – Instra-Analyzed or equivalent
- Sodium Thiosulfate – ACS Grade or equivalent

22.3 DEFINITION OF HOLDING TIME

The date and time of sampling documented on the COC form establishes the day and time zero. As a general rule, when the maximum allowable holding time is expressed in "days" (e.g., 14 days, 28 days), the holding time is based on calendar day measured. Holding times expressed in "hours" (e.g., 6 hours, 24 hours, etc.) are measured from date and time zero. The first day of holding time ends twenty-four hours after sampling. Holding times for analysis include any necessary reanalysis. However there are some programs, such as AFCEE and Alaska Department of Environmental Conservation, which determine holding time compliance based on the date and specific time of analysis compared to the time of sampling regardless of how long the holding time is.

22.4 SAMPLING CONTAINERS, PRESERVATION REQUIREMENTS, HOLDING TIMES

The preservation and holding time criteria specified in the following tables are derived from the source documents for the methods. If method requires holding times (this information is available in the SOPs) or preservation requirements are not met, the reports will be qualified using a flag, footnote or case narrative. As soon as possible or "ASAP" is an EPA designation for tests for which rapid analysis is advised, but for which neither EPA nor the laboratory have a basis for a holding time.

22.5 SAMPLE ALIQUOTS / SUBSAMPLING

Taking a representative sub-sample from a container is necessary to ensure that the analytical results are representative of the sample collected in the field. The size of the sample container, the quantity of sample fitted within the container, and the homogeneity of the sample need consideration when sub-sampling for sample preparation. It is the laboratory's responsibility to take a representative subsample or aliquot of the sample provided for analysis.

Analysts should handle each sample as if it is potentially dangerous. At a minimum, safety glasses, gloves, and lab coats must be worn when preparing aliquots for analysis.

Guidelines on taking sample aliquots & subsampling are located SOP Nos. WS-QA-0018, "Subsampling and Compositing of Samples (Method ASTM D 6323-98)" and WS-QA-0028, "Multi-Incremental Subsampling of Soils and Sediments".

Table 22-1.
Holding Times, Preservation and Container Requirements: Drinking Water (SDWA)

PARAMETER	CONTAINER	PRESERVATION[1,2] Temp.[23]	Chemical	HOLDING TIME[3]	SAMPLE VOLUME
Asbestos	Plastic/Glass	4ºC	None	48 hours[5]	1 L
Coliforms (Total and Fecal)	Plastic/Glass[20]	10ºC	$Na_2S_2O_3$	30 hours[21]	120 mL
Cyanide	Plastic/Glass	4ºC	NaOH to pH >12 Ascorbic acid [9] or Sodium arsenite [9]	14 days	500 mL
Fluoride	Plastic/Glass	None	None	None	250 mL
Perchlorate (EPA 331.0)	Plastic/Glass[20]	4ºC	None Filtered, 1/3 Headspace to minimize anaerobic conditions	28 days	250 mL
Heterotrophic Plate Count	Plastic/Glass[20]	10ºC	$Na_2S_2O_3$	8 hours (24 hours[22])	120 mL
Mercury	Plastic/Glass	None	HNO_3 to pH<2	28 days	250 mL
Metals [4]	Plastic/Glass	None	HNO_3 to pH<2 [24]	6 months	250 mL
Nitrate	Plastic/Glass	4ºC	None	48 hours[6]	250 mL
Nitrate-Nitrite	Plastic/Glass	None	H_2SO_4 to pH<2	28 days	250 mL
Nitrite	Plastic/Glass	4ºC	None	48 hours	250 mL
THMs Only	Glass[8]	4ºC	$Na_2S_2O_3$ [9] HCl to pH <2 may also be used	14 days	3 X 40 mL
Volatile Organic Compounds	Glass[8]	4ºC	HCl to pH <2 $Na_2S_2O_3$ [9] or Ascorbic acid [9]	14 days / 24 hrs[25]	3 X 40 mL
EDB, DBCP, 1,2,3-TCP (EPA 504.1)	Glass[8]	4ºC	$Na_2S_2O_3$	14 days[11]	3 X 40 mL
Organochlorine Pesticides/PCBs (EPA 505)[10]	Glass[8]	4ºC	$Na_2S_2O_3$	14 days[11]	3 X 40 mL

PARAMETER	CONTAINER	PRESERVATION[1,2] Temp.[23]	Chemical	HOLDING TIME[3]	SAMPLE VOLUME
Nitrogen and Phos. Pesticides (EPA 507)	Glass-Amber[8]	4ºC	$Na_2S_2O_3$	14 days[12]	1 L
Total PCBs (EPA 508A)	Glass-Amber[8]	4ºC	None	14 days[13]	1 L
Pesticides and PCBs (EPA 508.1)[14]	Glass-Amber[8]	4ºC	HCl to pH <2 $Na_2S_2O_3$[9]	14 days[13]	1 L
Chlorinated Acids (EPA 515.1)	Glass-Amber[8]	4ºC	$Na_2S_2O_3$	14 days[12]	1 L
Nitrosamines (EPA 521)	Glass-Amber[8]	4ºC	$Na_2S_2O_3$	14 days[12]	1 L
Semivolatiles (EPA 525.2)	Glass-Amber[8]	4ºC	HCl to pH <2 $Na_2S_2O_3$[9]	14 days[13]	1 L
N-Methylcarbamoyloxamines and N-Methylcarbamates (EPA 531.1)	Glass[8]	4ºC	$Na_2S_2O_3$, Monochloroacetic Acid buffer to pH<3	28 days	3 X 60 mL
Acetamide Herbicide Degradates (EPA 535)	Glass-Amber[8]	4ºC	Ammonium Chloride	14 days[12]	250 mL
Glyphosate (EPA 547)	Glass[8]	4ºC	$Na_2S_2O_3$	14 days	3 X 60 mL
Endothall (EPA 548)	$Na_2S_2O_3$	4ºC	None	7 days[15]	1 L
Diquat/Parquat (EPA 549.1)	Glass-Amber[8] (Silanized or PVC amber)	4ºC	H_2SO_4 to PH <2 $Na_2S_2O_3$[9]	7 days[16]	1 L
Chlorinated Disinfection Byproducts, Chlorinated Solvents, and Halogenated Pesticides/Herbicides (EPA 551)	Glass[8]	4ºC	Phosphate Buffer and Ammonium Chloride[19]	14 days[17]	3 X 60 mL
Haloacetic Acids (EPA 552.1)	Glass-Amber[8]	4ºC	Ammonium Chloride	28 days[18]	250 mL
2,3, 7, 8 TCDD	Glass-Amber[8]	4ºC	$Na_2S_2O_3$	1 year	1 L

Key to Table

1. Sample preservation should be performed immediately upon sample collection. For composite chemical samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.
2. When any sample is to be shipped by common carrier or sent through the United States mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring compliance. For the

Key to Table

preservation requirements of Table 6-8, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid, (HCl) in water, solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

3. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.
4. All metals except Hg.
5. Instructions for containers, preservation procedures and holding times as specified in Method 100.2 must be adhered to for all compliance analysis including those conducted with Method 100.1.
6. If the sample is chlorinated, the holding time for an un-acidified sample kept at 4°C is extended to 14 days.
7. Nitrate-Nitrite refers to a measurement of total nitrite.
8. With Teflon lined septum.
9. If chlorinated, add reagent prior to acidification (for Cyanide, add before NaOH).
10. Heptachlor has a 7 day hold time.
11. 14 days until extraction. 24 hours after extraction.
12. 14 days until extraction. 28 days after extraction.
13. 14 days until extraction. 30 days after extraction.
14. For cyanazine, cool to 4°C only.
15. 7 days until derivitization. 1 day after derivitization.
16. 7 days until extraction. 21 days after extraction.
17. 14 days until extraction. 14 days after extraction.
18. 28 days until extraction. 48 hours after extraction.
19. Sodium Sulfite may be used as a dechlorinating agent in some instances. Verify with laboratory prior to sampling.
20. Sterilized. Plastic must be Polypropylene.
21. 40 CFR part 141.74 regulations to avoid filtration or disinfection state 8 hours (DW compliance testing). Most facilities are using either disinfection or filtration so the 8 would not apply in most cases.
22. 40 CFR part 141.74 regulations for Disinfection By-Product rule state 8 hours (DW compliance testing) where SM 9215 allows up to 24 hours if sample is stored between > 0 and $\leq$ 4° C.
23. For samples with a temperature requirement of 4°C, a sample temperature of just above the water freezing temperature to $\leq$ 6°C is acceptable.
24. Acid preservation may be omitted for shipping and laboratory will acidify at least 24 hours prior to analysis.
25. Holding Time is 24 hours if pH adjustment is not performed.

Table 22-2
Holding Times, Preservation and Container Requirements: NPDES – Bacteria, Protozoa, Toxicity Tests

PARAMETER	CONTAINER [1]	PRESERVATION[2,3] Temp.	PRESERVATION[2,3] Chemical	HOLDING TIME[4]	SAMPLE VOLUME
Total, Fecal, and E.coli Coliforms	Plastic/Glass	10ºC	0.0008 % $Na_2S_2O_3$[6]	6 hours	100 mL
Fecal Streptococci	Plastic/Glass	10ºC	0.0008 % $Na_2S_2O_3$[6]	6 hours	100 mL
Enterococci	Plastic/Glass	10ºC	0.0008 % $Na_2S_2O_3$[6]	6 hours	100 mL
Cryptosporidium	LPDE Plastic	0-8ºC	None	96 Hours	500 mL
Giardia	LPDE Plastic	0-8ºC	None	96 Hours	500 mL
Toxicity – Acute/Chronic	Plastic/Glass	$\leq$ 6ºC[5]	None	36 Hours	2 L

Key to Table

1. Plastic should be Polypropylene or other sterilizable plastic.
2. Sample preservation should be performed immediately upon sample collection. For composite chemical samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4^{o}C until compositing and sample splitting is completed.
3. When any sample is to be shipped by common carrier or sent through the United States mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring compliance. For the preservation requirements of Table 6-8, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid, (HCl) in water, solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).
4. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.
5. Samples must not be frozen. Sufficient ice should be placed with the samples in the shipping container to ensure that ice is still present when the samples arrive at the laboratory. However, even if ice is present, when samples arrive, it is necessary to measure the temperature of the samples and confirm that the $\leq$ 6^{o}C temperature has not been exceeded.
6. Should only be used in the presence of residual chlorine.

Table 22-3
Holding Times, Preservation and Container Requirements: NPDES - Inorganic

PARAMETER	CONTAINER [1]	PRESERVATION[2,3] Temp[14].	Chemical	HOLDING TIME[4]	SAMPLE VOLUME
Acidity	Plastic/Glass	≤ 6ºC	None	14 days	100 mL
Alkalinity	Plastic/Glass	≤ 6ºC	None	14 days	100 mL
Ammonia	Plastic/Glass	≤ 6ºC	H_2SO_4 to pH<2	28 days	400 mL
BOD 5 Day	Plastic/Glass	≤ 6ºC	None	48 hours	1000 mL
Boron	Plastic[5]	None	HNO_3 to pH<2	6 months	200 mL
Bromide	Plastic/Glass	None	None	28 days	100 mL
CBOD 5 Day	Plastic/Glass	≤ 6ºC	None	48 hours	1000 mL
COD	Plastic/Glass	≤ 6ºC	H_2SO_4 to pH<2	28 days	100 mL
Chloride	Plastic/Glass	None	None	28 days	50 mL
Chlorine, Residual	Plastic/Glass	None	None	15 min.[6]	200 mL
Color	Plastic/Glass	≤ 6ºC	None	48 hours	50 mL
Cyanide –Total [16, 17]	Plastic/Glass	≤ 6ºC	NaOH to pH >12, 0.6 g Ascorbic Acid[7]	14 days	100 mL
Cyanide – Amenable [16, 17]	Plastic/Glass	≤ 6ºC	NaOH to pH >12, 0.6 g Ascorbic Acid[7]	14 days	100 mL
Fluoride	Plastic	None	None	28 days	300 mL
Hardness	Plastic/Glass	None	HNO_3 to pH<2[8]	6 months	100 mL
Hexavalent Chromium	Plastic/Glass	≤ 6ºC	Ammonium sulfate buffer pH = 9.3 - 9.7	28 days / 24 hrs[15]	200 mL
Hydrogen Ion (pH)	Plastic/Glass	None	None	15 min.[6]	200 mL
Kjeldahl and organic Nitrogen	Plastic/Glass	≤ 6ºC	H_2SO_4 to pH <2	28 days	500 mL
Mercury[11]	Plastic/Glass	None	HNO_3 to pH<2	28 days	200 mL
Metals[9,10]	Plastic/Glass	None	HNO_3 to pH<2 [18]	6 months	200 mL
Nitrate	Plastic/Glass	≤ 6ºC	None	48 hours	100 mL
Nitrate-Nitrite	Plastic/Glass	≤ 6ºC	H_2SO_4 to pH <2	28 days	100 mL
Nitrite	Plastic/Glass	≤ 6ºC	None	48 hours	100 mL
Oil and Grease	Glass	≤ 6ºC	H_2SO_4 or HCl to pH <2	28 days	1 L

PARAMETER	CONTAINER [1]	PRESERVATION[2,3] Temp[14].	Chemical	HOLDING TIME[4]	SAMPLE VOLUME
Organic Carbon (TOC)	Plastic/Glass	≤ 6ºC	H_2SO_4 or HCl to pH <2[12]	28 days	250 mL
Orthophosphate	Plastic/Glass	≤ 6ºC	Filter within 15 min.	48 hours	250 mL
Oxygen, Dissolved Probe	Glass[13]	None	None	15 min.[6]	200 mL
Oxygen, Winkler	Glass[13]	None	Fix on site and store in dark.	8 hours	300 mL
Phenols	Glass	≤ 6ºC	H_2SO_4 to pH <2	28 days	500 mL
Phosphorus, Elemental	Glass	≤ 6ºC	None	48 hours	250 mL
Phosphorus, Total	Plastic/Glass	≤ 6ºC	H_2SO_4 to pH <2	28 days	250 mL
Residue, Total	Plastic/Glass	≤ 6ºC	None	7 days	1 L
Residue, Filterable	Plastic/Glass	≤ 6ºC	None	7 days	1 L
Residue, Non-Filterable	Plastic/Glass	≤ 6ºC	None	7 days	1 L
Residue, Settleable	Plastic/Glass	≤ 6ºC	None	48 hours	1 L
Residue, Volatile	Plastic/Glass	≤ 6ºC	None	7 days	1 L
Silica	Plastic[5]	≤ 6ºC	None	28 days	250 mL
Specific Conductance	Plastic/Glass	≤ 6ºC	None	28 days	250 mL
Sulfate	Plastic/Glass	≤ 6ºC	None	28 days	250 mL
Sulfide	Plastic/Glass	≤ 6ºC	Zinc acetate plus NaOH to pH>9	7 days	500 mL
Sulfite	Plastic/Glass	None	None	15 min.[6]	200 mL
Surfactants	Plastic/Glass	≤ 6ºC	None	48 hours	1 L
Temperature	Plastic/Glass	None	None	N/A	100 mL
Turbidity	Plastic/Glass	≤ 6ºC	None	48 hours	1 L

Key to Table

1. Plastic should be Polyethylene.
2. Sample preservation should be performed immediately upon sample collection. For composite chemical samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at ≤ 6ºC until compositing and sample splitting is completed.

Key to Table

3. When any sample is to be shipped by common carrier or sent through the United States mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring compliance. For the preservation requirements of Table 6-8, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid, (HCl) in water, solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).
4. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.
5. May also be collected in quartz or PFTE Plastic.
6. For compliance testing, the analysis must be performed in the field at the time of analysis. If transported to the laboratory for analysis, the analysis will be performed as soon as practical and reported qualified.
7. Should only be used in the presence of residual chlorine. (Alternatively, sodium arsenite may be used.)
8. H_2SO_4 to a pH <2 is also acceptable.
9. Except Mercury and Hexavalent Chromium.
10. For dissolved metals, samples must be filtered on site before adding HNO_3 preservative (or before shipping to laboratory).
11. Samples collected for determination of trace level mercury (100 ng/L) using EPA 1631 must be collected in tightly capped Fluor polymer or glad bottles and preserved with BrCl or HCl solution within 48 hours of sample collection. The time to preservation may be extended to 28 days if a sample is oxidized in the sample bottle. Samples collected for dissolved trace level mercury should be filtered in the laboratory. However, if circumstances prevent overnight shipping, samples should be filtered in a designated clean area in the field in accordance with procedures given in Method 1669. Samples that been collected for determination of total or dissolved trace level mercury must be analyzed within 90 days of sample collection.
12. Phosphoric acid (H_3PO_4) may also be used.
13. Should have glass lid or top.
14. Aqueous samples must be preserved at ≤6 °C unless otherwise indicated, and should not be frozen unless data demonstrating that sample freezing does not adversely impact sample integrity is maintained on file and accepted as valid by the regulatory authority. Also, for purposes of NPDES monitoring, the specification of ‘‘≤ °C’’ is used in place of the ‘‘4 °C’’ and ‘‘<4 °C’’ sample temperature requirements listed in some methods. It is not necessary to measure the sample temperature to three significant figures (1/100th of 1 degree); rather, three significant figures are specified so that rounding down to 6 °C may not be used to meet the ≤6 °C requirement. The preservation temperature does not apply to samples that are analyzed immediately (less than 15 minutes).
15. Holding time is 24 hours if pH adjustment is not performed.
16. In the Field: Samples are to be tested for Sulfide using lead acetate paper prior to the addition of Sodium Hydroxide (NaOH). If sulfide is present, the sample must be treated with Cadmium Chloride and filtered prior to the addition of NaOH. If the sulfide test and treatment is not performed in the field, the lab will test the samples for sulfide using lead acetate paper at the time of receipt and if sulfide is present in the sample, the client will be notified and given the option of retaking the sample and treating in the field per the method requirements or the laboratory can analyze the samples as delivered (with sulfide treatment by laboratory) and qualify the results in the final report.
17. It is the responsibility of the client to notify the laboratory if thiosulfate, sulfite, or thiocyanate are known or suspected to be present in the sample. This notification may be on the chain of custody. The samples may need to be subcontracted to a laboratory that performs a UV digestion. If the lab does not perform the UV digestion on samples that contain these compounds, the results must be qualified in the final report.
18. Acid preservation may be omitted for shipping and laboratory will acidify at least 24 hours prior to analysis.

Table 22-4
Holding Times, Preservation and Container Requirements: NPDES - Organic

PARAMETER	CONTAINER	PRESERVATION[1,2] Temp.[15]	PRESERVATION[1,2] Chemical	HOLDING TIME[3]	SAMPLE VOLUME
Purgeable Halocarbons	Glass[4]	≤ 6ºC	0.0008 % $Na_2S_2O_3$[5]	14 days	40 mL
Purgeable Aromatic Hydrocarbons	Glass[4]	≤ 6ºC	0.0008 % $Na_2S_2O_3$[5], HCl to pH<2	14 days[6]	40 mL
Acrolein and Acrylonitrile	Glass[4]	≤ 6ºC	0.0008 % $Na_2S_2O_3$[5], adjust pH to 4-5[7]	14 days	40 mL
Phenols[9]	Glass[4]	≤ 6ºC	0.0008 % $Na_2S_2O_3$[5]	7 days[8]	1 L
Benzidines[9]	Glass[4]	≤ 6ºC	0.0008 % $Na_2S_2O_3$[5]	7 days[8, 11]	1 L
Phthalate esters[9]	Glass[4]	≤ 6ºC	None	7 days[8]	1 L
Nitrosamines[9,12]	Glass[4]	≤ 6ºC	0.0008 % $Na_2S_2O_3$[5,13]	7 days[8]	1 L
PCBs[9]	Glass[4]	≤ 6ºC	None	1 year[8]	1 L
Nitroaromatics and Isophorone[9]	Glass[4]	≤ 6ºC	0.0008 % $Na_2S_2O_3$[5,13]	7 days[8]	1 L
Polynuclear Aromatic Hydrocarbons[9]	Glass[4]	≤ 6ºC	0.0008 % $Na_2S_2O_3$[5,13]	7 days[8]	1 L
Haloethers[9]	Glass[4]	≤ 6ºC	0.0008 % $Na_2S_2O_3$[5]	7 days[8]	1 L
Chlorinated Hydrocarbons[9]	Glass[4]	≤ 6ºC	None	7 days[8]	1 L
CDD/CDFs[9] – Aqueous: Field/Lab Preservation	Glass	≤ 6ºC	pH <9, 0.0008 % $Na_2S_2O_3$[5]	1 year	1 L
CDD/CDFs[9] – Solids/Mixed Phase/ - Field Preservation	Glass	≤ 6ºC	None	7 days	1 L
CDD/CDFs[9] – Tissue – Field Preservation	Glass	≤ 6ºC	None	24 hours	
CDD/CDFs[9] – Solids/Mixed Phase/Tissue - Lab Preservation	Glass	< -10ºC	None	1 year	1 L
Pesticides[9]	Glass	≤ 6ºC	pH 5-9 [14]	7 days[8]	1 L

Key to Table

1. Sample preservation should be performed immediately upon sample collection. For composite chemical samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at $\leq 6^{o}C$ until compositing and sample splitting is completed.
2. When any sample is to be shipped by common carrier or sent through the United States mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring compliance. For the preservation requirements of Table 6-8, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid, (HCl) in water, solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).
3. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.
4. With Teflon lined septum.
5. Should only be used in the presence of residual chlorine. Ascorbic may be used instead.
6. Samples receiving no pH adjustments must be analyzed within 7 days. If 2-chlorovinylethylether is a target analyte, the sample should not be acidified.
7. The pH adjustment is not required if acrolein is not being measured. Samples for acrolein receiving no pH adjustment must be analyzed within three days of sampling.
8. 7 days until extraction, 40 days after extraction. (PCB only – 1 year after extraction)
9. When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more categories, the sample may be preserved by cooling to $\leq 6^{o}C$ reducing residual chlorine with 0.0008 % sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9. Samples preserved in this manner may be held for 7 days before extraction and for 40 days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 5 (re the requirement for thiosulfate reduction of residual chlorine) and footnotes 10 and 11(re the analysis of Benzidine).
10. If 1,2-diphenylhydrazine is likely to be present, adjust pH to of the sample to 4.0 $\pm$ 0.2 to prevent rearrangement to benzidine.
11. Extracts may be stored up to 30 days before analysis if storage temperature is $< 0^{o}C$.
12. For the analysis of diphenylnitrosamine, add 0.008 % $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.
13. Store in dark.
14. The pH adjustment may be performed upon receipt in the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.0008 % $Na_2S_2O_3$.
15. Aqueous samples must be preserved at ≤6 °C unless otherwise indicated, and should not be frozen unless data demonstrating that sample freezing does not adversely impact sample integrity is maintained on file and accepted as valid by the regulatory authority. Also, for purposes of NPDES monitoring, the specification of ‘‘≤ °C’’ is used in place of the ‘‘4 °C’’ and ‘‘<4 °C’’ sample temperature requirements listed in some methods. It is not necessary to measure the sample temperature to three significant figures (1/100th of 1 degree); rather, three significant figures are specified so that rounding down to 6 °C may not be used to meet the ≤6 °C requirement. The preservation temperature does not apply to samples that are analyzed immediately (less than 15 minutes).

Table 22-5.
Holding Times, Preservation and Container Requirements: NPDES - Radiological

PARAMETER	CONTAINER	PRESERVATION[1,2] Temp.	Chemical	HOLDING TIME[3]	SAMPLE VOLUME
Alpha, Beta, Radium	Plastic/Glass	None	HNO_3 to pH<2	6 months	1 L

Key to Table

1. Sample preservation should be performed immediately upon sample collection. For composite chemical samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.
2. When any sample is to be shipped by common carrier or sent through the United States mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring compliance. For the preservation requirements of Table 6-8, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater).
3. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.

Table 22-6.
Holding Times, Preservation and Container Requirements: RCRA - Aqueous

PARAMETER	CONTAINER [1]	PRESERVATION[2,3] Temp.[12]	Chemical	HOLDING TIME[4]	SAMPLE VOLUME
Chloride	Plastic/Glass	4ºC	None	28 days	100 mL
Cyanide -Total	Plastic/Glass	4ºC	NaOH to pH >12[5]	14 days	250 mL
Cyanide -Amenable	Plastic/Glass	4ºC	NaOH to pH >12[5]	14 days	250 mL
Hydrogen Ion (pH)	Plastic/Glass	4ºC	None	24 hours[11]	100 mL
Nitrate	Plastic/Glass	4ºC	None	48 hours	28 days
Oil and Grease	Glass	4ºC	HCl	28 days	1 L
Organic carbon (TOC)	Plastic/Glass	4ºC	pH to <2[6] Store in dark	28 days	28 days
Sulfate	Plastic/Glass	4ºC	None	28 days	400 mL
Sulfide	Plastic/Glass	4ºC	Add Zn Acetate	7 days	400 mL
Chromium VI	Plastic/Glass	4ºC	None	24 hours	250 mL
Mercury	Plastic/Glass	None	HNO_3 to pH<2	28 days	250 mL
Other Metals	Plastic/Glass	None	HNO_3 to pH<2[15]	6 months	250 mL
Acrolein and Acrylonitrile	Glass[10]	4ºC	0.0008 % $Na_2S_2O_3$[7] Adjust pH to 4-5[13]	14 days	1 L
Benzidines	Glass[10]	4ºC	0.0008 % $Na_2S_2O_3$[7]	7 days[8]	1 L
Chlorinated Hydrocarbons	Glass[10]	4ºC	0.0008 % $Na_2S_2O_3$[7]	7 days[8]	1 L
Dioxins and Furans	Glass[10]	4ºC	None	30 days[8]	1 L
Haloethers	Glass[10]	4ºC	0.0008 % $Na_2S_2O_3$[7]	7 days[8]	1 L
Nitroaromatics and cyclic ketones	Glass[10]	4ºC	0.0008 % $Na_2S_2O_3$[7], store in dark	7 days[8]	1 L
Nitrosamines	Glass[10]	4ºC	0.0008 % $Na_2S_2O_3$[7], store in dark	7 days[8]	1 L
Organochlorine Pesticides	Glass[10]	4ºC	None	7 days[8]	1 L
Organophosphorus Pesticides	Glass[10]	4ºC	Adjust pH[9]	7 days[8]	1 L
PCBs	Glass[10]	4ºC	None	None[14]	1 L
Phenols	Glass[10]	4ºC	0.0008 % $Na_2S_2O_3$[7]	7 days[8]	1 L

PARAMETER	CONTAINER [1]	PRESERVATION[2,3] Temp.[12]	Chemical	HOLDING TIME[4]	SAMPLE VOLUME
Phthalate Esters	Glass[10]	4ºC	None	7 days[8]	1 L
Polynuclear Aromatic Hydrocarbons	Glass[10]	4ºC	0.0008 % $Na_2S_2O_3$[7], store in dark	7 days[8]	1 L
Purgeable Hydrocarbons	Glass[10]	4ºC	0.0008 % $Na_2S_2O_3$[7] Adjust pH <2[2]	14 days	40 mL
Purgeable Halocarbons	Glass[10]	4ºC	0.0008 % $Na_2S_2O_3$[7]	14 days	40 mL
Total Organic Halides (TOX)	Glass[10]	4ºC	Adjust pH to <2 with H_2SO_4	28 days	1 L
Radiological Tests (Alpha, Beta, Radium)	Plastic/Glass	None	HNO_3 to pH<2	6 months	250 mL

Key to Table

1. Plastic should be Polyethylene.
2. Sample preservation should be performed immediately upon sample collection. For composite chemical samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.
3. When any sample is to be shipped by common carrier or sent through the United States mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring compliance. For the preservation requirements of Table 6-8, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid, (HCl) in water, solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).
4. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.
5. If oxidizing agents are present, add 5 mL 0.1 N $NaAsO_2$ or 0.06 g of ascorbic acid per L. See Cyanide SOP for additional information about other interferences.
6. Adjust pH to <2 with H_2SO_4, HCl, or solid $NaHSO_4$. Free Chlorine must be removed prior to adjustment.
7. Free Chlorine must be removed by the appropriate addition of $Na_2S_2O_3$.
8. 7 days until extraction. 40 days after extraction.
9. Adjust pH to 5-8 using NaOH or H_2SO_4.
10. With Teflon lined septum.
11. Holding Time is listed as “As Soon as Possible” in SW 846. Per EPA MICE, the recommended maximum holding time for pH in water is 24 hours and pH in soil is 7 days. There are no mandated regulatory requirements.
12. For samples with a temperature requirement of 4°C, a sample temperature of just above the water freezing temperature to $\leq$ 6°C is acceptable.
13. Based on guidance from EPA MICE, if samples are received without pH adjustment, the holding time is 7 days.
14. Analysis to be completed within 40 days after extraction.
15. Acid preservation may be omitted for shipping and laboratory will acidify at least 24 hours prior to analysis.

Table 22-7.
Holding Times, Preservation and Container Requirements: RCRA – Non-Aqueous

PARAMETER	CONTAINER [1]	PRESERVATION Temp.[7]	PRESERVATION Chemical	HOLDING TIME[2]	SAMPLE WEIGHT
Chloride	Glass	4ºC	None	28 days	50 g
Cyanide -Total	Glass	4ºC	None	14 days	50 g
Cyanide - Amenable	Glass	4ºC	None	14 days	50 g
Hydrogen Ion (pH)	Glass	4ºC	None	7 days[6]	50 g
Nitrate	Glass	4ºC	None	N/A	50 g
Oil and Grease	Glass	4ºC	None	28 days	50 g
Sulfide	Glass	4ºC	Add Zn Acetate, zero headspace	7 days	50 g
Chromium VI	Glass	4ºC	None	30 days	50 g
Mercury	Plastic/Glass	None	None	28 days	50 g
Other Metals	Plastic/Glass	None	None	6 months	50 g
Acrolein and Acrylonitrile	Glass[4]	4ºC	None	14 days	50 g
Benzidines	Glass[4]	4ºC	None	14 days[3]	50 g
Chlorinated Hydrocarbons	Glass[4]	4ºC	None	14 days[3]	50 g
Dioxins and Furans	Glass[4]	4ºC	None	30 days[3]	50 g
Haloethers	Glass[4]	4ºC	None	14 days[3]	50 g
Nitroaromatics and cyclic ketones	Glass[4]	4ºC	None	14 days[3]	50 g
Nitrosamines	Glass[4]	4ºC	None	14 days[3]	50 g
Organochlorine Pesticides	Glass[4]	4ºC	None	14 days[3]	50 g
Organophosphorus Pesticides	Glass[4]	4ºC	None	14 days[3]	50 g
PCBs	Glass[4]	4ºC	None	None[8]	50 g
Phenols	Glass[4]	4ºC	None	14 days[3]	50 g
Phthalate Esters	Glass[4]	4ºC	None	14 days[3]	50 g
Polynuclear Aromatic Hydrocarbons	Glass[4]	4ºC	None	14 days[3]	50 g

PARAMETER	CONTAINER [1]	PRESERVATION Temp.[7]	PRESERVATION Chemical	HOLDING TIME[2]	SAMPLE WEIGHT
Purgeable Hydrocarbons	Glass[4]	4ºC	None	14 days[5]	50 g
Purgeable Halocarbons	Glass[4]	4ºC	None	14 days[5]	50 g
Total Organic Halides (TOX)	Glass[4]	4ºC	None	28 days	50 g

Key to Table

1. Plastic should be Polyethylene.
2. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.
3. 14 days until extraction. 40 days after extraction.
4. With Teflon Lined Septum.
5. See Volatile SOP for more detailed preservation requirements.
6. Holding Time is listed as “As Soon as Possible” in SW 846. Per EPA MICE, the recommended maximum holding time for pH in water is 24 hours and pH in soil is 7 days. There are no mandated regulatory requirements.
7. For samples with a temperature requirement of 4^{o}C, a sample temperature of just above the water freezing temperature to $\leq$ 6^{o}C is acceptable.
8. Analysis to be completed within 40 days after extraction.

Table 22-8.
Holding Times, Preservation and Container Requirements: Air Samples

PARAMETER	CONTAINER [1]	PRESERVATION Temp.	PRESERVATION Chemical	HOLDING TIME[2]	SAMPLE WEIGHT
Volatile Organics	Summa Canister	None	None	30 days	6L or 1L
Volatile Organics	Tedlar Bag	None	None	72 hrs[3,4]	1 L

Key to Table

1. Plastic should be Polyethylene.
2. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.
3. Holding Time is based on SW 846 Method 0040 “SAMPLING OF PRINCIPAL ORGANIC HAZARDOUS CONSTITUENTS FROM COMBUSTION SOURCES USING TEDLAR® BAGS”. Some states specifically enforce this holding time (e.g. Florida, New Jersey) and others have not specified this information in their regulatory requirements.
4. The holding time is 72 hours unless the laboratory has a documented validation study that indicates a longer HT is acceptable for the analytes of interest.

SECTION 23

HANDLING OF SAMPLES *(NELAC 5.5.8)*

Sample management procedures at the laboratory ensure that sample integrity and custody are maintained and documented from sampling/receipt through disposal.

23.1 CHAIN OF CUSTODY (COC)

The COC form is the written documented history of any sample and is initiated when bottles are sent to the field, or at the time of sampling. This form is completed by the sampling personnel and accompanies the samples to the laboratory where it is received and stored under the laboratory's custody. The purpose of the COC form is to provide a legal written record of the handling of samples from the time of collection until they are received at the laboratory. It also serves as the primary written request for analyses from the client to the laboratory. The COC form acts as a purchase order for analytical services when no other contractual agreement is in effect. An example of a COC form may be found in Figure 23-1.

23.1.1 Field Documentation

The information the sampler needs to provide at the time of sampling on the container label is:

- Sample identification
- Date and time
- Preservative

During the sampling process, the COC form is completed and must be legible (see Figure 23-1). This form includes information such as:

- Client name, address, phone number and fax number (if available)
- Project name and/or number
- The sample identification
- Date, time and location of sampling
- Sample collectors name
- The matrix description
- The container description
- The total number of each type of container
- Preservatives used
- Analysis requested
- Requested turnaround time (TAT)
- Any special instructions
- Purchase Order number or billing information (e.g. quote number) if available

- The date and time that each person received or relinquished the sample(s), including their signed name.

The samples are stored in a cooler with ice, as applicable, and remain solely in the possession of the client's field technician until the samples are delivered to the laboratory. The sample collector must assure that each container is in his/her physical possession or in his/her view at all times, or stored in such a place and manner to preclude tampering. The field technician relinquishes the samples in writing on the COC form to the sample control personnel at the laboratory or to a TestAmerica courier. Samples are only considered to be received by lab when personnel at the laboratory have physical contact with the samples.

Note: Independent couriers are not required to sign the COC form. The COC is usually kept in the sealed sample cooler. The receipt from the courier is stored in log-in by date; it lists all receipts each date.

23.1.2 Legal / Evidentiary Chain-of-Custody

If samples are identified for legal/evidentiary purposes on the COC, legal COCs will be generated per the Manual for Certification of Laboratories Analyzing Drinking Water, Fifth Edition, January 2005, Appendix A, and SOP No. WS-QA-0003, "Sample Receipt and Procedures".

23.2 SAMPLE RECEIPT

Samples are received at the laboratory by designated sample receiving personnel and a unique laboratory project identification number is assigned. Each sample container shall be assigned a unique sample identification number that is cross-referenced to the client identification number such that traceability of test samples is unambiguous and documented. Each sample container is affixed with a durable sample identification label. Sample acceptance, receipt, tracking and storage procedures are summarized in SOP No. WS-QA-0003, "Sample Receipt and Procedures"

23.2.1 Laboratory Receipt

Laboratory receipt procedures are summarized in SOP No. WS-QA-0003.

23.2.1.1 Sample Acceptance Policy

The laboratory has a written sample acceptance policy (Figure 23-2) that clearly outlines the circumstances under which samples shall be accepted or rejected. These include:

- a COC filled out completely;
- samples must be properly labeled;
- proper sample containers with adequate volume for the analysis (Sampling Guide) and necessary QC;
- samples must be preserved according to the requirements of the requested analytical method (Sampling Guide);
- sample holding times must be adhered to (Sampling Guide);

- the project manager will be notified if any sample is received in damaged condition.

Data from samples which do not meet these criteria are flagged and the nature of the variation from policy is defined. A copy of the sample acceptance policy is provided to each client prior to shipment of samples.

Once sample acceptance is verified, the samples are logged into the LIMS according SOP No. WS-QA-0003.

23.3 SAMPLE STORAGE

In order to avoid deterioration, contamination or damage to a sample during storage and handling, from the time of receipt until all analyses are complete, samples are stored in refrigerators suitable for the sample matrix. In addition, samples to be analyzed for volatile organic parameters are stored in separate refrigerators designated for volatile organic parameters only. Samples are never to be stored with reagents, standards or materials that may create contamination.

To ensure the integrity of the samples during storage, refrigerator blanks are maintained in the volatile sample refrigerators and analyzed every two weeks.

Analysts and technicians retrieve the sample container allocated to their analysis from the designated refrigerator and place them on carts, analyze the sample, and return the remaining sample or empty container to the refrigerator from which it originally came. All unused portions of samples, including empty sample containers, are returned to the secure sample control area. All samples are kept in the refrigerators for 30 days past invoicing, unless other arrangements have been made with the client.

Access to the laboratory is controlled such that sample storage need not be locked at all times unless a project specifically demands it. Samples are accessible to laboratory personnel only. Visitors to the laboratory are prohibited from entering the refrigerator and laboratory areas unless accompanied by an employee of TestAmerica.

23.4 HAZARDOUS SAMPLES AND FOREIGN SOILS

Foreign soil samples are sent out for incineration by a USDA-approved waste disposal facility.

23.5 SAMPLE SHIPPING

In the event that the laboratory needs to ship samples, the samples are placed in a cooler with enough ice to ensure the samples remain just above freezing and at or below 6.0°C during transit. The samples are carefully surrounded by packing material to avoid breakage (yet maintain appropriate temperature). A trip blank is enclosed for those samples requiring water/solid volatile organic analyses. The chain-of-custody form is signed by the sample control technician and attached to the shipping paperwork. Samples are generally shipped overnight express or hand-delivered by a TestAmerica courier to maintain sample integrity. All personnel involved with shipping and receiving samples must be trained to maintain the proper chain-of-custody documentation and to keep the samples intact and on ice. The Environmental, Health and Safety Manual contains additional shipping requirements.

23.6 SAMPLE DISPOSAL

Samples should be retained for a minimum of 30 days after the project report is sent, however, provisions may be made for earlier disposal of samples once the holding time is exceeded. Some samples are required to be held for longer periods based on regulatory or client requirements (e.g., 60 days after project report is sent). The laboratory must follow the longer sample retention requirements where required by regulation or client agreement. Several possibilities for sample disposal exist: the sample may be consumed completely during analysis, the sample may be returned to the customer or location of sampling for disposal, or the sample may be disposed of in accordance with the laboratory's waste disposal procedures (SOP: WS-EHS-001, "Waste Disposal"). All procedures in the laboratory Environmental, Health and Safety Manual are followed during disposal. Samples are normally maintained in the laboratory no longer than two months from receipt unless otherwise requested. Unused portions of samples found or suspected to be hazardous according to state or federal guidelines may be returned to the client upon completion of the analytical work.

Figure 23-1.

Example: Chain of Custody (COC)

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Test America West Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel 916 373-5600 Fax 916 372-1059

Chain of Custody Record

Client Contact	Project Manager:	Site Contact:	Date:	COC No:
Your Company Name here	Tel/Fax:	Lab Contact:	Carrier:	____ of ____ COCs
Address	Analysis Turnaround Time			Job No.
City/State/Zip	Calendar (C) or Work Days (W) _____			
(xxx) xxx-xxxx Phone	TAT if different from Below _____			SDG No.
(xxx) xxx-xxxx FAX	☐ Standard			
Project Name:	☐ 1 week			
Site:	☐ 3 days			
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type	# of Cont. / Matrix	Filtered Sample	Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For _____ Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

Figure 23-2

Example: Sample Acceptance Policy

NELAC and TestAmerica West Sacramento have specific requirements under which all samples will be received by the laboratory for analysis. TestAmerica West Sacramento will review your sample shipment against those requirements as listed below, and will communicate any discrepancies to you. Your project manager will assist you in the appropriate resolution of any issues related to sample receipt. Please contact your project manager with any questions.

TestAmerica West Sacramento requirements are as follows:

- ✓ Proper, full and complete documentation, which includes sample identification, the location, date and time of collection, the collector's name, the preservation type, the sample matrix type, the requested testing method, and any special remarks concerning the samples, shall be provided.
- ✓ Samples must be accompanied by written disclosure of the known or suspected presence of any hazardous substances, as defined by applicable federal or state law.
- ✓ Each sample shall be collected in the appropriate sample container and labeled with unique, durable and indelible identification.
- ✓ Drinking waters samples for Method 1613B that may have residual chlorine must be checked and treated in the field, or collected in sodium thiosulfate preserved containers.
- ✓ The samples shall arrive at the laboratory with adequate remaining holding time for the analyses requested.
- ✓ Sufficient sample volume must be available to perform the requested analyses.
- ✓ Received samples must not exhibit obvious signs of damage, contamination or inadequate preservation.
- ✓ For samples undergoing chemical warfare degradate analysis, the sample must be screened for agent prior to shipment in accordance with appendix 10 of our Sample Receipt Procedure (WS-QA-0003).
- ✓ Samples containing mammalian tissue will not be accepted without prior coordination with a project manager. Additional conditions for receipt and handling of tissue are outlined in Appendix 11 of our Sample Receipt Procedure (WS-QA-0003).

The laboratory will notify the client/Project Manager upon sample receipt if the samples fail to meet any of the above requirements.

When completing the chain of custody form, please do not forget to sign your name in the "relinquished by" box.

SECTION 24

ASSURING THE QUALITY OF TEST RESULTS *(NELAC 5.5.9)*

24.1 OVERVIEW

In order to assure our clients of the validity of their data, the laboratory continuously evaluates the quality of the analytical process. The analytical process is controlled not only by instrument calibration as discussed in Section 20, but also by routine process quality control measurements (e.g. Blanks, Laboratory Control Samples (LCS), Matrix Spikes (MS), duplicates (DUP), surrogates, Internal Standards (IS)). These quality control checks are performed as required by the method or regulations to assess precision and accuracy. In addition to the routine process quality control samples, Proficiency Testing (PT) Samples (concentrations unknown to laboratory) are analyzed to help ensure laboratory performance.

24.2 CONTROLS

Sample preparation or pre-treatment is commonly required before analysis. Typical preparation steps include homogenization, grinding, solvent extraction, sonication, acid digestion, distillation, reflux, evaporation, drying and ashing. During these pre-treatment steps, samples are arranged into discreet manageable groups referred to as preparation (prep) batches. Prep batches provide a means to control variability in sample treatment. Control samples are added to each prep batch to monitor method performance and are processed through the entire analytical procedure with investigative/field samples.

24.3 NEGATIVE CONTROLS

Table 24-1. Example – Negative Controls

Control Type	Details
Method Blank (MB)	Are used to assess preparation and analysis for possible contamination during the preparation and processing steps.
	The specific frequency of use for method blanks during the analytical sequence is defined in the specific standard operating procedure for each analysis. Generally it is 1 for each batch of samples; not to exceed 20 environmental samples.
	The method blank is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (e.g., Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The method blank goes through all of the steps of the process (including as necessary: filtration, clean-ups, etc.).
Calibration Blanks	Are prepared and analyzed along with calibration standards where applicable. They are prepared using the same reagents that are used to prepare the standards. In some analyses the calibration blank may be included in the calibration curve.
Solvent/Reagent /Consumable Material Blanks	When new lots of solvents, reagents or consumable materials are received, a blank using these new materials must be prepared and shown to be ND to less than ½ the reporting limit. The blank can be a batch Method Blank with the exception of DoD method blanks which cannot be used for this purpose.

Table 24-1. Example – Negative Controls

Control Type	Details
Instrument Blanks	Are blank reagents or reagent water that may be processed during an analytical sequence in order to assess contamination in the analytical system. In general, instrument blanks are used to differentiate between contamination caused by the analytical system and that caused by the sample handling or sample prep process. Instrument blanks may also be inserted throughout the analytical sequence to minimize the effect of carryover from samples with high analyte content.
Trip Blank [1]	Are required to be submitted by the client with each shipment of samples requiring aqueous and solid volatiles analyses. Additionally, trip blanks may be prepared and analyzed for volatile analysis of air samples, when required by the client. A trip blank may be purchased (certified clean) or is prepared by the laboratory by filling a clean container with pure deionized water that has been purged to remove any volatile compounds. Appropriate preservatives are also added to the container. The trip blank is sent with the bottle order and is intended to reflect the environment that the containers are subjected to throughout shipping and handling and help identify possible sources if contamination is found. The field sampler returns the trip blank in the cooler with the field samples.
Field Blanks [1]	Are sometimes used for specific projects by the field samplers. A field blank prepared in the field by filling a clean container with pure reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)
Equipment Blanks [1]	Are also sometimes created in the field for specific projects. An equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (NELAC)
Holding Blanks	Also referred to as refrigerator or freezer blanks, are used to monitor the sample storage units for volatile organic compounds during the storage of VOA samples in the laboratory

[1] When known, these field QC samples should not be selected for matrix QC as it does not provide information on the behavior of the target compounds in the field samples. Usually, the client sample ID will provide information to identify the field blanks with labels such as "FB", "EB", or "TB."

Evaluation criteria and corrective action for these controls are defined in the specific standard operating procedure for each analysis.

24.4 POSITIVE CONTROLS

Control samples (e.g., QC indicators) are analyzed with each batch of samples to evaluate data based upon (1) Method Performance (Laboratory Control Sample (LCS) or Blank Spike (BS)), which entails both the preparation and measurement steps; and (2) Matrix Effects (Matrix Spike (MS) (Matrix spikes are not applicable to air) or Sample Duplicate (MD, DUP), which evaluates field sampling accuracy, precision, representativeness, interferences, and the effect of the matrix on the method performed. Each regulatory program and each method within those programs specify the control samples that are prepared and/or analyzed with a specific batch

Note that frequency of control samples vary with specific regulatory, methodology and project specific criteria. Complete details on method control samples are as listed in each analytical SOP.

24.4.1 Method Performance Control - Laboratory Control Sample (LCS)

24.4.1.1 The LCS measures the accuracy of the method in a blank matrix and assesses method performance independent of potential field sample matrix affects in a laboratory batch.

24.4.1.2 The LCS is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (for example: Reagent water, Ottawa sand, glass

beads, etc.) and is processed along with and under the same conditions as the associated samples. The LCS is spiked with verified known amounts of analytes or is made of a material containing known and verified amounts of analytes, taken through all preparation and analysis steps along with the field samples. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process (such as Phosphorus), a calibration verification standard is reported as the LCS. In some instances where there is no practical clean solid matrix available, aqueous LCS's may be processed for solid matrices; final results may be calculated as mg/kg or ug/kg, assuming 100% solids and a weight equivalent to the aliquot used for the corresponding field samples, to facilitate comparison with the field samples.

24.4.1.3 Certified pre-made reference material purchased from a NIST/A2LA accredited vendor may also be used for the LCS when the material represents the sample matrix or the analyte is not easily spiked (e.g. solid matrix LCS for metals, TDS, etc.).

24.4.1.4 The specific frequency of use for LCS during the analytical sequence is defined in the specific standard operating procedure for each analysis. It is generally 1 for each batch of samples; not to exceed 20 environmental samples.

24.4.1.5 If the mandated or requested test method, or project requirements, do not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample (and Matrix Spike) where applicable (e.g. no spike of pH). However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, at a minimum, a representative number of the listed components (see below) shall be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses, permit specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.

24.4.1.5.1 For methods that have 1-10 target analytes, spike all components.

24.4.1.5.2 For methods that include 11-20 target analytes, spike at least 10 or 80%, whichever is greater.

24.4.1.5.3 For methods with more than 20 target analytes, spike at least 16 components.

24.4.1.5.4 Exception: Due to analyte incompatibility in pesticides, Toxaphene and Chlordane are only spiked at client request based on specific project needs.

24.4.1.5.5 Exception: Due to analyte incompatibility between the various PCB aroclors, aroclors 1016 and 1260 are used for spiking as they cover the range of all of the aroclors. Specific aroclors may be used by request on a project specific basis.

24.5 SAMPLE MATRIX CONTROLS

Table 24-3. Sample Matrix Control

Control Type	Details	
Matrix Spikes (MS)	Use	used to assess the effect sample matrix of the spiked sample has on the precision and accuracy of the results generated by the method used;
	Typical Frequency [1]	At a minimum, with each matrix-specific batch of samples processed, an MS is carried through the complete analytical procedure. Unless specified by the client, samples used for spiking are randomly selected and rotated between different client projects.If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. Refer to the method SOP for complete details
	Description	essentially a sample fortified with a known amount of the test analyte(s).
Surrogate	Use	Measures method performance to sample matrix (organics only).
	Typical Frequency [1]	Are added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. The recovery of the surrogates is compared to the acceptance limits for the specific method. Poor surrogate recovery may indicate a problem with sample composition and shall be reported, with data qualifiers, to the client whose sample produced poor recovery.
	Description	Are similar to matrix spikes except the analytes are compounds with properties that mimic the analyte of interest and are unlikely to be found in environment samples.
Duplicates[2]	Use	For a measure of analytical precision, with each matrix-specific batch of samples processed, a matrix duplicate (MD or DUP) sample, matrix spike duplicate (MSD), or LCS duplicate (LCSD) is carried through the complete analytical procedure.
	Typical Frequency [1]	Duplicate samples are usually analyzed with methods that do not require matrix spike analysis.
	Description	Performed by analyzing two aliquots of the same field sample independently or an additional LCS.
Internal Standards	Use	Are spiked into all environmental and quality control samples (including the initial calibration standards) to monitor the qualitative aspect of organic and some inorganic analytical measurements.
	Typical Frequency [1]	All organic and ICP methods as required by the analytical method.
	Description	Used to correct for matrix effects and to help troubleshoot variability in analytical response and are assessed after data acquisition. Possible sources of poor internal standard response are sample matrix, poor analytical technique or instrument performance.

[1] See the specific analytical SOP for type and frequency of sample matrix control samples.

[2] LCSD's are normally not performed except when regulatory agencies or client specifications require them. The recoveries for the spiked duplicate samples must meet the same laboratory established recovery limits as the accuracy QC samples. If an LCSD is analyzed both the LCS and LCSD must meet the same recovery criteria and be included in the final report. The precision measurement is reported as "Relative Percent Difference" (RPD). Poor precision between duplicates (except LCS/LCSD) may indicate non-homogeneous matrix or sampling.

24.6 ACCEPTANCE CRITERIA (CONTROL LIMITS)

24.6.1 As mandated by the test method and regulation, each individual analyte in the LCS, MS, or Surrogate Spike is evaluated against the control limits published in the test method. Where there are no established acceptance criteria, the laboratory calculates in-house control limits with the use of control charts or, in some cases, utilizes client project specific control limits. When this occurs, the regulatory or project limits will supersede the laboratory's in-house limits.

Note: For methods, analytes and matrices with very limited data (e.g., unusual matrices not analyzed often), interim limits are established using available data or by analogy to similar methods or matrices.

24.6.2 Once control limits have been established, they are verified, reviewed, and updated if necessary on an annual basis unless the method requires more frequent updating. Control limits are established per method (as opposed to per instrument) regardless of the number of instruments utilized.

24.6.3 Laboratory generated % Recovery acceptance (control) limits are generally established by taking $\pm$ 3 Standard Deviations (99% confidence level) from the average recovery of a minimum of 20-30 data points (more points are preferred).

24.6.3.1 Regardless of the calculated limit, the limit should be no tighter than the Calibration Verification (ICV/CCV). (Unless the analytical method specifies a tighter limit).

24.6.3.2 In-house limits cannot be any wider than those mandated in a regulated analytical method. Client or contract required control limits are evaluated against the laboratory's statistically derived control limits to determine if the data quality objectives (DQOs) can be achieved. If laboratory control limits are not consistent with DQOs, then alternatives must be considered, such as method improvements or use of an alternate analytical method.

24.6.3.3 The lowest acceptable recovery limit will be 10% (the analyte must be detectable and identifiable). Exception: The lowest acceptable recovery limit for Benzidine will be 5% and the analyte must be detectable and identifiable.

24.6.3.4 The maximum acceptable recovery limit will be 150%.

24.6.3.5 The maximum acceptable RPD limit will be 35% for waters and 40% for soils. The minimum RPD limit is 10%.

24.6.3.6 If either the high or low end of the control limit changes by $\leq$ 5% from previous, the control chart is visually inspected and, using professional judgment, they may be left unchanged if there is no affect on laboratory ability to meet the existing limits.

24.6.4 The lab must be able to generate a current listing of their control limits and track when the updates are performed. In addition, the laboratory must be able to recreate historical control limits. See Policy WS-PQA-003 for further details.

24.6.5 A LCS that is within the acceptance criteria establishes that the analytical system is in control and is used to validate the process. Samples that are analyzed with an LCS with recoveries outside of the acceptance limits may be determined as out of control and should be reanalyzed if possible**.** If reanalysis is not possible, then the results for all affected analytes for samples within the same batch must be qualified when reported. The internal corrective action process (see Section 12) is also initiated if an LCS exceeds the acceptance limits. Sample results may be qualified and reported without reanalysis if:

24.6.5.1 The analyte results are below the reporting limit and the LCS is above the upper control limit.

24.6.5.2 If the analytical results are above the relevant regulatory limit and the LCS is below the lower control limit.

24.6.5.3 Or, for NELAC and Departement Of Defense (DOD) work, there are an allowable number of Marginal Exceedances (ME):

- <11 analytes – 0 marginal exceedances are allowed.
- 11 – 30 Analytes – 1 marginal exceedance is allowed
- 31-50 Analytes – 2 marginal exceedances are allowed
- 51-70 Analytes – 3 marginal exceedances are allowed
- 71-90 Analytes – 4 marginal exceedances are allowed
- > 90 Analytes – 5 marginal exceedances are allowed

24.6.5.3.1 Marginal exceedances are recovery exceedances between 3 SD and 4 SD from the mean recovery limit (NELAC).

24.6.5.3.2 Marginal exceedances must be random. If the same analyte exceeds the LCS control limit repeatedly, it is an indication of a systematic problem. The source of the error must be located and corrective action taken. The laboratory has a system to monitor marginal exceedances to ensure that they are random.

24.6.5.3.3 Though marginal excedences may be allowed, the data must still be qualified to indicate it is outside of the normal limits.

24.6.6 If the MS/MSDs do not meet acceptance limits, the MS/MSD and the associated spiked sample is reported with a qualifier for those analytes that do not meet limits. If obvious preparation errors are suspected, or if requested by the client, unacceptable MS/MSDs are reprocessed and reanalyzed to prove matrix interference. A more detailed discussion of acceptance criteria and corrective action can be found in the lab's method SOPs and in Section 12.

24.6.7 If a surrogate standard falls outside the acceptance limits, if there is not obvious chromatographic matrix interference, reanalyze the sample to confirm a possible matrix effect. If the recoveries confirm or there was obvious chromatographic interference, results are reported from the original analysis and a qualifier is added. If the reanalysis meets surrogate recovery criteria, the second run is reported (or both are reported if requested by the client). Under certain circumstances, where all of the samples are from the same location and share similar chromatography, the reanalysis may be performed on a single sample rather than all of the samples and if the surrogate meets the recovery criteria in the reanalysis, all of the affected samples would require reanalysis.

24.7 ADDITIONAL PROCEDURES TO ASSURE QUALITY CONTROL

24.7.1 The laboratory has written and approved method SOPs to assure the accuracy of the test method including calibration (see Section 20), use of certified reference materials (see Section 21) and use of PT samples (see Section 15).

24.7.2 A discussion regarding MDLs, Limit of Detection (LOD) and Limit of Quantitation (LOQ) can be found in Section 19.

24.7.3 Use of formulae to reduce data is discussed in the method SOPs and in Section 20.

24.7.4 Selection of appropriate reagents and standards is included in Section 9 and 21.

24.7.5 A discussion on selectivity of the test is included in Section 5.

24.7.6 Constant and consistent test conditions are discussed in Section 18.

24.7.7 The laboratories sample acceptance policy is included in Section 23.

SECTION 25

REPORTING RESULTS *(NELAC 5.5.10)*

25.1 OVERVIEW

The results of each test are reported accurately, clearly, unambiguously, and objectively in accordance with State and Federal regulations as well as client requirements. Analytical results are issued in a format that is intended to satisfy customer and laboratory accreditation requirements as well as provide the end user with the information needed to properly evaluate the results. Where there is conflict between client requests and laboratory ethics or regulatory requirements, the laboratory's ethical and legal requirements are paramount, and the laboratory will work with the client during project set up to develop an acceptable solution. Refer to Section 7.

A variety of report formats are available to meet specific needs.

In cases where a client asks for simplified reports, there must be a written request from the client. There still must be enough information that would show any analyses that were out of conformance (QC out of limits) and there should be a reference to a full report that is made available to the client.

Review of reported data is included in Section 19.

25.2 TEST REPORTS

Analytical results are reported in a format that is satisfactory to the client and meets all requirements of applicable accrediting authorities and agencies. A variety of report formats are available to meet specific needs. The report is printed or prepared electronically, reviewed, and signed by the appropriate project manager. At a minimum, the standard laboratory report shall contain the following information:

25.2.1 A report title (e.g. Analytical Report For Samples) with a "sample results" column header.

25.2.2 Each report cover page printed on company letterhead, which includes the laboratory name, address and telephone number.

25.2.3 A unique identification of the report (e.g. work order number) and on each page an identification in order to ensure the page is recognized as part of the report and a clear identification of the end.

Note: Page numbers of report are represented as page # of ##. Where the first number is the page number and the second is the total number of pages.

25.2.4 A copy of the chain of custody (COC).

- Any COCs involved with Subcontracting are included.
- The applicable COC is an integral part of the report.

- Any additional addenda to the report must be treated in a similar fashion so it is a recognizable part of the report and cannot accidentally get separated from the report (eg. Sampling information).

25.2.5 The name and address of client and a project name/number, if applicable.

25.2.6 Client project manager or other contact

25.2.7 Description and unambiguous identification of the tested sample(s) including the client identification code.

25.2.8 Date of receipt of sample, date and time of collection, and date(s) of test preparation and performance, and time of preparation or analysis if the required holding time for either activity is less than or equal to 72 hours.

25.2.9 Date reported or date of revision, if applicable.

25.2.10 Method of analysis including method code (EPA, Standard Methods, etc).

25.2.11 Reporting limit.

25.2.12 Method detection limits (if requested)

25.2.13 Definition of Data qualifiers and reporting acronyms (e.g. ND).

25.2.14 Sample results.

25.2.15 QC data consisting of method blank, surrogate, LCS, and MS/MSD recoveries and control limits.

25.2.16 Condition of samples at receipt including temperature. This may be accomplished in a narrative or by attaching sample login sheets (Refer to Sec. 25.2.4 – Item 3 regarding additional addenda).

25.2.17 A statement expressing the validity of the results, that the source methodology was followed and all results were reviewed for error.

25.2.18 A statement to the effect that the results relate only to the items tested and the sample as received by the laboratory.

25.2.19 A statement that the report shall not be reproduced except in full, without prior express written approval by the laboratory coordinator.

25.2.20 A signature and title of the person(s) accepting responsibility for the content of the report and date of issue. Signatories are appointed by the Lab Director.

25.2.21 When NELAC accreditation is required, the lab shall certify that the test results meet all requirements of NELAC or provide reasons and/or justification if they do not.

25.2.22 The laboratory includes a cover letter.

25.2.23 Where applicable, a narrative to the report that explains the issue(s) and corrective action(s) taken in the event that a specific accreditation or certification requirement was not met.

25.2.24 When soil samples are analyzed, a specific identification as to whether soils are reported on a "wet weight" or "dry weight" basis.

25.2.25 Appropriate laboratory certification number for the state of origin of the sample, if applicable.

25.2.26 If only part of the report is provided to the client (client requests some results before all of it is complete), it must be clearly indicated on the report (e.g., partial report). A complete report must be sent once all of the work has been completed.

25.2.27 Any non-TestAmerica subcontracted analysis results are provided as a separate report on the official letterhead of the subcontractor. All TestAmerica subcontracting is clearly identified on the report as to which laboratory performed a specific analysis.

Note: Refer to the Corporate SOP on Electronic Reporting and Signature Policy (No. CA-I-P-002) for details on internally applying electronic signatures of approval.

25.3 REPORTING LEVEL OR REPORT TYPE

The laboratory offers three levels of quality control reporting. Each level, in addition to its own specific requirements, contains all the information provided in the preceding level. The packages provide the following information in addition to the information described above:

- Level II is a report with the features described in Section 25.2 above plus summary information, including results for the method blank reported to the laboratory MDL if required, percent recovery for laboratory control samples and matrix spike samples, and the RPD values for all MSD and sample duplicate analyses.
- Level III contains all the information supplied in Level II, but presented on the CLP-like summary forms or instrument print-outs, and relevant calibration information. No raw data is provided unless it is necessary to provide the relevant calibration information.
- Level VI is the same as Level III with the addition of all raw supporting data.

In addition to the various levels of QC packaging, the laboratory also provides reports in electronic deliverable form, either via e-mail or CD ROM. Initial reports may be provided to clients by facsimile. All faxed reports are followed by hardcopy. Procedures used to ensure client confidentiality are outlined in Section 25.7.

25.3.1 Electronic Data Deliverables (EDDs)

EDDs are routinely offered as part of TestAmerica's services. West Sacramento offers a variety of EDD formats including Environmental Restoration Information Management System (ERPIMS), New Agency Standard (NAS), Format A, Excel, Dbase, GISKEY, and Text Files.

EDD specifications are submitted to the IT department by the PM for review and undergo the contract review process. Once the facility has committed to providing data in a specific electronic format, the coding of the format may need to be performed. This coding is documented and validated. The validation of the code is retained by the IT staff coding the EDD.

EDDs shall be subject to a review to ensure their accuracy and completeness. If EDD generation is automated, review may be reduced to periodic screening if the laboratory can demonstrate that it can routinely generate that EDD without errors. Any revisions to the EDD format must be reviewed until it is demonstrated that it can routinely be generated without errors. If the EDD can be reproduced accurately and if all subsequent EDDs can be produced error-free, each EDD does not necessarily require a review.

25.4 SUPPLEMENTAL INFORMATION FOR TEST

The lab identifies any unacceptable QC analyses or any other unusual circumstances or observations such as environmental conditions and any non-standard conditions that may have affected the quality of a result. This is typically in the form of a footnote or a qualifier and/or a narrative explaining the discrepancy in the front of the report.

25.4.1 Numeric results with values outside of the calibration range, either high or low are qualified as 'estimated'.

25.4.2 Where quality system requirements are not met, a statement of compliance/non-compliance with requirements and/or specifications is required, including identification of test results derived from any sample that did not meet NELAC sample acceptance requirements such as improper container, holding time, or temperature.

25.4.3 Where applicable, a statement on the estimated uncertainty of measurements; information on uncertainty is needed when a client's instructions so require.

25.4.4 Opinions and Interpretations - The test report contains objective information, and generally does not contain subjective information such as opinions and interpretations. If such information is required by the client, the Laboratory Director will determine if a response can be prepared. If so, the Laboratory Director will designate the appropriate member of the management team to prepare a response. The response will be fully documented, and reviewed by the Laboratory Director, before release to the client. There may be additional fees charged to the client at this time, as this is a non-routine function of the laboratory.

Note: Review of data deliverable packages for submittal to regulatory authorities requires responses to non-conforming data concerning potential impact on data quality. This necessitates a limited scope of interpretation, and this work is performed by the QA Department. This is the only form of "interpretation" of data that is routinely performed by the laboratory.

When opinions or interpretations are included in the report, the laboratory provides an explanation as to the basis upon which the opinions and interpretations have been made. Opinions and interpretations are clearly noted as such and where applicable, a comment should be added suggesting that the client verify the opinion or interpretation with their regulator.

25.5 ENVIRONMENTAL TESTING OBTAINED FROM SUBCONTRACTORS

If the laboratory is not able to provide the client the requested analysis, the samples would be subcontracted following the procedures outlined in the Corporate SOP on Subcontracting (SOP # CA-L-S-002).

Data reported from analyses performed by a subcontractor laboratory are clearly identified as such on the analytical report provided to the client. Results from a subcontract laboratory outside of TestAmerica are reported to the client on the subcontract laboratory's original report stationary and the report includes any accompanying documentation.

25.6 CLIENT CONFIDENTIALITY

In situations involving the transmission of environmental test results by telephone, facsimile or other electronic means, client confidentiality must be maintained.

TestAmerica will not intentionally divulge to any person (other than the Client or any other person designated by the Client in writing) any information regarding the services provided by TestAmerica or any information disclosed to TestAmerica by the Client. Furthermore, information known to be potentially endangering to national security or an entity's proprietary rights will not be released.

Note: This shall not apply to the extent that the information is required to be disclosed by TestAmerica under the compulsion of legal process. TestAmerica will, to the extent feasible, provide reasonable notice to the client before disclosing the information.

Note: Authorized representatives of an accrediting authority are permitted to make copies of any analyses or records relevant to the accreditation process, and copies may be removed from the laboratory for purposes of assessment.

25.6.1 Report deliverable formats are discussed with each new client. If a client requests that reports be faxed or e-mailed, the reports are faxed with a cover sheet or e-mailed with the following note that includes a confidentiality statement similar to the following:

This material is intended only for the use of the individual(s) or entity to whom it is addressed, and may contain information that is privileged and confidential. If you are not the intended recipient, or the employee or agent responsible for delivering this material to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by telephone at (916) 373-5600 (or for e-mails: please notify us immediately by e-mail or by phone (916 373-5600) and delete this material from any computer.

25.7 FORMAT OF REPORTS

The format of reports is designed to accommodate each type of environmental test carried out and to minimize the possibility of misunderstanding or misuse.

25.8 AMENDMENTS TO TEST REPORTS

Corrections, additions, or deletions to reports are only made when justification arises through supplemental documentation. Justification is documented using the laboratory's corrective action system (refer to Section 12).

The revised report is retained on the Archive data server, as is the original report. The revised report is stored in the Archive data server under the sample number followed by "Amend". The revised report will have the word "revised" or "amended" next to the date in the footer.

When the report is re-issued, a notation of "Amended" is placed on the cover/signature page of the report *or at the top of the narrative page* with a brief explanation of reason for the re-issue and a reference back to the last final report generated. For Example: Report was revised on 11/3/07 to include toluene in sample NQA1504 per client's request. This final report replaces the final report generated on 10/27/07.

25.9 POLICIES ON CLIENT REQUESTS FOR AMENDMENTS

25.9.1 Policy on Data Omissions or Reporting Limit Increases

Fundamentally, our policy is simply to not omit previously reported results (including data qualifiers) or to not raise reporting limits and report sample results as ND. This policy has few exceptions. Exceptions are:

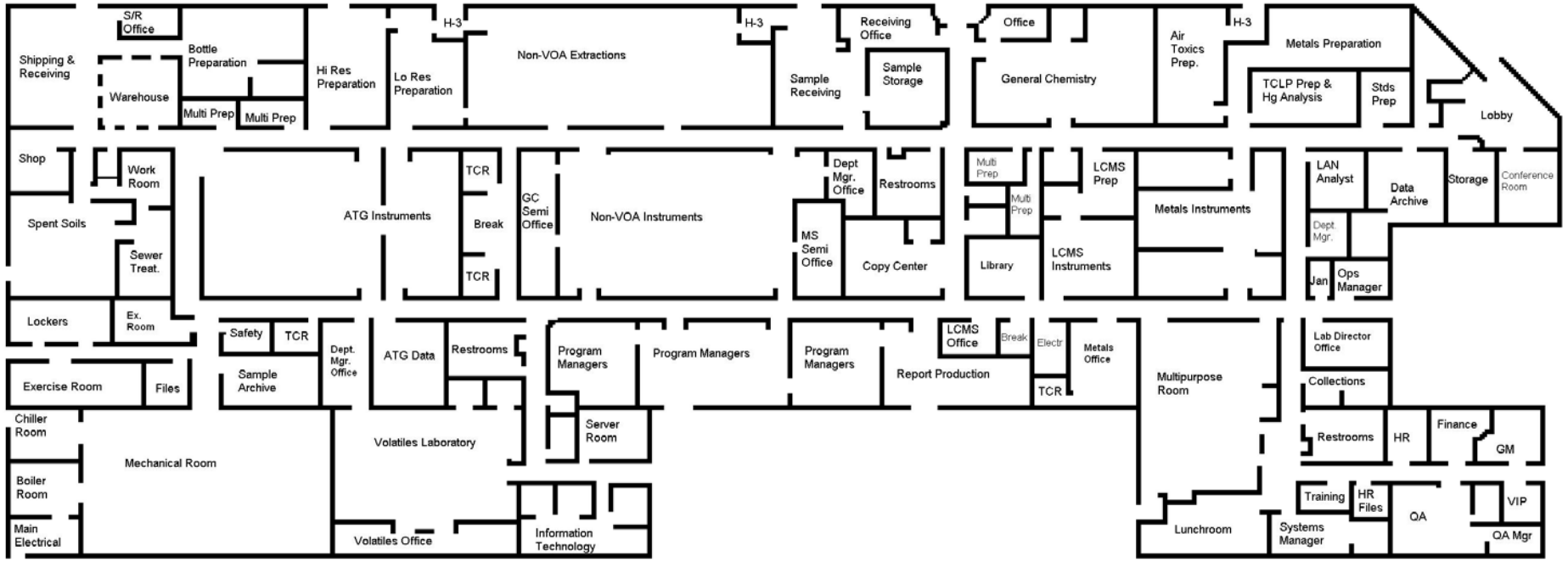
- Laboratory error.
- Sample identification is indeterminate (confusion between COC and sample labels).
- An incorrect analysis (not analyte) was requested (e.g., COC lists 8315 but client wanted 8310). A written request for the change is required.
- Incorrect limits reported based on regulatory requirements.
- The requested change has absolutely *no possible* impact on the interpretation of the analytical results and there is *no possibility* of the change being interpreted as misrepresentation by anyone inside or outside of our company.

25.9.2 Multiple Reports

TestAmerica does not issue multiple reports for the same workorder where there is different information on each report (this does not refer to copies of the same report) unless required to meet regulatory needs and approved by QA.

Appendix 1.

Laboratory Floor Plan



Facility Size	Square Feet
Total Area	66,000
Lab Area	43,000
Storage Area	5,200
	Linear Feet
Bench Top	3,000
Hoods	500

Appendix 2. Glossary/Acronyms

Glossary:

Acceptance Criteria:

Specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation:

The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one. (NELAC)

Accrediting Authority:

The Territorial, State, or Federal Agency having responsibility and accountability for environmental laboratory accreditation and which grants accreditation (NELAC) [1.5.2.3]

Accuracy:

The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Analyst:

The designated individual who performs the “hands-on” analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality. (NELAC)

Batch:

Environmental samples which are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) and /or those samples not requiring preparation, which are analyzed together as a group using the same calibration curve or factor. An analytical batch can include samples originating from various environmental matrices and can exceed 20 samples. (NELAC Quality Systems Committee)

Blank:

A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC)

Blind Sample:

A sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst’s or laboratory’s proficiency in the execution of the measurement process.

Calibration:

To determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter, instrument, or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

Calibration Curve:

The graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (NELAC)

Calibration Method:

A defined technical procedure for performing a calibration. (NELAC)

Calibration Standard:

A substance or reference material used to calibrate an instrument (QAMS)

Certified Reference Material (CRM):

A reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. (ISO Guide 30–2.2)

Chain of Custody:

An unbroken trail of accountability that ensures the physical security of samples and includes the signatures of all who handle the samples. (NELAC) [5.12.4]

Clean Air Act:

The enabling legislation in 42 U>S>C> 7401 et seq., Public Law 91-604, 84 Stat. 1676 Pub. L. 95-95, 91 Stat., 685 and Pub. L. 95-190, 91 Stat., 1399, as amended, empowering EPA to promulgate air quality standards, monitor and enforce them. (NELAC)

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/SUPERFUND):

The enabling legislation in 42 U.S.C. 9601-9675 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. 9601 et seq., to eliminate the health and environmental threats posed by hazardous waste sites. (NELAC)

Compromised Samples:

Those samples which are improperly sampled, insufficiently documented (chain of custody and other sample records and/or labels), improperly preserved, collected in improper containers, or exceeding holding times when delivered to a laboratory. Under normal conditions, compromised samples are not analyzed. If emergency situation require analysis, the results must be appropriately qualified. (NELAC)

Confidential Business Information (CBI):

Information that an organization designates as having the potential of providing a competitor with inappropriate insight into its management, operation or products. NELAC and its representatives agree to safeguarding identified CBI and to maintain all information identified as such in full confidentiality.

Confirmation:

Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to:

Second column confirmation
Alternate wavelength

Derivatization
Mass spectral interpretation
Alternative detectors or
Additional Cleanup procedures
(NELAC)

Conformance:

An affirmative indication or judgement that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

Correction:

Actions necessary to correct or repair analysis specific non-conformances. The acceptance criteria for method specific QC and protocols as well as the associated corrective actions. The analyst will most frequently be the one to identify the need for this action as a result of calibration checks and QC sample analysis. No significant action is taken to change behavior, process or procedure.

Corrective Action:

The action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Data Audit:

A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data re of acceptable quality (i.e., that they meet specified acceptance criteria). (NELAC)

Data Reduction:

The process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form. (EPA-QAD)

Deficiency:

An unauthorized deviation from acceptable procedures or practices, or a defect in an item. (ASQC)

Detection Limit:

The lowest concentration or amount of the target analyte that can be identified, measured, and reported with confidence that the analyte concentration is not a false positive value. See Method Detection Limit. (NELAC)

Document Control:

The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly, and controlled to ensure use of the correct version at the location where the prescribed activity if performed. (ASQC)

Duplicate Analyses:

The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory. (EPA-QAD)

Environmental Detection Limit (EDL):

The smallest level at which a radionuclide in an environmental medium can be unambiguously distinguished for a given confidence interval using a particular combination of sampling and measurement

procedures, sample size, analytical detection limit, and processing procedure. The EDL shall be specified for the 0.95 or greater confidence interval. The EDL shall be established initially and verified annually for each test method and sample matrix. (NELAC Radioanalysis Subcommittee)

Equipment Blank:

Sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (NELAC)

External Standard Calibration:

Calibrations for methods that do not utilize internal standards to compensate for changes in instrument conditions.

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA):

The enabling legislation under 7 U.S.C. 135 et seq., as amended, that empowers the EPA to register insecticides, fungicides, and rodenticides. (NELAC)

Federal Water Pollution Control Act (Clean Water Act, CWA):

The enabling legislation under 33 U.S.C. 1251 et seq., Public Law 92-50086 Stat 816, that empowers EPA to set discharge limitations, write discharge permits, monitor, and bring enforcement action for non-compliance. (NELAC)

Field Blank:

Blank prepared in the field by filing a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken (EPA OSWER)

Field of Testing:

NELAC's approach to accrediting laboratories by program, method and analyte. Laboratories requesting accreditation for a program-method-analyte combination or for an up-dated/improved method are required to submit to only that portion of the accreditation process not previously addressed (see NELAC, section 1.9ff). (NELAC)

Holding Times (Maximum Allowable Holding Times):

The maximum times that samples may be held prior to analyses and still be considered valid or not compromised. (40 CFR Part 136)

Internal Standard:

A known amount of standard added to a test portion of a sample and carried through the entire measurement process as a reference for evaluating and controlling the precision and bias of the applied analytical test method. (NELAC)

Internal Standard Calibration:

Calibrations for methods that utilize internal standards to compensate for changes in instrument conditions.

Instrument Blank:

A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample):

A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes, taken through all preparation and analysis steps. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process (such as Phosphorus), there is no LCS. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

An LCS shall be prepared at a minimum of 1 per batch of 20 or less samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The results of these samples shall be used to determine batch acceptance.

Note: NELAC standards allow a matrix spike to be used in place of this control as long as the acceptance criteria are as stringent as for the LCS. (NELAC)

Laboratory Duplicate:

Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently. (NELAC)

Least Squares Regression (1st Order Curve):

The least squares regression is a mathematical calculation of a straight line over two axes. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The regression calculation will generate a correlation coefficient (r) that is a measure of the "goodness of fit" of the regression line to the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r must be greater than or equal to 0.99 for organics and 0.995 for inorganics.

Limit of Detection (LOD):

An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory dependent. (Analytical Chemistry, 55, p.2217, December 1983, modified) See also Method Detection Limit.

Matrix:

The component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

Aqueous: Any aqueous sample excluded from the definition of Drinking Water matrix or Saline/Estuarine source. Includes surface water, groundwater, effluents, and TCLP or other extracts.

Drinking Water: any aqueous sample that has been designated as a potable or potential potable water source.

Saline/Estuarine: any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.

Non-aqueous Liquid: any organic liquid with <15% settleable solids.

Biological Tissue: any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

Solids: includes soils, sediments, sludges, and other matrices with >15% settleable solids.

Chemical Waste: a product or by-product of an industrial process that results in a matrix not previously defined.

Air: whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device. (NELAC)

Matrix Spike (spiked sample or fortified sample):

Prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix spikes shall be performed at a frequency of one in 20 samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as, total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in a matrix spike may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the spike. (QAMS)

Matrix Spike Duplicate (spiked sample or fortified sample duplicate):

A second replicate matrix spike is prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

Matrix spike duplicates or laboratory duplicates shall be analyzed at a minimum of 1 in 20 samples per matrix type per sample extraction or preparation method. The laboratory shall document their procedure to select the use of an appropriate type of duplicate. The selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in the duplicates may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the duplicate. (QAMS)

Method Blank:

A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. (NELAC)

Method Detection Limit:

The minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136, Appendix B)

National Environmental Laboratory Accreditation Conference (NELAC):

A voluntary organization of State and Federal environmental officials and interest groups purposed primarily to establish mutually acceptable standards for accrediting environmental laboratories. A subset of NELAP. (NELAC)

Negative Control:

Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results. (NELAC)

Performance Audit:

The routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory. (NELAC)

Performance Based Measurement System (PBMS):

A set of processes wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner. (NELAC)

Positive Control:

Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects. (NELAC)

Precision:

The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (NELAC)

Preservation:

Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample. (NELAC)

Proficiency Testing:

A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (NELAC) [2.1]

Proficiency Testing Program:

The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (NELAC)

Proficiency Test Sample (PT):

A sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria. (QAMS)

Quality Assurance:

An integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence. (QAMS)

Quality Assurance [Project] Plan (QAPP):

A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EAP-QAD)

Quality Control:

The overall system of technical activities which purpose is to measure and control the quality of a product or service so that it meets the needs of users. (QAMS)

Quality Control Sample:

An uncontaminated sample matrix spiked with known amounts of analytes from a source independent from the calibration standards. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. (EPA-QAD)

Quality Manual:

A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (NELAC)

Quality System:

A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC (ANSI/ASQC-E-41994)

Quantitation Limits:

The maximum or minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be quantified with the confidence level required by the data user. (NELAC)

Range:

The difference between the minimum and the maximum of a set of values. (EPA-QAD)

Reagent Blank (method reagent blank):

A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

Reference Material:

A material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (ISO Guide 30-2.1)

Reference Standard:

A standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived. (VIM-6.0-8)

Replicate Analyses:

The measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval. (NELAC)

Report Limit (RL):

The laboratory nominal Quantitation Limit (QL) or the level of sensitivity required by the client but not lower than the LOD.

Resource Conservation and Recovery Act (RCRA):

The enabling legislation under 42 USC 321 et seq. (1976), that gives EPA the authority to control hazardous waste from the “cradle-to-grave”, including its generation, transportation, treatment, storage, and disposal. (NELAC)

Safe Drinking Water Act (SDWA):

The enabling legislation, 42 USC 300f et seq. (1974), (Public Law 93-523), that requires the EPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations. (NELAC)

Sample Duplicate:

Two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method including sampling and analysis. (EPA-QAD)

Second Order Polynomial Curve (Quadratic):

The 2^{nd} order curves are a mathematical calculation of a slightly curved line over two axis. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The 2^{nd} order regression will generate a coefficient of determination (COD or r^2) that is a measure of the "goodness of fit" of the quadratic curvature the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r^2 must be greater than or equal to 0.99.

Selectivity:

(Analytical chemistry) the capability of a test method or instrument to respond to a target substance of constituent in the presence of non-target substances. (EPA-QAD)

Sensitivity:

The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (NELAC)

Spike:

A known mass of target analyte added to a blank, sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, a representative number (at a minimum 10%) of the listed components may be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses permit specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.. (NELAC)

Standard:

The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of NELAC and meets the approval requirements of NELAC procedures and policies. (ASQC)

Standard Operating Procedures (SOPs):

A written document which details the method of an operation, analysis, or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. (QAMS)

Standardized Reference Material (SRM):

A certified reference material produced by the U.S. National Institute of Standards and Technology or other equivalent organization and characterized for absolute content, independent of analytical method. (EPA-QAD)

Surrogate:

A substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes.

Surrogate compounds must be added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. Poor surrogate recovery may indicate a problem with sample composition and shall be reported to the client whose sample produced poor recovery. (QAMS)

Systems Audit (also Technical Systems Audit):

A thorough, systematic, qualitative on-site assessment of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system. (EPA-QAD)

Toxic Substances Control Act (TSCA):

The enabling legislation in 15 USC 2601 et seq., (1976) that provides for testing, regulating, and screening all chemicals produced or imported into the United States for possible toxic effects prior to commercial manufacture. (NELAC)

Traceability:

The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons. (VIM-6.12)

Uncertainty:

A parameter associated with the result of a measurement that characterizes the dispersion of the value that could reasonably be attributed to the measured value.

Acronyms:

A2LA – American Association for Laboratory Accreditation
ANSI – American National Standards Institute
ASQ – American Society for Quality
ASTM – American Society for Testing and Materials
BS – Blank Spike
BSD – Blank Spike Duplicate
CAR – Corrective Action Report
CCB – Continuing Calibration Blank
CCC – Calibration Check Compound
CCV – Continuing Calibration Verification
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
CF – Calibration Factor
CFR – Code of Federal Regulations
CLP – Contract Laboratory Program
COC – Chain of Custody
CRS – Change Request Form
DL – Detection Limit
DOC – Demonstration of Capability
DQO – Data Quality Objectives
DU – Duplicate
DUP - Duplicate
EHS – Environment, Health and Safety
EPA – Environmental Protection Agency
GC - Gas Chromatography
GC/MS - Gas Chromatography/Mass Spectrometry
HPLC - High Performance Liquid Chromatography
ICB – Initial Calibration Blank
ICP - Inductively Coupled Plasma Atomic Emission Spectroscopy
ICV – Initial Calibration Verification
IDL – Instrument Detection Limit
IH – Industrial Hygiene
IS – Internal Standard
LOD- Level of Detection
LOQ- Level of Quantitation
LCS – Laboratory Control Sample
LCSD – Laboratory Control Sample Duplicate
LIMS – Laboratory Information Management System
MDL – Method Detection Limit
MS – Matrix Spike
MSD – Matrix Spike Duplicate
MSDS - Material Safety Data Sheet
NELAC - National Environmental Laboratory Accreditation Conference
NELAP - National Environmental Laboratory Accreditation Program
NIOSH – National Institute for Occupational Safety and Health
NPDES – National Pollutant Discharge Elimination System
NRC – Nuclear Regulatory Commission
NRM – National Reference Material
PT – Performance Testing
PUF – Polyurethane Foam

QAM – Quality Assurance Manual
QA/QC – Quality Assurance / Quality Control
QAPP – Quality Assurance Project Plan
RF – Response Factor
RPD – Relative Percent Difference
RSD – Relative Standard Deviation
SD – Standard Deviation
SOP: Standard Operating Procedure
SPCC – System Performance Check Compound
TAT – Turn-Around-Time
VOA – Volatiles
VOC – Volatile Organic Compound
WS – Water Supply
WP – Water Pollution

Appendix 3.

Laboratory Certifications, Accreditations, Validations

West Sacramento maintains certifications, accreditations, certifications, and validations with numerous state and national entities. Programs vary but may include on-site audits, reciprocal agreements with another entity, performance testing evaluations, review of the QA Manual, Standard Operating Procedures, Method Detection Limits, training records, etc. At the time of this QA Manual revision, the laboratory has accreditation/certification/licensing with the following organizations:

Organization	Certificate Number Or Laboratory ID Number	Organization	Certificate Number Or Laboratory ID Number
AFCEE	--	Nevada	CA44
Alaska	UST-055	New Jersey	CA005
Arizona	AZ0708	New Mexico	--
Arkansas	88-0691	New York	11666
California	01119CA	Oregon	CA200005
Colorado	--	Pennsylvania	68-01272
Connecticut	PH-0691	South Carolina	87014002
EPA - UCMR	--	Texas	T104704399-08-TX
EPA – UCMR2	--	Utah	QUAN1
Florida	E87570	USACE	--
Georgia	960	USDA Soil Permit	S-73787
Guam	--	Virginia	00178
Hawaii	--	Washington	C1281
Illinois	200060	West Virginia (DOH)	9930C
Kansas	E-10375	West Virginia (DEP)	334
Louisiana	30612	Wisconsin	998204680
Michigan	9947	Wyoming	8TMS-Q
NFESC (Navy)	--		

The certificates and parameter lists (which may differ) for each organization may be found on the corporate web site, the laboratory's public server, the final report review table, and in the QA office.

Appendix 4: Listing of Methods Performed

Preparation Only Methods

Method	Aqueous	Solid	Waste	Biological	Air
Organics					
Calif. CAM-WET	X	X	X		
EPA 1311	X	X	X		
EPA 3510C	X				
EPA 3520C	X				
EPA 3535	X				
EPA 3540B		X			
EPA 3542					X
EPA 3550B		X		X	
EPA 3580A			X		
EPA 3600C	X	X	X		
EPA 3620B	X	X	X		
EPA 3630C	X	X	X		
EPA 3640A	X	X		X	
EPA 5030B	X	X	X		
EPA 5035	X	X	X		
Inorganics					
Calif. CAM WET	X	X	X		
EPA 1311	X	X	X		
EPA 1312 (W)	X	X	X		
EPA 3005A	X				
EPA 3010A	X				
EPA 3050B		X	X	X	

Organics Methods Performed

Parameter	Method	Aqueous	Solid	Waste	Biological	Air
Volatile Organics	SW846 8260B	X	X	X		
Base Neutrals and Acids (BNAs)	SW846 8270B	X	X	X	X	
	TO-13A					X
	IP-7					X
	EPA 23					X
Organochlorine Pesticides	SW846 8081A	X	X	X	X	
	TO-4A					X
	TO-10A					X
	IP-8					X
	WS-ID-0014	X	X	X	X	
PCBs	EPA 8082	X	X	X	X	
	TO-4A					X
	TO-10A					X
Petroleum Hydrocarbons	EPA 8015B	X	X	X		
	CA LUFT	X	X	X		
	AK101	X	X	X		
	Ak102	X	X	X		
	AK103	X	X	X		
	NWTPH-Gx	X	X	X		
	NWTPH-Dx	X	X	X		
	GRO/DRO	X	X	X		
Nitroaromatics and Nitroamines	EPA 8330	X	X	X		X
	EPA 8330A	X	X	X		
	EPA 8330B	X	X	X		
	EPA 8321A (modified)	X	X	X		
	WS-LC-0001	X	X	X		
	WS-LC-0009	X	X	X		
	WS-LC-0010	X	X	X		
PAHs	EPA 8270C (SIM Isotope dilution)	X	X	X	X	X
	EPA 8270C (SIM)	X	X	X		
	CARB 429	X	X	X	X	X
	TO-13A					X
	IP-7					X
Nonyl Phenols	WS-MS-0013	X	X		X	
CBSA	WS-LC-0013	X	X			
Chemical Warfare Degradates	EPA 8321A (Modified)	X	X			
	WS-LC-0004	X	X			

Parameter	Method	Aqueous	Solid	Waste	Biological	Air
Organosulfur Degradates	EPA 8270C	X	X			
	WS-MS-0003	X	X			
PFOA/PFOS	WS-LC-0020	X	X			
PPCPs (Pharmaceuticals & Personal Care Products)	EPA 1694	X				
Steroids & Hormones	EPA 1698	X				
PCB Congeners	EPA 1668A	X	X	X	X	X
Dioxins & Furans	EPA 1613B	X	X			
	EPA 8290	X	X	X	X	
	EPA 8280A	X	X	X	X	
	NCASI 551	X	X			
	DLFM01.1	X	X	X		
	EPA 0023A					X
	EPA 23					X
	TO-9					X

Metals Methods Performed

Parameter	Methods	Aqueous	Solid	Waste	Biological	Air
Trace Metals	EPA 200.7	X				
	EPA 200.8	X				
	EPA 6010B	X	X	X	X	X
	EPA 6020	X	X	X	X	X
	EPA 0060					X
	EPA 12					X
	CARB 12					X
	EPA 29					X
	CARB 436					X
Hardness	SM 2340B	X				
	EPA 200.7	X				
	EPA 200.8	X				
Mercury	EPA 245.1	X				
	EPA 200.8	X				
	EPA 6020	X				X
	EPA 7470A	X				
	EPA 7471A		X	X	X	X
	EPA 101A					X
	ASTM D6784-02					X
	Ontario-Hydro					X
	EPA 0060					X
	EPA 29					X
	CARB 436					X

Inorganics Methods Performed

Parameter	Method	Aqueous	Solid	Waste	Biological	Air
Alkalinity (Carbonate, Bicarbonate, Total)	SM 2320B	X				
Ammonia	EPA 350.1	X				
Bromide	EPA 300.0	X				
	EPA 9056	X	X			
	EPA 9057					X
	EPA 26A					X
	CARB 421					X
Carbon, Total Inorganic	EPA 9060	X	X			
Carbon, Total Organic	EPA 9060	X	X			
	SM 5310 C	X				
Chloride	EPA 300.0	X				
	EPA 9056	X	X			
	EPA 9057					X
	EPA 26A					X
	CARB 421					X
Chromium, Hexavalent	EPA 7196A	X	X			
	EPA 0061					X
	EPA 306					X
	CARB 426					X
Conductivity	EPA 9050A	X				
	SM 2510 B	X				
Cyanide, Free	EPA 9012A	X	X			
	SM 4500 CN E	X				
Cyanide, Total	EPA 335.4	X				
	EPA 9012A	X	X			
	CARB 426					X
Demand, Chemical Oxygen	EPA 410.4	X				
Flouride	EPA 300.0	X	X			
	EPA 9056	X	X			
	EPA 9214	X	X			
	SM 4500 F C	X				
	EPA 9057					X
	EPA 26A					X
	CARB 421					X
n-Hexane Extractable Materials	EPA 1664A	X				
	EPA 9070A	X				
	EPA 9071B		X			
Moisture	ASTM 2216		X			

Nitrate	EPA 353.2	X				
	EPA 300.0	X				
	EPA 9056	X	X			
	CARB 421					X
Nitrate-Nitrite	EPA 353.2	X				
Nitrite	EPA 353.2	X				
	EPA 300.0	X				
	EPA 9056	X	X			
	CARB 421					X
Nitrocellulose	EPA 353.2	X	X			
	WS-WC-0050	X	X			
Total Kjeldahl Nitrogen	EPA 351.2	X				
Orthophosphate	EPA 365.3	X				
	EPA 300.0	X				
	EPA 9056	X	X			
Particulates in Air	EPA 5					X
	40 CFR Part 50					X
Perchlorate	EPA 314.0	X				
	EPA 331.0	X				
	EPA 6850	X	X			
	WS-LC-0012	X	X			
pH	SM 4500 H+ B	X				
	EPA 150.2	X				
	EPA 9040A	X				
	EPA 9041A	X				
	EPA 9045C		X	X		
Phenolics	EPA 420.4	X				
	EPA 9066	X	X			
Phosphorus, Total	EPA 365.3	X				
	EPA 365.4	X				
Solids, Total	SM 2540 B	X				
Solids, Total Dissolved	SM 2540 C	X				
Solids, Total Suspended	SM 2540 D	X				
Settleable Solids	SM 2540 F	X				
Sulfate	EPA 300.0	X				
	EPA 9065	X				
Sulfide	SM 4500 S2- D	X				
Turbidity	SM 2130 B	X				

Appendix 5 . Data Qualifiers

Qualifier Organic	Qualifier Inorganic	Footnote
U	U	Analyte analyzed for but was not detected.
G	G	Elevated reporting limit. The reporting limit is elevated due to matrix interference.
J	B	Estimated result. Result is less than RL.
E	I	Estimated result. Result concentration exceeds the calibration range.
B	J	Method blank contamination. The associated method blank contains the target analyte at a reportable level.
P	*	Relative percent difference (RPD) is outside stated control limits.
a	N	Spiked analyte recovery is outside stated control limits.
*		Surrogate recovery is outside stated control limits.
PG		The percent difference between the original and confirmation analyses is greater than 40%.