Weck Laboratories, Inc.
Environmental and Analytical Services - Since 1964

Quality Assurance Program Manual

Facility Name:	**Weck Laboratories, Inc.**
Location:	**14859 E. Clark Ave., Industry, CA 91745**
Telephone:	**626-336-2139**

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Approved by:

Alan Ching **QA Officer**	**Date** 10-3-07	**Telephone** 626-336-2139
Alfredo Pierri **President/Laboratory Technical Director**	**Date** 10/2/07	**Telephone** 626-336 2139 x 111
Joe Chau **Laboratory Manager**	**Date** 10/3/07	**Telephone** 626-336-2139 x110
Hai-Van Nguyen **Technical Director/Microbiology**	**Date** 10/3/07	**Telephone** (626) 336-2139 x 102

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1 INTRODUCTION

Weck Laboratories is an independent testing laboratory specializing in environmental analytical services. The company was founded in 1964 and it is organized as a California corporation.

The purpose of the Weck Laboratories Quality Assurance Program is to operate under standardized QA procedures, to provide guidance to all personnel and it is designed to continually monitor the reliability of test results, ensuring that they fall within acceptable limits, and provide guidelines for the implementation of corrective action when necessary.

This Quality Assurance Manual is a summary document that outlines the policies and operational procedures and the laboratory management system associated with work carried out at its permanent facility in the City of Industry, California, as well as at sites away from its permanent facilities, or in associated temporary or mobile facilities.
It is intended to ensure the high quality of analytical services that the Laboratory is committed to provide to its clients. This Manual contains references to other supporting documents also related to the Quality Assurance Program, such as SOPs, QC acceptance limits, MDL studies, Performance Evaluation Results and Policy documents.

The QA Manual and its supporting documents are reviewed annually to ensure that they reflect current laboratory practices and are in agreement with current regulations.

All policies and procedures have been structured in accordance with the NELAC standards and applicable requirements, regulations, guidance, and technical standards from the USEPA and State regulatory agencies. This manual has been prepared in accordance with the guidance documents listed in section 19.

If more stringent standards or requirements than the specified in this Manual are included in a mandated test method or by regulation, such requirements must be met. If it is not clear which requirements are more stringent, the standard from the method or regulation is to be followed.

This Quality Manual, SOPs and related documentation describe the quality system for Weck Laboratories, Inc.

1.1 Mission Statement

Weck Laboratories provides qualitative and quantitative data for use in critical decisions relating to the protection of the public and the environment. The data used for such purposes must be scientifically valid, defensible and of known and documented quality. All environmental testing activities are carried out in such a way as to meet the requirements of the current NELAC Standard and to satisfy the needs of the client, the regulatory authorities or organizations providing recognition.

It is our goal to provide our clients with the best possible services, in terms of quality of laboratory work, honesty in our procedures and reporting, efficiency in our turnaround time and reasonable prices for our services and at the same time satisfy the needs of the regulatory authorities and organizations providing recognition.

Top management of the laboratory is totally committed to the attainment of the best possible quality of data and instructs and educates the staff on this company policy.
All the necessary resources and materials shall be provided to the personnel of the laboratory in order to meet and/or improve the quality requirements of NELAC and consequently of ISO 9001 and 9002, of the analytical methods performed at the lab and any special requirements from clients.

1.2 Services provided

The services provided by this facility are the following:

- Organic chemical analyses
- Inorganic chemical analyses
- Trace metal analyses
- Microbiological analysis limited to total coliform, fecal coliform and standard plate count.
- Physical analyses
- Field services (sampling and simple field determinations)

The technical and service requirements for all requests to provide analyses are thoroughly evaluated before commitments are made to accept the work. This includes a review of facilities and instrumentation, staffing, and any special QC or reporting requirements to ensure that analyses can be performed within the expected schedule. All measurements are made using published reference methods or methods developed by Weck Laboratories. Competence with all methods is demonstrated according to the procedure described in Appendix 9 prior to use.

1.3 Proficiency Testing

Weck Laboratories, Inc. analyzes Proficiency Testing samples at a frequency established by the current regulations, typically two times per year, from an approved PT provider that meets the requirements specified in chapter 2 of the current NELAC standard. The specific analytes and matrices analyzed are based on the current scope of the laboratory services and are documented in a laboratory SOP on PT samples analyses.
The goal for PT results is obtaining 100% of all analytes within acceptable limits. When there are results out of the acceptance range, corrective action is initiated to prevent the error from reoccurring. A report with the documentation of the corrective action is also filed.

1.4 Ethics policy

Weck Laboratories, Inc. has developed a proactive program for prevention and detection of improper, unethical or illegal actions. A main component of this program is the periodic training and communications that the employees receive from management about the ethics policy and the utmost importance of an honest and ethical behavior in all activities performed at the laboratory.

Proper ethical conduct in the laboratory is strictly enforced. The Company's Code of Ethics (Appendix 2) is presented to current and prospective employees in both the QA manual and the Employee Handbook.

The Data Integrity Plan, which includes the description of the data integrity procedures, serves to combine the elements currently in place and document further procedures to ensure our compliance with requirements in the NELAC standard and from other regulatory agencies.

These procedures include the following elements:

- data Integrity training
- signed data integrity documentation for all laboratory employees
- in-depth, periodic monitoring of data integrity
- data integrity procedure documentation.

The data integrity procedures are signed and dated by senior management. These procedures and the associated implementation records are properly maintained and made available for assessor review. The data integrity procedures are annually reviewed and updated if necessary by management.

The Data Integrity Plan also provides a mechanism for confidential reporting of data integrity issues in the laboratory. A primary element of the mechanism is to assure confidentiality and a receptive environment in which all employees may privately discuss ethical issues or report items of ethical concern. In instances of ethical concern, the mechanism also includes a process whereby laboratory management is to be informed of the need for any further detailed investigation.

Each employee is required to understand and sign a Data Integrity Agreement, contained in the Data Integrity Plan document. The Laboratory Ethics seminar that is presented as a refresher to current employees on an annual basis and as part of the hiring process for new employees include elements describing examples of improper and illegal actions, how to identify appropriate and inappropriate laboratory and instrument manipulation practices, guidance for manual integration practices and consequences of unethical or improper behavior.

Punishment for improper, illegal or unethical activities range from suspension to termination, depending on the degree and nature of the unethical activity.

Employees are required and encouraged to bring up to management any improper activities they detect or are suspicious of. Any incident reported is immediately investigated by the management and the person or persons involved are subject to disciplinary actions.
The Management shall also monitor the program for detecting improper, unethical or illegal action by performing internal proficiency testing (single or double blind), reviewing of analytical data post-analysis, performing electronic data audits using special software as Mint Miner® and providing an open door policy for employees to report any suspicious activity without fears.

In order to assist the laboratory technical personnel in performing their duties without detrimental influences, it is the policy of the Company that the laboratory be impartial and that it and its personnel are free from any undue commercial, financial and other pressures which might influence or adversely affect their normal performance having an impact on the quality of the work they produce or their technical judgment. By this policy all laboratory personnel dedicated to technical activities should not be influenced by, or involved in any financial or commercial matter while performing laboratory work. If any employee feels that he or she might be under any kind of pressure as described above, the Laboratory Director must be notified immediately. Additionally, the Laboratory will not engage in any activities that may endanger the trust in its independence of judgment and integrity in relation to its environmental testing.

2 QUALITY POLICY

2.1 QA objectives for measuring data

The objective of the Quality Assurance Program is to monitor the reliability of the analytical data produced by the Laboratory and to implement effectively the quality control procedures and operations defined for each analysis. The purposes of this program are:

- Provide data that is scientifically valid, defensible, and of known and documented quality in accordance with standards developed by the National Environmental Laboratory Accreditation Conference (NELAC) and any applicable state or EPA regulations or requirements.

- Ensure that analytical results fall between acceptable control limits.
- Provide mechanisms for corrective action when necessary.
- Establish standardized practices to provide consistency in the generation of data.
- Define the quality of each analytical system in terms of accuracy, precision and sensitivity.
- Identify in the early stages possible problems that may affect data quality.

2.2 Resources

The resources of Weck Laboratories are instrumental in implementing this policy. Highly trained personnel, including chemists and related scientists continue their education by attending seminars and technical meetings; instrumentation that is continuously upgraded to maintain the state-of-the-art in analytical instruments; and a facility currently consisting of 22,000 sq. ft. of laboratory area distributed in a manner that minimizes laboratory contamination.

3 DESCRIPTION OF THE QAP MANUAL

3.1 Terminology

°C	Degrees Celsius
AA	Atomic Absorption
ANSI/ASQC	American National Standards Institute/American Society for Quality Control
ASQC	American Society for Quality Control
ASTM	American Society for Testing and Materials
Audit	A documented investigative evaluation used to determine the degree of compliance with established procedures and guidelines, applied to specific analytical processes.
BFB	Bromofluorobenzene
BNA	Base, neutral and acid
BOD	Biochemical Oxygen Demand
BS	Blank Spike, equivalent to LFB and LCS
BTEX	Benzene, toluene, ethyl benzene and xylene
CA	Corrective Action, the measures taken to correct a situation that is out of the control limits set by QC procedures
CAL	Calibration standard, a solution prepared from the dilution of stock standard solutions. The CAL solutions are used to calibrate the instrument response with respect to analyte concentration.
CARB	California Air Resources Board
CAS	Chemical Abstract Service
CATC	Cyanide amenable to chlorination
CCC	Calibration check compound
CCV	Continuing calibration verification
CFR	Code of Federal Regulations
CI	Chemical ionization
Cl2	Chlorine
CLP	Contract Laboratory Program

COC	Chain of Custody
COD	Chemical oxygen demand
CRDL	Contract Required Detection Limit
CV	Coefficient of variation
CVAA	Cold Vapor Atomic Absorption Spectroscopy
DBCP	1,2-dibromo-3-chloropropane
DBF	Dibenzofurans
D/DBP	Disinfectants and disinfection by-products
DFTPP	Decafluorotriphenylphosphine
Dissolved	The concentration of analyte in an aqueous sample that will pass through a 0.45 µm membrane filter assembly prior to sample acidification.
DLR	Detection Limit for Reporting purposes, established by the California Department of Health Services for potable water analysis.
DO	Dissolved oxygen
DOC	Demonstration of capability
DOC	Dissolved Organic Carbon
DOE	Department of Energy
DOT	Department of Transportation
DOD	Department of Defense
DQIs	Data Quality Indicators
DQOs	Data Quality Objectives
DRO	Diesel-range organics
ECD	Electron capture detector
EDB	1,2-dibromoethane
EDD	Electronic data deliverable
El	Electron impact ionization
ELAP	Environmental Laboratory Accreditation Program. A program managed by the State of California, Department of Health Services for accreditation of environmental testing laboratories.
EPA	United States Environmental Protection Agency
FIA	Flow-injection analysis
FID	Flame-ionization detector
FPD	Fame photometric detector
GC/MS	Gas chromatography/mass spectrometry
GFAA	Graphite Furnace Atomic Absorption Spectroscopy
GPC	Gel-permeation chromatography
GRO	Gasoline-range organics
HAA	Haloacetic acid
HAN	Haloacetonitrile
HDPE	High Density Polyethylene
HPLC	High Performance Liquid Chromatography
HRGC	High Resolution Gas Chromatography
HRMS	High Resolution Mass Spectrometry
IC	Ion Chromatography
IC/MS/MS	Ion Chromatography-Tandem Mass Spectrometry
ICAP	Inductively Coupled Argon Plasma Spectroscopy
ICP	Inductively Coupled Plasma
ICP-AES	Inductively Coupled Atomic Emission Spectroscopy
ICP-MS	Inductively coupled plasma-mass spectrometer
ICV	Initial calibration verification
ICS	Interference check sample

IDL	Instrument Detection Limit
IEC	interelement correction factor
IPC	Instrument Performance Check Solution - A solution of the method analyte, used to evaluate the performance of the instrument system with respect to a defined set of method criteria.
ISE	Ion-selective electrode
ISO/IEC	International Standards Organization/International Electrotechnical Commission
LCL	Lower Control Limit
LCS	Laboratory control sample, equivalent to LFB.
LC/MS/MS	Liquid Chormatography-Tandem Mass Spectrometry
LD1 and LD2	Laboratory Duplicates - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analyses of LD1 and LD2 indicate precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.
LDR	Linear Dynamic Range - The concentration range over which the instrument response to an analyte is linear.
LFB	Laboratory Fortified Blank - An aliquot of LRB to which known quantities of the method analytes are added in the laboratory. The LFB is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements.
LFM	Laboratory Fortified Sample Matrix (LFM) – Also known as Matrix Spike. An aliquot of an environmental sample to which a known quantity of the method analyte is added in the laboratory. The LFM is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentration of the analyte in the sample matrix must be determined in a separate aliquot and the measured value in the LFM corrected for background concentration.
LIMS	Laboratory information management system
LLE	Liquid-liquid extraction
LOD	Limit of detection, equivalent to MDL
LOQ	Limit of quantitation, equivalent to RL, PQL and MRL
LRB	Laboratory Reagent Blank - An aliquot of reagent water or other blank matrices that are treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, and internal standards that are used with other samples. The LRB is used to determine if the method analyte or other interferences are present in the laboratory environment, reagents, or apparatus.
LWL	Lower Warning Limit
MBAS	Methylene Blue Active Substance
MDL	Method Detection Limit - The minimum concentration of an analyte that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero.
MEK	Methyl ethyl ketone
MRL	Method Reporting Limit, equivalent to RL and PQL
MS	Matrix spike
MSA	Method of standard additions
MSD	Mass-selective detector
MSD	Matrix spike duplicate
MSDS	Material Safety Data Sheet
MS/MS	Multistage mass spectrometry
MTBE	Methyl-tertiary-butyl ether

NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute for Standards and Technology
NPD	Nitrogen-phosphorus detector
NPDES	National Pollutant Discharge Elimination System
OCP	Organochlorine pesticides
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbons (or PNA)
PBMS	Performance Based Measurement System
PC	Personal computer
PCBs	Polychlorinated biphenyls
PCDD	Polychlorinated dibenzo-p-dioxins
PCDF	Polychlorinated dibenzofurans
PID	Photoionization detection
PQL	Practical Quantitation Limit
PT	Proficiency Testing
RF	Response Factor
QA	Quality Assurance
QAP	Quality Assurance Program
QAPP	Quality Assurance Program Plan
QAPjP	Quality Assurance Project Plan
QC	Quality Control
QCS	Quality Control Sample - A solution of the method analyte of known concentration, which is used to fortify an aliquot of LRB or sample matrix. The QCS is obtained from a source external to the laboratory and different from the source of the calibration standards. It is used to check either laboratory or instrument performance.
RL	Reporting limit
RPD	Relative percent difference
RSD	Relative standard deviation
RT	Retention time
SCAQMD	South Coast Air Quality Management District
SI	International System of Units
SIM	Selected-ion monitoring
SOC	Synthetic organic chemical
SOP	Standard Operating Procedure
SPCC	System Performance Check Compounds
SPE	Solid-phase extraction
SPME	Solid-phase microextraction
SRM	Standard Reference Material
SUR	Surrogate compound,
SVOA	Semivolatile organics analysis
TCD	Thermal conductivity detector
TCDD	Tetrachlorodibenzodioxin
TCDF	Tetrachlorodibenzofuran
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total dissolved solids
TEM	Transmission electron microscopy
TIC	Tentatively identified compounds
TKN	Total Kjeldahl Nitrogen

TOC	Total Organic Carbon
TOX	Total Organic Halides
TPH	Total petroleum hydrocarbon
TPH-D	Total petroleum hydrocarbons as diesel
TRPH	Total recoverable petroleum hydrocarbon
TSS	Total suspended solids
UCL	Upper Control Limit
UV	Ultraviolet
UV/VIS	Ultraviolet/visible-light
UWL	Upper Warning Limit
VOA	Volatile Organic Analyte
VOC	Volatile organic compound(s)
WET	Waste Extraction Test (California leaching test)
WET	Whole effluent toxicity
WP	Water Pollution Performance Evaluation Samples
WS	Water Supply Performance Evaluation Samples
ZHE	Zero-headspace extraction

Other terminology commonly used can be found in the glossary section of the NELAC standards.

3.2 Scope

The purpose of the Quality Assurance Program (QAP) described in this manual is to ensure the integrity of the data produced by the laboratory. The QAP encompasses all aspects of the analytical process. The management of Weck Laboratories, Inc. is committed to provide analytical and environmental services of the highest possible quality in order to satisfy the requirements of the regulatory agencies and to meet or exceed our clients' expectations.

This commitment is transmitted to all levels of our organization. Employees and associates are encouraged to constantly improve the quality of their work.

3.3 Fields of Testing

The analytical activities that will be described in this manual are divided into the following main groups:

- Environmental testing involving analysis of drinking water, wastewater, soil and hazardous waste. The analysis of environmental samples follows primarily the methodology approved by the California Department of Health Services under the Environmental Laboratory Accreditation Program and other regulatory agencies.

- Industrial Hygiene analysis of metals and organics in air filters and sorbent tubes following primarily NIOSH published methods.

- Analysis of air samples follows the methodology of the California Air Resources Board, the SCAQMD and other agencies.

3.4 Management of the QAP Manual

The Quality Assurance Program is constantly monitored, reviewed and evaluated. The Quality Assurance Officer is the primary person in charge of updating, revising and distributing this QAP Manual. The

Laboratory Director and Technical Directors also have input in the upgrade of the Manual. The revision process takes place when needed if there is a change in some of the processes described, and it is also reviewed and re-approved yearly, if no changes are needed. After the revision is completed, the manual is approved for release by the QA Officer and by the Management. After it is submitted, some time is allowed for training of the personnel in the changes introduced if any. The Dates of submittal and the effective date are in the cover page of the document.

4 DESCRIPTION OF THE LABORATORY

4.1 Identification

Dr. Friedrich J. Weck founded Weck Laboratories, Inc. in 1964 as a consulting and contract laboratory dedicated to independent analytical testing and research activities. Over the years the Laboratory's primary activity shifted to environmental analytical chemistry.

The company is a California Corporation established in 1981. The address of the Laboratory facility is 14859 East Clark Avenue, City of Industry, California, 91745, located north of the 60 Freeway, Seventh Avenue exit.

4.2 Fields of Activity

Weck Laboratories offers a full range of environmental testing, including drinking water, wastewater, groundwater, soil, hazardous waste, ambient air and industrial hygiene testing. The types of analyses performed include both organic & inorganic chemical, physical and bacteriological tests, distributed between two buildings located at the facility.

4.3 Organizational Structure

The different positions within the laboratory have job descriptions that are maintained in the Human Resources department. The organization chart of Weck Laboratories, Inc. can be found in Appendix 3.

5 STAFF

5.1 Management Personnel

The managerial and technical personnel have the authority and resources needed to carry out their duties and to identify the occurrence of departures from the quality system or from the procedures for performing environmental tests and/or calibrations, and to initiate actions to prevent or minimize such departures.
Technical management has overall responsibility for the technical operations and for the provision of the resources needed to ensure the required quality of laboratory operations.
Deputies are appointed for key managerial personnel, including the technical director(s) and QA Officer, to perform their duties in case of prolonged absences.
The following are the responsibilities and activities within the QAP in which the key and management personnel are engaged:

<u>Laboratory Management</u>

- Defining the minimal level of experience and skills necessary for all positions in the laboratory.
- Ensuring that all technical laboratory personnel have demonstrated capability in the activities for which they are responsible.
- Ensuring that the training of its personnel is kept up-to-date.
- Documenting all analytical and operational activities.
- Supervising all personnel
- Ensuring that all sample acceptance criteria are verified and that samples are logged into the sample tracking system and properly labeled and stored.
- Performing with the other management staff an annual Management System Review.
- Documenting the quality of all data reported by the laboratory
- Ensuring that the laboratory has the appropriate resources and facilities to perform requested work
- Ensuring that corrective actions relating to findings from the internal audit are completed; and
- Nominating deputies when the Technical Directors or QA Officer are absent.
- Developing a proactive program for prevention and detection of improper, unethical or illegal actions.
- Ensuring that only those outside support services and supplies that are of adequate quality to sustain confidence in the laboratory's tests are used.

QA Officer

The QA Officer is responsible for the Quality System of the laboratory and its implementation. He or she has direct access to the highest level of management (President/Laboratory Director) and to the Technical Directors to resolve any dispute involving data quality.

The specific functions and characteristics of the QA Officer are the following:

- Serve as the focal point for QA/QC and be responsible for the oversight and/or review of quality control data.
- Have functions independent from laboratory day-to-day operations for which he or she has quality assurance oversight.
- Be able to evaluate data objectively and perform assessments without any outside influence.
- Have documented training and/or experience in QA/QC procedures and be knowledgeable in the quality system as defined under NELAC.
- Have a general knowledge of the analytical tests methods for which data review is performed.
- Arrange for or conduct internal audits on the entire technical operation annually
- Notify laboratory management of deficiencies and non-compliance items in the quality system and monitor corrective action.
- The QA Officer has sufficient authority to stop work as deemed necessary in the event of serious QA/QC issues.

Technical Directors

The full time individuals who have overall responsibility for the technical operation of the laboratory. There are three technical directors: for Chemistry, Microbiological analysis and Radiochemistry.
The daily activities and responsibilities of the Technical Directors are the following:

- Certifying that personnel with appropriate educational and/or technical background perform all tests for which the laboratory is accredited
- Monitoring standards of performance in quality control and quality assurance.
- Monitoring the validity of the analyses performed and data generated in the laboratory to assure reliable data
- Ensuring that sufficient number of qualified personnel are employed to supervise and perform the work of the laboratory
- Providing educational direction to laboratory staff
- Exercising day-to-day supervision of laboratory operations for the corresponding department.

The Technical Directors of Weck Laboratories meet the requirements specified in Section 4.1.1.1 of the NELAC Standards.

Resumes of management personnel are in Appendix 1

5.2 Personnel Qualifications

The technical staff is responsible for sample analysis and identification of corrective actions. The staff reports directly to the Laboratory Director or Lab Manager. All personnel are responsible for complying with all quality assurance/quality control (QA/QC) requirements that pertain to their organizational/technical function. As documented in the employee records, each employee has the experience and education to adequately demonstrate knowledge for their particular function and the general knowledge of laboratory operations, analytical test methods, QA/QC procedures and records management.

The laboratory management shall ensure the competence of all who operate specific equipment, perform environmental tests, evaluate results, and sign test reports and calibration certificates. When using staff that are undergoing training, appropriate supervision shall be provided. Personnel performing specific tasks shall be qualified on the basis of appropriate education, training, experience and/or demonstrated skills, as required.

5.3 Personnel Training

Each employee is required to read, understand, and to use the current versions of the established Standard Operating Procedures and Analytical Method Protocols, which relates to his/her job responsibilities. The Training records show evidence of the revisions of the SOPs the employees have reviewed. Each employee demonstrates initial proficiency by following the procedure described in Appendix 9 of this manual, and demonstrates continued proficiency on a yearly basis by acceptable performance on Laboratory Control Samples (LCS), successful analysis of blind samples or by analyzing in parallel a sample analyzed by a trained or re-trained analyst. The training records of the analysts are organized by analyst and kept with personnel files. They include initial and continuing training, continuing education, participation in technical conferences or seminars and internal training activities.
Initial training for new employees is performed by experienced personnel with management guidance and includes the observation of the QC procedures described in this manual.

The company has a policy that encourages all technical personnel to participate in technical seminars and meetings involving innovative analytical technologies, new instrumentation and software applied to environmental testing. Records of this participation are maintained in the personnel files.

The management of the laboratory shall formulate the goals with respect to the education, training and skills of the laboratory personnel.
The personnel performing analytical and related tasks at the laboratory must be employed by, or under contract to, the laboratory. Where contracted and additional technical and key support 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.
The laboratory shall maintain current job descriptions for all personnel who manage, perform, or verify work affecting the quality of the environmental tests.
The management shall authorize specific personnel to perform particular types of sampling, environmental test, to issue test reports and calibration certificates, to give opinions and interpretations and to operate particular types of equipment. The laboratory shall maintain records of the relevant authorization(s), competence, educational and professional qualifications, training, skills and experience of all technical personnel, including contracted personnel. This information shall be readily available and shall include the date on which authorization and/or competence is confirmed.
Records on the relevant qualifications, training, skills and experience of the technical personnel shall be maintained by the laboratory, including records on demonstrated proficiency for each laboratory test method.

6 LABORATORY CAPABILITIES AND ACCREDITATIONS

Weck Laboratories, Inc. analyzes water, soil, hazardous waste and air samples. The following are the type of analysis performed:

- Drinking Water and Groundwater

  - Sampling: production wells and monitoring wells
  - Inorganic: trace metals, physical parameters, wet chemistry
  - Organic: volatile, semi-volatile, pesticides, herbicides
  - Bacteriological: Total and fecal coliforms, Heterotrophic Plate Count

- Waste Water

  - Sampling: composite samplers, grabs.
  - Inorganic: metals, physical parameters, wet chemistry
  - Organic: volatile, semi-volatile, pesticides, herbicides
  - Bacteriological: Total and fecal coliforms, Heterotrophic Plate Count

- Hazardous Waste and Soil

  - Characteristics: physical properties, leaching tests
  - Organic: volatile, semi-volatile, pesticides, herbicides
  - Inorganic: metals, wet chemistry

- Industrial Hygiene

- Indoor Air Analysis: air filters (metals)
- Sorbent tubes (organics)

The different analytical techniques and methods performed at the laboratory are described in the laboratory specific SOPs.

The Laboratory is accredited by various regulatory agencies to perform environmental testing. Current accreditations are listed in appendix 11.

The instrumental analytical capabilities of Weck Laboratories, Inc. include the following:

- **Sampling and field equipment**

  24 hours composite samplers for water.
  Flow measurement instruments
  Water quality kits
  Encore samplers for soil
  Immunoassay determinations

- **Inorganic analysis**:

  ICP-AES
  ICP-MS
  ICP-MS Flow Injection Analysis (hydride generation)
  Cold Vapor Atomic Absorption
  Cold Vapor Atomic Fluorescence
  Cold Vapor Atomic Florescence with Gold Amalgamation
  UV-visible spectrometry
  Ion Chromatography
  IC/MS/MS
  Ion Selective Electrodes

- **Organic Analysis**

  Purge and Trap equipment for direct purging of soils
  Purge and Trap for water
  Automated SPME
  GC/MS for volatile organics
  GC/MS for semi volatile organics
  GC/MS/MS (tandem Mass spectrometry)
  GC/MS with Chemical Ionization positive ion and negative ion
  GC with FID,NPD,ECD,PID,TCD
  LC/MS/MS for UCMR 2. EDC/PPCPs & Perchlorate
  HPLC with post-column derivatization and UV-Visible and Fluorescence detectors.
  TOX
  TOC
  Infrared analysis

  A complete list of laboratory instrumentation is in Appendix 4.

7. QUALITY ASSURANCE OBJECTIVES

The overall QA objective of Weck Laboratories, Inc. is to develop and implement procedures for laboratory analysis, chain-of-custody, and reporting that will provide results, which are of known and documented quality. Data Quality Indicators (DQIs) are used as qualitative and quantitative descriptors in interpreting the degree of acceptability or utility of data. The principal DQIs are precision, bias (accuracy), representativeness, comparability, completeness and detection limits. The DQIs are used as quantitative goals for the quality of data generated in the analytical measurement process. This section summarizes how specific QA objectives are achieved. The specific application of these various activities are contained in the method SOPs.

7.1 Precision

Precision is a measure of the degree to which two or more measurements are in agreement.

Precision is assessed through the calculation of relative percent differences (RPD) and relative standard deviations (RSD) for replicate samples. For analyses that have detectable levels of analytes (for example inorganic analyses), laboratory precision is usually assessed through the analysis of a sample/sample duplicate pair and field duplicate pairs. For analyses that frequently show no detectable levels of analytes (e.g., organic analyses), the precision is usually determined through the analysis of matrix spike/matrix spike duplicates (MS/MSD) and field duplicate samples.

7.2 Accuracy

Accuracy (Bias) is the degree of agreement between an observed value and an accepted reference or true value.

Accuracy is assessed by the analysis of blanks and through the adherence to all sample handling, preservation and holding times. Laboratory accuracy is further assessed through the analysis of MS/MSD, external quality control check samples, laboratory control samples (LCS and LCSD) and surrogate compounds spikes.

7.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point process condition, or an environmental condition within a defined spatial and/or temporal boundary.

Representativeness is ensured by using the proper sampling techniques, proper analytical procedures, appropriate methods; meeting sample holding times and analyzing field duplicate samples.

7.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

Laboratory completeness is a measure of the amount of valid measurement obtained from all the measurement taken in the project. The laboratory completeness objective is that the generation of valid data for all samples be greater than 95 percent.

7.5 Comparability

Comparability is an expression of the confidence with which one data can be compared to another.

Comparability is achieved by the use of routine analytical methods, achieving holding times, reporting results in common units, use of consistent detection levels, and consistent rules for reporting data.

7.6 Detection Limits

Method Detection Limits (MDLs) are determined for all analytes as specified in the NELAC standards. From these, Reporting Limits (RLs) are obtained. See section 12.2 for more detailed information.

8. SAMPLING

Most samples processed at the laboratory are collected by clients or their representatives. When required, Weck Laboratories can provide technical assistance for sample collection and handling and can prepare appropriate sample containers with preservatives.
Weck Laboratories field personnel conduct sampling of wastewater and potable water for projects that require this service. Our personnel do not perform industrial hygiene sampling.

In order to assure the quality of the entire analytical process, Weck Laboratories works closely with field personnel employed by the client to meet general QA criteria and if available specific criteria as per the QAPjP.

When performing sampling activities related to environmental testing, the laboratory sampling personnel follows the corresponding SOPs. Copies of the SOPs are kept at the field for reference.

The procedures to obtain subsamples, such as obtaining sample aliquots, are documented in each analytical SOP that requires it.

Where the client requires deviations, additions or exclusions from the documented sampling procedure, these are recorded in detail in the case narrative of the work order and reported with the analytical report. They are also communicated to the appropriate personnel.

In the instances that the laboratory does not perform the sampling and whenever possible all sampling information, such as name of sampler, company that employs the sampler, sampling procedure, etc. is recorded in the sampling section of each work order and reported to the client. All other pertinent sampling information and relevant data for operations relating to sampling that forms part of the environmental testing that is undertaken is also recorded and reported with the analytical report.

9. SAMPLE HANDLING

This section summarizes policies and practices for sample handling. Further details are contained in the corresponding SOPs.

9.1 Sample Tracking

Weck Laboratories, Inc. uniquely identifies each sample to be tested, to ensure that there can be no confusion regarding identity. The sample identification system includes identification for all samples, sub-samples and subsequent extracts and/or digestates. A unique identification (ID) code is placed on each sample container.

9.2 Review of Requests, Tenders and Contracts

When a request, tender or contract is received by the Laboratory, the Management or designated staff member will review and ensure that the requirements, including the methods to be used, are adequately defined, documented and understood and that the laboratory has the capability and resources to meet the requirements. The purpose of this review of capability is to establish that the laboratory possesses the necessary physical, personnel and information resources, and that the laboratory's personnel have the skills and expertise necessary for the performance of the tests in question. The review may encompass results of earlier participation in interlaboratory comparisons or proficiency testing and/or the running of trial environmental test or calibration programs using samples or items of known value in order to determine uncertainties of measurement, detection limits of confidence limits, or other essential quality control requirements. The current accreditation status of the laboratory is also reviewed. The laboratory then informs the client of the results of this review if it indicates any potential conflict, deficiency, lack of appropriate accreditation status, or inability on the laboratory's part to complete the client's work.
Another item to review is whether or not the appropriate test method is selected and capable of meeting the clients' requirements.
The management or designated staff will discuss and resolve any differences between the request or tender and the contract before any work commences in order to assure that each contract is acceptable both to the laboratory and the client.
A contract may be any written or oral agreement to provide a client with environmental testing or other laboratory services.
Records of reviews, including any significant changes, shall be maintained. Records shall also be 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.
For review of routine and other simple tasks, the date and the identification (e. g. the initials) of the person in the laboratory responsible for carrying out the contracted work are considered adequate.
For repetitive routine tasks, the review need be made only at the initial enquiry stage or on granting of the contract for on-going routine work performed under a general agreement with the client, provided that the client's requirements remain unchanged. For new, complex or advanced environmental testing, a more comprehensive record should be maintained.
The review shall also cover any work that is subcontracted by the laboratory.
The client shall be informed of any deviation from the contract.
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.
If there is any suspension of accreditation, revocation of accreditation, or voluntary withdrawal of accreditation during the time the contract is in effect, this must be reported to the client.

9.3 Sample Acceptance Policy

The following are the requirements for sample acceptance. Data from any samples, which do not meet the policy here specified, are noted in the laboratory report defining the nature and substance of the variation:

- Proper, full, and complete documentation, including the sample identification, the location, date and time of collection, collector's name, preservation type, sample type and any special remarks concerning the sample. This information must be fully documented in the chain of custody record. Appendix 5
- Unique identification of samples using durable labels completed in indelible ink on all sample containers.
- Use of appropriate sample containers and preservatives as per table in Appendix 6.

- All samples have adequate holding time to be analyzed (Appendix 6).
- If no previous special arrangements were made, parameters that are "field" analysis (i.e. pH, residual chlorine, etc.) will be analyzed within 24 hours from arrival at the laboratory. Samples that arrive at the laboratory after 4 PM on Friday or on the weekend will be analyzed no later than the next business day after receipt (Monday unless a holiday).
- Adequate sample size for all analysis requested.
- Special instructions and additional information required to perform the analysis properly (i.e., time, flow rate, etc.).
- Procedures that are used when samples show signs of damage or contamination.
- Samples received at the required temperature (usually $4^{o}C \pm 2\ ^{o}C$) or with evidence of chilling process started (received "on ice") if they were collected the same day as received at the lab.

If any of the above requirements are not met, the client is notified immediately, and the irregularity is documented:

- If the client acknowledges the irregularity and instructs the laboratory to continue with analysis this is documented and samples accepted.
- If the client does not acknowledge the irregularity the samples are rejected.
- If the irregularity is noted in samples submitted for bacteriological analysis for compliance purposes, the samples are rejected without exception.

When a request for a new project is received involving multiple samples or tests that have a short holding time the Management is notified. The Management staff with the assistance of the appropriate technical personnel evaluates the project and calculates the resources needed to complete it within the turn around time required and the holding times, taking into consideration the volume of work in house and/or expected.
If it is determined that the new project will not affect the proper completion of jobs already in house and that the laboratory has the resources (personnel, equipment and facilities) necessary to accommodate the new project, this is accepted.
If the Management or any of the technical staff involved thinks that the new job will create problems in terms of reduced quality of work, completion out of specified or required time, or any other detrimental situation, the new project is not accepted and the client notified.
If there are alternatives, such as postponement, modification of sampling schedules or partial subcontracting to another lab in order to accommodate the project, this is proposed to the client.

9.4 Sample Receipt Protocol

Upon receipt, the condition of the sample, including any abnormalities or departures from standard condition is recorded. All samples, which require thermal preservation, are considered acceptable if the arrival temperature is either within $+/- 2\ ^{o}C$ of the required temperature or the method specific range. Samples that are hand delivered to the laboratory immediately after collection may not meet these criteria. In these cases, the samples will be considered acceptable if there is evidence that the chilling process has begun, such as arrival on ice. The temperature at which the samples are received is measured and recorded in the documents and in the LIMS.

Where applicable, Weck Laboratories, Inc. verifies chemical preservation using readily available techniques, such as pH or free chlorine, prior to or during sample preparation or analysis. The results of all checks are recorded.
When there is any doubt as to the sample's suitability for testing or if the sample does not meet any of the above criteria or if irregularities are noted, the client is notified immediately, and the irregularity is

documented. If the client acknowledges the irregularity and instructs the laboratory to continue with analysis this is also documented. If the client does not acknowledge the irregularity the samples are rejected. If the irregularity is noted in samples submitted for bacteriological analysis for compliance purposes, the samples are rejected without exception.

The sample identification number is affixed to all sample containers and worksheets are prepared for the different types of analyses requested. When there are different containers or sub-samples belonging to one sample for multiple tests, the fraction name is indicated on the sample bottle by a suffix letter or other means. Alternatively, pre-labeled bottles containing the required tests are also provided.

9.5 Storage conditions

Samples that require thermal preservation are stored under refrigeration, which is +/- 2 ^{o}C of the specified preservation temperature. When this temperature is 4 ^{o}C, a storage temperature of just above the freezing temperature to 6 ^{o}C is considered acceptable. Samples are stored in a manner that prevents cross contamination, normally they are separated based on matrix, analysis and level of known contamination. Other samples are kept in specific areas while they are being tested. Evidence samples are stored in secured and controlled access areas.

9.6 Custody of Samples and Documentation

The Chain-of-Custody procedures begin when the sample is collected. At that time, a COC form is prepared, containing all the information about the sample (project name, sample identification, date and time of collection, name of person performing the sampling, matrix type, tests requested, number of containers, field measurements, and all other pertinent information).

The person who does the sampling must sign the COC record. The relinquishing and receiving parties must also sign the COC, indicating the date and time this operation was performed.
If the client submits the sample to the laboratory, a copy of the COC form is given to the client as evidence of receipt, while the other two copies are kept at the laboratory.

For samples received in sealed ice chests by commercial freight companies (UPS, FedEx), copies of shipping papers are attached to the COC form for future reference. The person receiving the sample also makes a notation of the type of shipment on the COC.

Access to all samples and sub-samples is controlled. The laboratory area is maintained secured and is restricted to authorized personnel only.

When full Legal/Evidentiary Chain of Custody protocols are required, COC records are used to establish an intact, continuous record of the physical possession, storage and disposal of sample containers, collected samples, sample aliquots, and sample extracts or digestates, The COC records account for all time periods associated with the samples. The COC records identify all individuals who physically handled individual samples. The COC forms remain with the samples during transport or shipment. If shipping containers and/or individual sample containers are submitted with sample custody seals, and any seals are not intact, the lab shall note this on the chain of custody. Other documents pertaining to the transport of the samples, such as receipts from common carriers are kept as part of the documentation. When evidentiary samples, subsamples, digestates or extracts are transferred to another party they are subject to the requirements of legal chain of custody. These samples are kept in a locked area or refrigerator with the key in possession of the designated sample custodian.

9.7 Sample disposal

Samples are retained for thirty days from report date unless otherwise instructed by the client or if the samples are part of litigation or have been received under legal/evidentiary requirements, in which case the disposal of the physical sample is accomplished with the concurrence of the affected legal authority. After the retention period samples are either returned to the client or properly disposed of according to federal and state laws and regulations.

10 CALIBRATION PROCEDURES AND FREQUENCY

10.1 Measurement Traceability

10.1.1 General

Whenever applicable, calibration of analytical support equipment and instruments and the overall program of calibration and/or verification is designed and operated so as to ensure that measurements are traceable to national standards of measurement.

All equipment used for environmental tests and/or calibrations, including equipment for subsidiary measurements (e. g. for environmental conditions) having a significant effect on the accuracy or validity of the result of the environmental test or sampling shall be calibrated before being put into service and on a continuing basis. The calibration of such equipment is performed according to the established program and procedure. This includes balances, thermometers, and control standards. The program also includes a system for selecting, using, calibrating, checking, controlling and maintaining measurement standards, reference materials used as measurement standards, and measuring and test equipment used to perform environmental tests.

10.1.2 Specific Requirements

The calibration of equipment shall be designed and operated so as to ensure that calibrations and measurements made by the laboratory are traceable to the International System of Units (SI).
The traceability is established for measuring instruments to the SI by means of an unbroken chain of calibrations or comparisons linking them to relevant primary standards of the SI units of measurement. The link to SI units may be achieved by reference to national measurement standards. National measurement standards may be primary standards, which are primary realizations of the SI units or agreed representations of SI units based on fundamental physical constants, or they may be secondary standards which are standards calibrated by another national metrology institute. When using external calibration services, traceability of measurement shall be assured by the use of calibration services from laboratories that can demonstrate competence, measurement capability and traceability.
There are certain calibrations that currently cannot be strictly made in SI units. In these cases calibration shall provide confidence in measurements by establishing traceability to appropriate measurement standards such as the use of certified reference materials provided by a competent supplier to give a reliable physical or chemical characterization of a material and the use of specified methods and/or consensus standards that are clearly described and agreed by all parties concerned.
Participation in a suitable program of interlaboratory comparisons is required where possible.

The requirements above specified do not apply when it has been established that the associated contribution from the calibration contributes little to the total uncertainty of the test result. When this situation arises, the laboratory shall ensure that the equipment used can provide the uncertainty of measurement needed.

Where traceability of measurements to SI units is not possible and/or not relevant, the same requirements for traceability to, for example, certified reference materials, agreed methods and/or consensus standards, are required.

- The overall program of calibration and/or verification and validation of equipment shall be designed and operated so as to ensure that measurements made by the laboratory are traceable to national standards of measurement.
- Calibration certificates shall indicate the traceability to national standards of measurement and shall provide the measurement results and associated uncertainty of measurement and/or a statement of compliance with an identified metrological specification. The laboratory shall maintain records of all such certifications.
- Where traceability to national standards of measurement is not applicable, the laboratory shall provide satisfactory evidence of correlation of results, for example by participation in a suitable program of interlaboratory comparisons, proficiency testing, or independent analysis.

Calibration certificates obtained by the laboratory shall indicate the traceability to national standards of measurement and shall provide the measurement results and associated uncertainty of measurement and/or a statement of compliance with an identified metrological specification. The laboratory shall maintain records of all such certifications.

Where traceability to national standards of measurement is not applicable, the laboratory shall provide satisfactory evidence of correlation of results, for example by participation in a suitable program of interlaboratory comparisons, proficiency testing, or independent analysis, if any is available.

10.2 Reference Standards and Reference Materials

Reference standards of measurement (such as Class S or equivalent weights or traceable thermometers) are used for calibration only and for no other purpose, unless it can be shown that their performance as reference standards would not be invalidated. Reference standards are subjected to in-service checks between calibrations and verifications. Reference standards shall be calibrated before and after any adjustment.

Where traceability of measurements to SI units is not possible or not relevant, the same requirements for traceability to, for example, certified reference materials, agreed methods and/or consensus standards, are required. The laboratory shall provide satisfactory evidence of correlation of results, for example by participation in a suitable program of interlaboratory comparisons, proficiency testing, or independent analysis.

Reference materials that require re-certification are submitted promptly to a qualified certification body can provide traceability to national standards of measurement.

Reference materials shall, where commercially available, be traceable to SI units of measurement, or to certified reference materials. Where possible, traceability shall be to national or international standards of measurement, or to national or international standard reference materials. Internal reference materials shall be checked as far as is technically and economically practicable.

Checks needed to maintain confidence in the status of reference, primary, transfer or working standards and reference materials are carried out according to defined procedures and schedules recommended by the manufacturer or maintenance organization.

The procedures employed for safe handling, transport, storage and use of reference standards and reference materials in order to prevent contamination or deterioration and in order to protect their integrity, are the ones recommended by the manufacturer or other organization involved in the maintenance of such materials/standards.

10.3 General Requirements

Each calibration is dated and labeled with or traceable to the method, instrument, analysis date, and each analyte name, concentration and response (or response factor). Sufficient information is recorded to permit reconstruction of the calibration. Acceptance criteria for calibrations comply with method requirements or are established and documented.

10.4 Analytical Support Equipment

Analytical support equipment includes but it is not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, temperature measuring devices (including thermometers and thermistors), thermal/pressure sample preparation devices and volumetric dispensing devices (such as Eppendorf®, or automatic dilutor/dispensing devices) if quantitative results are dependent on their accuracy, as in standard preparation and dispensing or dilution into a specified volume. All such support equipment is:

- Maintained in proper working order. The records of all activities including service calls are kept.
- Calibrated or verified annually using NIST traceable references when available, over the entire range of use. The results of such calibration must be within the specifications required in the application for which the equipment is used, if not, the equipment is either removed from service until repaired or a correction factor is applied to it, if applicable.

Raw data records shall be retained to document equipment performance.

Prior to use on each working day, balances, ovens, refrigerators, freezers, incubators and water baths are verified for the expected use range using NIST traceable references (where possible). The acceptability for use or continued use is according to the needs of the analysis or application for which the equipment is being used.
Mechanical volumetric dispensing devices (except Class A glassware and microsyringes) are checked for accuracy quarterly.

For chemical tests the temperature, cycle time, and pressure of each run of autoclaves is documented by the use of appropriate chemical indicators or temperature recorders and pressure gauges.
For biological tests that employ autoclave sterilization see SOP MIS031.

10.4.1 Balances and reference weights

Laboratory balances and Class S reference weights are serviced and calibrated once a year by a third party specialist, Watson Bros. Weck Laboratories has a contract with Watson Bros., by which they automatically come for balance and weights inspection and calibration every year. The calibration or service is performed more frequently if a problem is suspected or observed by visual inspection.

10.4.2 Thermometers

All thermometers are checked annually against a NIST traceable reference thermometer, which is submitted for certification on annual basis.

10.4.3 Monitoring of Temperature

All refrigerators and freezers used for storage of samples and standards or reagents are monitored for temperature daily. The incubators used for bacteriological analysis are monitored twice a day for temperatures and the incubator for BOD is monitored daily. The temperatures are entered in charts posted on each unit that also include the initials of the person performing the checks and the acceptance ranges. When a temperature is out of compliance in any refrigerator, freezer or incubator, immediate action is taken to correct the problem.
Some support instruments such as ovens and water bath for fecal coliforms are not in use every day, so temperature is checked only for the days they are actually in operation.

10.5 Initial Instrument Calibration and Continuing Calibration Verification

All instruments are calibrated in accordance with the respective SOPs and/or method of analysis. The typical calibration procedure consists of an initial calibration, performed by running a series of standards and calculating the response by using either the response factors or by linear or polynomial regression analysis. This is followed by a calibration verification when an initial instrument calibration is not performed on the day of analysis. All calibration procedures are thoroughly documented. The frequency, acceptance criteria and the conditions that will require recalibration are described in the corresponding SOPs. In all cases, the initial calibration is verified using an independently prepared calibration verification solution. For all chemical determinations in which standards are involved for calibration, it is the policy of the company to use a secondary reference material obtained from a different source, such as another supplier (preferred) or a different lot number, or prepared in house. This secondary reference can be an LCS or other standard run to verify the integrity of the primary standard.

Specific analyses' calibrations are checked more frequently. Some instruments, such as TOX analyzers have built-in calibration features. The internal calibration of these instruments is monitored daily for accuracy.

Some calibration curves for spectrophotometric methods are very stable over a long period of time, however it is the policy of the Laboratory to perform a new initial calibration curve even if the continuing calibration check meets specified criterion, in any of the following events:

- At least every three years
- When the instrument is moved to a different location
- If any maintenance that can affect the calibration has been performed
- If the analysts judges it necessary for special projects or different range of calibration

Spectrophotometers are also subject to wavelength calibration which it shall be performed at least annually, according to the procedure described by the manufacturer in the instrument manual or other documentation.

All results are calculated based on the response curve from the initial calibration and generally not quantitated from any continuing instrument calibration verification unless otherwise required by regulation, method, or program. The results are bracketed by calibration standards being the lowest calibration standard the lowest concentration for which quantitative data are to be reported. Any data reported below the lower limit of quantitation is considered to have an increased quantitative uncertainty and consequently it is reported using defined qualifiers or flags or explained in the case narrative; and the highest calibration standard is the highest concentration for which quantitative data are to be reported. Any data reported above this highest standard is considered to have an increased quantitative uncertainty and it is reported as an estimated value using the defined data qualifiers or explained in the case narrative, unless the sample can be diluted and re-run within the limits of the initial calibration curve.

The following is the criteria used for the acceptance of an initial calibration, unless specified differently in the analytical methods:

- Use the average response factor (RF) if the percent relative standard deviation (%RSD) of the points is less than 20%. In this case, linearity through the origin is assumed.
- If the %RSD is greater than 20%, linearity through the origin cannot be assumed and a linear regression, a weighed linear regression or a non-linear regression can be used. The acceptance criteria for linear regression are a coefficient of correlation (r) equal or greater than 0.99 and for non-linear regression the coefficient of determination (COD) must be equal or greater than 0.98. In both cases, the curve is not to be forced through the origin nor the origin is used as another point. The sample results must be within the first and last standards.
- The number of data points to construct the initial calibration curve shall be obtained from the analytical method employed. If no criteria are specified, the laboratory shall construct initial calibration curves using a minimum of two data points without counting the blank and zero standard.
- The lowest standard shall be at or near the reporting limit for the method and at or below the regulatory limit/decision level if known by the laboratory.
- The lowest calibration standard must be above the detection limit. Noted exception: The following shall occur for instrument technology (such as ICP or ICP/MS) with validated techniques from manufacturers or methods employing standardization with a zero point and a single point calibration standard:
    - Prior to the analysis of samples the zero point and single point calibration must be analyzed and the linear range of the instrument must be established by analyzing a series of standards, one of which must be at the lowest quantitation level.
    - Zero point and single point calibration standard must be analyzed with each analytical batch.
    - A standard corresponding to the lowest quantitation level must be analyzed with each analytical batch and must meet established acceptance criteria.
    - The linearity is verified at a frequency established by the method and/or the manufacturer.
    - If a sample within an analytical batch produces results above its associated single point standard then one of the following should occur:
        - analyze reference material at or above the sample value that meets established acceptance criteria for validating the linearity;
        - dilute the sample such that the result falls below the single point calibration concentration;
        - Report the data with an appropriate data qualifier and/or explain in the case narrative.

If the initial calibration fails, the analysis procedure is stopped and evaluated. For example, a second standard may be analyzed and evaluated or a new initial calibration curve may be established and verified. In all cases, the initial calibration must be acceptable before analyzing samples. If samples can not be reanalyzed, data associated with an unacceptable initial instrument calibration must be reported with appropriate data qualifiers.

When an initial calibration is not performed on the day of the analysis, a calibration verification check standard is analyzed at the beginning and at the end of each batch. An exception to this policy is for internal standard methods (e.g. most organic methods). For these analyses, the calibration check is only analyzed at the beginning of the analytical sequence or analytical batch. The concentration of this

calibration check is specified in each method SOP and whenever possible is varied within the established calibration range.

Sufficient raw data records are retained electronically as printouts to permit reconstruction of the continuing instrument calibration verification, e.g., test method, instrument, analysis date, each analyte name, concentration and response, calibration curve or response factor, or unique equations or coefficients used to convert instrument responses into concentrations. Continuing calibration verification records explicitly connect the continuing verification data to the initial instrument calibration by listing in the quantification report the initial calibration file that was used for the calculation.

If a calibration check standard fails, and routine corrective action procedures fail to produce a second consecutive calibration check within acceptance criteria, a new initial calibration curve is constructed. If the continuing calibration acceptance criteria are exceeded high (i.e. high bias), and there are non-detects for the corresponding analyte in all environmental samples associated with the continuing calibration check, then those non-detects may be reported as qualified data, otherwise the samples affected by the unacceptable check are reanalyzed after a new calibration has been established, evaluated and accepted. If the continuing calibration acceptance criteria are below the low limit, results may be reported as qualified data if sample results indicate a concentration above an action level and accurate values are not required by the customer. Otherwise, additional sample analysis does not occur until a new calibration curve is established and verified.

When intermediate checks are needed to maintain confidence in the calibration status of the equipment, these checks shall be carried out according to each Standard Operating Procedure for the analytical method.

Where calibrations give rise to a set of correction factors, the laboratory shall have procedures to ensure that copies (e. g. in computer software) are correctly updated.

If the continuing instrument calibration verification results obtained are outside established acceptance criteria, corrective actions are performed. If routine corrective action procedures fail to produce a second consecutive (immediate) calibration verification within acceptance criteria, the following options are available:

- Demonstrate performance after corrective action with two consecutive successful calibration verifications
- Perform a new initial instrument calibration.

If acceptable performance has not been demonstrated, sample analyses shall not occur until a new initial calibration curve is established and verified. However, sample data associated with an unacceptable calibration verification may be reported as qualified data under the following special conditions:

- When the acceptance criteria for the continuing calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported.
- When the acceptance criteria for the continuing calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level or if the samples are not for regulatory compliance and accurate values are not required by the customer.

11 TEST METHODS AND STANDARD OPERATING PROCEDURES

The methods and procedures used at the laboratory are the appropriate ones for all environmental tests within its scope. These include sampling, handling, transport, storage and preparation of samples, and, where appropriate, an estimation of the measurement uncertainty as well as statistical techniques for analysis of environmental test and/or calibration data.

The methods used at the laboratory, including methods for sampling, must meet the needs of the client and are appropriate for the environmental tests it undertakes. These analytical procedures currently in use are based on the methodology approved by the EPA, the California Department of Health Services, the AIHA, and other regulatory agencies.

In some cases, Weck Laboratories can perform analyses that are not specifically described in the guidelines cited above. In these cases, the following approach is taken:

- Review other sources of test methods such as AOAC, ASTM, Pesticide Manual, etc., to find a suitable method for the matrix and analyte in question.
- Produce a modification of a standard test procedure for similar parameter or matrix
- Develop a special method in house suitable for the particular problem

For these special situations the analytical procedure is discussed with the client and performed upon the client's approval. Whenever possible, the same QA/QC guidelines as for standard methods are used, but the laboratory may deviate from these guidelines if necessary.

The Laboratory in some instances must deviate from prescribed environmental test methods; if this occurs the deviation is documented, technically justified, authorized, and accepted by the client.

The Laboratory maintains Standard Operating Procedures (SOPs) that accurately reflect all phases of current laboratory activities such as assessing data integrity, corrective actions, handling customer complaints, and all test methods.
The SOPs provide all information needed to perform the different analytical tasks in accordance with regulatory requirements and in a consistent and controlled manner following the guidelines described in this QAP manual. They are subject to continuous review and update. Copies of all SOPs are accessible to all personnel. Each SOP has an alphanumeric code that indicates the section it belongs, the number that identifies it, the revision number, the effective date and the signature of the QA Officer, Technical Director or Laboratory Director.

If other documents besides laboratory generated SOPs (i.e. equipment manuals, copies of published methods, etc.) are used as Standard Operating Procedures, they must be written in a way that they can be used as written and any changes, including the use of a selected option must be documented and included in the laboratory's SOP manual.

A current list of the Standard Operating Procedures in use is in Appendix 7.

11.1 Test Methods

11.1.1 Source of Methods

The sources of Methods used at the laboratory are the following:

- Methods published in international, regional or national standards are preferably used, ensuring that the latest valid edition of a standard is used unless it is not appropriate or possible to do so. When necessary, the standard shall be supplemented with additional details to ensure consistent application.

- When the use of specific methods for a sample analysis are mandated or requested, only those methods shall be used.
- When the client does not specify the method to be used or where methods are employed that are not required, as in the Performance Based Measurement System approach, the methods shall be fully documented and validated, and be available to the client and other recipients of the relevant reports. The laboratory shall select appropriate methods that have been published either in international, regional or national standards, or by reputable technical organizations, or in relevant scientific texts or journals, or as specified by the manufacturer of the equipment. In some cases Laboratory-developed methods or methods adopted by the laboratory might be used if they are appropriate for the intended use and if they are validated. The client shall be informed as to the method chosen.
- The client is informed when the method proposed by the client is considered to be inappropriate or out of date.

The Laboratory in some instances will develop methods for its own use; in this case this is considered a planned activity and will be assigned to qualified personnel equipped with adequate resources. Plans shall be updated as development proceeds and effective communication amongst all personnel involved shall be ensured.

When it is necessary to use methods not covered by standard methods, these shall be subject to agreement with the client and shall include a clear specification of the client's requirements and the purpose of the environmental test and/or calibration. The method developed shall have been validated appropriately before use.

Most methods in use at the laboratory are described in the following publications:

- Tests Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, current edition,
- Methods for Chemical Analysis of Water and Wastewater, EPA-600/4-79-020.
- Standard Methods for the Examination of Water and Wastewater, current approved edition, APHA, AWWA, WPCF.
- Criteria for Identification of Hazardous and Extremely Hazardous Wastes, California Code of Regulations Title 22.
- Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater EPA-600/4-82-057.
- Recommended Methods of Analysis for the Organic components required for AB1803, 5th Edition Revised April 1986.
- Draft Method for Total Petroleum Hydrocarbons and Total Organic Lead, LUFT Methods, California Department of Health Services.
- Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water - EPA 500 series.
- NIOSH Manual of Analytical Methods, US Department of Health and Human Services.
- Laboratory Methods of Analysis for Enforcement samples, SCAQMD, 1986.
- Stationary Source Test Methods, Air Resources Board, 1990.
- OSHA Analytical Methods Manual, 2nd Ed., U.S. Dept. of Labor, 1990.

Reference methods for all analytical procedures are kept in the Laboratory Office. Copies of specific methods are also in the corresponding sectors where the analyses are performed.

11.1.2 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.

The laboratory shall validate non-standard methods, laboratory-designed/developed methods, standard methods used outside their intended scope, and amplifications and modifications of standard methods to confirm that the methods are fit for the intended use. The validation shall be as extensive as is necessary to meet the needs of the given application or field of application. The laboratory shall record the results obtained, the procedure used for the validation, and a statement as to whether the method is fit for the intended use.
The range and accuracy of the values obtainable from validated methods (e. g. the uncertainty of the results, detection limit, selectivity of the method, linearity, limit of repeatability and/or reproducibility, robustness against external influences and/or cross-sensitivity against interference from the matrix of the sample/test object), as assessed for the intended use, shall be relevant to the clients' needs.

The minimum requirements for method validation are the ones specified in Appendix C.3 of NELAC chapter 5.

11.2 SOPs for Sample Management

These SOPs describe the receipt, handling, scheduling, and storage of samples

Sample receipt and handling – These procedures describe the precautions to be used in opening sample shipment containers and how to verify that chain of custody has been maintained, examine samples for damage, check for proper preservatives and temperatures, and log samples into the laboratory sample streams.

Sample scheduling – These procedures describe the sample scheduling in the laboratory and includes procedures used to ensure that holding time requirements are met.

Sample storage – These procedures describe the storage conditions for all samples, verification and documentation of daily storage condition, and how to ensure that custody of the samples is maintained while in the laboratory.

11.3 SOPs for Reagent/Standard Preparation

These SOPs describe how to prepare standards and reagents. Information concerning specific grades of materials used in reagent and standard preparation, appropriate glassware and containers for preparation and storage, and labeling and record keeping for stocks and dilutions is included.

11.4 SOPs for General Laboratory Techniques

These SOPs describe all essentials of laboratory operations that are not addressed elsewhere. These techniques include glassware cleaning procedures, operation of analytical balances, pipetting techniques, and use of volumetric glassware, among others.

Procedures for test methods describing how the analyses are actually performed in the laboratory are specified in method SOPs. These SOPs for sample preparation, cleanup and analysis are based on publications listed in Section 11.1 above or on internally developed methods validated according to EPA’s Performance-Based Measurement System.

The elements included or referenced in the SOPs, when applicable are the following:

11.4.1 Identification of the test method
11.4.2 Applicable matrix or matrices
11.4.3 Method detection limit
11.4.4 Scope and application, including components to be analyzed
11.4.5 Summary of the method
11.4.6 Definitions
11.4.7 Interferences
11.4.8 Safety
11.4.9 Equipment and supplies
11.4.10 Reagents and standards
11.4.11 Sample collection, preservation and handling
11.4.12 Quality control
11.4.13 Calibration and Standardization
11.4.14 Procedure
11.4.15 Calculations
11.4.16 Method Performance
11.4.17 Pollution prevention
11.4.18 Data assessment and acceptance criteria for quality control measures
11.4.19 Corrective actions for out-of-control data
11.4.20 Contingencies for handling out-of-control or unacceptable data
11.4.21 Waste management
11.4.22 References
11.4.23 Tables, Diagrams, flowcharts and data verification checklists.

11.5 SOPs for Equipment Calibration and Maintenance

These SOPs describe how to ensure that laboratory equipment and instrumentation are in working order. These procedures include calibration procedures and schedules, maintenance procedures and schedules, maintenance logs, services agreements for all equipment, and spare parts available in-house. Calibration and maintenance of laboratory equipment and instrumentation are in accordance with manufacturers' specifications or applicable test specifications.

12 QUALITY CONTROL DETERMINATIONS

12.1 General

The quality control procedures are used for monitoring the validity of environmental tests undertaken. The resulting data is recorded in a computerized database contained within the LIMS system which permits the monitoring of trends and the application of statistical techniques for the reviewing of the results. This monitoring includes among other parameters the use of certified reference materials and/or internal quality control using secondary reference material, participation in interlaboratory comparisons and proficiency-testing programs, replicate tests using the same or different methods, retesting of retained samples and correlation of results for different characteristics of a sample (for example, total phosphate should be greater than or equal to orthophosphate).

12.2 Essential QC determinations

The data acquired from QC determinations are used to estimate the quality of analytical data, to determine the need for corrective action in response to deficiencies, and to interpret results after corrective action

procedures are implemented. Each method SOP includes a QC section, which addresses the minimum QC requirements for the procedure. The internal QC checks may differ slightly for each individual procedure but in general are described below. The acceptance limits and corrective actions for these QC checks are described in Section 15 and 16 of this manual.

The quality control protocols specified in each analytical method and method SOP are followed, as well as the essential standards outlined in Appendix D of NELAC Chapter 5 or mandated methods or regulations (whichever are more stringent). When it is not apparent which is more stringent the QC in the mandated method or regulations is to be followed.

All quality control measures are assessed and evaluated on an on-going basis, and quality control acceptance criteria is used to determine the usability of the data. The procedures for the development of acceptance/rejection criteria where no method or regulatory criteria exist have been established (See Section 9.3, Sample Acceptance Policy)

12.2.1 Blanks – Negative Controls

Method Blanks or LRBs are performed at a frequency of one per preparation batch of samples per matrix type. The result of this analysis is one of the QC measures to be used to assess batch acceptance.

The method blank is used to assess the preparation batch for possible contamination during the preparation and processing steps. The method blank is processed along with and under the same conditions as the associated samples to include all steps of the analytical procedure.

The method blank is analyzed at a minimum of 1 per preparation batch or one every 20 environmental samples, whichever is more frequent. The method blank shall consist of a matrix that is similar to the associated samples and is known to be free of the analytes of interest.

Blanks and negative controls are used in microbiological analysis on regular basis. They consist of blanks, sterility checks and known negative cultures. The detailed description is contained in the corresponding SOP.

Blanks are prepared and analyzed in the following situations, or whenever there is a need to obtain further information:

- A blank is extracted for every batch and type of matrix for analysis of semi-volatile organics by GC, GC/MS or HPLC.
- A blank is carried through all the digestion procedures for analysis of metals by AA, ICP or ICP-MS for every batch of samples and type of matrix for each instrument used.
- A blank is carried through the leaching procedures (TCLP, EP TOX, and WET) using the same extraction fluid, bottles and agitators as the samples.
- System/Reagent blanks are analyzed at the beginning of the day prior to calibration, after a high level standard, after changing matrix and after samples that are known or suspected to be very concentrated.
- Reagent blanks are analyzed for all wet chemistry determinations involving titrations or colorimetry and their value are subtracted from the reading of the samples, if appropriate.
- Blanks for mobility procedures (TCLP, ZHE, EP TOX, and WET) are analyzed by the appropriate method.
- Additional field and trip blanks are prepared and analyzed where required or whenever requested by the client

Sometimes the blanks may show detectable amounts of target analytes. In these cases the source of the contamination must be investigated and measures taken to correct, minimize or eliminate the problem if:

- The blank contamination is at or above the reporting limit and exceeds a concentration greater than 1/10 of the measured concentration of any sample in the associated sample batch or
- The blank contamination exceeds the concentration present in the samples and is greater than 1/10 of the specified regulatory limit.
- The blank contamination otherwise affects the sample results as per the test method requirements or the individual project data quality objectives.

Any sample associated with the contaminated blank shall be reprocessed for analysis or the results reported with appropriate data qualifying codes.

12.2.2 Reproducibility and Recovery Determinations – Positive Controls

For the determination of accuracy and precision of the analytical methods, the techniques of fortified blanks, matrix spike/ matrix spike duplicate, sample duplicates and surrogate spiking are used on a regular basis. The frequency is dictated by each analytical method or Standard Operating Procedure (minimum 1 per batch of 20 samples). The results obtained are compared with current acceptance limits (Appendix 8) and recorded in the LIMS. For methods that do not specify the acceptance criterion, this is statistically obtained from data generated at the lab.
For microbiological determination of total and fecal coliforms positive checks are included with each batch analyzed. A more detailed description is included in the corresponding SOP.

12.2.2.1Duplicates

Matrix duplicates are defined as replicate aliquots of the same sample taken through the entire analytical procedure. The results from this analysis indicate the precision of the results for the specific sample using the selected method. The matrix duplicate provides a usable measure of precision only when target analytes are found in the sample chosen for duplication and it is performed on replicate aliquots of actual samples, usually of unknown composition.
The frequency of the analysis of matrix duplicates may be determined as part of a systematic planning process (e.g. Data Quality Objectives) or as specified by the mandated test method. Duplicate analysis is also performed when unusual or suspicious results are obtained or when a higher degree of confidence in the analytical result is desired.
The routine analysis of field duplicates is often impractical (many analytes are frequently not detected) or not possible (not enough sample provided), so the evaluation of precision for most methods is accomplished by comparing the results obtained for matrix spike and matrix spike duplicate determinations (Section 12.1.2.3), rather than analysis of field duplicate samples. This is preferred since in many cases samples with frequent “not detected” results yield no useful information for statistical determinations of precision.

The results from matrix duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD) or another statistical treatment (e.g., absolute differences). The calculation of the RPD is detailed in Section 12.1.2.5.
Results are compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, internal criteria developed at the laboratory is used, which consists on using a minimum of 20 data points and calculating the maximum acceptable RPD based on 3 standard deviations

of the historical values. For matrix duplicates results outside of established criteria corrective action shall be documented or the data reported with appropriate data qualifying codes.

12.2.2.2Laboratory Control Sample (LCS)

Laboratory Control Samples are also known as LFBs or Blank Spikes and are defined as a quality system matrix, free from the analytes of interest, spiked with verified known amounts of analytes from a source independent of the calibration standards or a material containing known and verified amounts of analytes. The LCS is used to evaluate the performance of the total analytical system, including all preparation and analysis steps. Results of the LCS are compared to established criteria and, if found to be outside of these criteria, indicates that the analytical system is "out of control". Any affected samples associated with an out of control LCS shall be reprocessed for re-analysis or the results reported with appropriate data qualifying codes.
At least one LCS is analyzed per preparation batch. Exceptions would be for those analytes for which no spiking solutions are available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. In those instances for which no separate preparation method is used (example: volatiles in water) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.
The LCS is a quality system matrix, known to be free of analytes of interest, spiked with known and verified concentrations of analytes. The matrix spike (Sect. 12.1.2.3) may be used in place of this control as long as the acceptance criteria are as stringent as for the LCS. Alternatively the LCS may consist of a media containing known and verified concentrations of analytes or as Certified Reference Material (CRM). All analyte concentrations shall be within the calibration range of the methods.
The components to be spiked shall be as specified by the mandated test method or other regulatory requirement or as requested by the client. In the absence of specified spiking components the laboratory shall spike per the following:

- For those components that interfere with an accurate assessment such as spiking simultaneously with technical chlordane, toxaphene and PCBs, the spike should be chosen that represents the chemistries and elution patterns of the components to be reported.
- For those test methods that have extremely long lists of analytes, a representative number may be chosen. The analytes selected should be representative of all analytes reported. The following criteria shall be used for determining the minimum number of analytes to be spiked. However, the laboratory shall insure that all targeted components are included in the spike mixture over a 2-year period.
    a) For methods that include 1-10 targets, spike all components.
    b) For methods that include 11-20 targets, spike at least 10 compounds or 80% of the total, whichever is greater.
    c) For methods with more than 20 targets, spike at least 16 components.

The results of the individual batch LCS are calculated in percent recovery as specified in Sect.12.1.2.5. The individual LCS is compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, internal criteria are generated based on recoveries of past LCSs. To determine these criteria, at least 20 data points are used and the upper and lower acceptance limits are calculated as the "Mean + 3 SD" and "Mean – 3 SD" respectively, where SD is the standard deviation.
A LCS that is determined to be within the criteria effectively establishes that the analytical system is in control and validates system performance for the samples in the associated batch. Samples analyzed along with a LCS determined to be "out of control" should be considered suspect and the samples reprocessed and re-analyzed or the data reported with appropriate data qualifying codes.
If a large number of analytes are in the LCS, it becomes statistically likely that a few will be outside control limits. This may not indicate that the system is out of control, therefore corrective action may not be necessary. Upper and lower marginal exceedance (ME) limits can be established to determine when

corrective action is necessary. A ME is defined as being beyond the LCS control limit (3 standard deviations), but within the ME limits. ME limits are between 3 and 4 standard deviations around the mean. The number of allowable marginal exceedances is based on the number of analytes in the LCS. If more analytes exceed the LCS control limits than is allowed, or if any one analyte exceeds the ME limits, the LCS fails and corrective action is necessary. This marginal exceedance approach is relevant for methods with long lists of analytes. It will not apply to target analyte lists with fewer than 11 analytes.

The number of allowable marginal exceedances is as follows:

1) >90 analytes in LCS, 5 analytes allowed in ME of the LCS control limit;
2) 71-90 analytes in LCS, 4 analytes allowed in ME of the LCS control limit;
3) 51-70 analytes in LCS, 3 analytes allowed in ME of the LCS control limit;
4) 31-50 analytes in LCS, 2 analytes allowed in ME of the LCS control limit;
5) 11-30 analytes in LCS, 1 analytes allowed in ME of the LCS control limit;
6) <11 analytes in LCS, no analytes allowed in ME of the LCS control limit;

Marginal exceedances must be random. If the same analyte exceeds the LCS control limit repeatedly, it is an indication of a systemic problem. The source of the error must be located and corrective action taken.

The procedure to monitor the application of marginal exceedance allowance to the LCS to ensure random behavior consist of establishing a data base with all exceedances and compare the analytes affected on quarterly basis to verify is not the same analyte having the problem.

12.2.2.3Matrix Spikes and Matrix Spike Duplicates

The procedure to determine the effect of the sample matrix on method performance is by analyzing with each preparation batch matrix spikes, matrix spikes duplicates sample duplicates and surrogates, which are designed as data quality indicators for a specific sample using the designated test method. These controls alone are not used to judge laboratory performance.

Matrix specific QC samples indicate the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. The information from these controls is sample/matrix specific and would not normally be used to determine the validity of the entire batch.
The frequency of the analysis of matrix specific samples is determined as part of a systematic planning process (e.g. Data Quality Objectives) or as specified by the required mandated test method or SOP and it is at a minimum, one per batch of 20 samples or less, per matrix type.
The components to be spiked are the ones specified by the mandated test method or laboratory SOP. Matrix spikes are not performed for analytes for which spiking solutions are not available such as, solids determinations (total suspended, total dissolved, total volatile), pH, color, odor, temperature, dissolved oxygen, BOD, COD or turbidity.
The selected sample(s) for spiking are to be rotated among client samples, as much as possible, so that various matrix problems may be noted and/or addressed. The spiked samples are then analyzed as the other samples in the batch and the recoveries calculated and compared with acceptance limits. Results are recorded in the LIMS, where the analysts or QA Officer can track and manage the results for QC samples. For industrial hygiene samples, unused sample collection media is used for spiking. Samples that are labeled equipment blanks, field blanks or trip blanks must not be used for matrix spiking. All efforts shall be made to obtain additional sample aliquots for matrix spiking; when bottles are prepared in house, additional containers are provided for matrix spikes. If the sample containers are prepared by the client or provided by a third party, good communication should be established with all parties involved in order to obtain enough sample aliquots to perform matrix spiking for all test methods required. If, in spite of all efforts made, there are no extra samples received for matrix spiking, a pair of LCS/ LCS duplicate is analyzed for assessing accuracy and precision.

Any permit specified analytes, as specified by regulation or client requested analytes shall also be included. If there are no specified components, the laboratory shall spike per the following:

- For those components that interfere with an accurate assessment such as spiking simultaneously with technical chlordane, toxaphene and PCBs, the spike should be chosen that represents the chemistries and elution patterns of the components to be reported.
- For those test methods that have extremely long lists of analytes, a representative number may be chosen using the following criteria for choosing the number of analytes to be spiked, but alternating them in order to ensure that all targeted components are included in the spike mixture over a 2 year period.
- For methods that include 1-10 targets, spike all components;
- For methods that include 11-20 targets, spike at least 10 components or 80% of the total, whichever is greater;
- For methods with more than 20 targets, spike at least 16 components.

The results from matrix spike/matrix spike duplicate are primarily designed to assess the precision and accuracy of analytical results in a given matrix and are expressed as percent recovery (%R) and relative percent difference (RPD). The calculations are performed as specified in Sect.12.1.2.5.
Results are compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory established internal criteria determined as described in Sect. 12.1.2.2 for LCSs. Poor performance in a matrix spike generally indicates a problem with the sample composition, and not the laboratory analysis and is reported to the client whose sample was used for the spike with the appropriate data qualifiers or in the case narrative to assist in data assessment.

12.2.2.4Surrogates

For GC and GC/MS analysis, surrogate standards are added to all samples, blanks and QC samples, prior to sample preparation/extraction, for all organic chromatography test methods except when the matrix precludes its use or when a surrogate is not available. Surrogates are compounds that are very similar in their chemical and chromatographic characteristics as the target compounds but are not present in environmental samples, or at least they are not part of the target compounds list.
Results from recoveries of surrogate standards are compared with acceptance values, mandated by the method if available or lab generated and recorded in the LIMS. Acceptance limits generated at the laboratory are established based on a minimum of 20 valid data points by calculating the mean and standard deviation, the upper limit is set at “mean + 3SD” and the lower limit at “Mean – 3SD”. Surrogates outside the acceptance criteria are evaluated for the effect indicated for the individual sample results. A corrective action is initiated which is guided by the data quality objectives or other site specific requirements. Results reported from analyses with surrogate recoveries outside the acceptance criteria include appropriate data qualifiers.

12.2.2.5Equations used for calculations

The following equations are used in the calculation of recovery and RPD:

From duplicate sample:

$$RPD = \frac{S_a - S_b}{((S_a + S_b) \div 2)} x100\%$$

Where: S_a = First sub-sample analyzed
S_b = Second sub-sample analyzed

From MS/MSD analysis:

$$RPD = \frac{R_a - R_b}{((R_a + R_b) \div 2)} x100\%$$

Where: R_a = Amount of analyte found in Matrix Spike.
R_b = Amount of analyte found in Matrix Spike Duplicate

Recovery of matrix spikes:

$$\text{Recovery} = \frac{SSR - SR}{CA} x100\%$$

Where: SSR= Results of spiked sample
SR = Results of sample (unspiked)
CA = Concentration of spike added

Surrogate recoveries:

$$\%\ \text{Recovery} = \frac{ConcentrationFound}{ConcentrationAdded} x100\%$$

Where: Concentration found = Result obtained after analysis
Concentration added = Amount of surrogate spiked

12.2.2.6Quality Control Charts

Quality Control charts can be generated at any time from data stored in the LIMS for recoveries of matrix spikes, LCSs, surrogates and RPD and they are a valuable tool to monitor in real time the performance of the analytical method, providing a graph with the mean and upper and lower warning and acceptance limits (2 and 3 standard deviation respectively).

12.2.3 External References and Control Samples

External Reference Samples or QCS are obtained from various sources are analyzed on a regular basis, minimum quarterly. Reference samples simulating matrix and analytes of interest are purchased from Environmental Resource Associates, Inc. or other NIST approved vendors, and analyzed for drinking water, wastewater, hazardous waste and priority pollutants.
Interlaboratory comparisons are run whenever possible, as well as intralaboratory comparisons by analyzing an analyte by different analytical methods.

12.3 Method Detection Limit and Reporting Limits

In general the laboratory utilizes a test method that provides a Limit of Detection (LOD) that is appropriate and relevant for the intended use of the data. LODs are determined by the protocol in the mandated test method or applicable regulation, e.g., Method Detection Limit (MDL) and all sample-

processing steps of the analytical method are included. If the protocol for determining detection limits is not specified, the selection of the procedure must reflect instrument limitations and the intended application of the test method.

The MDL is defined as the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.

For analytes for which spiking is a viable option, detection limits are determined by a Method Detection Limit (MDL) study for each common matrix (water and soil/solid) by the procedure described in 40CFR Part 136, Appendix B. This procedure consists of spiking seven or more aliquots of the matrix with each compound of interest, at a concentration between 3 and 5 times the estimated MDL. These spiked samples are subject to the entire analytical process and analyzed. The MDL is calculated as follows:

$$MDL = S \times t$$

Where

S	=	Standard deviation of the seven replicates.
t	=	Student's "t" value for 99% confidence for the corresponding number of degrees of freedom. For 7 replicates this number is 3.14.

The method detection limit is initially determined for the compounds of interest in each method and in each matrix (aqueous or soil/solid). Laboratory pure reagent water and Ottawa sand are used as matrices for aqueous and soil/solid matrix respectively.

The detection limit is initially determined for the compounds of interest in each test method in a matrix in which there are neither target analytes nor interferences at a concentration that would impact the results. Detection limits are repeated each time there is a change in the test method that affects how the test is performed, or when a change in instrumentation occurs that affects the sensitivity of the analysis.

The MDL studies are documented in spreadsheets created for that purpose. The documentation includes the matrix type, date of analysis, analyst name or initials, instrument used, values obtained and calculations. The raw data and supporting documents are retained, either attached to the spreadsheet used for calculation or filed by date with the general raw data.

The validity of the LOD shall be confirmed by qualitative identification of the analyte(s) in a QC sample in each quality system matrix containing the analyte at no more than 2-3X the LOD for single analyte tests and 1-4X the LOD for multiple analyte tests. This verification must be performed on every instrument that is to be used for analysis of samples and reporting of data.

A LOD study is not required for any component for which spiking solutions or quality control samples are not available such as temperature, or, when test results are not to be reported to the LOD (versus the limit of quantitation or working range of instrument calibration), according to Appendices D.1.2, D.4.5, D.5.4, and D.6.6 of NELAC chapter 5, 2003. Where an LOD study is not performed, the laboratory may not report a value below the Limit of Quantitation.

The Limit of Quantitation (LOQ) is normally set at 10 times the standard deviation. This is equivalent to multiply the MDL (obtained for 7 replicates) by 3.18 and rounding to the nearest 1, 2 or 5. In other cases, for certain methods the reporting limit is obtained by multiplying the MDL by another factor (between 2 and 10). The reporting limit for each analyte in each method is referenced in the corresponding SOP.

The LOQ is often referenced as Reporting Level or Practical Quantitation Limit (PQL). Certain projects require reporting all detected analytes, even below the reporting limit; in this case, when an analyte is detected but it is below the PQL, it is reported with a "J" flag indicating that the concentration is only estimated.

Unless the analytical method specifies otherwise, the LOQ is confirmed for each analyte of concern by analyzing a standard at the LOQ level or near and obtaining a recovery between 50 and 150% of the true value. This confirmation is not performed for any component or property for which spiking solutions or quality control samples are not commercially available or otherwise inappropriate (e.g., pH).
In certain cases the recovery of each analyte must be within the established test method acceptance criteria or client data quality objectives for accuracy.

In some cases project-specific reporting limits are used, when the DQOs mandate a different reporting limit than the RLs used routinely by Weck Laboratories.

For potable water analysis, the Detection Limit for Reporting purposes (DLRs) is used instead of the actual MDLs or RLs. For this matrix the calculated MDL must not be greater than the DLR. DLRs are verified on regular basis by including the lowest calibration point at or below the DLR.

12.4 Selectivity

Absolute retention time and relative retention time aid in the identification of components in chromatographic analyses and to evaluate the effectiveness of a column to separate constituents. Acceptance criteria for retention time windows are documented in the corresponding method SOP or in the SOP ORG074.
A confirmation shall be performed to verify the compound identification when positive results are detected on a sample from a location that has not been previously tested by the laboratory. Such confirmations shall be performed on organic tests such as pesticides, herbicides, or acid extractable or when recommended by the analytical test method except when the analysis involves the use of a mass spectrometer. Confirmation is required unless stipulated in writing by the client. The confirmation is documented in the bench sheets and/or the LIMS.
Other procedures for evaluating selectivity are described in the analytical methods, which may include mass spectral tuning, ICP inter-element interference checks, sample blanks, spectrochemical absorption or fluorescence profiles, co-precipitation evaluations, and electrode response factors.
Acceptance criteria for mass spectral tuning are contained in the corresponding SOPs.

12.5 Demonstration of Method Capability

Prior to acceptance and use of any method, satisfactory initial demonstration of method performance is required. The initial demonstration of method performance is performed each time there is a significant change in instrument type, personnel or test method. The process is described in Appendix 9. A Certification Statement is completed for each analyst documenting that this activity has been performed (Appendix 9). The associated records supporting the activity are also retained at the laboratory and they are available to reproduce the analytical results summarized in the Certification Statement.
The demonstration of method capability consists of performing the analysis on a clean quality system matrix, which has been spiked with the compounds of interest or purchased from a certified vendor.
For analysis that require the use of a specialized "work cell" (a group consisting of analysts with specifically defined tasks that together perform the test method), the group as a unit performs the IDC. The supporting documentation is also kept at the laboratory.
When a work cell is employed, and the members of the cell change, the new employee works with experienced analysts in the specialty area and this new work cell demonstrates acceptable performance

through acceptable continuing performance checks, such as laboratory control samples. This continued performance check is documented and the four preparation batches following the change in personnel is monitored to ensure that none of the batches result in the failure of any batch acceptance criteria (method blank and laboratory control sample). If there is a failure, the demonstration of capability is repeated. When the entire work cell is changed or replaced, the new work cell repeats the demonstration of capability (Appendix 9).
When a work cell(s) is employed the performance of the group (work cell) is linked to the training records of the individual members of the work cell.

For test methods that have been in use by the laboratory before July 1999, and there have been no significant changes in instrument type, personnel or test method, the continuing demonstration of method performance and the analyst's documentation of continued proficiency is considered acceptable. Records are kept on file to demonstrate that a demonstration of capability is not required.

12.6 Performance and Proficiency Testing Programs

The following are the proficiency testing programs in which the laboratory currently participates on regular basis:

- Drinking water analysis: WS Studies
- Wastewater analysis: WP studies
- Hazardous waste and soil
- Bacteriological Performance Evaluation Study.

The Proficiency Testing samples are purchased from NIST approved vendors.

The PT samples are analyzed and the results returned electronically to the PT Provider by the closing date of the study, which is no later than 45 calendar days from study opening. All PT samples are handled (i.e., managed, analyzed, and reported) by the laboratory management and individual analysts in the same manner as real environmental samples utilizing the same staff, methods as used for routine analysis of that analyte, procedures, equipment, facilities, and frequency of analysis. When analyzing a PT sample, the same calibration, laboratory quality control and acceptance criteria, sequence of analytical steps, number of replicates and other procedures are employed as used when analyzing routine samples.

In addition to the required PT studies, the laboratory participates in other special PT programs managed by government agencies or private entities.

12.7 Additional Quality Control Checks

The laboratory shall assure that the test instruments consistently operate within the specifications required of the application for which the equipment is used.

Glassware shall be cleaned to meet the sensitivity of the test method. The cleaning and storage procedures that are not specified by the test method are documented in the method SOPs or in SOP MIS028 for cleaning protocols.

Whenever possible, additional QC checks are performed such as running a sample using different techniques and different standards (EPA Method 602 & EPA Method 624), correlations between COD, BOD and TOC; TDS & Specific Conductivity, balance between cations and anions on water analysis, etc.

12.8 Estimation of Uncertainty of Measurement

A procedure to estimate the uncertainty of measurement for all analytical methods used at the laboratory has been established.
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 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.
The need of estimating uncertainty will be considered satisfied where a well-recognized test method specifies limits to the values of the major sources of uncertainty of measurement and specifies the form of presentation of calculated results and the test method and reporting instructions are followed appropriately.
When estimating the uncertainty of measurement, all uncertainty components which are of importance in the given situation shall be taken into account using appropriate methods of analysis.

13 DATA REDUCTION, VERIFICATION AND REPORTING

13.1 Laboratory worksheets - Raw data documentation

Upon acceptable receipt of samples by the laboratory, sample worksheets are generated for the required testing. These worksheets are distributed to the respective laboratory departments.

The data that is being obtained, such as weights, extraction volumes, calculations, etc. are recorded in the worksheets or in the LIMS. “Bench sheets” are generated either from the data entered in the LIMS or manually for all raw data being produced.

After raw data is entered in the corresponding worksheets and run logs, it is initialed by the analyst and saved chronologically for future review. All electronic raw data is stored in magnetic tapes or CDs.

13.2 Data Reduction and Review

Some instruments have a computerized data reduction and calculation, such as GC/MS, HPLC, GC and ICP. The protocols to perform these tasks are described in the corresponding SOPs and the computer programs used for data reduction are validated before use and checked periodically by manual calculations. The results obtained from computer data reduction are double checked by the analyst and transferred directly to the LIMS, whenever possible, or manually entered. Most methods have a Data Review Checklist that is completed by the analyst and addresses all the required QC determinations.
A supervisor or second analyst performs a secondary review of the raw data (e.g. chromatograms and reports summary) for proper integration of peaks, identification of compounds, QC, etc. If a discrepancy is noted, the package is returned to the primary analyst for corrective action. For analyses that do not have automatic data reduction, the analyst performs the necessary calculations to obtain the final result, and then the results are reviewed by the supervisor or second analyst.

All information used in the calculations (e.g. raw data, calibration files, tuning records, results of standard additions, interference check results, sample response, and blank or background correction protocols) as well as sample preparation information (e.g. weight or volume of sample used, percent dry weight for solids, extract volume, dilution factor used) are recorded in order to enable reconstruction of the final result.

As described in Section 16, the results of the quality control sample analysis are reviewed, and evaluated before data are reported.

After the results are entered into the LIMS they are verified for completeness and correctness and if no discrepancies are encountered they are released for reporting.

13.3 Report Format and Contents

After the data is entered in the LIMS and approved, a report or "Certificate of Analysis" is generated from the information contained in the LIMS database. The certificate of analysis, containing the results of each test, or series of tests, is then submitted with all supporting documentation to the Project Manager for signature. Other authorized signatory personnel include the Lab Technical Director, QA Officer or Lab Manager. The signature could be either in the form of "wet signature" or "electronic signature" which is stored in the LIMS database.

The analytical report, of which the Chain of Custody Document is part, contains the following information, at a minimum:

- Header with complete laboratory information.
- Unique identification of each page and an indication of the total number of pages included in the report
- Client's information (Company name, address, contact person, etc.)
- Project name or number
- Lab ID number assigned to the sample (unique identification number).
- Description and unambiguous identification of the sample(s) including the client identification code.
- Sample login information (date, time and initials of person that received the sample)
- Sampling information (date, time, name of sampler)
- If the laboratory collected the sample, reference to sampling procedure.
- Analysis performed.
- Results obtained with reporting units
- Date of preparation and analysis
- Time of preparation and/or analysis for tests with holding times of equal or less than 72 hours when required to demonstrate that the test was performed within holding times (the time of preparation/analysis can be entered in the case narrative section of the report).
- Name of method used for preparation and analysis
- Minimum Reporting Level or PQL
- Identification of results for any sample that did not meet sample acceptance requirements.
- Signature of authorized person (Lab Manager, Lab Director, etc.)
- Any additional information that is important to be reported.
- Any deviations from, additions to, or exclusion from SOPs; any conditions that may have affected the quality of results and any failures (such as failed quality control), including the use and definitions of data qualifiers (appendix 12).

- Measurements, examinations and derived results, supported by tables, graphs, sketches and photographs as appropriate, and any failures identified; identification of whether data are calculated on dry weight basis; identification of the reporting units such as ug/l or mg/kg
- Clear identification of all test data provided by outside sources, such as subcontracted laboratories, clients, etc.
- Clear identification of numerical results with values below the RL (J qualifier).

Exceptions to this standard approach for reporting are allowed with the approval of the Technical Director and are documented.

Any result not obtained in accordance with the approved method and the lab QA Plan by use of proper lab technique, must be documented as such in the case narrative section of the Certificate of Analysis.

Material amendments to a test report after issue are made only in the form of a further document, or data transfer including the statement "Supplement to Certificate of Analysis, identification number".

Clients are notified promptly, in writing, of any event such as the identification of defective measuring or test equipment that cast doubt on the validity of results given in any test report or amendment to a report.

Test results are certified to meet all requirements of the NELAC standards, or reasons are provided if they do not.
After signed, the Certificates of Analysis are sent to the client by US mail. In some cases the report is submitted by facsimile, electronically or electromagnetically. In this last case, all reasonable steps are taken to preserve confidentiality and the data is only sent to fax numbers or email addresses properly authorized by the client. Hard copies are submitted by US Mail.

13.4 Records

Records provide the direct evidence and support for the necessary technical interpretations, judgments, and discussions concerning laboratory results. These records, particularly those that are anticipated to be used as evidentiary data, provide the historical evidence needed for later reviews and analyses. Records must be legible, identifiable, and retrievable, and protected against damage, deterioration or loss. All records referenced in this section are retained for a minimum of ten years.

The laboratory has established and maintain procedures to control all documents that form part of its quality system (internally generated or from external sources), such as regulations, standards, other normative documents, environmental test and/or calibration methods, as well as drawings, software, specifications, instructions and manuals. Documents include policy statements, procedures, specifications, calibration tables, charts, textbooks, posters, notices, memoranda, software, drawings, plans, etc. These may be on various media, whether hard copy or electronic, and they may be digital, analog, photographic or written.
A procedure has been established to review and approve for use by authorized personnel prior to issue, all documents issued to personnel in the laboratory as part of the quality system. The procedure also establishes a document control system and the policy to be followed with invalid and/or obsolete documents.

Laboratory records generally consist of bound notebooks with pre-numbered pages, official laboratory worksheets, personnel qualifications and training forms, facilities, Corrective Action reports, PT records, equipment maintenance and calibration forms, chain-of-custody forms, sample analysis request forms, and analytical change request forms. All records are recorded in indelible ink and retained for ten years.

Records that are stored or generated by computers have hard copy or write protected backup copies. Electronic records are supported by the hardware and software necessary for their retrieval.

Any documentation changes are corrected by drawing a single line through the change so that it remains legible and is initialed by the responsible individual, along with the date of change and reason. The correction is written adjacent to the error. Strip-chart recorder or computer printouts are signed by the person who performed the instrumental analysis. If corrections need to be made in computerized data, a system parallel to the corrections for handwritten data is used.
In the event the Laboratory is sold, all past records shall be transferred to the custody of the new legal owner or operator of the Laboratory.
This management however shall maintain responsibility and accountability for laboratory work performed prior to the transfer. A written statement to this effect shall be provided.
The new owner/operator shall be accountable and liable for all work performed after the transfer date and he/she shall provide a written statement to that effect.
In the case the laboratory goes out of business, the present management shall maintain custody of all records and make them available to clients for a period of ten years.

Laboratory records include the following:

13.4.1 Standard Operating Procedures

SOPs are controlled documents. They are reviewed on regular basis and if there are any revisions, these are distributed to all affected individuals to ensure implementation of changes. All revisions of SOPs are archived.

13.4.2 Equipment Maintenance Documentation

Documents detailing the receipt and specification of analytical equipment are retained. A history of the maintenance record of each system serves as an indication of the adequacy of maintenance schedules and parts inventory. As appropriate, the maintenance guidelines of the equipment manufacturer are followed. When maintenance is necessary, it is documented in either standard forms or in logbooks.

13.4.3 Calibration Records and Traceability of Standards/Reagents

The frequency, conditions, standards, reagents and records reflecting the calibration history of a measurement system are recorded. These include but are not limited to the source of standards and reagents, receipt, preparation and use.

The overall program of calibration and/or verification and validation of equipment is designed and operated so as to ensure that measurements made by the laboratory are traceable to national standards of measurement.
Calibration certificates indicate the traceability to national standards of measurement and provide the measurement results and associated uncertainty of measurement and/or a statement of compliance with an identified metrological specification. The laboratory maintains records of all such certifications.
Where traceability to national standards of measurement is not applicable, the laboratory will provide evidence of correlation of results by participation in a suitable program of interlaboratory comparisons, proficiency testing, independent analysis or other suitable means.

13.4.4 Sample Management

A record of all procedures to which a sample is subjected while in the possession of the laboratory is maintained, including the personnel involved in each activity. These include records pertaining to:

- Sample preservation including appropriateness of sample container and compliance with holding time requirements.
- Sample identification, receipt, acceptance or rejection and log-in
- Sample storage and tracking including shipping receipts, transmittal forms, and internal routing and assignment records.
- Disposal of hazardous samples including the date of sample or sub-sample disposal and name of responsible person.
- Automated sample handling systems

13.4.5 Original Data

The raw data and calculated results for all samples is maintained in laboratory notebooks, logs, bench sheets, files or other sample tracking or data entry forms. Instrumental output is stored in a computer file and/or a hard copy report. These records include:

- Laboratory sample ID code
- Date of analysis
- Instrumentation identification and instrument operating conditions/parameters
- Analysis type and sample preparation information, including sample aliquots processed, cleanup, and separation protocols.
- All manual, automated, or statistical calculations
- Confirmatory analysis data, when required to be performed
- Review history of sample data
- Analyst's or operator's initials/signature
- All data generated, except those that are generated by an automated data collection system, are recorded directly, promptly and legibly in permanent ink.
- Date of analysis and extraction as well as time if the Hold Time is 72 hours or less.

13.4.6 QC Data

The raw data and calculated results for all QC samples and standards are maintained in the manner described in 13.4.5. Documentation allows correlation of sample results with associated QC data. Documentation also includes the source and lot numbers of standards for traceability. QC samples include, but are not limited to, control samples, method blanks, matrix spikes and matrix spike duplicates.

13.4.7 Correspondence

Correspondence pertinent to a project is kept and placed in the project files.

13.4.8 Deviations

When a deviation from a documented policy occurs, including SOPs, analytical methods, QA/QC criteria, etc., the laboratory notifies the client of this in the Certificate of Analysis under the case narrative section or in a supplemental report indicating the deviation and the reasons for it.
All deviations from SOPs are reviewed and approved by the QA Officer or Technical Director.
When mistakes occur in records, each mistake is crossed out, leaving it legible, and the correct value and initials of person making the correction are entered alongside.
When corrections are due to reasons other than transcription errors, the reason for the correction is documented.

13.4.9 Final Reports

Copies of final reports are kept in each client's file, along with supporting documentation

13.4.10 Administrative Records

The following are maintained:

- Personnel qualifications, experience and training records
- Initial and continuing demonstration of proficiency for each analyst
- A log of names, initials and signatures for all individuals who are responsible for signing or initialing any laboratory record.

13.5 Document Control System

The laboratory has established and maintains procedures to control all documents that form part of its quality system (internally generated or from external sources).

A document control system is used to ensure that all personnel have access to current policies and procedures at all times. Documents, which are managed by this system, include this Quality Manual, all SOPs, policy statements, procedures, specifications, calibration tables, charts, textbooks, posters, notices, memoranda, software, drawings, plans, etc. The system consists of a document review, revision and approval system, and document control and distribution. The documents may be on various media, whether hard copy or electronic, and they may be digital, analog, photographic or written.

All quality documents (this manual, SOPs, policies, etc.) are reviewed and approved by the QA Officer, the Technical Director and the Laboratory Director. Such documents are revised whenever the activity described changes significantly. All documents are reviewed at least every 5 years, with the exception of the QA Manual, which is reviewed annually.

All QA/QC documents are controlled by the QA Officer. Controlled copies are provided to individuals in the laboratory who need copies. The QA Officer maintains a distribution list for controlled copies and ensures that any revisions are distributed appropriately.

More detailed procedures related to Document Control are specified in the corresponding SOP (MIS045).

13.6 Confidentiality

All analytical reports, results, electronic records and transmission of results are kept in confidence to the customer who requested the analyses and only released to third parties with written permission from a properly authorized representative of the client. This information includes, but is not limited to COCs, Certificates of Analysis, raw data, bench sheets, electronic information and sample results.
In addition no information pertaining to clients is posted in public areas where the access is not restricted. Access to laboratory records and LIMS data is limited to authorized laboratory personnel except with the permission of the QA Officer or Laboratory Director. NELAP-related records are made available to authorized accrediting authority personnel.

13.7 Service to the Client

The laboratory shall afford clients or their representatives' cooperation to clarify the client's request and to monitor the laboratory's performance in relation to the work performed, provided that the laboratory ensures confidentiality to other clients.

14 PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

14.1 Internal Laboratory Audits

Annual internal audits are performed to verify that laboratory operations continue to comply with the requirements of the quality system and the corresponding NELAC Standard. The internal audit program shall address all elements of the quality system, including all of the environmental testing activities.
The quality assurance officer plans and organizes internal audits as required by a predetermined schedule and requested by management. Such audits are performed by the Quality Assurance Officer or personnel designated by the QA officer, who are by trained and qualified and wherever resources permit, independent of the activity to be audited. Technical personnel are not allowed to audit their own activities unless it can be thoroughly demonstrated that an effective audit will be carried out.
Where the audit findings cast doubt on the correctness or validity of the laboratory's results, an immediate corrective action is initiated and any client must be notified in writing within 30 days of the finding if investigations show that the laboratory results may have been affected.
The laboratory shall notify clients 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 test report or test certificate or amendment to a report or certificate.
The internal system audits include an examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain-of-custody procedures, sample preparation and analysis, instrument operating records, etc.

14.2 Management Review

At least once per year, laboratory executive management conducts a review of the quality system and environmental testing activities to ensure its continuing suitability and effectiveness and to introduce any necessary changes or improvements in the quality system and laboratory operations. The review takes account of the following:

- The suitability of policies and procedures;
- Reports from managerial and supervisory personnel;
- The outcome of recent internal audits;
- Corrective and preventive actions;
- Assessments by external bodies;
- The results of interlaboratory comparisons or proficiency tests;
- Changes in the volume and type of the work;
- Client feedback;
- Complaints;
- Other relevant factors, such as quality control activities, resources and staff training.

The managerial review is performed according to specified procedures detailed in the corresponding SOP and the records of review findings and actions are kept at the laboratory.
The area of activity audited, the audit findings and corrective actions that arise from them shall be recorded. The laboratory management shall ensure that these actions are discharged within the agreed time frame as indicated in this QA manual and/or in the corresponding SOPs.

Follow-up audit activities shall verify and record the implementation and effectiveness of the corrective action taken.
The management shall ensure that those actions are carried out within an appropriate and agreed timescale.
The laboratory, as part of their overall internal auditing program, shall insure that a review is conducted with respect to any evidence of inappropriate actions or vulnerabilities related to data integrity. Discovery of potential issues shall be handled in a confidential manner until such time as a follow up evaluation, full investigation, or other appropriate actions have been completed and the issues clarified. All investigations that result in finding of inappropriate activity shall be documented and shall include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients. All documentation of these investigation and actions taken shall be maintained for 10 years.

14.3 Other Audits

The Laboratory is also subject to external audits performed by regulatory agencies and clients. The State regulatory agency under which the laboratory is accredited under NELAC performs a bi-annual quality systems audit. The QA Manager and other relevant management personnel ensure that all the items identified in NELAC Chapter 5 Quality Systems are available for on-site inspection at the time they are requested in order to facilitate the audit process.
Audits performed by clients are non-routine and could be part of the evaluation process in selecting a laboratory for a particular project. For these audits, the management personnel can make available all items requested that are relevant to the evaluation of the Quality System and specific QA/QC practices without releasing information that could be considered confidential or pertaining to other clients data.

15 FACILITIES, EQUIPMENT AND REAGENTS

15.1 Facilities

The Laboratory is segregated into different areas for operations that are not compatible with each other. This separation prevents contamination of low levels of common laboratory solvents in the volatile organics analyses and maintains culture handling or incubation areas segregated from other areas.
The access to the volatile organics laboratory and microbiology laboratory is restricted to appropriate personnel only; signs to that effect are posted on the entry doors of these areas.
It is the policy of the company to assure that the facilities housing the laboratory and the workspaces are adequate to perform the analyses for which it is accredited. These include physical space, energy sources, lighting and environmental conditions, sufficient storage space, workbenches, ventilation, utilities, access and entryways to the laboratory, sample receipt area(s), sample storage area(s), chemical and waste storage area(s); and data handling and storage area(s). For microbiology, floors and work surfaces shall be non-absorbent and easy to clean and disinfect. Work surfaces shall be adequately sealed and shall be clean and free from dust accumulation. Plants, food, and drink shall be prohibited from the laboratory work area. The company will procure to improve the condition of the facilities whenever possible and make plans for future expansions or improvements.

The laboratory, as per Standard Operating Procedures, monitors, control and records environmental conditions as required by the relevant specifications, methods and procedures or where they influence the quality of the results, for example monitoring biological sterility and other environmental effects, as appropriate to the technical activities concerned. Environmental tests shall be stopped when the environmental conditions jeopardize the results of the environmental tests and/or calibrations.

Adequate measures are taken to ensure good housekeeping in the laboratory and to ensure that any contamination does not adversely affect data quality.

15.2 Equipment and Equipment Maintenance

The Laboratory is furnished with all items of sampling, measurement and test equipment required for the correct performance of the environmental tests (including sampling, preparation of samples, processing and analysis of environmental data). If the laboratory needs to use equipment outside its permanent control, this equipment must meet the requirements of other lab equipment according to this QA Manual.

The Laboratory acquires only equipment and its software required for testing and sampling that is capable of achieving the accuracy required and that complies with specifications relevant to the environmental tests concerned.

Before being placed into service, equipment (including that used for sampling) is calibrated and/or checked to establish that it meets the laboratory's specification requirements and complies with the relevant standard specifications.

Records are maintained for all major equipment, including documentation of all routine and non-routine maintenance activities.

The records include:

- The name of the equipment
- The manufacturer’s name, type identification, and serial number or other unique identification of the equipment and its software.
- Date received and date placed in service (if available)
- Current location, where appropriate.
- If available, condition when received (e.g. new, used, reconditioned)
- Dates and results of calibrations, if appropriate
- Details of routine and non-routine maintenance carried out to date and planned for the future
- History of any damage, malfunction, modification or repair

When purchasing new laboratory equipment and accessories, only reputable brands will be considered and always the instruments that have the best quality shall be considered, regardless of the difference in price with a similar instrument, considered of an inferior quality.

Instruments and equipment are maintained in optimum condition. Frequent inspections, routine preventative maintenance, prompt service, etc. ensure optimal performance.

It is the policy of the company to provide analytical instruments and software adequate to meet the method requirements and the quality control operations specified in both NELAC and the individual methods. Older instruments shall be replaced with newer ones as technology improves and efforts shall be made to provide a greater degree of automation and security in analytical instruments. A list of major instruments and reference materials is in Appendix 4.

Equipment shall be operated by authorized personnel. Up-to-date instructions on the use and maintenance of equipment (including any relevant manuals provided by the manufacturer of the equipment) shall be readily available for use by the appropriate laboratory personnel.

Service contracts or agreements with the manufacturer or instrument Maintenance Company are maintained for the following instruments:

- ICP and/or ICP-MS instruments for metal analysis
- GC/MS units for volatile organics
- Purge and Trap systems and autosamplers
- GC/MS units for semi-volatile organics

The analyst in charge of each particular instrument performs preventive maintenance for all other analytical instruments.

All maintenance and repairs are thoroughly documented in logbooks, with information pertaining to the description of the problem or routine maintenance, date of occurrence and name of person that performed the maintenance operation.

A routine preventive maintenance program is used to minimize the occurrence of instrument failure and other system malfunctions. Designated employees regularly perform routine scheduled maintenance and repair of instruments. They also check that equipment complies with the specifications, design a plan for maintenance, where appropriate, and verify that the maintenance is carried out to date. All laboratory instruments are maintained according with manufacturer’s specifications.

Any item of the equipment which has been subjected to overloading or mishandling, or which gives suspect results, or has been shown by verification or otherwise to be defective, is taken out of service, isolated to prevent its use or clearly labeled as being out of service until it has been repaired and shown by calibration, verification or test to perform satisfactorily. The laboratory will examine the effect of this defect or departure from specified limits on previous tests and shall institute the "Control of nonconforming work" or Corrective Action procedures.

The equipment and its software used for testing, calibration and sampling used at the laboratory is capable of achieving the accuracy required and comply with specifications relevant to the environmental tests concerned. Calibration programs are established for key quantities or values of the instruments where these properties have a significant effect on the results. All new analytical and sampling equipment is calibrated or checked to establish that it meets the laboratory's specification requirements and complies with the relevant standard specifications before being placed into service. All pieces of equipment are calibrated or checked before use.

Whenever practicable, all equipment under the control of the laboratory and requiring calibration shall be labeled, coded or otherwise identified to indicate the status of calibration, including the date when last calibrated and the date or expiration criteria when recalibration is due.

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

Test and calibration equipment, including both hardware and software, shall be safeguarded from adjustments which would invalidate the test and/or calibration results.

Glassware is cleaned to meet the sensitivity of the method. Any cleaning and storage procedures that are not specified by the method are documented in laboratory records or SOPs.

15.3 Reagents and Chemicals

The reagents and chemicals used in the laboratory are obtained from reputable suppliers that have proven consistency over the years. Purity specifications are chosen based on the analysis and this is always verified by the analysis of solvent blanks and check standards. In methods where the purity of reagents is not specified, analytical reagent grade are used. Reagents of lesser purity than those specified by the test method are not used. Upon receipt of reagents, the labels on the container are checked to verify that the purity of the reagents meets the requirements of the particular test method. Such information is documented in the corresponding logbook for reagents and chemicals.

The following are some of the reagents used:

- Solvents used for Gas Chromatography and GC/MS are "organic residue analysis" grade.
- Methanol used for volatile organics by GC or GC/MS is "Purge and Trap" grade.
- All inorganic chemicals are "reagent grade" or better, depending of the requirement.
- Nitric acid used for preparation of standards for ICP/MS analysis is "trace metals".

The quality of reagent water sources is monitored for trace metals, TKN, TOC and bacteria content. The results are documented in the corresponding logbook kept at the Microbiological Lab. On daily basis, the quality of reagent water is monitored by performing method blanks and system blanks for all tests that require water and the results documented with the analytical batch. If the reagent water does not meet method specific requirements a corrective action procedure is initiated.

The concentration of titrants is verified in accordance with written laboratory procedures (SOPs) and documented in the Standardization log book kept in the Wet Chemistry section of the Laboratory.

15.4 Analytical Standards and Reference Materials

In general the Laboratory uses reference materials that are traceable, when possible to SI units of measurement, or to certified reference materials. Where possible, traceability shall be to national or international standards of measurement, or to national or international standard reference materials. Internal reference materials are checked as far as is technically and economically practicable.

Most of the standards used are purchased as certified solutions from qualified vendors. These stock standards are traceable to NIST, the corresponding documentation, including certificate of analysis or purity, date of receipt, recommended storage conditions, expiration date, etc., is maintained in laboratory files.

The original containers provided by the vendor are labeled with an expiration date.

All analytical standards received at the laboratory are inspected for appearance and expiration date, if any. They are recorded in the LIMS, which assigns a unique identification number. All chemicals received are also inspected and recorded into a book to assure traceability. The identification number is referenced when a dilution of the stock is made or when a reagent solution is prepared.

All reference materials after they have been properly inspected and logged in, are handled, transported, stored and used, according to the manufacturer's instructions in order to prevent contamination or deterioration and to protect their integrity.

Analytical standards prepared in the laboratory are prepared from certified stock solutions or pure product. Quality Control Standards (QCS) are prepared or obtained from a separate source other than the working standards.

The management does not reject any request from technical personnel to obtain a reference material or any type of instrument or chemical that he or she considers essential for the normal operation of the laboratory.

15.5 Computers and Electronic Data Related Requirements

Where computers or automated equipment are used for the acquisition, processing, recording, reporting, storage or retrieval of test data the following are taken into consideration:

- Computer software developed by the user is documented in sufficient detail and is suitably validated as being adequate for use;
- Procedures are established and implemented for protecting the data; including, but not limited to, integrity and confidentiality of data entry or collection, data storage, data transmission and data processing;
- Computers and automated equipment are maintained to ensure proper functioning and are provided with the environmental and operating conditions necessary to maintain the integrity of environmental test data.
- Establishment and implementation of appropriate procedures for the maintenance of security of data including the prevention of unauthorized access to, and the unauthorized amendment of, computer records.
- Commercial off-the-shelf software (e. g. word processing, database and statistical programs) in general use within their designed application range is considered to be sufficiently validated, however, laboratory software configuration or modifications must be validated.

16 SPECIFIC ROUTINE PROCEDURES USED TO EVALUATE DATA QUALITY

Quality control acceptance criteria are used to determine the validity of the data based on the analysis of internal quality control check (QC) samples (see section 11). The specific QC samples and acceptance criteria are found in the laboratory SOPs. Typically, acceptance criteria are taken from published EPA methods. Where no EPA criteria exist, laboratory generated acceptance criteria are established. Acceptance criteria for bias are based on historical mean recovery plus or minus three standard deviation units, and acceptance criteria for precision range from zero (no difference between duplicate control samples) to the historical mean relative percent difference plus three standard deviation units.

Analytical data generated with QC samples that fall within prescribed acceptance criteria indicate the laboratory was in control. Data generated with QC samples that fall outside the established acceptance criteria indicate the laboratory was “out of control” for the failing tests. These data are considered suspect and the corresponding samples are reanalyzed or reported with qualifiers.

Many published EPA methods do not contain recommended acceptance criteria for QC sample results. In these situations, Weck Laboratories, Inc. uses 70 – 130 % as interim acceptance criteria for recoveries of spiked analytes, until in-house limits are developed. In-house limits are based on a 95% confidence interval and should include all historical data points (minimum of 20 data points).

16.1 Laboratory Control Samples

A Laboratory Control Sample is analyzed with each batch of samples to verify that the accuracy of the analytical process is within the expected performance of the method.

The results of the LCS are compared to acceptance criteria to determine usability of the data. Data generated with LCS samples that fall outside the established acceptance criteria are judged to be out-of-control. These data are considered suspect and the corresponding samples are reanalyzed or reported with qualifiers.
LCS samples are prepared in each corresponding matrix (reagent water for aqueous and Ottawa sand for soil/solid), which must be free of the target analytes to be analyzed.

16.2 Matrix Spikes/Matrix Spike Duplicates

Results from MS/MSD analyses are primarily designed to assess data quality in a given matrix, and not laboratory performance. In general, if the LCS results are within acceptance criteria, performance problems with MS/MSD results may either be related to the specific sample matrix or to an inappropriate choice of extraction, cleanup, or determinative methods. If any individual percent recovery in the matrix spike (or matrix spike duplicate) falls outside the designated acceptance criteria, Weck Laboratories, Inc. will determine if the poor recovery is related to a matrix effect or a laboratory performance problem. A matrix effect is indicated if the LCS data are within acceptance criteria but the matrix spike data exceed the acceptance criteria.

16.3 Surrogates Recoveries

Surrogates are exclusively used in organic analysis. Surrogate recovery data from individual samples are compared to surrogate recovery acceptance criteria in the methods. As for MS/MSD results, surrogate recoveries are used primarily to evaluate data quality and not laboratory performance.

16.4 Method Blanks

Method blank analyses are used to assess acceptance of sample results. The source of contamination is investigated and measures taken to correct, minimize or eliminate the problem in the situations detailed in Section 12.1.1.
Any sample associated with the contaminated blank is reprocessed for analysis or the results reported with appropriate qualifying codes.

17 NON-COMFORMING WORK, CORRECTIVE ACTION AND PREVENTIVE ACTION

17.1 Control of Nonconforming Environmental Testing Work

A policy has been established to handle situations when any aspect of the Laboratory's environmental testing work, or the results of this work, do not conform to its own procedures or the agreed requirements of the client.

The procedures to be implemented when this situation occurs are detailed in the corresponding SOP (MIS044),

17.2 Corrective Action

Corrective action is the process of identifying, recommending, approving and implementing measures to counter unacceptable procedures or out of control QC performance that can affect data quality. To the extent possible, samples are reported only if all quality control measures are acceptable. If a quality control measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure are reported with the appropriate data qualifier(s). Sample results may

also be qualified when holding times are not met, improper sample containers and/or preservatives are used or when other deviations from laboratory standard practices and procedures occur.

Corrective action in the laboratory may occur prior to, during and after initial analyses. A number of conditions such as broken sample containers, multiple phases, low or high pH readings, and potentially high concentration samples may be identified during sample login or just prior to analysis. The SOPs specify conditions during and after analysis that may automatically trigger corrective action or optional procedures. These conditions may include dilution of samples, additional sample extract cleanup, and automatic reinjection/reanalysis when certain QC criteria are not met.

Any QC sample result outside of acceptance limits requires corrective action. Once the problem has been identified and addressed, corrective action may include the reanalysis of samples, or appropriately qualifying the results.

The analyst will identify the need for corrective action. The Technical Director will approve the required corrective action to be implemented by the laboratory staff. The QA Officer will ensure implementation and documentation of the corrective action.

Corrective actions are performed prior to release of the data from the laboratory. The corrective action will be documented in both a corrective action log (Appendix 10), signed by the personnel involved, and the narrative in the data report.

Where a complaint, or any other circumstance, raises doubt concerning the laboratory's compliance with the laboratory's policies or procedures, or with the quality of the laboratory's tests, the laboratory shall ensure that those areas of activity and responsibility involved are promptly audited in accordance with internal audit procedures established under this QA Manual. All complaints received at the laboratory from clients or other parties shall be treated according to the corresponding standard operating procedure for its resolution. Records of the compliant and subsequent actions are maintained for future review.

There are some cases in which the QC checks do not fail but the analyst or supervisor discovers that an unexpected or contradictory result has been obtained. These situations are considered also as "Out-Of-Control" and an investigation is carried out.

The investigations/corrective action procedures include but are not limited to:

- Identification of the individuals responsible for assessing each QC data type
- Identification of the individuals responsible for initiating and/or recommending corrective actions
- Definition of how the analyst should treat the data set if the associated QC measurements are unacceptable
- Investigate the probable cause of irregularity and determine the root cause(s) of the problem.
- Review the sample's documented history.
- Review the documentation for errors.
- Scrutinize the sample preparation (digestion, extraction, dilutions, cleanup, etc.)
- Verify standards with reference materials.
- Re-analyze the sample if possible.
- Investigate alternate methodologies.
- If the event is determined to be matrix dependent the data is reported with a qualifier.
- Definition of how out-of-control situations and subsequent corrective actions are to be documented

- Definitions of how management, including the QA Officer, review corrective action reports

Where corrective action is needed, the laboratory shall identify potential corrective actions. It shall select and implement the action(s) most likely to eliminate the problem and to prevent recurrence.

Corrective actions shall be to a degree appropriate to the magnitude and the risk of the problem. The laboratory shall document and implement any required changes resulting from corrective action investigations.

The laboratory shall monitor the results to ensure that the corrective actions taken have been effective.

Where the identification of nonconformances or departures casts doubts on the laboratory's compliance with its own policies and procedures, or on its compliance with the NELAC Standard, the laboratory shall ensure that the appropriate areas of activity are audited in accordance with Section 14.1 of this Manual, Internal Laboratory Audits as soon as possible.

17.3 Preventive Action

Preventive action is a pro-active process to identify opportunities for improvement rather than a reaction to the identification of problems or complaints.

Needed improvements and potential sources of nonconformances, either technical or concerning the quality system, shall be identified. If preventive action is required, action plans shall be developed, implemented and monitored to reduce the likelihood of the occurrence of such nonconformances and to take advantage of the opportunities for improvement.

Procedures for preventive actions shall include the initiation of such actions and application of controls to ensure that they are effective.

18 SUBCONTRACTING AND SUPPORT SERVICES AND SUPPLIES

18.1 Subcontracted Laboratory Services

A subcontracted laboratory will be used only if Weck Laboratories does not have the capability of performing the requested test, because of unforeseen reasons (e. g. workload, need for further expertise or temporary incapacity) or if the client specifically requests a particular analysis to be subcontracted.
Weck Laboratories advises the client in writing or by other means of its intention to subcontract any portion of the testing to another party, and when appropriate, gain the approval of the client, preferably in writing.
When subcontracting any part of the testing, this work will be placed with a laboratory accredited under NELAP for the tests to be performed or with a laboratory that meets applicable statutory and regulatory requirements for performing the tests and submitting the results of tests performed.
The corresponding records demonstrating that the above requirements are met are retained (e.g. copies of the subcontracted lab certifications, communications with the client, etc.)
When subcontracted laboratories are used, this is indicated in the Certificate of Analysis and a copy of the subcontractor’s report is kept in file in case the client requests it at a later time. Subcontracted work performed by non-NELAP accredited laboratories is also clearly identified in the final report.
Weck Laboratories is responsible to the client for the subcontractor’s work, except in the case where the client or a regulatory authority specifies which subcontractor is to be used.

A register of all subcontractors that are routinely used by the laboratory is kept on file, along with evidence of certifications.

18.2 Outside Support Services and Supplies

Weck Laboratories, Inc. only uses those outside support services and supplies that are of adequate quality to sustain confidence in the laboratory's tests. Records of all suppliers for support services or supplies required for tests are maintained.
Specific procedures to evaluate, select and monitor suppliers of materials and services as well as required documentation is detailed in the corresponding SOP (MIS042)

19 REFERENCES

19.1 NELAC 2003 Standard
19.2 Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans,
19.3 QAMS-005/80, December 29, 1980, Office of Monitoring Systems and Quality Assurance, ORD, USEPA, Washington, DC 20460
19.4 RCRA QAPP Instructions, USEPA Region 5, Revision: April 1998
19.5 ASTM D-5283-92. Generation of Environmental Data Related to Waste Management Activities: Quality Assurance and Quality Control Planning and Implementation.
19.6 American National Standards Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E-4), 1994.
19.7 EPA 2185 – Good Automated Laboratory Practices, 1995
19.8 ISO/IEC Guide 25: 1990. General Requirements for the Competence of Calibration and Testing Laboratories.
19.9 QA/R-2: EPA Requirements for Quality Management Plans, August 1994.
19.10 QA/G-4: Guidance for the Data Quality Objectives Process EPA/600/R-96/055, September 1994.
19.11 A/R-5: EPA Requirements for Quality Assurance Project Plans Draft – November 1997
19.12 QA/G-5: Guidance on Quality Assurance Project Plans EPA/600/R-98/018, February 1998.
19.13 A/G-6: Guidance for the Preparation of Standard Operating Procedures for Quality Related Operations EPA/600/R-96/027, November 1995.
19.14 A/G-9: Guidance for the Data Quality Assessment: Practical Methods for Data Analysis EPA/600/R-96/084, January 1998.
19.15 Manual for the Certification of Laboratories Analyzing Drinking Water EPA/570/9-90/008.

Appendix Detail

Appendix 1	**Resumes of Key Personnel**
Appendix 2	**Code of Ethics**
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APPENDIX 1
RESUMES OF KEY PERSONNEL

Name	**Position .**
Alfredo Pierri	President/Laboratory Technical Director for Chemistry and Radiochemistry
Alan Ching	QA Officer
Joe Chau	Laboratory Manager
Hai-Van Nguyen	Technical Director Microbiology

ALFREDO E. PIERRI

Title

President, Laboratory Technical Director

Education

M.S. (equiv.) - University of Buenos Aires, Argentina, 1978. Chemistry

- University of California, Los Angeles
  Certificate in Hazardous Materials Control and Management,
  1991 - 1993

Affiliations

American Chemical Society
American Water Works Association
National Association of Environmental Professionals
Water Environment Federation

Professional Experience

01/87 to Present	Weck Laboratories, Inc. Industry, California	President Laboratory Director
09/84 to 12/86	SCS Engineers Analytical Laboratory Long Beach, California	Laboratory Manager
07/79 to 09/84	Argentina Atomic Energy Energy Commission Chemistry Department Buenos Aires, Argentina	Analytical Chemist

Mr. Pierri has extensive experience in analytical chemistry. Most of his work in this field has been in the application and development of instrumental methods of analysis for organic analytes using GC, GC/MS, HPLC, IR and UV-Visible spectrometry. He has also worked in Atomic Absorption Spectrometry with flame and graphite furnace and Inductively Coupled Plasma (ICP) spectrometry. In the last 9 years he has been working exclusively in the environmental field obtaining in 1993 the certification as Registered Environmental Assessor (REA-04975) from the California Environmental Protection Agency.

As Laboratory Director, Mr. Pierri is responsible for all laboratory operations including the supervision of the overall performance of the laboratory, revision of analytical reports and Quality Assurance Program and provision of technical assistance and direction to laboratory personnel.

Mr. Pierri is well acquainted in all aspects of environmental regulations at Federal and State level, providing consulting services and guidance to clients in regulatory compliance and chemical treatment issues as well as understanding and interpreting analytical data.

Alfredo Pierri, continued

Other relevant experience and projects in which Mr. Pierri has participated are as follows:

- Characterization of wastes to be classified as hazardous as per State of California and Federal Regulations.
- Determination of contamination in soil and groundwater due to leaking underground storage tanks.
- Design and implementation of a Quality Assurance Program in Environmental Monitoring, writing of the QA manual and training of laboratory personnel.
- Interpretation of analytical data and compliance with regulations for drinking water for different potable water purveyors in Southern California.
- Compliance for wastewater discharges with local regulatory agencies and NPDES permits.
- Consulting services to industrial clients on pre-treatment of effluents in order to minimize organic matter and solids and reduce costs in taxes imposed by POTWs.
- Identification of unknown materials by chemical and physical methods.
- Implementation of a LIMS and use of personal computers for data acquisition, handling, and reporting.
- Teaching of Analytical Organic Chemistry at University Level for MS program.

ALAN CHING

Title:

QA Officer

Education

B.S. - Chu Hai College, Hong Kong, 1985
Chemistry

- Shangai University of Technology, China
Analytical Chemistry Courses 1978 - 1981

M.S - California Polytechnic University, Pomona
Analytical Chemistry, 1997

Professional Experience

11/05 - Pres	Weck Laboratories, Inc.	Radiation Safety Officer
07/02 - Pres	Weck Laboratories, Inc.	QA Officer/Tech Director Organic
09/00 – 07/02	Weck Laboratories, Inc.	Technical Director Organic Analyses
08/97 - 09/00	Weck Laboratories, Inc.	Organic Section Group Leader
04/96 - 07/97	Weck Laboratories, Inc.	QC Officer
02/95 - 03/96	Weck Laboratories, Inc.	Senior Chemist - GC
10/90 - 02/95	Weck Laboratories, Inc.	Senior chemist AA/ICP
04/89 - 06/89	Dinippon Ink and Chemical Hong Kong	Sales & Customer Technical Service
09/86 - 03/89	DIC - Sheng Zheng Company Shengzheng, China	Production Management and Quality Control
01/85 - 08/86	Dinippon Ink and Chemical	Lab Technician

Project Experience

- Basic radiation safety course provided by “Radiation Safety Academy”, completed on 12/2/2005.
- Supervision and training of personnel in the organic section.

Alan Ching, Continued

- Technical advisor for organic analysis and troubleshooting.
- Signing of organic analysis reports (in absence of Lab Manager or Lab Director).
- Reviewing and maintaining the QA manual and QA/QC documentation.
- Analysis of environmental samples for metals, and other elements by atomic absorption and ICP spectrometry using flame, hydride generation, cold vapor and graphite furnace.
- Preparation and set-up of leaching tests for hazardous waste characterization.
- Maintenance of atomic absorption and ICP instrumentation.
- Development and application of microwave digestion methods for metal analysis in environmental samples.
- Analysis of water in solvents, paints, inks and petroleum products by Karl-Fisher titration.
- Separation and detection of four different arsenic compounds using ion exchange chromatography and UV detection. (Master's degree project)
    - Analysis of environmental samples by GC and GC/MS including pesticides, herbicides, hydrocarbons, volatile organics, etc.

JOE CHAU

Title

Laboratory Manager

Education

B.S. - California Polytechnic University, Pomona, CA, 1988
Electrical Engineering

B.S - California Polytechnic University, Pomona, CA. 1993
Chemistry, Industrial Option

Professional Experience

09/00 – Pres.	Weck Laboratories, Inc. Industry, California	Technical Director for Inorganic Analysis and Microbiology
01/96 – 09/00	Weck Laboratories, Inc. Industry, California	Inorganic Section Supervisor
09/89 – 01/96.	Weck Laboratories, Inc. Industry, California	Senior chemist Spectroscopy (AA, ICP, ICP-MS)
09/88 - 09/89	Lights of America, Inc. Walnut, California	Electronic Technician

Project Experience

- Supervising and training of personnel in the wet chemistry, metals and microbiology groups.
- Technical advisor and troubleshooting for ICP-AES, ICP/MS and AA analyses.
- Signing of inorganic analysis reports (in absence of Lab Manager or Lab Director).
- Development of analytical procedures for the determination of environmental samples by ICP-MS
- ICP-MS operation and maintenance
- Analysis of water, wastewater, soil and hazardous waste samples by flame Atomic Absorption Spectrometry (AAS) and Inductively Coupled Plasma Emission Spectrometry (ICP-AES).
- Analysis of air filters for lead and other metals following NIOSH procedures.
- Operation and programming of ICP-AES spectrometer for analysis of metals.

Joe Chau, continued

- Maintenance and troubleshooting of AA and ICP instrumentation.
- Digestion methods and sample preparation for metal analysis including hot plate digestion and microwave digestion.
    - Leaching procedures for hazardous waste classification TCLP, WET and EP TOX.

Special Qualifications

Seminars:

Participation of seminars about AA, ICP and sample preparation given by Thermo Jarrell Ash, Varian and Perkin-Elmer, 1990 to 1992.

Continuing Education

Certificate Program for Hazardous Waste Management, University of California, Irvine, 1991

Perkin Elmer, ICP-MS training course. San Jose, CA 1996

HAI-VAN NGUYEN

Title

Technical Director Microbiology and Project Manager

Education

B.S. - California Polytechnic University, Pomona, CA, 2000
Biology (minor Chemistry)

Professional Experience

9/05 – Pres	Weck Laboratories, Inc. Industry, California	Technical Director Microbiology Project Manager
9/04 – 9/05	Weck Laboratories, Inc. Industry, CA	GC/MS Analyst
9/03 - 9/04	Weck Laboratories, Inc. Industry, CA	CG Analyst
4/00 - 9/03	Weck Laboratories, Inc. Industry, CA	Microbiology Analyst Inorganic Analyst

Project Experience

- Microbiological determinations in environmental samples
- GC and GC/MS operation, troubleshooting and maintenance
- Inorganic and Wet Chemistry determinations for water, wastewater, soil and hazardous waste samples
- Ion Chromatography analysis.

Training Classes and Seminars

- Comprehensive Gas Chromatography Seminar, Restek 9/2003
- Roads to LC and GC success, Agilent Technologies, 5/2003
- The Future of Ion Chromatography, Dionex Fall 2002

APPENDIX 2

CODE OF ETHICS

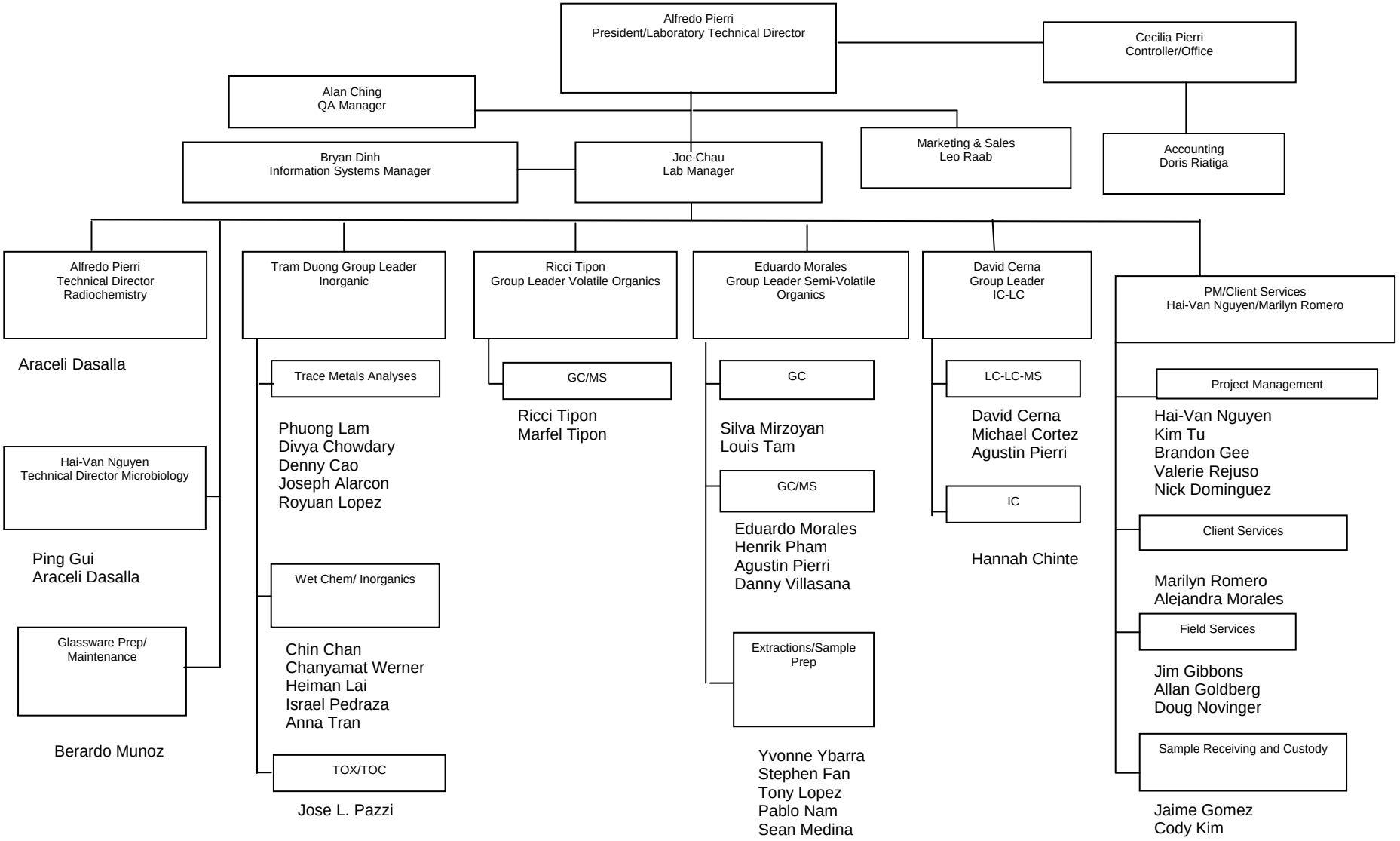
Weck Laboratories, Inc. is committed to ensuring the integrity of our data and meeting the quality needs of our clients. We pledge to manage our business according to the following principals:

- To produce results that are technically sound and legally defensible;
- To assert competency only for work for which adequate equipment and personnel are available;
- To present services in a confidential, honest, and forthright manner;
- To have a clear understanding with the client as to the extent and kind of services to be rendered;
- To provide employees with guidelines and an understanding of the ethical and quality standards required in this industry;
- To operate facilities in a manner that protects the environment and the health and safety of employees and the public;
- To obey all pertinent federal, state, and local laws and regulations;
- To continually improve product and service quality;
- To treat employees equitably, acknowledge their scientific contributions, and provide them with opportunities for professional growth and development;
- To recognize and respond to community concerns; and
- To deal openly, honestly, and fairly in all business and financial matters with employees, clients and the public.

APPENDIX 3

Weck Laboratories, Inc.

Company Organization Chart - October 2007



APPENDIX 4

List of Major Equipment as September 2007

Lab Section	Number	Instrument Description	Tests Performed
Semivolatiles	1	GC/MS/MS Triple quadrupole, Varian 1200 with EI, CI and MS/MS capabilities, equipped with Combi-Pal autosampler for automated SPME and headspace sampling	Special tests, low level pesticides; EDCs, EPA 521backup instrument
Semivolatiles	1	GC/MS/MS system, Varian Saturn 4000 with EI, CI and MS/MS capabilities	EPA 521, EPA 529, NDMA
Semivolatiles	1	GC/MS system, Agilent 7890/5975 Turbo with EI and PTV injection capabilities	EPA 525.2, 548.1, 527, 529
Semivolatiles	1	GC/MS system, Agilent 6890/5973N Turbo with EI and PCI capabilities	EPA 625, 8270 and 1,4-Dioxane
Semivolatiles	1	GC/MS system, ThermoFinnigan Trace Turbo with EI, PCI and NCI capabilities	NDMA, EPA 527
Semivolatiles	2	Gas chromatograph Agilent model 6890 with autosampler and dual ECD detectors	EPA 551.1, EPA 508, 515.3
Semivolatiles	1	Gas chromatographs Agilent 6890 with autosampler FID and ECD	EPA 8015 TPH, Alcohols
Semivolatiles	1	Gas chromatographs Varian 3800 with autosampler and dual ECDs and TSD detectors	EPA 504.1, EPA 552.2
Semivolatiles	1	Gas chromatograph Hewlett Packard model 5890A with autosampler and ECD and NPD detector.	EPA 507, Backup instrument for EPA 508, 504 or 515.3
Semivolatiles	1	Gas chromatograph Hewlett Packard model 5890A with autosampler and FID and TCD detectors.	Backup instrument for EPA 8015 TPH and alcohols
Volatiles	2	GC/MS system, Agilent 6890/5973	One has the Solatek autosampler and 3100 P&T and is used for 524.2, Low levels 123TCP, The other has an archon and 3100 P&T and is used for EPA 8260
Volatiles	2	GC/MS system, Hewlett-Packard 5890 series II/5972 MSD	One has the Aquatek 70 and 3000 P&T and is used for 524.2. The other has an archon and O-I Eclipse P&T and is used for EPA 624 and 8260

Lab Section	Number	Instrument Description	Tests Performed
Volatiles	2	GC/MS systems, Hewlett-Packard 5890/5970 MSD	EPA 624; back up instruments only
Volatiles	1	Gas Chromatograph, Hewlett-Packard 5890A with FID/PID in series	EPA 8021 BTEX
Volatiles	1	Purge and Trap unit O-I model Eclipse	Attached to GC/MS
Volatiles	2	Purge and Trap unit Tekmar model 3100	Attached to GC/MS
Volatiles	2	Purge and Trap unit Tekmar model 3000	Attached to GC/MS
Volatiles	1	Purge and Trap unit Tekmar model 2000	Attached to GC/MS
Volatiles	2	P&T autosamplers Varian model ARCHON for water and soils	Attached to GC/MS
Volatiles	1	P&T autosampler Tekmar model Aquatek 70	Attached to GC/MS
Volatiles	1	P&T autosampler Tekmar model Solatek for water and soils	Attached to GC/MS
Volatiles	1	P&T autosampler Tekmar model 2016 for water and soils	Attached to GC/MS
IC/HPLC	1	LC/MS/MS Varian 1200L Triple quad with positive and negative ESI, APCI and MS/MS capabilities	EPA 535, EPA 331, EPA 332
IC/HPLC	1	HPLC system Dionex DX-600 with gradient pump, post column derivatization, conductivity and Photodiode array detectors.	EPA 300.1 and 326 low levels Bromide, chlorite, chlorate and bromate
IC/HPLC	1	HPLC Systems Dionex DX500 with gradient pump, post-column reaction systems, and fluorescence and UV-VIS detectors.	EPA 531.1 and 547
IC/HPLC	1	HPLC System Dionex DX500 with gradient pump and UV-VIS detector	EPA 549.2, 8315 and 8330
IC/HPLC	1	Ion chromatograph DIONEX DX-120 with isocratic pump and conductivity detector	EPA 300.0
IC/HPLC	1	Ion Chromatograph Dionex with gradient pump, post-column derivatization and UV-Vis detector dedicated for hexavalent chromium.	EPA 218.6, EPA 7199
IC/HPLC	2	Ion Chromatograph Dionex DX-500 with gradient pump and conductivity detector dedicated to perchlorate analysis	EPA 314.0

Lab Section	Number	Instrument Description	Tests Performed
Metals	1	ICP-MS Spectrometer Agilent 7500ce	EPA 200.8, EPA 6020
Metals	1	ICP-MS Spectrometer Perkin Elmer model ELAN DRC-II	EPA 200.8, EPA 6020
Metals	1	FIAS (Flow injection) for ICP-MS hydride generation	Modified 200.8 for sea water and brines
Metals	1	ICP Spectrometer Perkin Elmer model Optima DV-3200	EPA 200.7, EPA 6010
Metals	1	Mercury analyzer CETAC model M-6000 with autosampler	EPA 245.1; EPA 7470; EPA 7471
Metals	1	Low Level Mercury Analyzer Leeman Labs model Hydra AF Gold +	EPA 1631; EPA 245.7
Extraction	1	Solid phase extraction system Horizon Technologies 4790 consisting in 6 automated extractors	Various EPA 500's series methods and UCMR
Extraction	3	Continuous accelerated liquid-liquid extractor/concentrator Corning from Organomation of 8 position each.	Various
Extraction	1	Automated solvent blow-down apparatus Horizon model Dry-Vap with 6 positions	Various
Extraction	1	ASE 200 Automated Extractor for soils/sediments	Various
Extraction	1	Automated Oil and Grease extractor 3 positions Horizon Technologies Model 3000 XL	EPA 1664
Extraction	1	Separatory funnel shaker 4-positions from Glas-Col	Various
Extraction	2	Block digesters for trace metal sample preparation	EPA 200.7, EPA 200.8; EPA 245.1; EPA 6010; EPA 6020; EPA 7470; EPA 7471
Extraction	2	TCLP rotary extractors for leaching procedures with glassware	Various
Extraction	2	Zero Headspace apparatus for TCLP extractions for Volatiles	EPA 8260-TCLP
General Chemistry	1	Automated Titration-ISE instrument Man-Tech Associates, model PC Titrate with autosampler	SM2320B; SM2310B, pH, ammonia
General Chemistry	1	Lachat model 8500 + FIAS auto analyzer with three simultaneous channels for NO_3-N, NO_2-N, TKN, TP, OP, Cyanide and NH_3	EPA 353.2, EPA 351.2; EPA 365.1; EPA 335.2; EPA 350.1
General Chemistry	1	Seal Analytical model AQ2+ discrete auto analyzer spectrophotometric wetchemistry analysis (NO_3, NO_2, TKN, TP, OP, Phenols, Cyanide and NH_3	EPA 353.2, EPA 351.2; EPA 365.1; EPA 335.2; EPA 350.1; EPA 420.4

Lab Section	Number	Instrument Description	Tests Performed
General Chemistry	2	Gas flow Alpha + Beta Counter Protean model MPC 9604 for radiological analyses.	EPA 900.0, SM7110C EPA 903.0, EPA 904
General Chemistry	1	Total organic carbon (TOC) Tekmar-Dorhman Phoenix 8000 with autosampler.	SM5310C
General Chemistry	1	Total organic halides (TOX) Mitsubishi TX-10.	SM5320B, EPA 9020
General Chemistry	1	UV-Visible Spectrophotometer Milton Roy Genesis 5.	Various
General Chemistry	1	UV-Visible Spectrophotometer Hach model DR4000U	Various
General Chemistry	1	Ion Selective electrode system Accumet 150 for pH, conductivity and ISE measurements	EPA 150.1, SM2510B,
General Chemistry	2	Scanning Infrared Spectrometers Beckman models Acculab B and 20-AX.	Sample identification
Field	3	Pickup trucks for field sampling Toyota Tacoma, models 2006. 1998 and 1999.	Field work
Field	9	Composite water sampling equipment ISCO, different models.	Wastewater sampling
Information Systems	1	Laboratory Information Management System (LIMS) "Element" from Promium running on SQL database.	Supports all methods
Information Systems	1	Element Web program to allow clients to review projects on real time through the Laboratories' web page.	Supports all methods
Information Systems	1	Element Data tool program to transfer analytical data directly from instruments into the LIMS.	Supports all methods
Information Systems	1	Agilent Chem Station software latest revision for control and data processing of Agilent GC and GC/MS instruments.	Suports organic methods
Information Systems	1	Varian Star Chromatography software for control and data processing of Varian GC and GC/MS instruments.	Suports organic methods
Information Systems	1	Dionex Peak Net Software for control and data processing of Dionex HPLC and IC instruments	Supports inorganic methods
Information Systems	1	Tal Technologies Wedge software for data acquisition of all RS232 devices (balances, pH meter, turbidimeter etc.) and other vendor specific software for data acquisition and processing of all other instruments.	Various

APPENDIX 5
Chain of Custody Form

Weck Laboratories, Inc.
Analytical Laboratory Services - Since 1964

14859 East Clark Avenue : Industry : CA 91745
Tel 626-336-2139 ♦ Fax 626-336-2634 ♦ www.wecklabs.com

CHAIN OF CUSTODY RECORD

Page 1 Of 1

CLIENT NAME:	PROJECT:
ADDRESS:	PHONE: FAX: EMAIL:
PROJECT MANAGER	SAMPLER

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☐ 10 - 15 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	ANALYSES REQUESTED	COMMENTS

RELINQUISHED BY	DATE / TIME	RECEIVED BY
RELINQUISHED BY	DATE / TIME	RECEIVED BY
RELINQUISHED BY	DATE / TIME	RECEIVED BY

SAMPLE CONDITION:

Actual Temperature:

Received On Ice	Y / N
Preserved	Y / N
Evidence Seals Present	Y / N
Container Attacked	Y / N
Preserved at Lab	Y / N

SAMPLE TYPE CODE:

AQ=Aqueous
NA= Non Aqueous
SL = Sludge
DW = Drinking Water
WW = Waste Water
RW = Rain Water
GW = Ground Water
SO = Soil
SW = Solid Waste
OL = Oil
OT = Other Matrix

PRESCHEDULED RUSH ANALYSES WILL TAKE PRIORITY OVER UNSCHEDULED RUSH REQUESTS
Client agrees to Terms & Conditions at: www.wecklabs.com

SPECIAL REQUIREMENTS / BILLING INFORMATION

COC version 042707

APPENDIX 6

Sample Collection and Holding Times

Weck laboratories, Inc. - Sampling Guidelines

				Preservative					
Test Name	**Matrix**	**Bottle Type**	**Bottle size**	**Unchlorinated Water (Raw)**	**Chlorinated Water (Treated)**	**Soil/Solid**	**Holding Time until start of analysis**	**Analytical Technique**	**Analytical Method**
1,2,3-TCP	Water	Glass	2 x 40 ml	None	Ascorbic		14 days	GC/MS Isot. Dil.	EPA 524.2SIM
1,4-Dioxane	Water	Amber Glass	2 x 1 L (*)	None	None		14 days	GC/MS Isot. Dil.	EPA 8270M
Alcohols	Water	Glass	1 x 40 ml	None	None		14 days	Dir. Inj./FID	EPA 8015B
Aldehydes	Water	Glass	2 x 40 ml	CuSO4	NH4Cl/CuSO4		7 Days	GC/ECD	EPA 556
Aldehydes	Water	Glass	1 L (*)	None	Thiosulfate		3 days	HPLC-UV	EPA 8315
Aldehydes(1)	Soil/Solid	Glass	4 oz			None	3 days	HPLC-UV	EPA 8315
Alkalinity, Total	Water	Poly	250 ml		None		14 Days	Titration	SM2320B
Anions by IC (F-,Cl-,SO4=)	Water	Poly	250 ml	None	None		28 days	IC	EPA 300.0
Anions by IC (NO2-,NO3-,PO4≡)	Water	Poly	250 ml	None	None		48 hours	IC	EPA 300.0
Arsenic speciation	Water	Poly	250 ml	EDTA/acetic acid	EDTA/acetic acid		14 Days	Resin-ICP/MS	EPA 200.8
Asbestos-Sub	Water	Poly	1 L	None	None		48 Hours	TEM	EPA 100.1/.2-Sub
Bacteria-Coliform - solid/sludge/soil	Soil/solid	Glass-Sterile	4 oz			None	N/A	MTF	SM 9221B
Bacteria-Coliform - Wastewater	Water	Poly-Sterile	125 ml	Thiosulfate	Thiosulfate		6 hours	MTF	SM 9221B
Bacteria-Coliform - Drinking Water	Water	Poly-Sterile	125 ml	Thiosulfate	Thiosulfate		24 Hours	Colilert P/A or enumeration	SM 9223B
Bacteria-Enterococcus - Wastewater	Water	Poly-Sterile	125 ml	Thiosulfate	Thiosulfate		24 Hours	Enumeration Quantitray	Enterolert
Bacteria-Heterotrophic Plate Count	Water	Poly-Sterile	125 ml	Thiosulfate	Thiosulfate		24 Hours	Pour Plate Method	SM 9215B
BOD	Water	Poly	1 L	None	None		48 Hours	DO Probe	SM 5210B
BOD, Carbonaceous	Water	Poly	1 L	None	None		48 Hours	DO Probe	SM 5210
Bromate	Water	Poly	250 ml	EDA	EDA		28 Days	IC	EPA 300.1
Bromate- Low Level	Water	Poly	250 ml	EDA	EDA		28 Days	IC	EPA 326
Bromide	Water	Poly	250 ml	None	None		28 Days	IC	EPA 300.0
Bromide-Low Level	Water	Poly	250 ml	None	None		28 Days	IC	EPA 300.1
Carbamates	Water	Glass	1 x 40 ml	MCAA	MCAA/thiosulf.		28 Days	HPLC	EPA 531.1
COD	Water	Poly	250 ml	H2SO4	H2SO4		28 Days	Colorimetric	EPA 410.4
Chloral Hydrate	Water	Glass	2 x 60 ml	Sulfite/buffer	Sulfite/buffer		14 days	GC/ECD	EPA 551.1
Chlorate	Water	Poly	250 ml	EDA	EDA		28 Days	IC	EPA 300.1
Chloride	Water	Poly	250 ml	None	None		28 Days	IC	EPA 300.0

Chlorine Dioxide	Water	Glass	250 ml	None	None		24 Hours	Colorimetric	SM 4500CLO2D
Chlorine Residual	Water	Glass	250 ml	None	None		24 Hours	Colorimetric	SM 4500CL-G
Chlorite	Water	Amber Glass	125 ml	EDA	EDA		14 Days	IC	EPA 300.1
Chlorophyll-a	Water	Amber Poly	2 x 1L	None			48 Hours	Spectrophotometric	SM 10200H
Chromium, Hexavalent	Water	Poly	250 ml	None	None		24 Hours	Spectrophotometric	SM3500CR-D/7196
Chromium, Hexavalent	Soil/solid	Glass	4 oz	None	None		30 days	Spectrophotometric	EPA 3060/7196
Chromium, Hexavalent (low level)	Water	Poly	250 ml	None	None		24 Hours	IC	EPA 218.6
Chromium, Hexavalent (low level)	Soil/solid	Glass	4 oz	None	None		30 days	IC	EPA 3060/7199
Color	Water	Glass	500 ml	None	None		48 Hours	Visual	SM2120B
Conductivity (Specific Conductance)	Water	Poly	250 ml	None	None		28 Days	Electrometric	SM2510B
Cyanide	Water	Poly	500 ml	NaOH	NaOH/ascorbic		14 Days	FIA-Colorimetric	EPA 335.2/335.4
Dioxin-Sub	Water	Glass	2 x 1 L	None	None		1 year	GC/ MS	EPA 1613/8290
Diquat/Paraquat	Water	Amber poly	1L	None	Thiosulfate		7 Days	HPLC	EPA 549.2
Disinfection by-products	Water	Glass	2 x 60 ml	Sulfite/buffer	Sulfite/buffer		14 days	GC/ECD	EPA 551.1
Diuron	Water	Amber Glass	1 L (*)	None	None		7 days	HPLC/UV	EPA 632
Diuron-UCMR	Water	Amber Glass	1 L (*)	CuSO4/Trizma	CuSO4/Trizma		14 days	HPLC/UV	EPA 532
EDB and DBCP	Water	Glass	2 x 40ml	None	Thiosulfate		14 Days	GC/ECD	EPA 504.1
Endothall	Water	Amber Glass	250 ml	None	None		7 days	GCMS	EPA 548.1
Ethanol	Water	Glass	1 x 40 ml	None	None		14 Days	Dir. Inj./FID	EPA 8015B
Explosives	Water	Amber Glass	1 L (*)	None	Thiosulfate		7 days	HPLC/UV	EPA 8330
Fluoride	Water	Poly	250 ml	None	None		28 Days	IC	EPA 300.0
General Minerals (excluding metals)	Water	Poly	1 L	None	None		Various	Wet Chem methods	various
General Minerals (metals only)	Water	Poly	250 ml	HNO3	HNO3		6 Months	ICP-AES	EPA 200.7
General Physical (Color, Odor, Turbidity	Water	Glass	500 ml	None	None		24 Hours	Wet Chem methods	various
Glyphosate	Water	Glass	1 x 40 ml	None	Thiosulfate		14 Days	HPLC	EPA 547
HAAs	Water	Amber Glass	250 ml (*)	NH4Cl	NH4Cl		14 days	GC/ECD	EPA 552.2
HAAs-Formation Potential	Water	Amber Glass	1L	None	None		14 days	GC/ECD	SM 5710B/EPA 552.2

Herbicides-DW	Water	Amber Glass	250 ml (*)	None	Thiosulfate		14 days	GC/ECD	EPA 515.3
Herbicides-GW	Water	Amber Glass	2 x 1 L (*)	None	Thiosulfate		7 Days	GC/ECD	EPA 8151
Mercury	Water	Glass jar	250 ml	HNO3	HNO3		28 Days	Cold Vapor AAS	EPA 245.1/7470
Methanol	Water	Glass	1 x 40 ml	None	None		14 Days	Dir. Inj./FID	EPA 8015B
Mercury in soil/solid/sludge	Soil/Solid	Glass jar	4 oz.	None	None		28 Days	Cold Vapor AAS	SW 7471
Metals (2)	Water	Poly	250 ml	HNO3	HNO3		6 Months	ICP/MS or ICP-AES	EPA 200.8/200.7
NDMA	Water	Amber Glass	2 x 1 L (*)	None	Ascorbic		7 days	GC/MS/CI SIM	EPA1625M
Nitrate	Water	Poly	250 ml	None	None		48 Hours	IC or FIA	EPA 300.0/353.2
Nitrite	Water	Poly	250 ml	None	None		48 Hours	IC or FIA	EPA 300.0/353.2
Nitrite+Nitrate as N	Water	Poly	250 ml	H2SO4	H2SO4		28 Days	FIA-Colorimetric	EPA353.2
Nitrogen, Total Kjeldahl (TKN)	Water	Poly	250 ml	H2SO4	H2SO4		28 Days	FIA-Colorimetric	EPA 351.2
Nitrogen-Ammonia	Water	Poly	250 ml	H2SO4	H2SO4		28 Days	FIA-Colorimetric	EPA 350.1
Nitrogen-Ammonia in ww with distillation	Water	Poly	250 ml	H2SO4	H2SO4		28 Days	FIA-Colorimetric	EPA 350.1
Nitrosamines	Water	Amber Glass	2 x 1 L (*)	None	Ascorbic		14 days	GC/MS/CI SIM	EPA 521
Odor	Water	Glass	500 ml	None	None		24 Hours	Odor	SM 2150B
Oil and Grease	Water	Glass	1 L	HCL	HCL		28 Days	Gravimetric	EPA1664
Organotins (tributyltin)	Water	Glass	1 L (*)	None	None		7 Days	GC/MS	GC/MS
Oxygen, Dissolved	Water	Glass	BOD bottle	None	None		24 Hours	O2 Probe	SM 4500-OG
PBDEs	Water	Amber Glass	2 x 1 L (*)	None	None		14 days	GC/MS SIM	EPA 1614M
Perchlorate	Water	Poly	250 ml	None	None		28 Days	IC	EPA 314
Perchlorate - Low Level by LC/MS/MS	Water	Poly Sterile	125 ml	Sterile field filtration	Sterile field filtration		28 Days	LC/MS/MS	EPA 331/332
Perchlorate in soils	Soil	Glass jar	4 oz	None	None		28 Days	IC	EPA 314M
Pesticides-Organophosphorus	Water	Amber Glass	2 x 1 L (*)	None	Thiosulfate		7 Days	GC/NPD	EPA8141
Pesticides, Chlorinated (DW)	Water	Amber Glass	2 x 1 L (*)	None	Thiosulfate		7 days	GC/ECD	EPA 508
Pesticides, Chlorinated WW/GW	Water	Amber Glass	2 x 1 L (*)	None	Thiosulfate		7 Days	GC/ECD	EPA 608/8081
PCBs - GW	Water	Amber Glass	2 x 1 L (*)	None	Thiosulfate		7 Days	GC/ECD	EPA 8082
Pesticides, N/P -DW	Water	Amber Glass	2 x 1 L (*)	None	Thiosulfate		14 days	GC/ NPD	EPA 507/8141
pH	Water	Poly	250 ml	None	None		3 Days	Electrometric	SM4500H
Phenolics	Water	Amber Glass	500 ml	H2SO4	H2SO4		28 Days	Spectrophotometric	EPA 420.1
Phosphate, Ortho	Water	Poly	250 ml	None	None		48 hours	FIA-Colorimetric	EPA 365.1

Phosphate, Total	Water	Poly	250 ml	H2SO4	H2SO4		28 Days	FIA-Colorimetric	EPA 365.1
Polynuclear Aromatics (PNAs) Low level	Water	Amber Glass	2 x 1L	None	Thiosulfate		7 Days	HPLC or GC/MS	EPA 610/8310 or EPA 8270SIM
Radiological-Gross Alpha	Water	Poly	1 L	HNO3	HNO3		6 Months	GPC	EPA 900.0
Radiological-Gross Alpha high TDS	Water	Poly	1 L	HNO3	HNO3		6 Months	Coprecipitation-GPC	SM7110C
Radiological-Gross Beta	Water	Poly	1 L	HNO3	HNO3		6 Months	GPC	EPA 900.0
Radiological-Radium 226-Sub	Water	Poly	2 x 1 L	HNO3	HNO3		6 Months		EPA 903.1 Sub
Radiological-Radium 228-Sub	Water	A-Poly	1 L	HNO3	HNO3		6 Months		RA-05 Sub
Radiological-Radon 222-Sub	Water	Glass	2 x 60 ml	None	None		4 Days	LSC	EPA 913.0
Radiological-Strontium 90-Sub	Water	Poly	1 L	HNO3	HNO3		6 Months		EPA 905.0 sub
Radiological-Tritium-Sub	Water	Amber Glass	125 ml	None	None		6 Months	LSC	EPA 906.0 sub
Radiological-Uranium-Sub	Water	Poly	250 ml	HNO3	HNO3		6 Months	ICP-MS	EPA 200.8
Semivolatile Organics (BNA) - GW or WW	Water	Amber Glass	2 x 1L	None	Thiosulfate		7 Days	GC/MS	EPA 625/8270C
Silica by ICP	Water	Poly	250 ml	None	None		28 Days	ICP	EPA 200.7
SOCs - Drinking Water	Water	Amber Glass	2 x 1 L	HCL	Sulfite/HCL		14 days	GC/MS	EPA 525.2
SOCs - Special Analytes	Water	Amber Glass	2 x 1 L	HCL	Asc., EDTA, Diazol. Urea, Buffer		14 days	GCMS	EPA 526
SOCs - Phenolics	Water	Amber Glass	2 x 1 L	HCL	Sulfite/HCL		14 days	GCMS	EPA 528
Solids, Settleable	Water	Poly	1 L	None	None		48 Hours	Gravimetric	EPA 160.5
Solids, TDS	Water	Poly	500 ml	None	None		7 Days	Gravimetric	SM2540C
Solids, Total	Water	Poly	500 ml	None	None		7 Days	Gravimetric	SM2540B
Solids, TSS	Water	Poly	500 ml	None	None		7 Days	Gravimetric	EPA 160.2
Solids, TVS	Water	Poly	500 ml	None	None		7 Days	Gravimetric	EPA 160.4
Solids, VSS	Water	Poly	500 ml	None	None		7 Days	Gravimetric	SM 2540E
Sulfate	Water	Poly	250 ml	None	None		28 Days	IC	EPA 300.0
Sulfide, Dissolved	Water	Poly	250 ml	NAOH	NAOH		24 hours	Colorimetric	SM4500S2D
Surfactants (MBAS)	Water	Poly	500 ml	None	None		48 Hours	Colorimetric	SM5540C
t-Butyl Alcohol	Water	Glass	2 x 40 ml	none	None		14 Days	GC/MS	EPA 524.2
THMs	Water	Amber Glass	2 x 40 ml	Thiosulfate	Thiosulfate		14 Days	GC/MS	EPA 524.2

THMs-Formation Potential	Water	Amber Glass	1L	None	None		14 Days	GC/MS	SM5710/EPA 524.2
Total Organic Carbon	Water	Amber Glass	250 ml	H3PO4	H3PO4		28 Days	UV-Persulfate	SM5310C
Total Organic Halides	Water	Amber Glass	500 ml	H2SO4	Sulfite/H2SO4		14 Days	Pyrolysis/ Coulometric	SM5320B/EPA 9020
Turbidity	Water	Poly	250 ml	None	None		48 Hours	Nephelometric	EPA 180.1
UCMR2-PBDEs	Water	Amber Glass	2 x 1 L	Ascorbic, EDTA, Citrate	Ascorbic, EDTA, Citrate		14 days	GCMS	EPA 527
UCMR2-Explosives	Water	Amber Glass	2 x 1 L	CuSO4/Trizma Buffer	CuSO4/Trizma Buffer		14 days	GCMS	EPA 529
UCMR2-Perchlorate	Water	Poly-Sterile	125 ml	Sterile Field Filtration	Sterile Field Filtration		28 days	LC/MS/MS	EPA 331/332
UCMR2-Acetanilide Degradates	Water	Amber Glass	2 x 500 ml	NH4Cl	NH4Cl		14 days	LC/MS/MS	EPA 535
UCMR2-Acetamide Pesticides	Water	Amber Glass	2 x 1 L	Sulfite/HCL	Sulfite/HCL		14 days	GCMS	EPA 525.2
UCMR2-Nitrosamines	Water	Amber Glass	1 x 1 L	Thiosulfate	Thiosulfate		14 days	GCMS	EPA 521
UV254	Water	Amber Glass	250 ml	None	None		2 Days	Spectrophotometric	SM 5910B
Volatile Organics-DW	Water	Glass	3 x 40 ml	HCL	Ascorbic/HCL		14 Days	GC/MS	EPA 524.2
Volatile Organics-Aromatics only	Water	Glass	2 x 40 ml	HCL	Thiosulfate/HCL		14 Days	P&T/PID	EPA 602
Volatile Organics-WW/GW	Water	Glass	2 x 40 ml	HCL	Thiosulfate/HCL		14 Days	GC/MS	EPA 624/8260B
Gasoline -TPH	Water	Glass	2 x 40 ml	HCL	Thiosulfate/HCL		14 Days	P&T/FID	EPA 8015B
Diesel/Oil-TPH	Water	Amber Glass	1 L (*)	HCL	Thiosulfate/HCL		14 Days	GC/FID	EPA 8015B

Notes:
(1): Formaldehyde and acetaldehyde only
(2): Al,Sb,As,Ba,Be,B,Cd,Ca,Na,Mg,K,Cr,Co,Cu,Fe,Pb,Li,Mn,Mo,Ni,Se,Ag,Sr,Tl,Ti,V,Zn
(*): Needs extra bottles for QA/QC for certain projects.

APPENDIX 7

List of SOPs as of September 2007

SOP's LIST AND INDEX
Administration - Miscellaneous and administrative SOPs

File Name	Rev No	Rev Date	Method	Title
MIS001	15	Sep-07	General	Sample receiving, log in storage and disposal
MIS002	4	Jun-04	Sampling	Industrial wastewater sampling instructions
MIS003	3	Jul-05	General	Back up System
MIS004	4	Nov-05	General	Chemicals receipt and storage and preparation of solutions
MIS005	2	Apr-00	General	Start and Shut down the Server
MIS006	1	Jul-96	General	Disposal of material used of microbiological determinations
MIS007	1	Jan-97	General	Sample container management
MIS008	2	Mar-97	General	Laboratory hazardous waste management
MIS009	2	Jan-98	General	Soil samples from Hawaii and Countries other than the United States
MIS010	1	Mar-99	Sampling	Sampling Instructions for protected groundwater supplies and water supplies with treatment
MIS011	3	Aug-00	General	Preparation, Approval, Distribution, & Revision of standard Operating Procedures
MIS012	1	Dec-99	General	Significant Figures and Rounding
MIS013	1	Dec-99	General	Generation and Utilization of Control Charts
MIS014	3	Sep-00	General	Performing Internal Audit
MIS015	2	Mar-00	General	Testing of Proficiency Test (PT) Samples
MIS016	2	Aug-00	General	Corrective Action Procedures
MIS017	2	Dec-03	General	Logbook Maintenance, Utilization, and Review
MIS018	3	Nov-06	General	Internal Laboratory Data Verification and Review
MIS019	2	Oct-03	General	Resolution of Customer Complaints
MIS020	2	Apr-04	General	Analytical Balance Calibration & Check
MIS021	2	Aug-00	General	Calibration & Maintenance of Mechanical Pipettes
MIS022	2	Oct-03	General	Lims Security Systems
MIS023	2	Oct-03	General	Login a sample into the LIMS
MIS024	1	Apr-00	General	DI water Quality checks
MIS025	2	Aug-06	General	Control of Data and Manual Data Entry
MIS026	1	Apr-00	General	Taking reprresentative samples and sub-samples in the Laboratory.
MIS027	3	Jul-05	General	Electronic Data Transfer of Analytical Results
MIS028	3	May-04	General	Standard Cleaning Protocols for containers and labware
MIS029	2	Apr-04	General	Calibration and Verification of Thermometers
MIS030	3	Dec-04	General	Managerial Reviews
MIS031	4	Nov-06	General	Calibration and Verification of Lab Support Equipment
MIS032	2	Aug-06	General	Calculation of MDL and RLs
MIS033	1	Apr-00	General	Rejection/acceptance criteria for special analyses
MIS034	3	Jul-06	General	Performing IDCs
MIS035	3	Mar-07	General	Hiring a new employee
MIS036	1	Aug-00	General	Use of areas of incompatible activities
MIS037	3	Nov-06	General	Computers and electronic data requirements
MIS038	1	Aug-00	General	Chain of Custody Procedures for Legal and Evidentiary custody of samples
MIS039	1	May-02	General	Proper Raw Data Handling and Manual Integration Procedures
MIS040	2	Oct-03	General	Company Data Backup and Archive Routine
MIS041	1	Oct-03	General	Subcontract samples
MIS042	3	Nov-06	General	Outside Support Services and Supplies
MIS043	2	Jul-06	General	Implementation of the Business Ethics and Data Integrity Policy

MIS044	2	Nov-06	General	Control of Nonconforming Environmental Testing
MIS045	3	Nov-06	General	Control of Records and Documents
MIS046	2	Mar-07	General	Training of Laboratory Personnel
MIS047	2	Nov-05	General	Estimating the Uncertainty of Measurements
MIS048	2	Mar-06	General	Development and maintenance of test method SOPs
MIS049	1	Mar-07	General	Health and Safety Training Procedures

SOP's LIST AND INDEX
Inorganic Department - Metals SOPs

File Name	Rev No	Rev Date	Method	Title
MET001	5	Apr-00	1311	Toxicity Characteristic Leaching Procedure (TCLP)
MET002	1	Jun-92	Pb&Cu	Analysis of Lead & Copper for drinking water (lead & copper rule)
MET003	1	Jan-94	N6009	Analysis of Mercury in solid sorbent by cold vapor technique (NIOSH 6009)
MET004	1	Nov-92	N7082	Analysis of Total Lead in air filter by NIOSH 7082
MET005	5	Nov-02	3010	Acid digestion of Aqueous samples & extracts for Total Metals for analysis by FLAA or ICP Spectroscopy EPA 3010 modified
MET006	4	Aug-96	200.9	Graphite Furnace Atomic Absorption - EPA method 200.9
MET007	4	Mar-02	3050	Acid digestion of sediments, sludges & soils (EPA 3050 B)
MET008	2	Apr-00	7000	Flame Atomic Absorption Spectrometry - EPA 7000
MET009	2	Mar-02	3050M	Acid digestion of sediments, sludges, soils & wipes (EPA 3050 M)
MET010	6	Feb-02	7471	Analysis of Hg in sediment by manual cold vapor technique, EPA 7471A
MET011	4	Feb-02	245.1	Analysis of Hg in water by manual cold vapor technique EPA method 245.1
MET012	2	Apr-00	7741	Selenium (Atomic Absorption, Gaseous Hydride) EPA 7741/270.3
MET013	1	Jan-94	7061	Arsenic (Atomic Absorption, Gaseous Hydride) EPA 7061/ 206.3
MET014	2	Mar-94	N7000	Analysis of total metals in air filters by flame atomic absorption using microwave digestion (NIOSH 7000M)
MET015	1	May-94	Pb in air	Determination of Lead in suspended Particulate matter collected from ambient air (Title 40 CFR part 50, appendix G) Rule 1420
MET016	1	May-94	N7300	Analysis of total metals in air filters by Inductively coupled plasma atomic emission spectrometry (ICP) using microwave digestion (NIOSH 7300M)
MET017	7	Mar-02	6010	Inductively coupled plasma atomic emission spectroscopy EPA method 6010B
MET018	9	Mar-07	200.8	EPA method 200.8 Analysis of trace metal in water in ICP/MS (ELAN and Agilent 7500ce)
MET019	6	Mar-07	6020	Metal Analysis by ICP/MS - EPA method 6020
MET020	3	Sep-01	200.2	Sample preparation procedure for spectrochemical determination of total recoverable elements :EPA method 200.2
MET021	2	Apr-00	WET	Waste Extraction test procedures. Title 22 part 66261.126 appendix ll
MET023	2	Feb-03	As-ICP/MS	Arsenic sample preparation by flow Injection vapor generation - ICP-MS
MET024	2	Feb-03	Se-ICP/MS	Selenium sample preparation by flow Injection vapor generation for ICP-MS
MET025	4	May-01	200.7	Inductively coupled plasma atomic emission spectroscopy EPA method 200.7
MET026	1	Apr-00	231.1	Analysis of Gold by Flame Atomic Absorption Spectrometry EPA 231.1
MET027	1	Apr-00	239.1	Analysis of Lead by Flame Atomic Absorption Spectrometry EPA 239.1

MET028	1	Apr-00	253.1	Analysis of Lead by Palladium by Flame Atomic Absorption Spectrometry EPA 253.1
MET029	1	Apr-00	265.1	Analysis of Rhodium by Flame Atomic Absorption Spectrometry EPA 265.1
MET030	1	Apr-00	255.1	Analysis of Platinum by Flame Atomic Absorption Spectrometry EPA 255.1
MET031	2	Feb-02	7470	Analysis of Mercury in liquid waste by Cold Vapor Atomic Absorption Spectrometry EPA 7470A
MET032	1	Jul-00	Maint	Maintenance of analytical instruments used for trace metal analysis
MET033	1	Nov-04	3005	Acid Digestion of Waters for Total Recoverable or Dissolved Metals for Analysis by ICP Spectroscopy and ICP-MS-EPA 3005A Modified
MET034	1	Mar-06	1631	Analysis of low level mercury by CVAFS, EPA Method 1631E
MET035	1	May-07	245.7	Analysis of low level mercury by CVAFS, EPA Method 245.7

SOP's LIST AND INDEX
Inorganic Department - Microbiology SOPs

File Name	Rev. No	Rev Date	Method	Title
MIC003	7	Jul-07	SM9223	Bacteriological Analysis of Water Samples by SM9223 (P/A Colilert) and enumeration by the Quanti-Tray method
MIC004	5	Jun-04	SM9215B/ SimPlate	Heterotrophic Plate Count: Pour Plate Method SM 9215B and SimPlate
MIC005	6	Jul-04	SM9221	Total and Fecal Coliform Analysis of Drinking Water and Waste Water by Multiple Tube Fermentation Technique SM 9221
MIC006	4	Jul-04	QAQC	Quality Assurance for Microbiological Tests
MIC007	1	May-00		Using New Methods or Test Kits for Microbiological Determinations
MIC008	2	May-04		Verification of Support Equipment Used for Microbiological Determinations
MIC009	1	Jul-05	Enterolert	Bacteriological Analysis of Ambient Water Samples for Enterococci by Enterolert Presence/Absence and Quanti-Tray® Method

SOP's LIST AND INDEX
Radio Chemistry Department - RadChem SOPs

File Name	Rev. No	Rev Date	Method	Title
RAD001	1	May-05	900.0	Determination of Gross Alpha and Gross Beta Radioactivity in Drinking Water, EPA Method 900.0
RAD002	1	Jul-05	SM7110C	Determination of Gross Alpha Radioactivity in Water by Coprecipitation, SM 7110C
RAD003	1	Jul-05	903.0	Determination of Alpha-emitting Radium Isotopes in Water, EPA Method 903.0
RAD004	1	Oct-05	All	Quality Control for Radiochemical analysis
RAD005	1	Apr-06	All	The Procedure for Monitoring Radiation Measurement instrumentation for Radioactive Contamination
RAD006	1	Apr-06	All	The Procedure for Handling, Storing and Establishment of Expiration Dates for Reference Standards
RAD007	1	Jul-06	RA-05	Radiochemical Determination of Radium-228 in water samples, EPA Method Ra-05
RAD008	1	Jul-06	904	Radiochemical Determination of Radium-228 in water samples, EPA Method 904.0
RAD009	1	Sep-07	200.8	Spectrometric Determination of Uranium in water samples for radiological compliance, EPA Method 200.8

SOP's LIST AND INDEX
Inorganic Department - Wet Chemistry SOPs

File Name	Rev No	Rev Date	Method	Title
WET001	8		300	Anions by IC
WET002			9056	Anions by IC
WET003	10	Apr-07	SM4500CN	Analysis of Total Cyanide in Water Samples SM4500 CN
WET004	6	Oct-01	SM5210B	5 Day Biological Oxygen Demand (BOD) Test by SM 5210B
WET005	1	Jun-92	ASTM D240	Heat of combustion
WET006	2	Jan-98	418.1	Analysis of Total Recoverable Petroleum Hydrocarbons in Soil - EPA 418.1M
WET007	1	Sep-02	5050	Bomb preparation method for solid waste EPA 5050(moved from ORG052)
WET008	2	Jun-98	SM5540D	Non-ionic Surfactants as CTAS(Cobalt Thiocyanate Active Substances) SM method 5540 D
WET009	6	Apr-07	SM2120B	Analysis of Color in Water by SM2120B
WET010	1	Jul-92	SM4500CNM	Analysis of Thiocyanate in Wastewater by Method SM4500-CN M
WET011	1	Jul-92	SM4500CNL	Analysis of Cyanate in Wastewater by Method SM4500-CN L
WET012	1	Sep-92	ASTMD19	Colorimetric Analysis of Formaldehyde in water by ASTM D-19
WET013	2	Aug-98	140.1	Analysis of Odor in Drinking Water by EPA method 140.1/SM 2150
WET014	1	Sep-92	SM2160B	Analysis of Taste by Standard methods 2160B,Flavor Threshold Test,FTT
WET015	1	Sep-92	ASTME203	Analysis of Water content by Karl Fisher Titration ASTM method E203
WET018	3	Apr-07	SM4500CN G	Cyanide Amenable to Chlorination in water ,SM 4500 CN-G
WET019	3	Apr-00	420.1	Analysis of Total Recoverable Phenolics in Water - EPA 420.1
WET021	6	Feb-02	1010	Pensky Marten closed cup method for determining Ignitability EPA 1010

WET022	3	Apr-00	SM2320B	Alkalinity as CaCO3 - Titrimetric method SM2320 B
WET023	3	Apr-00	ASTM D512	Chloride (Titrimetric, Silver Nitrate) ASTM D-512-89 B
WET024	4	Apr-00	SM2310B	Acidity as CaCO3 - SM 2310 B
WET025	2	Sep-99	AB titration	Acid Content (Titration)
WET026	2	Jul-94	SM4500F BC	Fluoride, Potentiometric Ion Selective Electrode(Direct & Following Distillation) SM 4500-F B/C
WET027	2	Apr-00	3060	Alkaline Digestion for Cr VI (EPA 3060)
WET028	4	Aug-00	SM4500 H B	pH (Electrometric), SM 4500-H+ B
WET029	3	Jul-00	SM3500 Cr D	Chromium, Hexavalent (Colorimetric) EPA SM 3500-Cr D
WET030	2	Apr-00	SW846	Determination of Total Releasable Cyanide (SW-846 chapter seven, step 7.3.3.2
WET031	1	Jun-94	SM4500S2 E	Dissolved Sulfide - Iodometric method (SM 4500 -S -2 E)
WET032	3	Oct-01	SM4500 S2 D	Dissolved Sulfide - Methylene Blue method (SM 4500-S-2 D)
WET033	3	Jul-00	9030/9034	Acid-Soluble & Acid-Insoluble Sulfides (EPA 9030A)
WET034	2	Apr-00	SW846	Determination of Total Releasable Sulfide (SW 846,Chapter seven, step 7.3.4.2)
WET035	4	Oct-01	SM4500NH3 E	Ammonia-Nitrogen (NH3 -N) Titrimetric method following distillation, SM4500NH3 E
WET036	7	Oct-01	SM4500NH3 F	Ammonia - Nitrogen (NH3-N) Ammonia-Selective Electrode method, SM4500NH3 F
WET038	3	Feb-02	SM4500Cl G	Chorine, Total Residual (spectrophotometric, DPD) SM 4500 - Cl G
WET039	5	Nov-02	SM2510B	Conductance (specific conductance) - SM 2510 B
WET040	2	Apr-00	SM2340C	Hardness, total, as CaCO3 (Titrimetric, EDTA) - SM 2340 C
WET041	6	Oct-01	SM2540C	Residue, Filterable - TDS (Gravimetric, Dried at 180°C) - SM 2540 C
WET042	6	Apr-07	SM2540D	Residue, non-filterable TSS (Gravimetric, dried at 103-105°C) SM2540D
WET043	3	Apr-00	SM5540C	Methylene Blue Active Substances (MBAS) -colorimetric SM5540C
WET044	1	Aug-94	253B	Thiosulfate and Sulfite (Iodometric,Aldehyde Adduct),(LACSD procedure 253B)
WET045	6	Feb-02	SM4500NH3 E	Nitrogen, Kjeldahl, Total (Titrimetric), SM4500 NH3 E
WET046	2	Apr-00	SM2540B	Residue, total (Gravimetric , Dried at 103-105°C) SM 2540B
WET047	3	Jul-00	160.4	Residue, Volatile (Gravimetric, Ignition at 550°C) EPA 160.4
WET048	3	Apr-07	SM2540F	Residue,Settleable (volumetric,Imhoff cone), SM2540F
WET049	1	Sep-94	B512	Residue(Modified ANSI/AWWA B512-91),Gravimetric, evaporated at 22°C
WET050	4	Jul-00	410.4	Chemical Oxygen Demand (Cod)test by EPA 410.4
WET053	2	Apr-00	SM4500CN F	Analysis of Total Cyanide in Water Samples by selective electrode method (SM 4500-CN F)
WET054	1	Jan-98	418.1AZ	EPA 418.1 Arizona
WET055	6	Sep-07	1664	HEM;Oil & Grease and SGT-HEM by Extraction and Gravimetry, EPA 1664 Rev A
WET056	4	Sep-00	180.1	Determination of Turbidity by Nephelometric Method EPA 180.1
WET057	2	Apr-00	SM4500P D	Total Phosphorus by SM4500 PD
WET058	1	Nov-98	SM2550B	Temperature measurements by SM 2550 B
WET059	2	Jun-99	FMC	Hydrogen Peroxide Analysis - Method FMC
WET062	2	Oct-02	420.1M	Total Recoverable phenols in soil and oil EPA 420.1Modified
WET063	1	Oct-99	418.1	Total Recoverable Petroleum hydrocarbons in water EPA 418.1
WET064	2	Apr-00	9045C	pH (Electrometric), EPA Method 9045C (soil and solid)
WET065	2	Apr-00	9040B	pH (Electrometric), EPA Method 9040B (multiphase wastes)
WET066	1	Nov-99	SM5560C	Analysis of Volatile Acids - SM 5560C
WET068	1	Apr-00	SM2330B	Corrosivity langlier Index SM 2330 B

WET069	1	Apr-00	SM2340B	Hardness as CaCO3 by Calculation SM 2340 B
WET070	2	Jul-00	SM4500ClO2 D	Chlorine Dioxide (DPD Method) SM 4500-ClO2 D
WET071	2	Jul-06	351.4	Kjeldahl Nitrogen, Total (Potentiometric), EPA 351.4
WET072	2	Feb-02	SM4500 O G	Dissolved Oxygen Membrane Electrode Method SM 4500-O G
WET073	2	Feb-02	SM4500SO3 B	Sulfite, Iodometric SM4500SO3= B
WET074	1	Apr-00	9010/9014	Distillation and analysis for total and amenable cyanide EPA 9010B/9014
WET075	1	Apr-00	CCR ch10	Ignitability as per CCR Chapter 10, Article 3
WET076	1	Apr-00	CCR ch10	Reactivity of a waste as per CCR Chapter 10, Article 3
WET077	1	Apr-00	CCR ch10	Corrosivity of a waste as per CCR Chapter 10, Article 3
WET078	1	Apr-00	SM5910	UV Absorbing Constituents UV-254 SM 5910
WET079	1	Apr-00	7196	Hexavalent Chromium, Spectrophotometric EPA 7196A
WET080	3		365.3	Total Phosphorus Analysis - EPA 365.3
WET081	1	May-00	ASTM2382	Heat of combustion ASTM2382
WET082	1	May-00	ASTM E203	Water by Karl Fischer ASTM E-203-75
WET083	1	Feb-04	326	Analysis of low level of bromate in drinking water by IC with PCR, EPA 326
WET084	1	Mar-05	353.2	Analysis of Nitrate and Nitrite in Drinking Water and Wastewater by Flow Injection and Colorimetry Using Lachat Quickchem 8500 FIA+ Analyzer, EPA Method 353.2
WET085				Not in use
WET086	1	Apr-05	350.1	Analysis of Ammonia in Drinking Water and Wastewater by Flow Injection and Colorimetry Using Lachat Quickchem 8500 FIA+ Analyzer, EPA Method 350.1
WET087	1	Apr-05	365.1	Analysis of Total Phosphorus (Acid Persulfate Digestion Method) in Drinking Water and Wastewater by Flow Injection and Colorimetry Using Lachat Quickchem 8500 FIA+ Analyzer, EPA Method 365.1
WET088	1	Apr-05	365.1	Analysis of Orthophosphate in Drinking Water and Wastewater by Flow Injection and Colorimetry Using Lachat Quickchem 8500 FIA+ Analyzer, EPA Method 365.1
WET089	2	Sep-07	351.2	Analysis of Total Kjeldahl Nitrogen in Drinking Water and Wastewater by Flow Injection and Colorimetry Using Lachat Quickchem 8500 FIA+ Analyzer, EPA Method 351.2
WET090	1	Jun-05	335.1	Analysis of cyanide amenable to chlorination
WET091	1	Jun-05	335.4	Analysis of Total Cyanide in Drinking Water and Wastewater by Flow Injection and Colorimetry Using Lachat Quickchem 8500 FIA+ Analyzer, EPA Method 335.4
WET092	1	Jun-05	335.2	Analysis of Total Cyanide in Drinking Water and Wastewater by Flow Injection and Colorimetry Using Lachat Quickchem 8500 FIA+ Analyzer, EPA Method 335.2
WET093	1	Jul-05	SM10200H	Analysis of Chlorophyll-a and Pheophytin-a , SM10200-H
WET094	1	Sep-05	SM5710B	Determination of Trihalomethane Formation Potential (THMFP) by SM5710B
WET095	1	May-06	415.3	Determination of TOC and UV254 in drinking water by EPA Method 415.3
WET096	1		D6646-03	Analysis of the Accelerated Hydrogen Sulfide Breakthrough Capacity of Granular and Pelletized Activated Carbon, ASTM D6646-03
WET097	1	Mar-07	D2862	Standard Test Method for Particle Size distribution of Granular Activated Carbon, ASTM D2862-82

WET098	1	Mar-07	D2867	Standard Test Method for Moisture in Activated Carbon, ASTM D2867-83
WET099	1	Mar-07	D2866	Standard Test Method for Total Ash in Activated Carbon, ASTM D2866-83
WET100	1	Mar-07	D3802	Standard Test Method for Ball-Pan Hardness of Activated Carbon, ASTM D3802-79
WET101	1	Mar-07	D5029	Standard Test Methods for Water solubles in Activated Carbon, ASTM D5029-98
WET102	1	Mar-07	D5832	Standard Test Methods for Volatile Matter content of Activated Carbon, ASTM D5832-98
WET103	1	Mar-07	USFilter	Standard Test Methods for Contact pH Test Method
WET104	1	Jun-07	D93	Standard Method for Test for Flash Point by Pensky-Martens Closed Cup Tester, ASTM D93-73

SOP's LIST AND INDEX
Organic Department - Organics SOPs

File Name	Rev. No	Rev Date	Method	Title
ORG002	2	Dec-01	SM5710B	Determination of the Maximum Total Trihalomethane Potential.
ORG003	7	Apr-05	SM5310C	Total Organic Carbon (TOC) and Dissolved Organic Carbon DOC by SM5310C
ORG004	9	Mar-02	SM5320B	Determination of Total Organic Halides in water by Adsorption-Pyrolysis-Titrimetric Method , SM-5320B
ORG005	6	Nov-00	8315	Determination of Ketones and aldehydes by HPLC - EPA method 8315
ORG006	5	Mar-01	8318	N-Methylcarbamates by HPLC - EPA method 8318
ORG007	1	Sep-92	9076	Determination of Total Halogens and Total Extractable Organic Halides - EPA 9076
ORG008	4	Sep-01	551.1	Analysis of Chlorination Disinfection Byproducts (DBPs) in Drinking water by Liquid-Liquid Extraction and GC/ECD- EPA 551.1
ORG009	10	Apr-01	8260	Determination of Volatile Organic Compounds in Groundwater and Soil by GC/MS, without cryogenic cooling- EPA 8260B
ORG011	4	Apr-01	8330	Explosive residues by HPLC - EPA method 8330
ORG012	4	Dec-04	508A	Screening for Polychlorinated Biphenyls by Perchlorination and Gas Chromatography - EPA Method 508A
ORG013	5	Sep-01	8015	Analysis of Volatile Petroleum Hydrocarbons (VPH, C6 to C10) in Soil and Water samples by P&T and GC/FID- EPA 8015
ORG014	4	Sep-01	8021	Determination of Aromatic and Halogenated Volatiles by GC/PID and GC/ELCD - EPA8021A
ORG015	6	Mar-02	8141	Analysis of Organophosphorus Compounds in Water, Soil, and Solid Waste by GC/NPD - EPA 8141A
ORG016	7	Mar-02	8081	Analysis of organochlorine pesticides in liquid and solid waste by GC/ECD - EPA 8081A
ORG017	5	Apr-01	549.2	Diquat and Paraquat by LSE and HPLC With UV Detection - EPA 549.2
ORG018	1	Jun-93	548	Analysis of Endothall in Drinking Water by GC/ECD - EPA 548
ORG019	4	Apr-00	6251B	Analysis of Haloacetic acids in drinking water by GC-ECD SM6251B
ORG020	5	Jan-02	547	Glyphosate by HPLC - EPA method 547
ORG021	4	Mar-01	507	Analysis of Nitrogen-Phosphorus-Containing Pesticides in Ground Water and Drinking Water By EPA method 507
ORG022	4	Mar-01	508	Analysis of organochlorine pesticides and PCB's in drinking water - EPA 508

ORG023	5	Mar-02	8015B	Analysis of Diesel Range Organics in soil and water samples by GC/FID - EPA 8015
ORG024	1	Dec-93	547M	Analysis of glyphosate in soil by EPA Method 547 modified
ORG025	2	Jul-94	24	Determination of Volatile Organic Content(VOC) in Paints and Related Coatings - EPA 24
ORG026	9	Jan-02	524.2	Determination of Volatile Organic Compounds by EPA method 524.2 Without Cryogenic cooling - EPA 524.2
ORG027	1	Feb-94	509	Ethylene Thiourea in Drinking Water - EPA 509
ORG028	5	Oct-01	531.1	Analysis of N-Methylcarbamates in Water by Direct Aqueous Injection HPLC with Post Column Derivatization - EPA 531.1
ORG029	5	Jun-02	8151	Chlorinated acid herbicides in water, soil and solid waste - EPA 8151
ORG030	5	Sep-01	504.1	Analysis of EDB, DBCP and 123TCP in Water by Microextraction and GC/ECD -EPA 504.1
ORG031	5	May-00	515.2	Analysis of Chlorinated Acids in Water By GC/ECD - EPA Method 515.2
ORG032	1	Mar-94	N1003	Analysis of halogenated hydrocarbons in charcoal tubes
ORG033	4	Sep-01	632	Diuron (carbamates and Urea pesticides) by HPLC - EPA method 632
ORG034	1	Jun-94	OSHA57	4,4-Methylenedianiline(MDA) in Air Filter, OSHA57
ORG035	2	Jan-03	551.1	Chloral Hydrate in Drinking Water, EPA551.1 -See ORG008
ORG036	10	Feb-01	8270	Determination of Semi-Volatile Organic Compounds in Waste Water, Soil, and Other Industrial wastes by GC/MS, Capillary Column Technique - EPA Method 8270C
ORG037	5	Mar-01	548.1	Analysis of Endothall in Drinking Water By Ion Exchange Disk Extraction, Acid Methanol Methylation and GC/MS or GC/FID - EPA 548.1
ORG038	2	Mar-02	508.1	Chlorinated Pesticides, SPE, GC/ECD, EPA508.1
ORG039	8	Apr-04	525.2	Determination of Organic Compounds in Drinking Water by Liquid Solid Extraction and GC/MS - EPA 525.2
ORG040	5	Feb-01	625	GC/MS Method for Semi-Volatile Organics - EPA 625
ORG041	3	Apr-00	601/602	Analysis of Purgeable Halocarbons and Aromatics by GC/ELCD, GC/PID - EPA Method 601/602
ORG042	8	Jan-02	314	Analysis of Perchlorate (ClO4-) by Ion Chromatography, EPA Method 314.0
ORG043	3	May-02	8270M	Determination of 1,4 Dioxane by Isotopic Dilution using GC/MS - EPA 8270M
ORG044	1	Dec-97	BLS191	Fuel Hydrocarbons in Soil Arizona Method BLS-191
ORG045	4	Feb-02	3600	Cleanup Methods for Organic Analysis EPA 3600
ORG046	3	Feb-02	3500	Sample Preparation and Extraction in Hazardous Waste - EPA 3500B
ORG047	3	Feb-02	3510	Separatory Funnel Liquid-Liquid Extraction - EPA 3510B
ORG048	3	Feb-02	3550	Ultrasonic Extraction - EPA 3550B
ORG049	2	Feb-02	3580	Waste Dilution - EPA 3580A
ORG050	3	Mar-02	5030	Purge-and-Trap Extraction - EPA 5030B
ORG051			9056	Moved to Wetchem WET002
ORG052			5050	Moved to Wetchem WET007
ORG053	2	Aug-00	8015az	C6 - C32 Hydrocarbons - 8015AZ
ORG054	1	Jun-98	8031	Determination of Acrylonitrile by Gas Chromatography - EPA 8031
ORG056	2	Feb-02	3520	Continuous Liquid-Liquid Extraction - EPA 3520C
ORG057	2	Feb-02	3540	Soxlet Extraction - EPA 3540C
ORG058	5	Mar-02	8082	Analysis of Polychlorinated Biphenyl's (PCBs) in liquid and solid waste by GC/ECD - EPA 8082
ORG059	1	Jul-99	1666	Determination of Volatile Organic Compounds Specific to the Pharmaceutical Industry by Isotope Dilution GC/MS - EPA 1666
ORG060	3	Feb-01	624	VOC in Wastewater by GC/MS - EPA 624

ORG061	5	Jan-02	300B	Analysis of Anions (BrO3-, Br-,ClO3-,ClO2-) by Ion Chromatography, EPA Method 300.0(B)
ORG062	6	Nov-03	9020B	Determination of Total Organic Halides in water by Adsorption-Pyrolysis-Titrimetric Method , EPA9020B
ORG063	3	Jul-02	9020M	Determination of Total Halogens and Total Extractable Organic Halides by Method 9020B Modified
ORG064	3	Mar-02	608	Analysis of organochlorine pesticides and PCBs in wastewater matrices by GC/ECD, EPA Method 608.
ORG065	10	Dec-03	1625M	Determination of ultra low levels of N_Nitrosodimethylamine (NDMA) by Isotopic - EPA 1625C
ORG066	2	Feb-03	8270sim	Determination of Polynuclear Aromatic Compound by SIM Method EPA 8270 Modified
ORG067	3	Mar-02	5035	Determination of Volatile Organic Compounds in Soil by closed-system Purge-and-Trap and GC/MS- EPA 5035
ORG068	1	Jan-00	Oregon	Total Petroleum Hydrocarbon (Oregon), TPH-G and TPH-D
ORG069	5		7199	Analysis of Hexavalent Chromium by Ion Chromatography - EPA 7199
ORG070	2	Apr-00	604	Analysis of Phenols in Municipal & Industrial Wastewater- EPA 604
ORG071	2	Mar-02	8015b	Analysis of alcohols by GC-FID EPA Method 8015B
ORG072	2	Mar-02	515.3	Analysis of chlorinated acid herbicides GC-ECD EPA Method 515.3
ORG073	3	Sep-01	505	Analysis of chlorinated pesticides by GC-ECD EPA Method 505
ORG074	1	May-00		Establishing retention times Windows for organic analysis by GC and GC/MS
ORG075	2	Mar-01	552.2	Analysis of Haloacetic acids by L-L extraction and GC-ECD EPA 552.2
ORG076	2	Mar-02		Instrument Maintenance
ORG077	2	Nov-00	218.6	Analysis of Hexavalent Chromium by Ion Chromatography EPA 218.6
ORG078	1	Apr-01	524.2M	Analysis of tert-butyl alcohol (TBA) in drinking water by EPA 524.2M
ORG079	1	May-01	luft	Analysis of TPH and BTEX by GC/MS LUFT Method
ORG080	1	Jan-02	528	Analysis of phenols in drinking water by SPE and GC/MS EPA Method 528
ORG081	1	Jan-02	526	Analysis of selected SVOA in drinking water by SPE and GC/MS EPA Method 526
ORG082	1	Apr-02	TCP-E	Analysis of 1,2,3-Trichloropropane by L-L extraction and GC/MS SIM mode
ORG083	1	May-02	TCP-PT	Analysis of 1,2,3-Trichloropropane by P&T and GC/MS SIM mode
ORG084	1	Oct-03	314low	Analysis of Perchlorate at low levels by IC, EPA 314
ORG085	1	Jul-02	556	Analysis of Aldehydes by L-L extraction and GC-ECD, EPA 556
ORG086	1	Jul-02	3535	SPE extraction by manual and automated mode
ORG087	1	Sep-02	300.1	Oxyhalides by EPA 300.1
ORG088	1	Oct-01	532	Diuron and Linuron by EPA 532
ORG089	1	Feb-04	1624	Acrolein and Acrylonitrile by EPA 1624
ORG090	1	Mar-04	8270SIM	Phenols low levels by GC/MS EPA 8270 SIM Mode
ORG091	1	Feb-04	326	Analysis of low level bromate
ORG092	1	Nov-04	OSHA 20M	Analysis of Hydrazine by HPLC, OSHA Method 20M (Modified)
ORG093	2	Nov-05	IC/LC/MS/MS	Analysis of Perchlorate in various matrices at Low Levels by IC-MS/MS and LC/MS/MS
ORG094	1	Jan-05	8316	Analysis of Acrylamide by HPLC, EPA Method 8316
ORG095	1	Sep-05	1614M	Analysis of PBDEs by isotopic dilution GC/MS-EI EPA 1614 modified
ORG096	1	Nov-06	Org. tin	Determination of low level Organotins using mass spectrometry with Electron Ionization GC-EI-MS.
ORG097	1	Jun-06	332	Analysis of Perchlorate at Low Levels by IC-MS/MS, EPA Method 332.0
ORG098	1	Aug-06	8310	Analysis of Polynuclear Aromatic Hydrocarbons by HPLC, EPA Method 8310
ORG099	1	Jan-06	331	Analysis of Perchlorate at Low Levels by LC-MS/MS, EPA Method 331.0
ORG100	1	Mar-06	535	Analysis of chloroacetanilde/acetamide herbicides by LC/MS, EPA Method

				535
ORG101	1	Mar-06	521	Analysis of Nitrosamines by SPE-GC/MS/MS EPA Method 521
ORG102	1	Apr-06	527	Analysis of Pesticides and flame retardants by SPE-GC/MS EPA Method 527
ORG103	1	Jul-06	529	Analysis of Explosives by SPE-GC/MS EPA Method 529
ORG104	1	May-06	300M	Analysis of Iodide by IC, EPA 300Mod
ORG105	1	Apr-06	LCMS	Tuning the Varian 1200L LC/MS
ORG106	1	Aug-06	610	Analysis of Polynuclear Aromatic Hydrocarbons by HPLC, EPA Method 610
ORG107	1	Oct-06	DOD-ClO4	Analysis of Perchlorate at Low Levels in water and soil by LC-MS/MS, DoD Method
ORG108	1	Jan-07	556M	Analysis of Aldehydes in Solid/Soil by GC-ECD, EPA 556M (Modified)
ORG109	1	Sep-07	1671	Analysis of Triethanolamine by direct injection and GC-FID

APPENDIX 8

Acceptance Limits for QC Determinations

The Acceptance Limits for QC determinations are in some cases mandatory limits and in other cases the limits are updated periodically from past results. This process is performed though the LIMS. For current acceptance limits please refer to the LIMS.

APPENDIX 9

DEMONSTRATION OF CAPABILITY

A demonstration of capability (DOC) must be made prior to using any test method, and at any time there is a change in instrument type, personnel or test method.

All demonstrations shall be documented through the use of the form in this appendix.

The following steps are performed.

a) A quality control sample shall be obtained from an outside source. If not available, the QC sample may be prepared by the laboratory using stock standards that are prepared independently from those used in instrument calibration.

b) The analyte(s) shall be diluted in a volume of clean matrix sufficient to prepare four aliquots at the concentration specified, or if unspecified, to a concentration approximately 10 times the method-stated or laboratory-calculated method detection limit.

c) At least four aliquots shall be prepared and analyzed according to the test method either concurrently or over a period of days.

d) Using all of the results, calculate the mean recovery in the appropriate reporting units and the standard deviations of the population sample for each parameter of interest. When it is not possible to determine mean and standard deviations, such as for presence/absence and logarithmic values, the laboratory must assess performance against established and documented criteria.

e) The calculated mean and standard deviation are compared to the corresponding acceptance criteria for precision and accuracy in the test method (if applicable) or in laboratory-generated acceptance criteria (if they are not established mandatory criteria). If all parameters meet the acceptance criteria, the analysis of actual samples may begin. If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter.

f) When one or more of the tested parameters fail at least one of the acceptance criteria, the analyst must proceed according to 1) or 2) below.

    1) Locate and correct the source of the problem and repeat the test for all parameters of interest beginning with c) above.

    2) Beginning with c) above, repeat the test for all parameters that failed to meet criteria. Repeated failure, however, confirms 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 c).

CERTIFICATION STATEMENT

The following certification statement shall be used to document the completion of each demonstration of capability. A copy of the certification statement shall be retained in the personnel records of each affected employee.

Weck Laboratories, Inc.
Environmental and Analytical Services - Since 1964

Training Record (Method and Technique) and Demonstration of Capability Statement

- **Analyte(s)/Description:** _____
- **Analyst name:** _____
- **Matrix:** _____ **Date:** _____
- **Method:** _____ **SOP:** _____

I have read, understand, and agree to use the latest version of the test method and SOP.

Analyst's Signature _____ Date _____

- **Training courses or workshops on equipments, analytical techniques and lab procedures:**

Standard and sample preparation, dilution, and spiking using syringes and volumetric flasks. On-site training for familiarization and operation of both software and hardware of GC/MS#1, 8(Agilent 5890,6890)provided by Ricci Tipon. GC and GC/MS seminars provided by Full Spectrum and Tekmar.

Analyst's Signature _____ Date _____

Technical Director's Name and Signature _____ Date _____

- **IDOC Certification Statement:**

- **Proficiency Demonstrated by:** (See attachment)
  - **a.** ____ Acceptable performance of a blind sample.
  - **b.** ____ Another demonstration of capability.
  - **c.** ____ Acceptable at least 4 consecutive LCS.
  - **d.** ____ Analysis of authentic sample analyzed by another trained analyst with statistically indistinguishable results

We, the undersigned, CERTIFY that:

1.- The Analyst identified above, using the cited test method(s), which is in use at this facility for the analyses of samples under the National Environmental Laboratory accreditation Program, have met the Demonstration of Capability

2.- The test method(s) was performed by the analyst(s) identified on this certification.

3.- A copy of the test method(s) and the laboratory-specific SOPs are available for all personnel on-site

4.- The data associated with the demonstration capability are true, accurate, complete and self-explanatory (*)

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 assessors

Technical Director's Name and Signature _____ Date _____

QA Officer's Name and Signature _____ Date _____

Notes: The demonstration of Capability is performed as per Section 12.5 of Quality Assurance Manual

*: True: Consistent with supporting data; Accurate: Based on good laboratory practices consistent with sound scientific principles/practices; Complete: Includes results of all supporting performance testing; Self-Explanatory: Data properly labeled and stored so that the results are clear and require no additional explanation.

APPENDIX 10
Corrective Action Report

QUALITY ASSURANCE
CORRECTIVE ACTION REPORT

Date: _____ Name of Analyst: _____

Sample ID Number(s) Involved: _____

Corrective action to be implemented (1):

Were samples reanalyzed and acceptable QC obtained: **YES - NO**
Were samples reported with qualifiers: **YES - NO**

Approval of corrective action by Technical Director:

Signed: _____ Date: _____
Technical Director
Comments by TD:

Verification of Implementation of corrective action by QA Officer:

Signed: _____ Date: _____
QA Officer
Comments by QA Officer:

---

(1): Describe whether the samples were reanalyzed and/or reported with qualifiers, steps taken to investigate the problem, probable cause of problem and how to prevent from happening again.

APPENDIX 10
Corrective Action Report

QUALITY ASSURANCE
CORRECTIVE ACTION REPORT

Date: _____ Name of Analyst: _____

Sample ID Number(s) Involved: _____

Corrective action to be implemented (1):

Were samples reanalyzed and acceptable QC obtained: **YES - NO**
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Approval of corrective action by Technical Director:

Signed: _____ Date: _____
Technical Director
Comments by TD:

Verification of Implementation of corrective action by QA Officer:

Signed: _____ Date: _____
QA Officer
Comments by QA Officer:

---

(1): Describe whether the samples were reanalyzed and/or reported with qualifiers, steps taken to investigate the problem, probable cause of problem and how to prevent from happening again.

APPENDIX 11

Laboratory Accreditations

- NELAC #04229CA
- State of California ELAP #1132
- USEPA UCMR 2 certification
- State of Nevada Division of Environmental Protection Certificate No. CA211-2004-41
- State of Hawaii
- State of Tennessee, certificate # 04015
- Los Angeles County Sanitation Districts Industrial Wastewater Testing Number 10143
- South Coast Air Quality Management District Ambient air testing Certificate number 93LA107

APPENDIX 12
Flags used for Data Qualifiers

Qualifier code	Description
<	<
>	>
> 1%	> 1 %
>1000	> 1000
>1500	>/= 1500
>2.78	> 2.78
_<2.7	< 2.78
_<fis	< 0.588
_<FL	No free liquids
_<FP	< 65
_>23	>/= 23
_>230	>/= 230
_>FB	> 750
_>fis	> 750
_>FL	Contains free liquids
_>FP	> 200
_0.00	0.000
_1600	>/= 1600
_16so	>/= 16000
_5700	>/= 5700
_A	Absent
_C	Canceled
_Cl	COD result is analyzed with chloride correction.
_ext	Extracted
_F-01	No fumes or gases but a mild odor detected.
_F-NR	No reaction
_FP70	< 70
_hold	Hold
_nd	None Detected
_P	Present
_pH<2	<2
_seeA	See Attached
_V	Grey
_V1	Brown
_Vis	None Visible
_Vis<	Visible < 1% vol
0	0 % Survival
01	-0.087
02	-0.143
03	-0.045
04	-0.069
100	100 % Survival
48.4	48.4 J
57000	>/= 57000
95	95 % Survival
A-01	[Custom Value]
A-02	[Custom Value]
ABHRP	The sample was treated with Silver, Barium, H+, and Organics cartridges to minimize chloride, sulfates, and organic interferences prior to analysis.

Qualifier code	Description
AgBaH	The sample was treated with Silver, Barium and H+ cartridges to minimize chloride and sulfates interferences prior to analysis.
AgH	The sample was treated with silver and H+ cartridges to minimize chloride interferences prior to analysis.
AS-1	None Detected
AS-2	Chrysotile greater than 1 %
B	Analyte is found in the associated blank as well as in the sample (CLP B-flag).
B-01	The sample dilutions set-up for the BOD analysis did not meet the oxygen depletion criteria of at least 2 mg/l dissolved oxygen depletion. Therefore the reported result is an estimated value only.
B-02	The sample dilutions set up for the BOD analysis failed to meet the criteria of residual dissolved oxygen of at least 1 mg/l. Therefore the reported result is an estimated value only.
B-03	Analyte is found in the travel blank as well as in the sample. The cause of the contamination was found to be a bad batch of VOA vials containing HCL as preservative.
B-04	Analyte was found in the travel blank, which was possibly contaminated in the lab during preparation. The batch was accepted since this analyte was not detected for all the samples in the batch.
B-05	Contamination in blank is carryover from previous sample analyzed in same purge vessel. This contamination is not present in purge vessels that the associated samples were purged in.
B-06	Analyte is found in the method blank, which was possibly contaminated during sample preparation. The batch was accepted since this analyte was not detected or 10x of the blank for samples in the batch.
B-07	Analyte is found in the method blank at levels above the MDL but below the reporting limit.
BaH	The sample was treated with Ba and H cartridges to reduce sulfates background interferences.
BR	Analyte was found in the method blank, which was possibly contaminated in the lab during preparation. The reporting limit was raised to account for the contamination.
BS-01	The recovery of this BS was over the control limit. Batch was accepted based on another acceptable BS and RPD.
BS-H	The recovery of this analyte in LCS was over control limit. Sample result is suspect.
C-01	To reduce matrix interference, the sample extract has undergone sulfuric acid clean-up, method 3665, which is specific to hydrocarbon contamination.
C-03	To reduce matrix interference, the sample extract has undergone silica-gel clean-up, method 3630, which is specific to polar compound contamination.
C-04	To reduce matrix interference, the sample extract has undergone florisil clean-up, method 3620, which is specific to non-polar compound contamination.
C-05	To reduce matrix interference, the sample extract has undergone GPC clean-up, method 3640, which is specific to contamination from high molecular weight material.
CN-1	See case narrative for an explanation of results.
CN-2	See Case Narrative
CV-SL	The surrogate was low bias in CCV. Sample result was justified valid since all target analytes in CCV were acceptable.
D-01	This sample appears to contain volatile range organics.
D-02	Hydrocarbon pattern present in the requested fuel quantitation range but does not resemble the pattern of the requested fuel.

Qualifier code	Description
D-03	The result for this hydrocarbon is elevated due to the presence of single analyte peak(s) in the quantitation range.
D-04	The hydrocarbons present are a complex mixture of diesel range and heavy oil range organics.
D-06	The sample chromatographic pattern does not resemble the fuel standard used for quantitation.
D-08	Results in the diesel organics range are primarily due to overlap from a gasoline range product.
D-09	Results in the diesel organics range are primarily due to overlap from a heavy oil range product.
D-10	The heavy oil range organics present are due to hydrocarbons eluting primarily in the diesel range.
D-12	Results in the Gasoline Range are primarily due to overlap from a heavier fuel hydrocarbon product.
D-13	Low boiling point fuel hydrocarbons are present below the requested fuel quantitation range.
D-14	Unidentified Hydrocarbons < C17.
D-15	Diesel
D-16	Gasoline
D-17	Diesel + unidentified hydrocarbons.
D-20	Unidentified Hydrocarbons > C9.
D-25	The hydrocarbon resembles weathered diesel.
D-30	Unidentified hydrocarbons C9-C16.
D-35	Sample does not display a fuel pattern. Sample contains several discreet peaks.
DryWt	The result is in dry weight basis.
E	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).
E-01	The concentration indicated for this analyte is an estimated value above the calibration range.
FILT	The sample was filtered prior to analysis.
FRE-P	Free product was observed in the sample container.
G-04	This sample contains compounds not identified as Benzene, Toluene, Ethylbenzene or Xylene.
GC-05	Results confirmed by GCMS.
GC-10	An unknown compound is coeluting with MTBE. This is Probably causing an artificially high MTBE value.
GC-15	Unidentified Hydrocarbons C6 - C12.
GC-20	An unknown compound is coeluting with naphthalene. Probably causing an artificially high naphthalene value.
GC-25	Weathered gasoline.
GC-30	MTBE did not confirm via GCMS on a sample from this site. Thus, MTBE for this sample was reported as non-detect.
GC-40	Naphthalene analyzed by GCMS - method 8260B.
GC-NC	8260 confirmation analysis was performed; initial GC results were not supported by GC/MS analysis and are reported as ND.
HDSP1	Sample aliquot taken from VOA vial with headspace (air bubble greater than 6 mm diameter).

Qualifier code	Description
HDSP2	Sample received in container other than VOA with headspace. Transferred at lab to VOA vial.
I-01	Due to matrix interference, the sample cannot be accurately quantified. The reported result is qualitative.
I-02	This result was analyzed outside of the EPA recommended holding time.
I-03	Low internal standard recovery possibly due to matrix interference or leak in system. The result is suspect.
I-04	No internal standard recovery
I-05	Low internal standard recovery possibly due to matrix interference. The result is suspect.
I-06	Contaminated IS spiking solution
I-07	High internal standard recovery possibly due to matrix interference.
J	Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
J-01	No J value detected.
L-01	The recovery of this analyte in LCS was below control limit. Sample result is suspect.
L-02	The recovery of this analyte in LCS was outside control limits. Sample was accepted based on the remaining LCS, MS and MSD results.
L-03	The recovery of this analyte in LCS or LCSD was outside control limit. Sample was accepted based on the remaining LCS, LCSD or LCS-LL.
L-04	The recovery of this analyte in QC sample was outside control limits. Sample was justified as ND based on the low level standard at or below the reporting limit.
M	Sample result is matrix suspect.
M-01	Result is not valid due to high sample background
M-02	Due to the nature of matrix interferences, sample was diluted prior to extraction. The reporting limits were raised due to the dilution.
M-03	Due to insufficient sample volume, sample was diluted prior to extraction. The reporting limits were raised due to the dilution.
M-04	Due to the nature of matrix interferences, sample extract was diluted prior to analysis. The reporting limits were raised due to the dilution.
M-05	Due to the nature of matrix interferences, sample was diluted prior to analysis. The reporting limits were raised due to the dilution.
M-06	Due to the high concentration of analyte in the sample, sample extract was diluted prior to analysis. The reporting limit was raised due to this dilution.
M-07	Due to high concentration of solid particles in the sample, a smaller volume was used for analysis. The reporting limit was raised due to this dilution.
M-08	Due to insufficient sample volume, sample was diluted prior to analysis of pH.
MIC-1	All presumptive fermentation tubes did not show any amount of gas, growth or acidity. Therefore, the fecal coliform procedure was not needed.
MIC-2	Result is suspect due to QC failure.
MSA	This result was determined by method of standard addition.
ns	No sample received
O-01	This compound is a common laboratory contaminant.
O-02	Due to matrix interference, the sample cannot be accurately quantitated. The reported result is qualitative.
O-03	The concentration reported is an estimated value above the linear quantitation range. Dilution and reanalysis is being performed and an amended report will follow.
O-04	This sample was analyzed outside the EPA recommended holding time.

Qualifier code	Description
O-05	This sample was extracted outside of the EPA recommended holding time.
O-06	Reanalysis by an alternate column or method has confirmed the identification and/or concentration of this result.
O-07	Sample date and/or time was not provided by client. Therefore, defaulted date and/or time have been entered. The analysis may be outside of recommended holding time.
O-08	The original extraction of this sample yielded QC recoveries outside acceptance criteria. It was re-extracted after the recommended maximum hold time.
O-09	This sample was received with the EPA recommended holding time expired.
O-10	The original analysis of this sample yielded QC recoveries outside acceptance criteria. It was re-analyzed after the recommended maximum hold time.
O-11	The sample was originally analyzed within holding time. However, it was reanalyzed with dilution that exceeded the recommended holding time.
O-12	The sample was originally analyzed within holding time. However, it was reanalyzed without dilution that exceeded the recommended holding time.
O-13	The original analysis of this sample yielded IPC or Calibration Blank recoveries outside acceptance criteria. It was re-analyzed after the recommended maximum hold time.
O-14	This analysis was requested by the client after the holding time was exceeded.
O-21	This sample was analyzed that exceeded 1 hours past the EPA recommended holding time.
O-22	This sample was analyzed that exceeded 2 hours past the EPA recommended holding time.
O-23	This sample was analyzed with the recommended holding time exceeding 3 hours.
O-24	This sample was analyzed that exceeded 4 hours past the EPA recommended holding time.
P-01	Low recovery due to preservative. Sample data accepted based on passing LCS result.
P-5	Due to the nature of the sample matrix a 1:10 dilution was necessary to perform a corrosivity measurement.
PH	Insufficient preservative to reduce the sample pH to less than 2. Sample was analyzed within 14 days of sampling, but beyond the 7 days recommended for Benzene, Toluene, and Ethylbenzene.
pH-01	Due to insufficient amount of sample, the ratio of the water extraction has to increase to 2X.
PRELM	Preliminary result. Revised report to follow.
PS-1	The recovery of the matrix spike is outside acceptance limits due to present of the inhibiting agents. Only diluted post spike can be recovered.
Q-08	This analyte has high bias in the QC sample, but not found in the samples.
Q-09	This analyte bias high in QC sample. A fresh spiking solution is going to be prepared.
Q-10	This analyte bias high in QC sample
Q-11	This analyte is low in QC sample. A fresh spiking solution is going to be prepared.
Q8141	Demeton-O and -S were spiked in QC samples, recovery for total Demeton is acceptable
QB-01	The method blank contains analyte at a concentration above the MRL; however, concentration is less than 10% of the sample result, which is negligible according to method criteria.

Qualifier code	Description
QC-5	Sample was originally analyzed within hold time. However, it was determined that positive interference was contributing to the sample result. So the sample was reanalyzed at a dilution to eliminate the interference.
QC-6	Sample was originally analyzed within hold time. However, the CCV corresponding to this sample was invalid and the sample was re-analyzed at a later time.
QI-01	Internal standards for this sample were out of control during the initial analysis performed within hold time. Immediate re-analysis (outside of recommended hold time) has confirmed the original result.
QL-01	Sample results for the QC batch were accepted based on LCS/LCSD percent recoveries and RPD values.
QL-02	Low recovery of this analyte in the qc sample. Sample data was confirmed ND based on reporting level standard.
QM-01	The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.
QM-02	The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample.
QM-03	Multiple analyses indicate the percent recovery exceeds the Quality Control acceptance criteria due to a matrix effect.
QM-04	Visual evaluation of the sample indicates the RPD or QC spike is above the control limit due to a non-homogeneous sample matrix.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to possible matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-06	Due to noted non-homogeneity of the QC sample matrix, the MS/MSD did not provide reliable results for accuracy and precision. Sample results for the QC batch were accepted based on LCS/LCSD percent recoveries and RPD values.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
QM-08	Due to the nature of matrix interferences, sample was diluted prior to analysis. The MS/MSD could not be quantitated due to the dilution. The batch was accepted based on acceptable LCS recovery.
QM-09	The recoveries of MS/MSD are not valid due to high sample background
QM-10	LCS/LCSD were analyzed in place of MS/MSD.
QM-11	
QM-12	Spiked with pesticides
QM-13	The spike recovery was outside acceptance limits for the MS and/or MSD, and/or LCS. The batch was accepted based on acceptable ICV and CCV recovery where re-analysis is prohibited.
QM-14	QC limits are not applicable for the MS/MSD due to positive present of target analyte in the matrix sample.
RxS	This sample does not contain levels of reactive sulfide that are characteristic of a reactive waste as defined by 40CFR 261.23. Concentration is below 500 ppm.
S-01	The surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interference's.
S-02	The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample extract.
S-03	High surrogate recovery for this sample is possibly due to a sample matrix effect. The data was accepted since all target analytes were not detected.

Qualifier code	Description
S-04	The surrogate recovery for this sample is outside of established control limits due to possible sample matrix effect.
S-06	The recovery of this surrogate is outside control limits due to sample dilution required from high analyte concentration and/or matrix interference's.
S-07	High surrogate recovery for this sample is possibly due to sample matrix effect. The sample was re-extracted and re-analyzed, and the results were comparable with the original one.
S-08	No surrogate recovery, possibly surrogate spiking was missed.
S-09	Wrong amount spiked, quantification is not accurate
S-10	Surrogate recovery outside method QC limits due to extraction related problems
S-11	No analyte recovery, possibly analyte spiking was missed.
S-AC	Acid surrogate recovery outside of control limits. The data was accepted based on valid recovery of remaining two acid surrogates.
S-BLK	Surrogate recovery outside of control limits. The data was accepted since all target analytes were not detected
S-BN	Base/Neutral surrogate recovery outside of control limits. The data was accepted based on valid recovery of remaining two base/neutral surrogates.
W-04	Free liquid was visually observed in the sample container but the sample did not exhibit free liquid as defined by 40CFR 264.314 or 265.314.
X-01	The recovery was outside acceptance limits due to extraction problems
QM-4X	The spike recovery was outside of QC acceptance limits for the MS and/or MSD due to analyte concentration at 4 times or greater the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.
QM-BG	The spike recovery was outside of QC acceptance limits for the MS and/or MSD due to sample background. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.
QR-01	Analyses are not controlled on RPD values from sample concentrations less than 10 times the reporting limit. QC batch accepted based on LCS and/or LCSD QC results.
QR-02	The RPD result exceeded the QC control limits; however, both percent recoveries were acceptable. Sample results for the QC batch were accepted based on percent recoveries and completeness of QC data.
QR-03	The RPD value for the sample duplicate or MS/MSD was outside of QC acceptance limits due to matrix interference. QC batch accepted based on LCS and/or LCSD recovery and/or RPD values.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
R-02	Elevated Reporting Limits due to limited sample volume.
R-03	The Reporting Limit for this analyte has been raised to account for interference from coeluting organic compounds present in the sample.
R-04	Due to foaming, the sample was diluted prior to analysis. The reporting limits were raised due to the dilution.
R-05	The sample was diluted due to the presence of high levels of non-target analytes resulting in elevated reporting limits.
ra228	-0.0115
RxCN	This sample does not contain levels of reactive cyanide that are characteristic of a reactive waste as defined by 40CFR 261.23. Concentration is below 250 ppm.

Qualifier code	Description
S-BS	Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the target analytes.
S-DUP	Duplicate analysis confirmed surrogate failure due to matrix effects.
S-GC	Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the remaining surrogate.
S-HI	High surrogate recovery was confirmed as a matrix effect by a second analysis.
S-LIM	Surrogate recoveries outside method QC limits. Site matrix effects verified by 10% duplicate analysis (including sample duplicate and MS/MSD analysis).
S-LOW	Low surrogate recovery confirmed as a matrix effect by a second analysis.
S-MS	Surrogate recovery outside of acceptance window confirmed as matrix effect by analysis of MS/MSD on this sample.
S-MS1	Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the target analytes.
S_EMS	Analysis subcontracted to EMS Laboratories, ELAP Certificate 1119
S_FGL	Analysis subcontracted to FGL Laboratories, NELAC Certificate 0110CA
S_PAR	Analysis subcontracted to Paradigm Analytical, ELAP Certificate 2451.
TIC	Tentatively Identified Compound. The reported concentration is relative concentration based on the nearest internal standard. If the library search produces no matches at, or above 85%, the compound is reported as unknown.
TOX-1	second column has more than 10% of first column
TR-1	The sample was treated with Ba and RP cartridges to reduce background interference.
U-01	The sample was received without the proper preservation.
U-02	The sample was received at the lab without proper preservation. However, the sample was then preserved at the lab.
W-01	No determinable quantities of cyanide amenable to chlorination.

Cover Page:

Quality Assurance Manual

TestAmerica Irvine
17461 Derian Avenue, Suite 100
Irvine, CA 92614
Tel 949-261-1022
Fax 949-260-3299

www.testamericainc.com

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Approval Signatures

Laboratory Director – Fred Haley	Date 1/30/08
Quality Manager - David Dawes	Date 1/30/08
Technical Director, **Semivolatiles** – Gerardo Muñoz	Date 1/30/08
Technical Director, **Volatiles** – Valerie Sierzchula	Date 1/30/08
Technical Director, **Metals** – Denny Tran	Date 1/30/08
Technical Director, **Wet Chemistry** – Tung Nguyen	Date 1/30/8
Technical Director, **Inorganic Prep** – Jim Blustein	Date 1/30/08
Technical Director, **Organic Prep** – Michelle Castro	Date 1/30/08

SECTION 2

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SOPs AND POLICIES REFERRED TO IN THE QA MANUAL

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-003	Management of Change Procedure
CA-Q-S-004	Method Compliance & Data Authenticity Audits
CA-Q-S-005	Calibration Curves (General)
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-L-P-001	Record Retention
CW-F-P-002	Authorization Matrix
CA-C-S-001	Work Sharing Process
CA-T-P-001	Qualified Products List
CW-F-S-004	Controlled Purchases Policy
IR-QA-DOC	Document Control and Review
CNTRLLIM.SOP	Control Charts and Statistical Process Control
LOTTEST.SOP	Container and Reagent Verification by Lot Testing
CAR.SOP	Corrective Actions
TRAINING.SOP	Training and Documentation

SOP/Policy Reference	Title
MDL.SOP	Determination of Method Detection Limits
LOGIN.SOP	Sample Control
DATAREV.SOP	General Data Review
PMDATA.SOP	Project Management Data Reporting, Validation and Distribution
BAL.SOP	Balance Calibration, Verification and Documentation
THERMA.SOP	Thermometer Calibration/Temperature Monitoring and Documentation
IR-QA-STD	Reagent and Standard Preparation, Control, and Documentation
FIELD.SOP	Field Sampling
LOTTEST.SOP	Container and Reagent Verification by Lot Testing
SUBSAMP.SOP	Subsampling
REFBLANK.SOP	Refrigerator Storage Blank
COMPSECU.SOP	Computer Secuirty
PIP.SOP	Pipet Calibration
ARCHIV.SOP	Record Archiving

SECTION 3

INTRODUCTION
(NELAC 5.1 - 5.3)

3.1 INTRODUCTION AND COMPLIANCE REFERENCES

Test America Irvine'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. Each TestAmerica 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 the various accreditation and certification programs listed in Appendix 6. The relevant NELAC section is included in the heading of each QAM section.

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; and Update III, December 1996.
- Federal Register, 40 CFR Parts 136, 141, 172, 173, 178, 179 and 261.
- APHA, *Standard Methods for the Examination of Water and Wastewater,* 18th Edition, 19th, 20th and 21st Edition.

3.2 TERMS AND DEFINITIONS

A Quality Assurance Program is a company-wide system designed to ensure that data produced by TestAmerica Irvine 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 5 for the Glossary/Acronyms.

3.3 SCOPE / FIELDS OF TESTING

TestAmerica Irvine analyzes thousands 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 water, air, industrial waste, and soil 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 TestAmerica Irvine 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

The manual is reviewed annually by the QA Manager and laboratory personnel to assure that it reflects current practices and meets the requirements of TestAmerica Irvine's clients and regulators. 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. The updates will be reviewed by the QA Manager, Laboratory Director, Technical Director(s), relevant operational staff and Corporate Quality Assurance (if a change is made to the Corporate template) and then formally incorporated into the document in periodic updates. The QAM is based on a Corporate QAM Template that is prepared and approved by the Chief Operating Officers (COOs) and Corporate Quality Assurance. This template is reviewed annually by the COOs, Corporate Quality, and each laboratory. Necessary changes are coordinated by the Vice President of Quality and Environmental Health & Safety (EHS) and distributed to each laboratory for inclusion in the laboratory specific QA Manuals.

Policies in the QAM that require immediate attention may be addressed through the use of Corporate QA/QC Policy Memoranda. QA/QC Policy Memoranda are published from time to time to facilitate immediate changes to QA/QC Policy. QA/QC Policy Memoranda supersede the QAM and all other SOPs (refer to Section 5.3). All policy memoranda are dated, archived and distributed by their placement into the front of the QAM between the signature page and Section 2. At a minimum, each policy memorandum is approved by the same authorized signatories as shown on the cover page of the QA Manual. In addition, Corporate QA/QC Policy Memoranda are signed by the COOs and VP of Quality and EHS. The QA/QC Policy Memoranda are incorporated into the QAM during the periodic updates. Policy memorandum

may also include an expiration date if appropriate. An example format can be found in Figure 3-1. A similar procedure is followed for local laboratory changes.

Laboratory-specific QAM changes are approved and documented through the Management of Change process (Refer to SOP No. CA-Q-S-003, Management of Change Procedure).

3.4.2 Control

This manual is considered confidential within TestAmerica and may not be altered in any manner by other than a duly appointed representative from TestAmerica. If the document has been provided to external users or regulators, it is for the exclusive purpose of reviewing TestAmerica Irvine's quality systems and shall not be used in any other way without the written permission of an appointed representative of TestAmerica. The procedure for control of distribution is incorporated by reference to the current revision of the laboratory's SOP, IR-QA-DOC (Document Control and Review).

The order of precedence in the event of a conflict between policies is outlined in Section 5.3 of this Quality Assurance Manual.

Figure 3-1.

Example - Format for a QA/QC Policy Memorandum

Corporate (or Laboratory) QA/QC Policy Memorandum # _____

Effective Date: _____ Expiration Date: When Appropriate QAM Section is Revised

Corporate: *(Only needed for Corporate Memorandum – Delete if Laboratory)*

_____		_____	
COO - West	Date	Vice-President, QA and EHS	Date
_____			
COO - East	Date		

Local:

_____		_____	
Laboratory Director Approval	Date	Quality Assurance Approval	Date
_____		_____	
Technical Director Approval	Date	Technical Director Approval	Date
_____		_____	
Technical Director Approval	Date	Technical Director Approval	Date
_____		_____	
Technical Director Approval	Date	Technical Director Approval	Date

1. **Purpose**

2. **Procedure**

3. **Attachments**

4. **References/Cross References**

SECTION 4

ORGANIZATION AND MANAGEMENT
(NELAC 5.4.1)

4.1 OVERVIEW

TestAmerica Irvine is part of a national network of laboratories known as TestAmerica. This Quality Assurance Manual (QAM) is applicable to the TestAmerica Irvine laboratory only.

TestAmerica Irvine
17461 Derian Avenue, Suite 100
Irvine, CA 92614
Tel 949-261-1022
Fax 949-260-3299
EPA Lab ID CA01531

The Corporate organization chart can be found in Figure 4-1 and the laboratory's organization chart can be found in Appendix 2. The locations of other TestAmerica labs are as follows:

Aerotech Environmental Laboratories (AEL)
TestAmerica Anchorage
TestAmerica Austin
TestAmerica Buffalo
TestAmerica Buffalo Grove
TestAmerica Burlington
TestAmerica Cedar Falls
TestAmerica Chicago
TestAmerica Connecticut
TestAmerica Corpus Christi
TestAmerica Dayton
TestAmerica Denver
TestAmerica Edison
TestAmerica Honolulu
TestAmerica Houston
TestAmerica King of Prussia
TestAmerica Knoxville
TestAmerica Los Angeles
TestAmerica Mobile
TestAmerica Morgan Hill
TestAmerica Nashville
TestAmerica North Canton
TestAmerica Ontario
TestAmerica Orlando
TestAmerica Pensacola
TestAmerica Phoenix
TestAmerica Pittsburgh
TestAmerica Portland
TestAmerica Richland

TestAmerica San Francisco
TestAmerica Savannah
TestAmerica Seattle
TestAmerica Spokane
TestAmerica St. Louis
TestAmerica Tacoma
TestAmerica Tallahassee
TestAmerica Tampa
TestAmerica Valparaiso
TestAmerica Watertown
TestAmerica West Sacramento
TestAmerica Westfield

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 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 TestAmerica Irvine. All employees have access to the QAM and are responsible for knowing the content of this manual and 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.

4.2.2 President/Chief Executive Officer (CEO)

The President/CEO is a member of the Board of Directors and is ultimately responsible for the quality and performance of all TestAmerica facilities. The President/CEO establishes the overall quality standard and data integrity program for the Analytical Division, providing the necessary leadership and resources to assure that the standard and integrity program are met.

4.2.3 Chief Operating Officer (COO)

The COO serves as the ranking executive for all respective analytical laboratory operational functions and reports to the President/CEO of the Analytical Division. The COO is responsible for the daily management of all analytical laboratories, long-term planning and development of technical policies and management plans. The COO ensures the attainment of corporate objectives through the selection, development, motivation, and evaluation of top management personnel. The COO approves all operating budgets and capital expenditures. The COO signs-off on the final QAM template that contains company policies for implementing the Quality Program

4.2.4 General Manager (GM)

Each GM reports directly to the COO. Each GM has full responsibility for the overall administrative and operational management of their respective laboratories. The GM's responsibilities include allocation of personnel and resources, long-term planning, setting goals, and achieving the financial, business, and quality objectives of TestAmerica. The GM ensures timely compliance with corporate management directives, policies, and management systems reviews. The GM is also responsible for restricting any laboratory from performing analyses that cannot be consistently and successfully performed to meet the standards set forth in this manual.

4.2.5 Vice President of Client and Technical Services

The Vice President (VP) of Client and Technical Services reports directly to the President/CEO and is responsible for offerings to clients including quality assurance, environmental health and safety, risk management, technical assistance, legal compliance and contract administration. The VP of Client and Technical Services provides support and direction to the Executive Director and Directors of these areas, and supports the COO in decisions regarding long term planning, resource allocation and capital expenditures.

4.2.6 Executive Director of Quality and Environmental Health and Safety (QA/EHS)

The Executive Director of QA/EHS reports to the VP of Client and Technical Services. With the aid of the Senior Management Team, Laboratory Director/ Managers, Quality Directors, EHS Directors, QA Managers and EHS Coordinators, the Executive Director-QA/EHS has the responsibility for the establishment, general overview and Corporate maintenance of the Quality Assurance and Environmental, Health and Safety Program within TestAmerica. Additional responsibilities include:

- Review of QA/QC aspects of Corporate SOPs, national projects and expansions or changes in services.
- Coordination/preparation of the Corporate QAM Template that is used by each laboratory to prepare its own laboratory-specific QAM.
- Maintenance of Corporate Policies, Quality Memorandums and SOPs. Maintenance of data investigation records that are reported to Corporate Management.
- Working with various organizations outside of TestAmerica to further the development of quality standards and represent TestAmerica at various trade meetings.
- Preparation of a monthly report that includes quality metrics across the Analytical Division and a summary of any quality related initiatives and issues.
- With the assistance of the Corporate Senior Management Team and the EHS Directors, development and implementation of the TestAmerica Environmental, Health and Safety Program.

4.2.7 Quality Directors (Corporate)

The Quality Directors report to the Executive Director-QA/EHS. Together with the Executive Director-QA/EHS, the Quality Directors have the responsibility for the establishment, general

overview and maintenance of the Analytical Division's Quality Assurance Program within TestAmerica. The Quality Directors are responsible for:

- Oversight of the QA/QC programs within each laboratory. This includes a final review of each laboratory-specific QAM and receipt of each laboratory's QA monthly report.
- Working with management to develop a plan of correction when a laboratory's quality system is determined to be inadequate.
- Review of QA/QC aspects of national projects.
- Assistance with certification activities.
- Providing assistance as needed in the selection of Quality Assurance Managers and reviewing their effectiveness.

4.2.8 Ethics and Compliance Officers (ECOs)

TestAmerica has designated two senior members of the Corporate staff to fulfill the role of Ethics and Compliance Officer (ECO) – VP-Client and Technical Services and the Executive Director–QA/EHS. Each ECO acts as a back-up to the other ECO and both are involved when data investigations occur. Each ECO has a direct line of communication to the entire senior Corporate and lab management staff.

The ECOs ensure that the organization distributes the data integrity and ethical practices policies to all employees and ensures annual trainings and orientation of new hires to the ethics program and its policies. The ECO is responsible for establishing a mechanism to foster employee reporting of incidents of illegal, unethical, or improper practices in a safe and confidential environment.

The ECOs monitor and audit procedures to determine compliance with policies and to make recommendations for policy enhancements to the CEO, COO, Laboratory Director/Manager or other appropriate individuals within the laboratory. The ECO will assist the laboratory QA Manager in the coordination of internal auditing of ethical policy related activities and processes within the laboratory, in conjunction with the laboratories regular internal auditing function.

The ECOs will also participate in investigations of alleged violations of policies and work with the appropriate internal departments to investigate misconduct, remedy the situation, and prevent recurrence of any such activity.

4.2.9 Director of Technical Services

The Director of Technical Services is responsible for establishing, implementing and communicating TestAmerica's Technical Policies, SOPs, and Manuals. Other responsibilities include conducting technical assessments as required, acting as a technical resource in national contracts review, coordinating new technologies, establishing best practices, advising staff on technology advances, innovations, and applications.

4.2.10 Chief Information Officer (CIO)

The CIO is responsible for establishing, implementing and communicating TestAmerica's Information Technology (IT) Policies, SOPs and Manuals. Other responsibilities include coordinating new technologies, development of electronic communication tools such as TestAmerica's intranet and internet sites, ensuring data security and documentation of software, ensuring compliance with the NELAC standard, and assistance in establishing, updating, and maintaining Laboratory Information Management Systems (LIMS) at the various TestAmerica facilities.

4.2.11 Environmental Health and Safety Directors (EHSDs) (Corporate)

The EHSDs report directly to the Executive Director-QA/EHS. The EHSDs are responsible for the development and implementation of the TestAmerica Environmental, Health and Safety program. Responsibilities include:

- Consolidation and tracking all safety and health-related information and reports for the company, and managing compliance activities for TestAmerica locations.
- Coordination/preparation of the corporate Environmental, Health and Safety Manual Template that is used by each laboratory to prepare its own laboratory-specific Safety Manual/CHP.
- Development and execution of the company Environmental Health and Safety Internal Audit program.
- Preparation of information and training materials for laboratory EHS Coordinators.
- Assistance in the internal and external coordination of employee exposure and medical monitoring programs to insure compliance with applicable safety and health regulations.
- Serving as Department of Transportation (D.O.T.) focal point and providing technical assistance to location management.
- Serving as Hazardous Waste Management main contact and providing technical assistance to location management.

4.2.6 Laboratory Director

TestAmerica Irvine'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.

Specific responsibilities include, but are not limited to:

- Provides one or more technical directors for the appropriate fields of testing. The name(s) of the Technical Director will be included in the national database. If the Technical Director is absent for a period of time exceeding 15 consecutive calendar days, the Laboratory Director must designate another full time staff member meeting the qualifications of the Technical Director to temporarily perform this function. If the absence exceeds 65 consecutive calendar days, the primary accrediting authority must be notified in writing.

- Ensures that all analysts and supervisors have the appropriate education and training to properly carry out the duties assigned to them and ensures that this training has been documented.
- Ensures that personnel are free from any commercial, financial and other undue pressures which might adversely affect the quality of their work.
- Ensures TestAmerica's human resource policies are adhered to and maintained.
- Ensures that sufficient numbers of qualified personnel are employed to supervise and perform the work of the laboratory.
- Ensures that appropriate corrective actions are taken to address analyses identified as requiring such actions by internal and external performance or procedural audits. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs may be temporarily suspended by the Laboratory Director.
- Reviews and approves all SOPs prior to their implementation and ensures all approved SOPs are implemented and adhered to.
- Pursues and maintains appropriate laboratory certification and contract approvals. Supports ISO 17025 requirements.
- Ensures client specific reporting and quality control requirements are met.
- Captains the management team, consisting of the QA Manager, the Technical Director(s), and the Operations Manager as direct reports.

4.2.7 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 officers to accomplish specific responsibilities, which include, but are not limited to:

- Having functions independent from laboratory operations for which he/she has quality assurance oversight.
- Maintaining and updating the QAM.
- Monitoring and evaluating laboratory certifications; scheduling proficiency testing samples.
- Monitoring and communicating regulatory changes that may affect the laboratory to management.
- Training and advising the laboratory staff on quality assurance/quality control procedures that are pertinent to their daily activities.
- Having a general knowledge of the analytical test methods for which data audit/review is performed (and/or having the means of getting this information when needed).
- Arranging for or conducting internal audits on quality systems and the technical operation.

- The laboratory QA Manager will maintain records of all ethics-related training, including the type and proof of attendance.
- Maintain, improve, and evaluate the corrective action database and the corrective and preventive action systems.
- Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs are temporarily suspended following the procedures outlined in Section 13.
- Monitoring standards of performance in quality control and quality assurance.
- Coordinating of document control of SOPs, MDLs, control limits, and miscellaneous forms and information.
- Review a percentage of all final data reports for internal consistency. Review of Chain of Custody (COC), correspondence with the analytical request, batch QC status, completeness of any corrective action statements, 5% of calculations, format, holding time, sensibility and completeness of the project file contents.
- Review of external audit reports and data validation requests.
- Follow-up with audits to ensure client QAPP requirements are met.
- Establishment of reporting schedule and preparation of various quality reports for the Laboratory Director, clients and/or Corporate QA.
- Development of suggestions and recommendations to improve quality systems.
- Research of current state and federal requirements and guidelines.
- Captains the QA team to enable communication and to distribute duties and responsibilities.

4.2.8 Technical Director/Department Manager

Department Managers are also designated as Technical Directors provided they meet the requirements specified in section 4.1.1.1 of the NELAC Standard. The Technical Director(s) report(s) directly to the Laboratory Director. He/she is accountable for all analyses and analysts with respect to ISO 17025. The scope of responsibility ranges from the new-hire process and existing technology through the ongoing training and development programs for existing analysts and second- and third-generation instrumentation. Specific responsibilities include, but are not limited to:

- Coordinating, writing, and reviewing preparation of all test methods, i. e., SOPs, with regard to quality, integrity, regulatory and optimum and efficient production techniques, and subsequent analyst training and interpretation of the SOPs for implementation and unusual project samples. He/she insures that the SOPs are properly managed and adhered to at the bench. He/she develops standard costing of SOPs to include supplies, labor, overhead, and capacity (design vs. demonstrated versus first-run yield) utilization.
- Reviewing and approving, with input from the QA Manager, proposals from marketing, in accordance with an established procedure for the review of requests and contracts. This procedure addresses the adequate definition of methods to be used for analysis and any limitations, the laboratory's capability and resources, the client's expectations. Differences are resolved before the contract is signed and work begins. A system documenting any

significant changes is maintained, as well as pertinent discussions with the client regarding their requirements or the results of the analyses during the performance of the contract. All work subcontracted by the laboratory must be approved by the client. Any deviations from the contract must be disclosed to the client. Once the work has begun, any amendments to the contract must be discussed with the client and so documented.

- Monitoring the validity of the analyses performed and data generated in the laboratory. This activity begins with reviewing and supporting all new business contracts, insuring data quality, analyzing internal and external non-conformances to identify root cause issues and implementing the resulting corrective and preventive actions, facilitating the data review process (training, development, and accountability at the bench), and providing technical and troubleshooting expertise on routine and unusual or complex problems.
- Providing training and development programs to applicable laboratory staff as new hires and, subsequently, on a scheduled basis. Training includes instruction on calculations, instrumentation management to include troubleshooting and preventive maintenance.
- Enhancing efficiency and improving quality through technical advances and improved LIMS utilization. Capital forecasting and instrument life cycle planning for second generation methods and instruments as well as asset inventory management.
- Coordinating sample management from “cradle to grave,” insuring that no time is lost in locating samples.
- Scheduling all QA/QC-related requirements for compliance, e.g., MDLs, etc.
- Captains department supervisors to communicate quality, technical, personnel, and instrumental issues for a consistent team approach.
- Coordinates audit responses with supervisors and QA Manager.

4.2.9 LIMS Administrator

The LIMS Administrator reports directly to the Laboratory Director. In the pursuit of his/her duties, he/she:

- Establishes and maintains the laboratory information system (LIMS) for tracking all samples in the laboratory.
- Updates and enhances LIMS.
- Develops expertise in the requirements described in Good Automated Laboratory Practices (GALP)-EPA 2185, 1995 Edition, in order to ensure compliance.
- Programs and tests software modifications/changes.
- Coordinates testing to ensure that all LIMS software accurately performs its intended functions. Testing is performed and documented after installation or when modifications/ changes are made.
- Maintains historical files of software, software operating procedures (manuals), software changes/modifications (Change Log) and software version numbers.
- Maintains log of repairs and service performed on LIMS hardware.
- Develops and verifies security practices to assure the integrity of LIMS data. Identifies threats, potential threats, and future threats.

- Maintains awareness of any environmental conditions of the facility housing the LIMS that may compromise LIMS raw data and informs management.
- LIMS database back-up once daily.

4.2.10 Operations Manager

The Operations Manager manages and directs the analytical production sections of the laboratory. He/She reports directly to the Laboratory Director. He/She assists the Technical Director in determining the most efficient instrument utilization. More specifically, he/she:

- Evaluates the level of internal/external non-conformances for all departments.
- Continuously evaluates production capacity and improves capacity utilization.
- Continuously evaluates turnaround time and addresses any problems that may hinder meeting the required and committed turnaround time from the various departments.
- Develops and improves the training of all analysts in cooperation with the Technical Director/QA Manager/Training Coordinator and in compliance with regulatory requirements.
- Is responsible for efficient utilization of supplies.
- Constantly monitors and modifies the processing of samples through the departments.

4.2.11 Client Services Manager

The Client Services Manager reports to the Laboratory Director and serves as the interface between the laboratory's technical departments and the laboratory's clients. The staff consists of the Project Management team. With the overall goal of total client satisfaction, the functions of this position are outlined below:

- Technical training and growth of the Project Management team.
- Technical liaison for the Project Management team.
- Human resource management of the Project Management team.
- Responsible to ensure that clients receive the proper sampling supplies.
- Accountable for response to client inquiries concerning sample status.
- Responsible for assistance to clients regarding the resolution of problems concerning COC.
- Ensuring that client specifications, when known, are met by communicating project and quality assurance requirements to the laboratory.
- Notifying the supervisors of incoming projects and sample delivery schedules.
- Accountable to clients for communicating sample progress in daily status meeting with agreed-upon due dates.
- Responsible for discussing with client any project-related problems, resolving service issues, and coordinating technical details with the laboratory staff.
- Responsible for staff familiarization with specific quotes, sample log-in review, and final report completeness.

- Monitor the status of all data package projects in-house to ensure timely and accurate delivery of reports.
- Inform clients of data package-related problems and resolve service issues.
- Coordinate requests for sample containers and other services (data packages).

4.2.12 Technical Manager

The Technical Manager is responsible for the development and implementation of new methods, maintenance and repair of all instruments and equipment, troubleshooting, the acquisition of new instruments, training new personnel and cross-training current employees to operate in other departments. The Technical Manager works closely with the Quality Assurance Director to ensure proper calibration and operation of all analytical equipment and directly with the Systems Administrator to help implement new computer analytical programs, maintain current system, and develop ideas for future improvements.

4.2.13 Project Manager

Project Managers are responsible for thoroughly coordinating client projects, maintaining clients' satisfaction and reviewing laboratory reports. All project status and technical questions generated by the client are directed to the Project Manager. Project Managers are responsible for reviewing potential work and incoming work with laboratory supervisors at daily operations meetings. The review is to ensure the lab has appropriate facilities and resources to perform the work and to disseminate client specific information.

4.2.14 Project Manager Assistant

The Project Manager (PM) Assistant provides clerical support to the project management staff in order to allow them to focus on client service and report review. The PM assistant performs faxing duties, prepares and sends electronic data deliverables (EDD) to clients, generates historical data as a cross reference for the laboratory, retrieves laboratory data, and tracks project reports

4.2.15 Sample Control Manager

The Sample Control Manager reports to the Laboratory Director. The responsibilities are outlined below:

- Direct the logging of incoming samples into the LIMS.
- Ensure the verification of data entry from login.
- Schedule and oversee all sample courier operations.
- Schedule and oversee all field sampling operations.
- Oversee the processing of bottle orders.
- Acts as a liason between the Project Managers and Analysts with respect to handling rush orders and resolving discrepancies with chain-of-custody forms and the routing of subcontracted analyses

4.2.16 Quality Assurance Scientist

The Quality Assurance (QA) Scientist performs several roles. The QA Scientist reports to the facility QA Manager and reviews data deliverable packages to ensure completeness and accuracy. As a statistician, the QA Scientist generates and reviews, in conjunction with the Quality Assurance Manager, Control Charts and Method Detection Limit (MDL) studies. The QA Scientist assists the QA Manager and lab staff with internal audits, corrective action review and overall implementation of the QA program and fills in as the "deputy" for QA Manager in their absence.

4.2.17 Training Coordinator

The Training Coordinator reports directly to the QA Manager. This person's role is to oversee the entire regime of training in the laboratory and ensure that adequate procedures and documentation are in place to maintain a high and consistent laboratory performance. Duties are outlined below:

- Ensure both initial and on-going demonstrations of capability are performed and are current.
- Maintain all course and individual training records in an organized and up-to-date manner.
- Assist QA Manager in maintaining current SOPs.
- Conduct all initial orientation training for new hires covering QA, Ethics, and Health & Safety.
- Utilize the General Processes Audit to reinforce laboratory basics with new employees after they have worked in the laboratory for a few months.
- Perform or coordinate audits of new employees to assess their training and performance.
- Research and develop a training system for ongoing training in the department and/or for individual analyses.
- Develop personnel through the use of specialized trainings by coordinating experts from within the company or outside venders to train on certain topics.
- Support laboratory personnel in special training needs that may arise.

4.2.18 Hazardous Waste Coordinator

The Hazardous Waste Coordinator reports directly to the Laboratory Director. The duties consist of:

- Staying current with the hazardous waste regulations.
- Continuing training on hazardous waste issues.
- Reviewing and updating annually the Hazardous Waste Contingency Plan in the Environmental Health & Safety Manual.
- Auditing the staff with regard to compliance with the Hazardous Waste Contingency Plan.

Contacting the hazardous waste subcontractors for review of procedures and opportunities for minimization of waste

4.2.19 Laboratory Analysts

Laboratory analysts are responsible for conducting analysis and performing all tasks assigned to them by the group leader or supervisor. The responsibilities of the analysts are listed below:

- Perform analyses by adhering to analytical and quality control protocols prescribed by current SOPs, this QA Manual, and project-specific plans honestly, accurately, timely, safely, and in the most cost-effective manner.
- Document standard and sample preparation, instrument calibration and maintenance, data calculations, sample matrix effects, and any observed non-conformance on worklists, benchsheets, lab notebooks and/or the Non-Conformance Database.
- Report all non-conformance situations, instrument problems, matrix problems and QC failures, which might affect the reliability of the data, to their supervisor, the Technical Director, and/or the QA Manager or member of QA staff.
- Perform 100% review of the data generated prior to entering and submitting for secondary level review.
- Suggest method improvements to their supervisor, the Technical Director, and the QA Manager. These improvements, if approved, will be incorporated. Ideas for the optimum performance of their assigned area, for example, through the proper cleaning and maintenance of the assigned instruments and equipment, are encouraged.
- Work cohesively as a team in their department to achieve the goals of accurate results, optimum turnaround time, cost effectiveness, cleanliness, complete documentation, and personal knowledge of environmental analysis.

4.2.20 Safety Officer

The Safety Officer reports to the Laboratory Director and ensures that systems are maintained for the safe operation of the laboratory. The Safety Officer is responsible to:

- Conduct ongoing, necessary safety training and conduct new employee safety orientation.
- Assist in developing and maintaining the Chemical Hygiene/Safety Manual.
- Administer dispersal of all Material Safety Data Sheet (MSDS) information.
- Perform regular chemical hygiene and housekeeping instruction.
- Give instruction on proper labeling and practice.
- Serve as chairman of the laboratory safety committee.
- Provide and train personnel on protective equipment.
- Oversee the inspection and maintenance of general safety equipment – fire extinguishers, safety showers, eyewash fountains, etc. and ensure prompt repairs as needed.
- Supervise and schedule fire drills and emergency evacuation drills.
- Determine what initial and subsequent exposure monitoring, if necessary to determine potential employee exposure to chemicals used in the laboratory.
- When determined necessary, conduct exposure monitoring assessments.
- Determine when a complaint of possible over-exposure is “reasonable” and should be referred for medical consultation.

- Assist in the internal and external coordination of the medical consultation/monitoring program conducted by TestAmerica's medical consultants

4.2.21 Data Package Coordinator

The Data Package Coordinator reports directly to the Technical Director. The person in this position manages the timely and thorough completion of data packages in accordance with project requirements

4.2.22 Data Package Assembler

The Data Package Assembler reports directly to the Data Package Coordinator as is responsible for the organization of data packages for final delivery. This includes insertion of dividers, creation of specialized summary forms, and the transcription of narrative comments.

4.2.23 Data Package Specialist

A Data Package Specialist is based in each analytical department and reports to that department's manager. The responsibilities include the retrieval and copying of all raw data required for the data package.

4.2.24 Couriers and Field Sampling Technicians

This group is responsible for general courier duties, water sampling by the grab method, and the proper installation of automatic ISCO 24-hour water sampling equipment.

4.2.25 Laboratory Technicians

Technicians prepare samples for analysis by weighing, extracting or digesting, filtering, or concentrating samples. Technicians prepare method specific QC Samples with each preparation batch. All personnel must adhere to all QC procedures specified in the analytical method and in accordance to laboratory procedures or policies and are responsible for the full documentation of these procedures.

4.2.26 Sample Control Technicians

Sample Control personnel report to the Sample Control Manager. These technicians are responsible for the receiving and logging-in of samples delivered to the laboratory. They record the condition of the samples and maintain chains of custody. They also ensure that samples have been preserved properly, have been delivered in the appropriate containers, have sufficient quantity for analysis, and are stored properly.

4.3 DEPUTIES

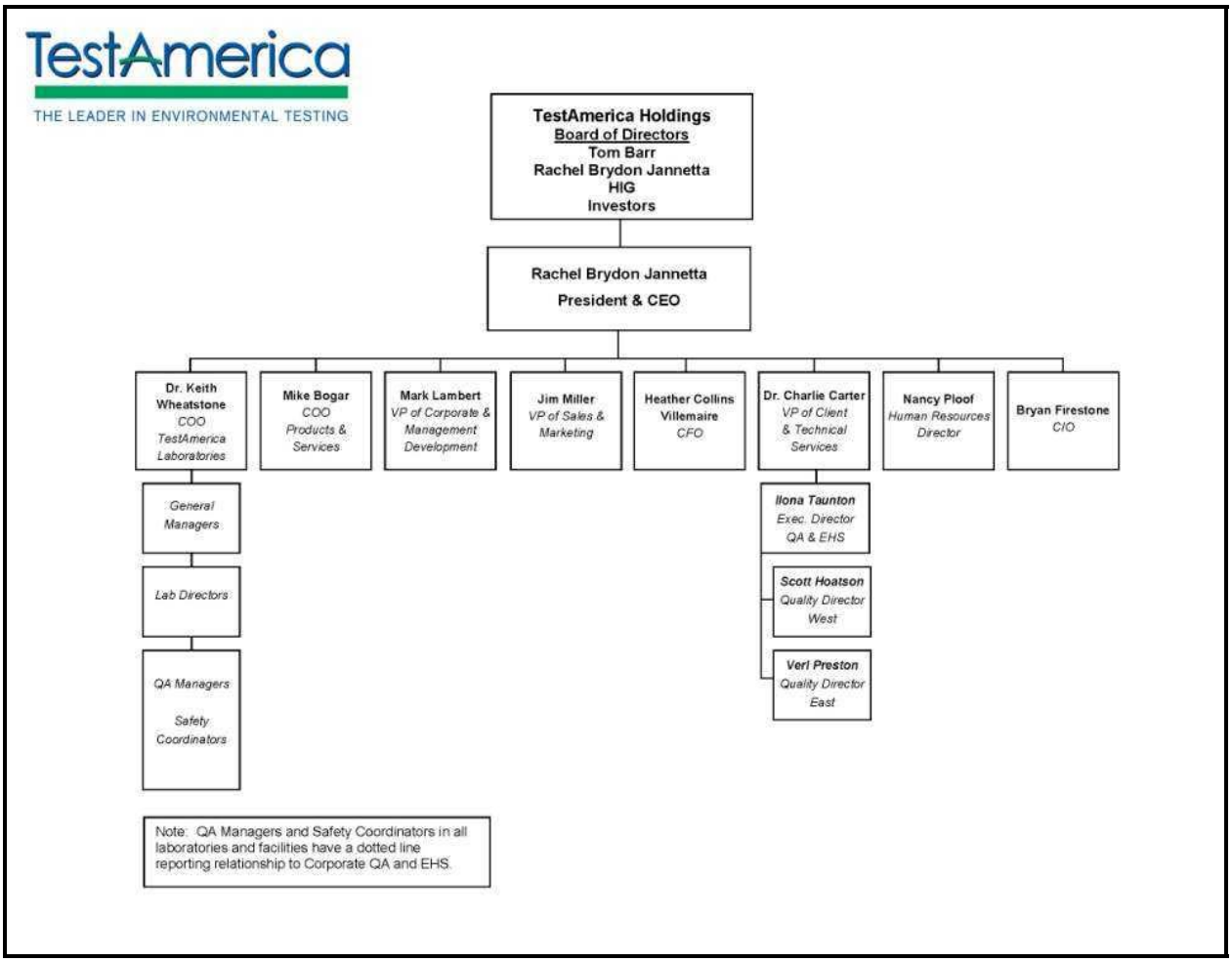
The following table defines who assumes the responsibilities of key personnel in their absence:

Key Personnel	Deputy
Laboratory Director	Client Services Manager
QA Manager	Senior QA Scientist

Key Personnel	Deputy
Department Manager/Technical Director	Department Group Leader
Client Services Manager	Department Group Leader
Safety Officer	Hazardous Waste Coordinator

Figure 4-1.

Corporate Organization Chart



SECTION 5

QUALITY SYSTEM
(NELAC 5.4.2)

5.1 QUALITY POLICY STATEMENT

The management of TestAmerica and TestAmerica Irvine are committed to providing data of known quality to its clients by adhering to approved methodologies, regulatory requirements and the QA/QC protocols described in this manual.

In all aspects of the laboratory and business operations, management is dedicated in maintaining the highest ethical standards. An Ethics Policy sign-off can be viewed in Appendix 1. Training on ethical and legal responsibilities is provided annually and each employee signs off annually on the policy as a condition of employment.

It is TestAmerica's Policy to continually improve systems and provide support to quality improvement efforts in laboratory, administrative and managerial activities. The company recognizes that the implementation of a quality assurance program requires management's commitment and support as well as the involvement of the entire staff.

TestAmerica Irvine strives to provide clients with the highest level of professionalism and the best service practices in the industry.

Every staff member at TestAmerica Irvine 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 7 elements of TestAmerica's Ethics and Data Integrity Program include:

- An Ethics Policy (Policy No. CA-L-P-001) and employee ethics statements (Appendix 1).
- An Ethics and Compliance Officer (ECO).
- 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. (SOP No. CA-L-S-001)
- Procedures and guidance for recalling data if necessary (SOP No. CA-L-S-001).
- An effective external and internal monitoring system that includes procedures for internal audits (Section 16).

As an American Council of Independent Laboratories (ACIL) member, all TestAmerica laboratories adhere to the following ACIL Code of Ethics:

- 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 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 SUPPORTING DOCUMENTATION

The laboratory's Quality System is communicated through a variety of documents prepared by the laboratory and company management:

- Quality Assurance Manual (QAM) Template
- 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 TestAmerica QA/QC Policy Memorandums (Refer to Section 3.4).
- Laboratory QA/QC Policy Memorandums (Refer to Section 3.4).

5.3.1 Order of Precedence

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

- TestAmerica QA/QC Policy Memorandum - Corporate
- Laboratory QA/QC Policy Memorandum
- Quality Assurance Manual
- Corporate SOPs and Policies
- Laboratory SOPs and Policies

- Other (Work Instructions (WI), memos, flow charts, etc.)

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. The calculation of precision is described in Section 25.

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. The calculation of accuracy is described in Section 25.

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, and by the degree to which approval from the US EPA or other pertinent regulatory agencies is obtained for any procedure for which significant modifications have been made.

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 prepares a Quality Control Limit Summary that contains tables that summarize the precision and accuracy acceptability limits for analyses performed at TestAmerica Irvine. This summary includes an effective date, is updated each time new limits are generated and is located on the network server. 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, TestAmerica Irvine has developed limits from evaluation of data from similar matrices. See laboratory SOP CNTRLLIM.SOP, Control Charts and Statistical Process Control. Additional criteria for development of control limits is contained in Section 25.

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)]. TestAmerica Irvine 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. The archive consists of the date range and number of points used in LIMS to generate the limits, thus allowing for recreation of the limits if necessary. 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 Section 25. 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 periodically to determine if adjustments need to be made or for corrective actions to methods. All findings are documented and kept on file.

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 17). 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 at each laboratory Facility:

- Laboratory Quality Assurance Manual
- Laboratory Standard Operating Procedures (SOP)
- Laboratory Policies
- Work Instructions and Forms
- Corporate Policies and Procedures distributed outside the intranet

The Corporate staff posts Corporate Manuals, SOPs, Policies, Work Instructions, White Papers and Training Materials on the company intranet site. These are collectively termed "Official Documents" and encompass the Policies and Procedures that all facilities are required to employ. These official documents are only considered controlled when they are read on the company 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 official documents is found in Corporate SOP No. CW-Q-S-001, Corporate Document Control and Archiving and the laboratory SOP IR-QA-DOC, Document Control and Review.

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 non-conformance/corrective action reports. Raw analytical data consists of bound logbooks, instrument printouts, any other notes, magnetic media, electronic data and final reports. Discussion on records control is described in Section 15.

The maintenance of purchasing data is discussed in Section 9.

The maintenance of sales and marketing contracts is discussed in Section 7.

6.2 DOCUMENT APPROVAL AND ISSUE

The pertinent elements of a control system for each document include a unique name and number, the number of pages of the item, the effective date, revision number and the

laboratory's name. The QA Manager responsible for the maintenance of the system and maintains the items in the QA office and in the on-site long-term data storage area.

Controlled documents are authorized by the QA Department and other management. 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 retains the official document on file. The official document is provided as needed to those using it. Controlled documents shall be available at all locations where the operational activity described in the document is performed (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 two years (annually for all drinking water program procedures) and will be revised as appropriate. Changes to documents occur when a procedural change warrants a revision of the document.

6.3 PROCEDURES FOR DOCUMENT CONTROL POLICY

For changes to the QA Manual, refer to t*he Corporate Document Control SOP, CW-Q-S-001*. 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.

For changes to SOPs, refer to SOP No. CW-Q-S-002, Writing a Standard Operating Procedure (SOP).

Forms, worksheets, work instructions and information are organized by department in the QA office. Electronic versions are kept on a hard drive in the QA department; hard copies are kept in QA files.

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 as described in Section 15.

SECTION 7

REVIEW OF WORK REQUEST

7.1 OVERVIEW

TestAmerica Irvine 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 TestAmerica'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 TestAmerica'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 TestAmerica'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 review process 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 any required certifications, that it can meet the clients' data quality and reporting requirements and that the lab has the capacity to meet the clients turn around needs. 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.

For new, complex or large projects, the proposed contract is given to the National Account Director, who will decide which lab will receive the work based on the scope of work and other requirements, including certification, testing methodology, and available capacity to perform the work. The contract review process is outlined in 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 Laboratory Project Management Director
- The Laboratory Operations 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**.** The Client Services Manager and/or the Project Manager may also keep a copy of the contracts, as necessary.

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. All contract documentation is kept by Marketing and is archive in the same manner as all other laboratory documents.

The contract will be distributed to and maintained by the appropriate sales/marketing personnel and the Regional Account Manager. A copy of the contract and formal quote will be filed with the laboratory PM and/or the Lab Director.

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. The PM keeps a phone log of conversations with the client.

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, TestAmerica Irvine assigns a PM to each client. The PM is the first point of contact for the 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 direct 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 also communicated to the laboratory during production meetings. Such changes are updated to the project notes and are 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).

TestAmerica 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.

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 corporate network. The phrase "work sharing" refers to internal transfers of samples between company 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 we must outsource testing for our clients because 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 the SOP on Subcontracting Procedures (CA-L-S-002) and the Work Sharing Process SOP (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.

8.2 QUALIFYING AND MONITORING SUBCONTRACTORS

Whenever a PM or Regional Account Executive (RAE) 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 network 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 the company (in JD Edwards): A listing of all approved subcontracting laboratories and supporting documentation is available on the TestAmerica intranet site. Verify necessary accreditation for the requested tests prior to sending samples.;
- 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 intra-company 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. Refer to SOP No. CA-C-S-001, Work Sharing Process.

When the potential sub-contract laboratory does not meet the above criteria, Account Executives or PMs may nominate a laboratory as a subcontractor based on need. The decision to nominate a laboratory must be approved by the Laboratory Director. The Laboratory Director requests that the QA Manager begin the process of approving the subcontract 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).

8.2.1 The QA Manager must ensure that the Subcontracting Approval Form (Figure 8-2) has been completed and have supporting documentation on file prior to initiation of any work A letter or e-mail is sent to the lab requesting the following information:

8.2.1.1 If a lab is NELAC or A2LA accredited,

8.2.1.1.1 Copy of necessary certifications verifying that the required approvals are current. Ensure that all needed analytes are included; some may not be accredit-able (if so, document). Certificate and scope of International Standard accreditation are required, when applicable.

8.2.1.1.2 Insurance Certificate. This is required by TestAmerica's Chief Financial Officer

8.2.1.1.3 USDA soil permit if available**

8.2.1.2 For Laboratories accredited by other agencies with an auditing program:

8.2.1.2.1 Copy of necessary certifications verifying that the required approvals are current. Ensure that all needed analytes are included; some may not be accredit-able (if so, document). Certificate and scope of International Standard accreditation are required, when applicable.

8.2.1.2.2 Insurance Certificate. This is required by TestAmerica's Chief Financial Officer

8.2.1.2.3 USDA soil permit if available**

8.2.1.2.4 Description of Ethics and Data Integrity Plan.

8.2.1.2.5 The most recent 2 sets of full proficiency testing (PT) results relevant to the analyses of interest and any associated corrective action.

8.2.1.2.6 State Audit with Corrective Action Response

8.2.1.2.7 Example final report to confirm format is compliant and provides the necessary information. (minimally, it must be determined that Batch QC results are included in the laboratory reports and data is appropriately qualified.

8.2.1.2.8 A copy of raw data associated with the first project is requested for internal review. The raw data is reviewed by the QA Manager and the PM to ensure that the results meet the client's needs. If the QA manager is unfamiliar with the analysis being performed, notify Corporate QA for guidance on the review (it may need to be sent elsewhere for evaluation). This requirement can be skipped if an on-site visit of the laboratory is planned. (This requirement is effective as of the effective date of this section. Laboratories worked with previously [minimum of 6 months] are grandfathered in.)

8.2.1.2.9 DoD work includes additional requirements as described in Section 8.1 above.

8.2.1.3 For laboratories performing tests that are unaccredited or accredited by an agency without an audit program:

8.2.1.3.1 A copy of their Quality Assurance Manual (controlled if possible). Ensure data quality limits for relevant methods are acceptable and that training procedures are adequate.

8.2.1.3.2 Copy of necessary certifications (if available) verifying that the required approvals are current. Ensure that all needed analytes are included; some may not be accredit-able (if so, document). Certificate and scope of International Standard accreditation are required, when applicable.

8.2.1.3.3 Insurance Certificate. This is required by TestAmerica's Chief Financial Officer.

8.2.1.3.4 USDA soil permit if available**

8.2.1.3.5 Evidence of a current SOP per method. A copy of the first page and signature page of the SOP is acceptable. A table of contents including effective dates may also be acceptable. The SOP can be examined if an on-site audit is performed.

8.2.1.3.6 Description of Ethics and Data Integrity Plan.

8.2.1.3.7 The most recent 2 sets of full proficiency testing (PT) results relevant to the analyses of interest and any associated corrective action.

8.2.1.3.8 Example final report to confirm format is compliant and provides the necessary information. (minimally, it must be determined that Batch QC results are included in the laboratory reports and data is appropriately qualified.

8.2.1.3.9 Statement of Qualification (SOQ) or summary list of Technical Staff and Qualifications – position, education and years of experience.

8.2.1.3.10 DoD work includes additional requirements as described in Section 8.1 above.

8.2.1.3.11 A copy of raw data associated with the first project is requested for internal review. The raw data is reviewed by the QA Manager and the PM to ensure that the results meet the client's needs. If the QA manager is unfamiliar with the analysis being performed, notify Corporate QA for guidance on the review (it may need to be sent elsewhere for evaluation). This requirement can be skipped if an on-site visit of the laboratory is planned. (This requirement is effective as of the effective date of this section. Laboratories worked with previously [minimum of 6 months] are grandfathered in.)

8.2.2 Once the information is received by the QA Manager, it is evaluated for acceptability 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.

**USDA permit is required if soils less than three feet deep from New York, North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Louisiana, Arkansas, Texas, Oklahoma, New Mexico, Arizona, California, Hawaii, or outside the continental U. S. are to be analyzed. These samples require special shipping measures; check with the EHS Department. It may be necessary to heat-treat the samples before shipping if the subcontract laboratory does not have a USDA permit; however, some analytes/tests may be irrelevant after heat treatment.

8.2.3 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. The company does not certify laboratories. The subcontractor is on our approved list and can only be recommended to the extent that we would use them.

8.2.4 The status and performance of qualified subcontractors will be monitored periodically by the Corporate Contract Department. Any problems identified will be brought to Corporate QA attention.

- 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 must be posted using the Vendor Performance Report (Form No. CW-F-WI-009).
- Information must 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 network laboratories and Corporate QA 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 Directors.

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 RAE 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's current and scope-inclusive. The information is documented on a Subcontracted Sample Form (Figure 8-3) and the form is retained in the project folder. For network laboratories, certifications can be viewed on the company website.

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 the network.

The PM will communicate with the subcontracted laboratory to monitor the status of the analyses, facilitate successful execution of the work and ensure 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. If subcontract laboratory data is incorporated into the laboratories EDD (i.e., imported), the report must explicitly indicate which lab produced the data for which methods and samples.

Note: The results submitted by a network work sharing laboratory may be transferred electronically and the results reported by the network 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, Corporate QA must be informed, and the QA Manager will be required to verify adequacy of proficiency scores and certifications. The laboratory must also request a copy of the raw data to support the analytical results for the first project submitted to the subcontract laboratory unless the laboratory has NELAC accreditation. The raw data is reviewed by the QA Manager and the PM to ensure that the results meet the client's needs. The QA Manager will request full documentation and qualify

the subcontractor under the provisions above. The approval process should be completed within 30 calendar days of subcontracting.

Figure 8-1.

Example - Client-Approved Subcontractor Form

Client Information:

Client Name & Account Number:_____

Client Contact: _____

Client Address: _____

_____

Project Information: (Please choose all applicable.)

- **Certification required: □ State □ NELAC □ A2LA □ Method___**

  □ Target compound_____ □ Other_____

- **Required Turn around time (method provisional)_____**

Subcontractor's Information:

Subcontractor's Name: _____

Subcontractor's Contact: _____

Subcontractor's Email: _____

Subcontractor's Address: _____

_____

Subcontractor's Phone Number: _____

Analytical Test/Compound/Method to be subcontracted: _____

Certification Statement:

I hereby give ***TestAmerica Irvine*** permission to use the above noted subcontractor for the above noted testing procedures/methods. I realize that the above subcontractor will be held liable for the validity of the above mentioned testing procedures/methods. All subcontractors shall meet the requirements as spelled out in project information and will follow all analytical holding times and turn around times for analytical reports. The subcontract laboratory, and not TestAmerica, will be held liable for liquidated damages for delays in subcontracted analytical reports and/or electronic data deliverables.

Client Signature **Date**

Figure 8-2.
Example - Subcontracting Laboratory Approval Form (Initial / Renewal)

SUBCONTRACTING LABORATORY APPROVAL

Reference: Section 8 – Quality Assurance Manual

Date: _____
Laboratory: _____
Address: _____
_____
Contact and e-mail address: _____
Phone: Direct _____ Fax _____

Requested Item[3]	Date Received	Reviewed/ Accepted	Date
1. QA Manual[3]			
2. Copy of State Certification[1]			
3. State Audit with Corrective Action Response (or NELAC or A2LA Audit)[3]			
4. Most Recent (and relevant) 2 Sets of WP/WS Reports with Corrective Action Response[1,3]			
5. SOQ or Summary list of Technical Staff and Qualifications [3]			
6. SOPs for Methods to Be Loadshifted[2,3]			
7. USDA Soil Permit			
8. Insurance Certificate			
9. Sample Report[3]			
10. For DoD Work: Statement that Lab quality system complies with QSM.			
11. For DoD Work: Approved by specific DoD Component laboratory approval process.			
11. Description of Ethics Program[3]			

1 - Required when emergency procedures are implemented.
2 - Some labs may not submit copies due to internal policies. In these cases, a copy of the first page and signature page of the SOP is acceptable. This requirement may also be fulfilled by supplying a table of SOPs with effective dates.
3 – If the laboratory has NELAC accreditation, Item #s 4 through 10 are not required.

On Site Audit Planned: YES NO If yes, Date Completed: _____ By Whom: _____

Comments:

Lab Acceptable for Subcontracting Work: YES NO Limitations: _____

QA Manager: _____ Date: _____
(Printed Name)
□ Forwarded to Contract Coordinator, by: _____ Date:_____

Figure 8-3.

Example - Subcontracted Sample Form

Date/Time: _____

Subcontracted Laboratory Information:

- Subcontractor's Name: _____
- Subcontractor Point of Contact: _____
- Subcontractor's Address: _____
- Subcontractor's Phone: _____
- Analyte/Method: _____
- Certified for State of Origin: _____
- NELAC Certified: Yes_____No_____
- A2LA (or ISO 17025) Certified: Yes_____No_____
- CLP-like Required: Yes_____No_____
  (Full doc required)
- Requested Sample Due Date: _____
  (Must be put on COC)

Project Manager: _____

Laboratory Sample # Range: _____
(Only of Subcontracted Samples)

Laboratory Project Number (Billing Control #): _____

All subcontracted samples are to be sent via bonded carrier and Priority Overnight. Please attach tracking number below and maintain these records in the project files.

PM Signature_____**Date**_____

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 the Controlled Purchases Procedure, CW-F-S-004. Only one quote is required where the item being purchased is a sole source product, Examples of sole source capital expenditures are laboratory test equipment, client specified purchases and building leases. A minimum of two quotes is required where the opportunity exists to source from more than one vendor. All documentation related to the purchase of capital items will be maintained in the individual CapEx files located in Corporate Purchasing. Data will be held in accordance with the record retention policy.

TestAmerica will enter into formal contracts with vendors when it is advantageous to do so. Contracts will be signed in accordance with the Authorization Matrix Policy, CW-F-P-002. Examples of items that are purchased through vendor contracts are laboratory instruments, consumables, copiers and office supplies. Request for Proposals (RFP's) will be issued where more information is required from the potential vendors than just price. 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.

Non-capital expenditure items are purchased through the requisition and approval process in JD Edwards or through other TestAmerica authorized methods (approved web-sites, purchasing cards). Labs have the ability to select from the approved vendors in JD Edwards.

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

Chemical reagents, solvents, glassware, and general supplies are ordered as needed to maintain sufficient quantities on hand. Purchasing guidelines for equipment and reagents must meet with the requirements of the specific method and testing procedures for which they are

being purchased. Solvents and acids are pre-tested in accordance with Corporate SOP on Solvent & Acid Lot Testing & Approval, SOP No. CA-Q-S-001 and laboratory SOP on Container and Reagent Verification by Lot Testing, LOTTEST.SOP

9.3.1 Purchasing

The nature of the analytical laboratory demands that all material used in any of the procedures is 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. The analyst should complete the Material Request Sheet (Figure 9-1) when requesting reagents, standards, or supplies.

All orders are initiated by analysts qualified for the method for which material is being ordered. Items ordered are based on Materials and Reagents specified in the laboratory's method SOP. If an item being ordered is not the exact item specified, approval must be obtained from the Technical Director prior to placing the order. The Operations Manager or Laboratory Director approves the order.

9.3.2 Receiving

It is the responsibility of the purchasing receiver 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 kept in each department and 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

There are many different grades of analytical reagents available to the analyst. 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 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.

- An expiration date can not be extended if the dry chemical is discolored or appears otherwise physically degraded, the dry chemical must be discarded.

- Expiration dates can be extended if the dry chemical is found to be satisfactory based on acceptable performance of quality control samples (Continuing Calibration Verification (CCV), Blanks, Laboratory Control Sample (LCS), etc.).

- If the dry chemical is used for the preparation of standards, the expiration dates can be extended 6 months if the dry chemical is compared to an unexpired independent source in performing the method and the performance of the dry chemical is found to be satisfactory. The comparison must show that the dry chemical meets CCV limits. The comparison studies are maintained in the QA office.

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 daily. The minimum total pressure must be 300 psig (at least 500 psig for overnight) or the tank must be replaced. 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 conductivity of less than 1.0 μohm-cm at 25°C. The conductivity is checked and recorded daily. If the water's conductivity is less than the specified limit, the Technical Director, Operations Manager, Lab Director or QA Manager 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) 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.

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.

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. Table 9-1 details specific storage instructions for reagents and chemicals. Section 22 discusses conditions for standard storage.

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 Laboratory Director. If they agree with the request the procedures outlined in 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, it is given a short name, such as GCMS77, and added to the QA-maintained equipment list described in Section. A New Instrumentation

Checklist is initiated (see figure 9-3) to ensure IT back-up, maintenance logbook creation, MDLs, etc are completed. The instrument's 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 (see Section 20). For software, its operation must be deemed reliable and evidence of instrument verification must be retained by the IT Department or QA Department as specified in the laboratory's procedure for software verification. 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 21. 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.

9.6 SUPPLIERS

TestAmerica selects vendors through a competitive proposal / bid process, strategic business alliances or negotiated vendor partnerships (contracts). The level of control used in the selection process is dependent on the anticipated spend 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 (CW-F-WI-009).

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 (CW-F-WI-007 – refer to Figure 9-2).

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 Technical Manager are consulted with vendor and product selection that have an impact on quality.

Figure 9-1.

Materials Request Sheet

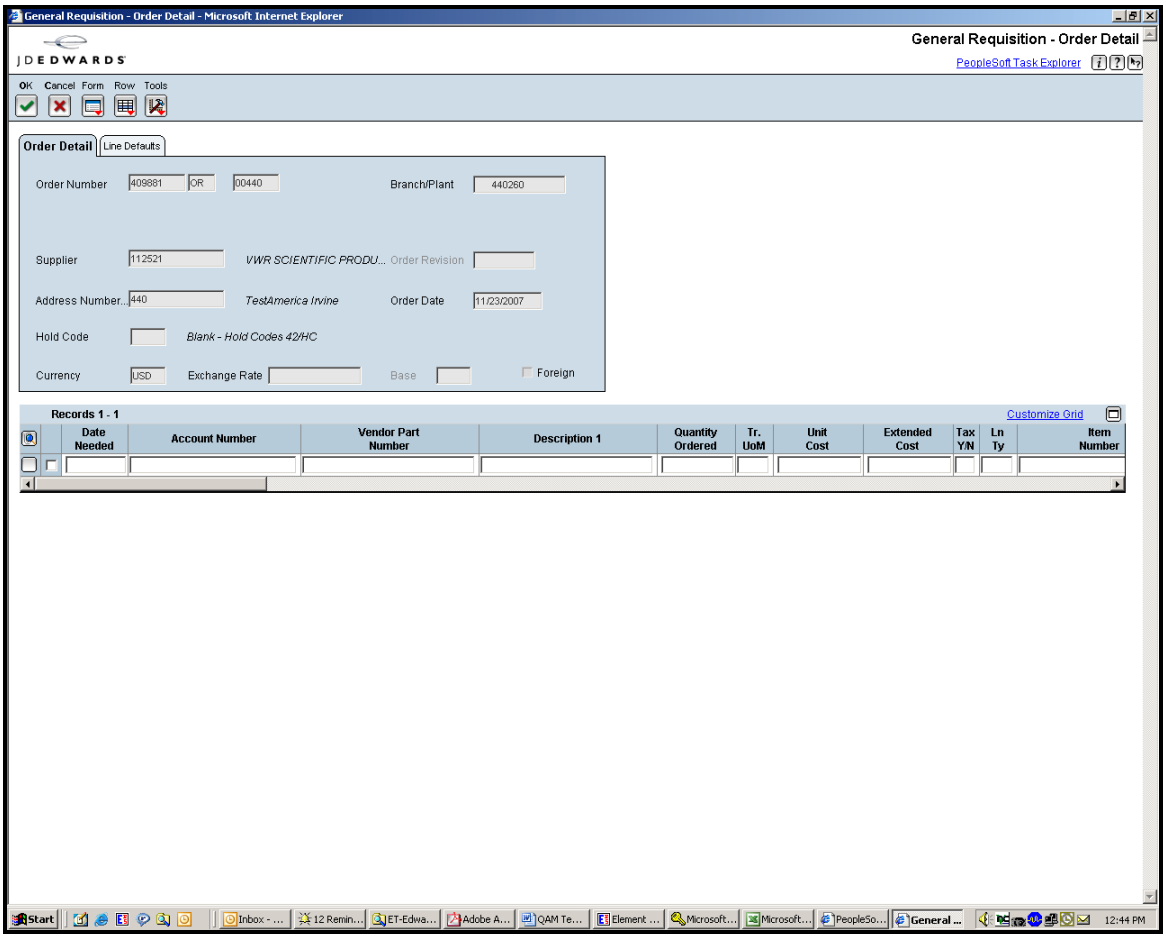


Table 9-1.

Storage of Reagents and Chemicals

Chemical	Storage Requirements
Concentrated Acids and Bases	Stored in the original containers at room temperature. All organic acids must be stored separately from inorganic acids. Acids should not be stored with bases.
Bulk Dry Chemicals	Stored in the original containers at room temperature. All organic acids must be stored separately from inorganic acids. Acids should not be stored with bases.
Working Solutions containing Organic Compounds	Stored as per method recommendation/ requirement. They are generally stored refrigerated at 4°C± 2°C.
Working Solutions containing only Inorganics	Stored at room temperature; refrigeration is optional.
Flammable Solvents	Stored in solvent cabinets at room temperature.
Non-Flammable Solvents	Stored separately from the flammable solvents in cabinets at room temperature.

Figure 9-2
Example – JD Edwards Vendor Add Request Form

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JD Edwards Vendor Add Request Form

Vendor name:	Lab location and individual making request:
Vendor address (remit to):	Vendor phone:
Vendor address (remit to):	Vendor fax:
Contact name:	Product / service provided:

Reason for Vendor Addition: Check all reasons that apply

☐ Cost Reduction	Estimated Annual Savings $
☐ Replace Current Vendor	Reason?
	Vendor being Replaced?
☐ New Product / Service	Describe:
☐ ISO Approved (Required for Aerotech / P&K only)	

Small Business:

Does this vendor help us to meet our small business objectives: _____

If yes, which category: _____

Personal and Ethical Considerations:

Is there any personal conflict of interest with a TestAmerica employee and the vendor listed above? _____

_____

Have ethical considerations been taken into account in your evaluation of this vendor?_____

_____

Can this product be sourced from another TestAmerica facility?_____

Please complete form and email to NCPurchasing@testamericainc.com or fax to (330) 966-9275.

I approve the addition of this vendor:

_____ _____

Purchasing Manager - Patrick Eckman Corporate Controller - Leslie Bowers

Form No. CW-F-WI-007

Figure 9-3.

New Instrumentation Checklist

Instrumentation/Equipment Checklist

To be completed by the department:

Department:			
ID Number:			
Date Installed:			
Method(s) Performed:			

Type*:			
Manufacturer:			
Model Number:			
Serial Number:			

*IC, GC, Autosampler, Balance, ASE etc.

To be completed by QA:

Item	Applicable	Date/ Initials	Comments
Maintenance/monitoring logbook created	Yes☐ No☐		
IT informed (so data backup process can be updated)	Yes☐ No☐		
Instrument tagged with ID number	Yes☐ No☐		
Instrument ID number entered into Element	Yes☐ No☐		
Calibrated thermometer placed in unit	Yes☐ No☐		
Passing calibration performed and documented	Yes☐ No☐		
Passing MDLs performed for all relevant methods and matrices	Yes☐ No☐		
Laboratory equipment list updated	Yes☐ No☐		

G:\Depts\QUALITY\EQUIPMT\New Instrumentation Checklist_r1.doc
Version 11/12/07

SECTION 10

SERVICE TO THE CLIENT
(NELAC 5.4.7)

10.1 OVERVIEW

TestAmerica Irvine 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 discussed in Section 5. The laboratory has procedures to ensure confidentiality to clients (Section 16 and 26).

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.

10.2 SPECIAL SERVICES

The laboratory's standard procedures for reporting data are described in Section 26. When requested the following special services are provided:

- The laboratory will provide the client or the client's representative reasonable access to the relevant areas of the laboratory for the witnessing of tests performed for the client.
- The laboratory will work with client-specified third party data validators as specified in the client's contract.
- The laboratory will provide the client with all requested information pertaining to the analysis of their samples. An additional charge may apply for additional data/information that was not requested prior to the time of sample analysis or previously agreed upon.

10.3 CLIENT COMMUNICATION

Project managers are an important communication link to the clients. The lab shall inform its clients of any delays in project completion as well as any non-conformances in either sample receipt (refer to Section 24) or sample analysis. Project management will maintain ongoing client communication throughout the entire client project.

Technical Directors are available to discuss any technical questions or concerns that the client may have.

10.4 REPORTING

The laboratory will work with the client to produce any special communication reports required by the contract.

10.5 CLIENT SURVEYS

The laboratory assesses both positive and negative client feedback. The results are used to improve overall laboratory quality and client service.

TestAmerica Irvine participates in the American Council of Independent Laboratories (ACIL) Seal of Excellence program. This program includes the submission of a survey to laboratory clients. The clients send their responses directly to ACIL.

TestAmerica's Sales and Marketing teams periodically develops lab and client specific surveys to assess client satisfaction.

SECTION 11

COMPLAINTS
(NELAC 5.4.8)

11.1 OVERVIEW

TestAmerica Irvine believes that effective client complaint handling processes have important business and strategic value. Listening to and documenting client concerns captures 'client knowledge' that helps to continually improve processes and improving 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, 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 dealing with both external and internal complaints.

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 13 (Corrective Actions) and is documented following the laboratory's SOP for Corrective Actions, CAR.SOP. It is the laboratory's goal to provide a satisfactory resolution to complaints in a timely and professional manner.

11.2 EXTERNAL COMPLAINTS

An employee that receives a complaint initiates the complaint resolution process and the documentation of the complaint.

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 likely hood of future occurrence and mitigation of client impact.

The general steps in the complaint handling process are:

- Receiving 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.

11.3 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 13. In addition, Corporate management, Sales and Marketing and Information Technology (IT) may initiate a complaint by contacting the laboratory or through the corrective action system described in Section 13.

11.4 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 17)

SECTION 12

CONTROL OF NON-CONFORMING WORK
(NELAC 5.4.9)

12.1 OVERVIEW

When data discrepancies are discovered or deviations and departures from laboratory standard procedures, 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 13).

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 or group leader for advice. The manager or group leader may elect to discuss it with the project manager or QA manager. If necessary, client may be contacted 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 13. 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 20. The client may request that the compound be reported based only on the calibration. Such a request would need to be approved by the Department Manager 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.

12.2 RESPONSIBILITIES AND AUTHORITIES

SOP No. CA-L-S-001, Internal Investigation of Potential Data Discrepancies and Determination for Data Recall, outlines the general procedures for the reporting and investigation of data discrepancies and alleged incidents of misconduct or violations of the company'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, a Department Manager, or a member of the QA team may exceptionally 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 described in Section 13. This information may also need to 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 laboratory management within 24-hours. The Senior Management staff is comprised of the Laboratory Director, the QA Manager, and the Department Managers. 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) and Quality Director within 24 hours.

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, QA Manager, ECOs, COO's – East and West, General Managers and the Quality Directors – East and West 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.

12.3 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.

SOP No. CA-L-S-001 distinguishes between situations when it would be appropriate for the laboratory QA Manager and Laboratory Director (or his/her designee) 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 ECO's and Corporate Management. Laboratory level decisions are documented and approved using the laboratory's standard nonconformance/corrective action reporting (Section 13) in lieu of the data recall determination form contained in SOP No. CA-L-S-001.

12.4 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 (Section 13).

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.

12.5 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 12.2, Paragraph 5 above.

Prior to suspension/restriction, confidentiality will be respected, and the problem and 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 13 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 (i.e., 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, Department Manager, QA Manager) can devise a start-up plan to cover all steps from client notification through compliance and release of reports. The Client Services Manager and Sales and Marketing should 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 as described in Section 13.

SECTION 13

CORRECTIVE ACTION
(NELAC 5.4.10)

13.1 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 Reports (NCR) and Corrective Action Reports (CAR) (refer to Figure 13-1).

13.2 DEFINITIONS

- **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 are contained in the method specific SOPs. 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 is not only a correction made to the immediate event, but a change in process, procedure or behavior that is required to eliminate the causes of an existing nonconformity, defect, or other undesirable situation in order to prevent recurrence.

13.3 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 for investigation.
- 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 (see more on client complaints in Section 11).

13.3.1 Non-Conformance Report (NCR) - 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
- Client Complaints

13.3.2 Corrective Action Report (CAR) - is used to document the following types of corrective actions:

- Questionable trends that are found in the monthly review of NCRs.
- Issues found while reviewing NCRs that warrant further investigation.
- Failed or Unacceptable PT results.
- Corrective actions that cross multiple departments in the laboratory.
- Systematic Reporting / Calculation Errors
- Health and Safety Violations

13.4 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.

13.4.1 Cause Analysis

- Upon discovery of a non-conformance event, the event must be defined and documented. An NCR or CAR must be initiated, someone is assigned to investigate the issue and the event is investigated for cause. Table 13-1 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, Lab Director, or QA Manager (or QA designee) is consulted.

13.4.2 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 NCR or CAR is used for this documentation.

13.4.3 Monitoring of the Corrective Actions

- The Department Manager and QA Manager is responsible to ensure that the corrective action taken was effective.

- Ineffective actions will be 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 NCR and CAR is entered into a database for tracking purposes and a monthly summary of all corrective actions is printed out for review to aid in ensuring that the corrective actions have taken effect.
- The QA Manager reviews monthly NCRs and CARs for trends. Highlights are included in the QA monthly report (refer to Section 17). 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.

13.4.4 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. (Section 16 includes additional information regarding internal audit procedures.)
- 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.

13.5 TECHNICAL CORRECTIVE ACTIONS

In addition to providing acceptance criteria and specific protocols for technical corrective actions in the method SOPs and Appendix 4, 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 12 for information regarding the control of non-conforming work). The documentation of these procedures is through the use of an NCR or CAR.

Table 13-1 includes examples of general technical corrective actions. For specific criteria and corrective actions refer to specific method SOPs and Appendix 4.

Table 13-1 provides some general guidelines for identifying the individual(s) responsible for assessing each QC type and initiating corrective action. The table 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, QAM Sections 20, 21 and Appendix 4, and SOP CA-L-S-001 (Internal Investigation of Potential Data Discrepancies and Determination for Data Recall). The QA Manager reviews all corrective actions, at a minimum, monthly 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 a written NCR or CAR and appropriate corrective action (e.g., reanalysis) is taken and documented.

13.6 BASIC CORRECTIONS

When mistakes occur in records, each mistake shall be crossed-out, and not erased, deleted, made illegible, or otherwise 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 13-1a.
Example - Corrective Action Report (initial entry screen)

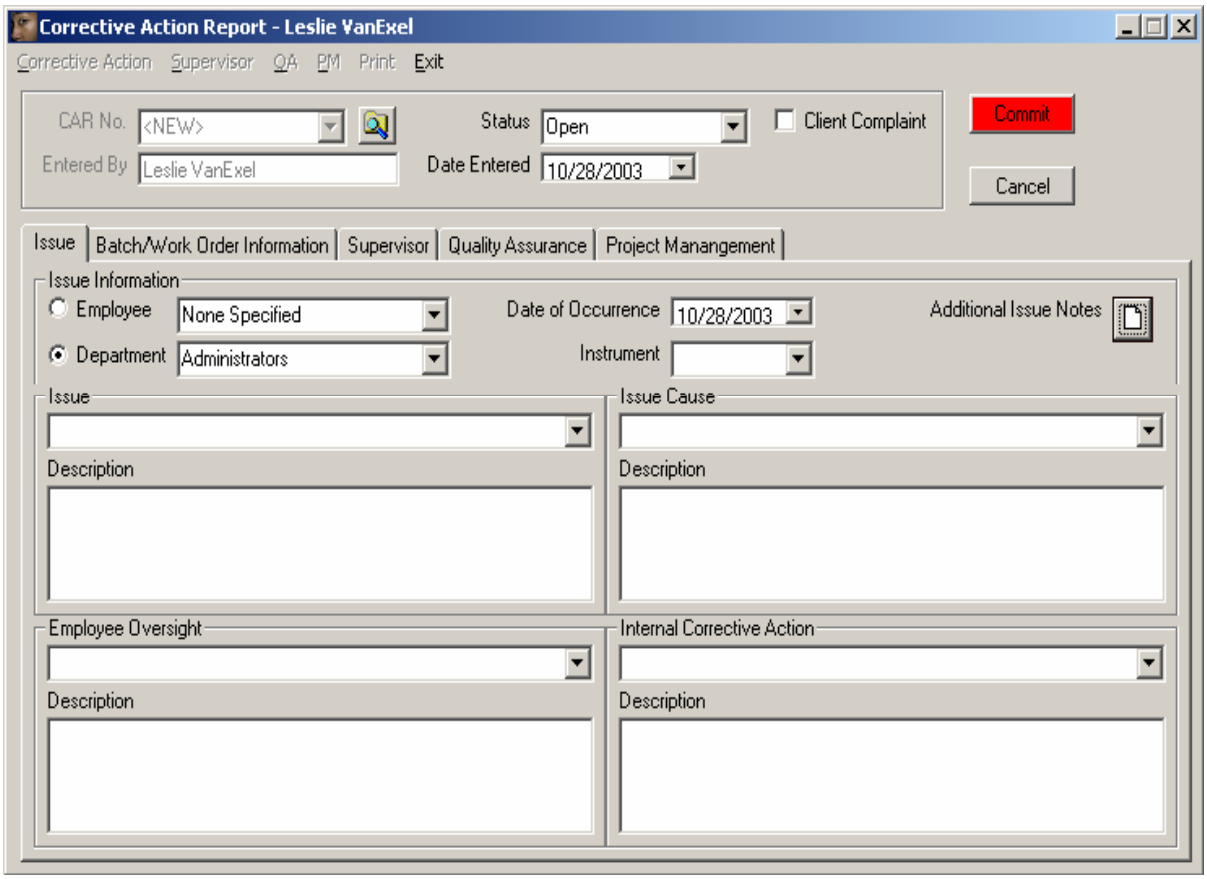


Figure 13-1b.
Example - Corrective Action Report (batch/workorder information)

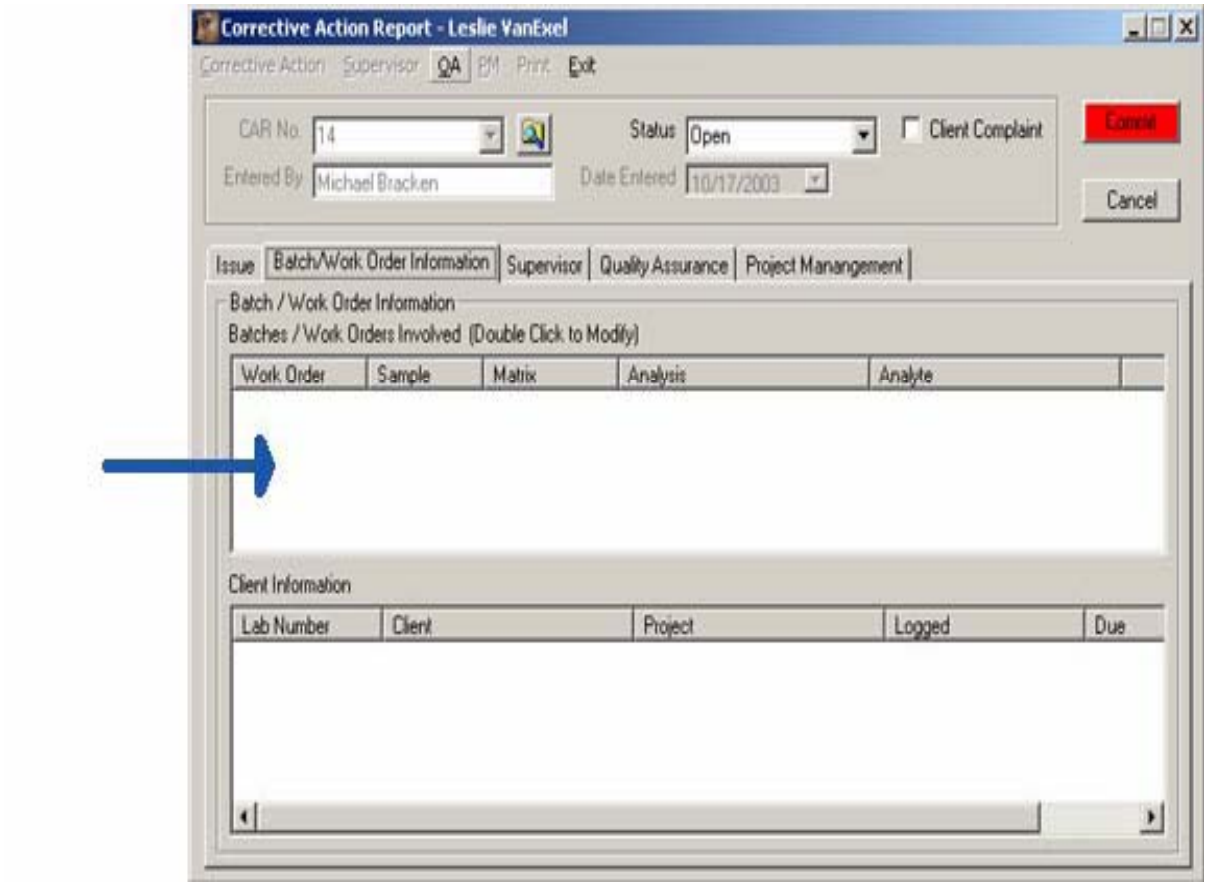


Table 13-1.

Example – General Corrective Action Procedures

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Initial Instrument Blank *(Analyst)*	- Instrument response < MDL or MRL.	- Prepare another blank. - If same response, determine cause of contamination: reagents, environment, instrument equipment failure, etc..
Initial Calibration Standards *(Analyst, Supervisor)*	- Correlation coefficient > 0.990 (organics) or >0.995 (inorganics) or RSD within Method SOP limits. - % Recovery within acceptance range documented in Method SOP, QAM section 21 and QAM Appendix 4	- Reanalyze standards. - If still unacceptable, remake standards and recalibrate instrument.
Independent Calibration Verification (Second Source) *(Analyst, Supervisor)*	% Recovery within control limits.	- Remake and reanalyze standard. - If still unacceptable, then remake calibration standards or use new primary standards and recalibrate instrument.
Continuing Calibration Standards *(Analyst, Data Reviewer)*	% Recovery within control limits.	- Reanalyze standard. - If still unacceptable, then recalibrate and rerun affected samples.
Matrix Spike / Matrix Spike Duplicate (MS/MSD) *(Analyst, Data Reviewer)*	- % Recovery within acceptance range documented in Method SOP, QAM section 21 and QAM Appendix 4	- If the acceptance criteria for duplicates or matrix spikes are not met because of matrix interferences, the acceptance of the analytical batch is determined by the validity of the LCS. - If the LCS is within acceptable limits the batch is acceptable. - The results of the duplicates, matrix spikes and the LCS are reported with the data set.
Laboratory Control Sample (LCS) *(Analyst, Data Reviewer)*	- % Recovery within acceptance range documented in Method SOP, QAM section 21 and QAM Appendix 4	- Batch must be re-prepared and re-analyzed. **Note:** If there is insufficient sample or the holding time cannot be met, contact client and report with flags.

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Surrogates *(Analyst, Data Reviewer)*	- % Recovery within acceptance range documented in Method SOP, QAM section 21 and QAM Appendix 4.	- Individual sample must be repeated. - If associated analytes are ND, qualify data only
Method Blank (MB) *(Analyst, Data Reviewer)*	< MRL [1]	- Reanalyze blank. - If still positive, determine source of contamination. If necessary, reprocess (i.e. digest or extract) entire sample batch. Report blank results. - If associated analytes are either ND or >10x (inorganics) or >20x (organics) data can be reported with qualifier
Proficiency Testing (PT) Samples *(QA Manager, Department Manager/Supervisor)*	- Criteria supplied by PT Supplier.	- Any failures or warnings must be investigated for cause. Failures may result in the need to repeat a PT sample to show the problem is corrected.
Reporting / Calculation Errors (Depends on issue – possible individuals include: Analysts, Data Reviewers, Project Managers, Department Manager/ Supervisor, QA Manager, Corporate QA, Corporate Management)	- SOP CA-L-S-001, Internal Investigation of Potential Data Discrepancies and Determination for Data Recall.	- Corrective action is determined by type of error. Follow the procedures in SOP CA-L-S-001.
Client Complaints *(Project Managers, Lab Director, Sales and Marketing)*	- Not Applicable	- Corrective action is determined by the type of complaint. For example, a complaint regarding an incorrect address on a report will result in the report being corrected and then follow-up must be performed on the reasons the address was incorrect (e.g., database needs to be updated).
QA Monthly Report (Refer to Section 17 for an example) (QA Manager, Lab Director, Department Supervisors/Managers)	- QAM, SOPs.	- Corrective action is determined by the type of issue. For example, CARs for the month are reviewed and possible trends are investigated.

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Health and Safety Violation (Safety Officer, Lab Director, Department Supervisor/Manager)	- Environmental Health and Safety (EHS) Manual.	- Non-conformance is investigated and corrected through CAR system.

Note:

1. Except as noted below for certain compounds, the method blank should be below the detection limit. Concentrations up to five times the reporting limit will be allowed for the ubiquitous laboratory and reagent contaminants: methylene chloride, toluene, acetone, 2-butanone and phthalates **provided** they appear in similar levels in the reagent blank and samples. This allowance presumes that the detection limit is significantly below any regulatory limit to which the data are to be compared and that blank subtraction will not occur. For benzene and ethylene dibromide (EDB) and other analytes for which regulatory limits are extremely close to the detection limit, the method blank must be below the method detection limit

SECTION 14.0

PREVENTIVE ACTION
(NELAC 5.4.11)

14.1 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 TestAmerica Irvine's commitment to its Quality Assurance (QA) 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 Quality Assurance 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 (Section 13) 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.

14.1.1 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, management review, and the Management of Change process (see below).

Note: There may be varying levels of formality and documentation during the preventive action process due to the simplicity/complexity of the action taken.

14.1.2 Any Preventive Actions undertaken or attempted shall be taken into account during the Annual Management Review (Section 17). 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.

14.2 MANAGEMENT OF CHANGE

The Management of Change process is designed to manage significant events and changes that occur within the laboratory. Through these procedures, 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 changes covered under this system include: Facility Changes, Major Accreditation Changes, Addition or Deletion to Division's Capabilities or Instrumentation, Key Personnel Changes, Laboratory Information Management System (LIMS) changes. This process is discussed in further detail in SOP CA-Q-S-003, Management of Change.

SECTION 15.0

CONTROL OF RECORDS
(NELAC 5.4.12)

TestAmerica Irvine 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.

15.1 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 15-1. Quality records are maintained by the Quality Assurance (QA) Manager in a database, which is backed up as part of the regular network 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 the individual department managers.

Table 15-1. Record Index[1]

Technical Records	Official Documents	QA Records	Project Records	Administrative Records
Retention Period				
5 Years from analytical report issue*	5 Years from document retirement date*	5 Years from archival* **Data Investigation:** 7years or the life of the affected raw data storage whichever is greater (beyond 5 years if ongoing project or pending investigation)	5 Years from analytical report issue*	**Personnel:** 7 Years (HR Records must be maintained as per Policy CW-L-P-001) **Finance:** See Accounting and Control Procedures Manual
Specific Documents Covered				
Raw Data Logbooks[2] Standards Certificates Analytical Records Lab Reports	Quality Assurance Manual (QAM)	Internal and External Audits/ Responses	Sample receipt and COC Documentation	Finance and Accounting
	Work Instructions	Certifications	Contracts and Amendments	EH&S Manual, Permits, Disposal Records
	SOPs Manuals	Corrective/Preventive Action	Correspondence	Employee Handbook
		Management Reviews	QAPP	Personnel files, Employee Signature & Initials, Administrative Training Records (e.g., Ethics)
		Method & Software Validation, Verification data	SAP	
		Data Investigation	Telephone Logbooks	Administrative Policies

	Policies		Lab Reports	Technical Training Records

[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 15-2.

All records are legible and stored and retained in such a way that they are secure and readily retrievable at the laboratory facility or at Cor-O-Van, an off-site data storage facility. Retention of records are maintained on-site at the laboratory for approximately 1year 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 15-2 have lengthier retention requirements and are subject to the requirements in Section 15.1.3. Policy CW-L-P-001 (Record Retention) provides additional information on record retention requirements.

15.1.1 Programs with Longer Retention Requirements

Some regulatory programs have longer record retention requirements than the standard record retention time. These are detailed in Table 15-3 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. For clients with specific retention requirements that exceed the laboratory defaults specified in Table 15-1, a complete data package is assembled and archived for the requisite period.

Table 15-2. 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)
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.

15.1.2 All records are held secure and in confidence. Records maintained at the laboratory are located either in the department that originally generated the data or on the data storage shelves adjacent to Sample Receiving. Records archived off-site are stored in a secure location where a record is maintained of any entry into the storage facility. Logs are maintained in each

storage box to note removal and return of records.

15.1.3 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, see section 20.12.1 'Computer and Electronic Data Related Requirements' for more information. See COMPSECU.SOP (Computer Security) for details on back-up and security procedures.

15.1.4 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 chain of custody 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.) Instrument data is stored sequentially by instrument. A given day's analyses are maintained in the order of the analysis. 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 13 and 20. 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. The procedure for this verification can be found in SOP ARCHIV.SOP.

- Also refer to Section 20.13.1 'Computer and Electronic Data Related Requirements'.

15.2 TECHNICAL AND ANALYTICAL RECORDS

15.2.1 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 (refer to Section 15.1). 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 checking of results.

15.2.2 Observations, data and calculations are recorded at the time they are made and are identifiable to the specific task.

15.2.3 Changes to hardcopy records shall follow the procedures outlined in Section 13 and 20. 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 (previous discussions relate where most of this information is maintained – specifics may be added below):

- laboratory sample ID code;
- Date of analysis and time of analysis is 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.
- Instrumentation identification and instrument operating conditions/parameters. Operating conditions/parameters are typically recorded in either the instrument maintenance logs where available or as part of the most recent calibration method file.
- analysis type;
- all manual calculations and manual integrations;
- analyst's or operator's initials/signature;
- sample preparation including cleanup, separation protocols, incubation periods or subculture, 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.

15.3 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

15.3.1 Sample Handling Records

Sample handling and tracking is discussed in Section 24. 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.

15.4 ADMINISTRATIVE RECORDS

The laboratory also maintains the administrative records in either electronic or hard copy form. See Table 15-1.

15.5 RECORDS MANAGEMENT, STORAGE AND DISPOSAL

15.5.1 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 to the accrediting body upon request.

15.5.2 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.

15.5.3 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**.**

15.5.4 TestAmerica Irvine 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 within a given analysis. No analysis has more than one active notebook at a time, so all data are recorded sequentially within a series of sequential notebooks. Bench sheets are filed sequentially. Standards are maintained in the LIMS; some departments may also keep logbooks for standards prepared frequently (e.g. daily).

15.5.5 Records are considered archived when moved off-site. Access to archived hard-copy information is documented with an access log and in/out records is used in archived boxes to note data that is removed and returned. 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**.**

15.5.6 In the event that the laboratory transfers ownership or goes out of business, TestAmerica Irvine 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.

15.5.7 Records Disposal

15.5.7.1 Records are removed from the archive and disposed 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.

15.5.7.2 Electronic copies of records must be destroyed by erasure or physically damaging off-line storage media so no records can be read.

15.5.7.3 If a third party records management company is hired to dispose of records, a "Certificate of Destruction" is required. [Refer to Policy No. CW-L-P-001 (Records Retention).]

SECTION 16

AUDITS
(NELAC 5.4.13)

16.1 OVERVIEW

Audits measure laboratory performance and insure compliance with accreditation/certification and project requirements. Audits specifically provide management with an on-going assessment of the quality of results produced by the laboratory, including how well the policies and procedures of the QA system and the Ethics and Data Integrity Program are being executed. They are also instrumental in identifying areas where improvement in the QA system will increase the reliability of data. There are two principle types of audits: Internal and External. Internal audits are performed by laboratory or corporate personnel. External audits are conducted by regulators, clients or third-party auditing firms. In either case, the assessment to program requirements is the focus.

Table 16-1. Audit Types and Frequency

Internal Audits	**Description**	**Performed by**	**Frequency**
	Analyst & Method Compliance	QA Department or Designee	- 100% of all methods over a two year period. - 100% of all analysts annually.
	Instrument	QA Department or Designee	100% of all organic instruments and any inorganic chromatography instruments over a two year period
	Work Order/ Final Report	QA Department or Designee	- 1 complete report each month.
	Support Systems	QA Department or Designee	- Annual for entire labs support departments & equipment (e.g., thermometers, balances), can be divided into sub-sections over the course of the year.
	Performance Audits (Double-Blind PTs)	Corporate QA, Laboratory QA Department or Designee	- As needed.
	Special	QA Department or Designee	- As Needed
External Audits	**Description**	**Performed by**	**Frequency**
	Program / Method Compliance	Regulatory Agencies, Clients, accreditation organizations	- As required by program and/or clients needs
	Performance Audits	Provided by a third party.	- As required by a client or regulatory agency. Generally provided semi-annually through the analysis of PT samples.

16.2 INTERNAL AUDITS

Annually, the laboratory prepares a schedule of internal audits to be performed throughout the year. As previously stated, these audits verify and monitor that operations continue to comply with the requirements of the laboratory's QA Manual and the Corporate Ethics Program. A

schedule of the internal audits is maintained by the QA Manager in the *Internal Audit Workbook*. An example can be found in Attachment 1.

It is the responsibility of the QA Manager to plan and organize audits in consideration of the laboratory work load and the department personnel schedules so that all pertinent personnel and operations are thoroughly reviewed. When designees (other than QA department personnel & approved by the QA Manager), perform audits, the QA Manager shall insure that these persons do not audit their own activities except when it can be demonstrated that an effective audit will be carried out. In general, the auditor:

- is neither the person responsible for the process being audited nor the immediate supervisor of the person responsible for the project/process.
- Is free of any conflicts of interest.
- Is free from bias and influences that could affect objectivity.

Laboratory personnel (e.g., supervisors and analysts) may assist with both method and support system audits as long as the items listed in the above paragraph are observed. These audits are conducted according to defined criteria listed in the checklists of the *Internal Audit Workbook.* These personnel must be approved by the QA Manager; and must complete the audit checklists in their entirety. This process introduces analyst experience and insight into the laboratory's auditing program.

The auditor must review the previous audit report and identify all items for verification of corrective actions. A primary focus will be dedicated to the ability of the laboratory to correct root-cause deficiencies and that the corrective action has been implemented and sustained as documented.

16.2.1 Systems

An annual 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. This audit is performed in portions throughout the year through method, analyst, instrument, work order/final report and support system audits. Audits are documented and reported to management within 1 week of their performance. Systems audits cover all departments of the facility, both operational and support. The multiple audits are compiled into one systems audit package at the end of the year (*Internal Audit Workbook*).

16.2.1.1 Method, Analyst, Instrument and Work Order/Final Report Audits

Procedures for the method compliance, analyst, instrument and work order/final report audits are incorporated by reference to SOP No. CA-Q-S-004, Method Compliance and Data Authenticity Audits. These audits are not mutually exclusive. For example, the performance of a method audit will also cover multiple analysts and instruments. The laboratory's goal is to annually review all analysts and instruments as described in SOP No. CA-Q-S-004. The laboratory will also audit all methods within a two year time period and audit a minimum of one Work Order/Final Report from receiving through reporting on a monthly basis.

16.2.1.2 Support Systems

Support system audits are performed to ensure that all departments & ancillary equipment are operating according to prescribed criteria. Support system audits include the review of both non-analytical and operational departments. Support equipment audits (e.g., metrology items) include the review of balance calibrations, weight calibrations; water quality testing, etc.. Non-analytical may include sample receiving and bottle preparation. These types of support audits ensure that the operations are being performed to support ethical data as well as ensuring the accuracy & precision of the utilized equipment.

These audits can be performed in portions throughout the year or in one scheduled session. However, the audit schedule must document that these aspects are reviewed annually. Many of the metrology systems are considered to be surveillance activities that can be monitored by QA personnel or delegated to specified department personnel. These surveillance activities are performed on a semi-annual basis unless issues warrant a greater frequency or previous audits continually showing no deficiencies allow the frequency to be reduced to once a year.

An example audit checklist can be found in Attachment 2. Instructions for reporting findings are included in the *Internal Audit Workbook*. In general, findings are reported to management within 1 week of the audit and a response is due from management within 30 days.

16.2.2 Performance Audits

Corporate QA may arrange for double blind PT studies to be performed in the laboratories. Results are given to Management and Corrective actions of any findings are coordinated at each facility by the QA Managers and Laboratory Directors/Managers. These studies are performed on an as needed basis. They may be performed when concerns are raised regarding the performance of a particular method in specific laboratories, periodically to evaluate methods that may not normally be covered in the external PT program or may be used in the process of developing best practices. The local QA Manager may also arrange for PT studies on an as needed basis. (Refer to Section 16.3.2 for additional information on Performance Audits.)

16.2.3 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.

16.3 EXTERNAL AUDITS

TestAmerica facilities are routinely audited by clients and external regulatory authorities. 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. The department managers 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. This time frame is generally 30 days.

Be aware that NELAC requires that the audit response report be acceptable to the primary accrediting authority after the second submittal. The lab shall have accreditation revoked for all or any portion of its scope of a accreditation for any or all fields of testing, a method, or analyte within a field of testing if it is not corrected.

TestAmerica Irvine 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.

16.3.1 Confidential Business Information (CBI) Considerations

During on-site audits, on-site 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.

16.3.2 Performance Audits

The laboratory is involved in performance audits conducted semi-annually through the analysis of PT samples provided by a third party. The laboratory generally participates in the following types of PT studies: WS (drinking water), WP (waste water/RCRA), and SOIL (RCRA)

- It is TestAmerica's policy that PT samples be treated as typical samples in the production process. Further, 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.

- PTs generally do not have holding times associated with them. In the absence of any holding time requirement, it is recommended that the holding time begin when the PT sample is prepared according to the manufacturers instructions. Holding times should apply to full volume PT samples only if the provider gives a meaningful "sampling date". If this is not provided, it is recommended that the date/time of opening of the full volume sample be considered the beginning of holding time.

- Login will obtain the COC information from the documentation provided with the PTs with review by QA or other designated staff.

- Vials will be prepared as required in the instruction set provided with the samples. After preparation to full volume the sample may be spiked, digested, concentrated, etc., as would be done for any normal sample requiring similar analysis.

- PT samples will not undergo multiple preps, multiple runs, multiple methods (unless being used to evaluate multiple methods), multiple dilutions, UNLESS this is what would be done to a normal client sample (e.g. if a client requests, as PT clients do, that we split VOA coeluters, then dual analysis IS normal practice).

- The type, composition, concentration and frequency of quality control samples analyzed with the PT samples shall be the same as with routine environmental samples.

- Instructions may be included in the laboratory's SOPs for how low level samples are analyzed, including concentration of the sample or adjustment of the normality of titrant. When a PT sample falls below the range of the routine analytical method, the low-level procedure may be used.

- No special reviews shall be performed by operation and QA, UNLESS this is what would be done to a normal client sample. To the degree that special report forms or login procedures are required by the PT supplier, it is reasonable that the laboratory WOULD apply special review procedures, as would be done for any client requesting unusual reporting or login processes.

- 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.

16.4 AUDIT FINDINGS

Internal audit findings are documented using the Internal Audit Workbook. External audit findings are documented using the Audit Database. The laboratory is expected to prepare a response to audit findings within 30 days of receipt of an audit report unless the report specifies a different time frame. The response may include action plans that could not be completed within the 30 day timeframe. In these instances, a completion date must set and agreed to by operations management and the QA Manager.

Responsibility for 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.

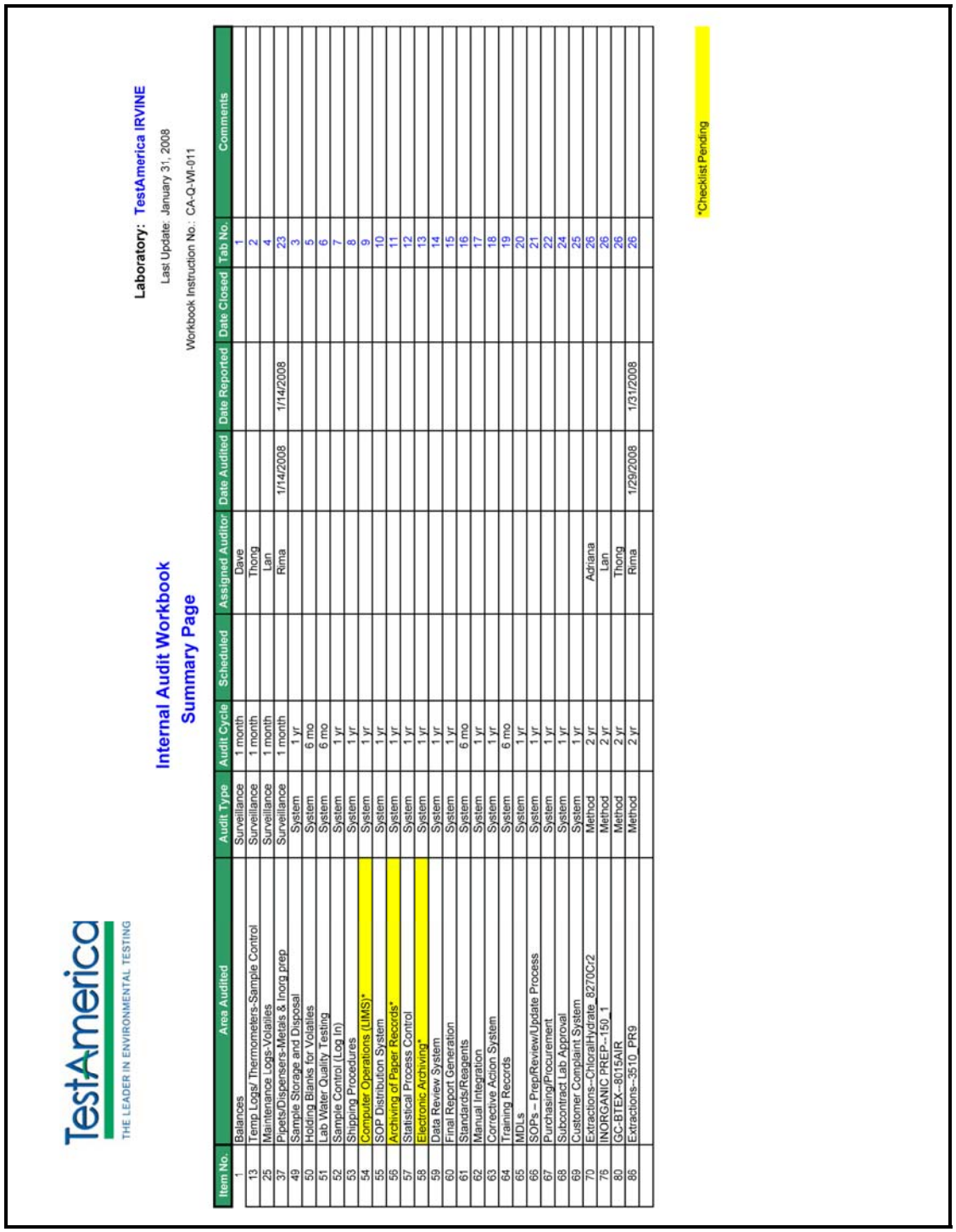
If any audit finding casts doubt on the effectiveness of the operations or on the correctness or validity of the laboratory's test results, the laboratory shall take timely corrective action, and shall notify clients in writing if the investigations show that the laboratory results have been affected. Once corrective action is implemented, a follow-up audit is scheduled to ensure that the problem has been corrected.

The procedures must be in accordance to SOP No. CA-L-S-001, Internal Investigations of Data Discrepancies and Determination of Data Recall.

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.

Figure 16-1.

Example - Internal Audit Workbook



TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Laboratory: TestAmerica IRVINE

Last Update: January 31, 2008

Workbook Instruction No.: CA-Q-WI-011

Internal Audit Workbook
Summary Page

Item No.	Area Audited	Audit Type	Audit Cycle	Scheduled	Assigned Auditor	Date Audited	Date Reported	Date Closed	Tab No.	Comments
1	Balances	Surveillance	1 month		Dave				1	
13	Temp Logs/ Thermometers-Sample Control	Surveillance	1 month		Thong				2	
25	Maintenance Logs-Volatiles	Surveillance	1 month		Lan				4	
37	Pipets/Dispensers-Metals & Inorg prep	Surveillance	1 month		Rima	1/14/2008	1/14/2008		23	
49	Sample Storage and Disposal	System	1 yr						3	
50	Holding Blanks for Volatiles	System	6 mo						5	
51	Lab Water Quality Testing	System	6 mo						6	
52	Sample Control (Log In)	System	1 yr						7	
53	Shipping Procedures	System	1 yr						8	
54	Computer Operations (LIMS)*	System	1 yr						9	
55	SOP Distribution System	System	1 yr						10	
56	Archiving of Paper Records*	System	1 yr						11	
57	Statistical Process Control	System	1 yr						12	
58	Electronic Archiving*	System	1 yr						13	
59	Data Review System	System	1 yr						14	
60	Final Report Generation	System	1 yr						15	
61	Standards/Reagents	System	6 mo						16	
62	Manual Integration	System	1 yr						17	
63	Corrective Action System	System	1 yr						18	
64	Training Records	System	6 mo						19	
65	MDLs	System	1 yr						20	
66	SOPs – Prep/Review/Update Process	System	1 yr						21	
67	Purchasing/Procurement	System	1 yr						22	
68	Subcontract Lab Approval	System	1 yr						24	
69	Customer Complaint System	System	1 yr						25	
70	Extractions--ChloralHydrate_8270Cr2	Method	2 yr		Adriana				26	
76	INORGANIC PREP--150_1	Method	2 yr		Lan				26	
80	GC-BTEX--8015AIR	Method	2 yr		Thong				26	
86	Extractions--3510_PR9	Method	2 yr		Rima	1/29/2008	1/31/2008		26	

*Checklist Pending

Figure 16-2.

Example – Internal Audit System Checklist: Corrective Actions

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica <Location>

INTERNAL AUDIT - Corrective Actions

[Printed Name(s) or Date(s)]

(Summary Page)

Area Audited:
Auditor:
Date:
Persons Contacted During Audit:

Date Reported to Department Manager:
Reported To:

Date Reported to Lab Director/Manager:
Reported To:

Date Response Due:

Response Received and Accepted by QA Manager:

Associated Corrective Action Report Number(s):

Scheduled Follow-up:

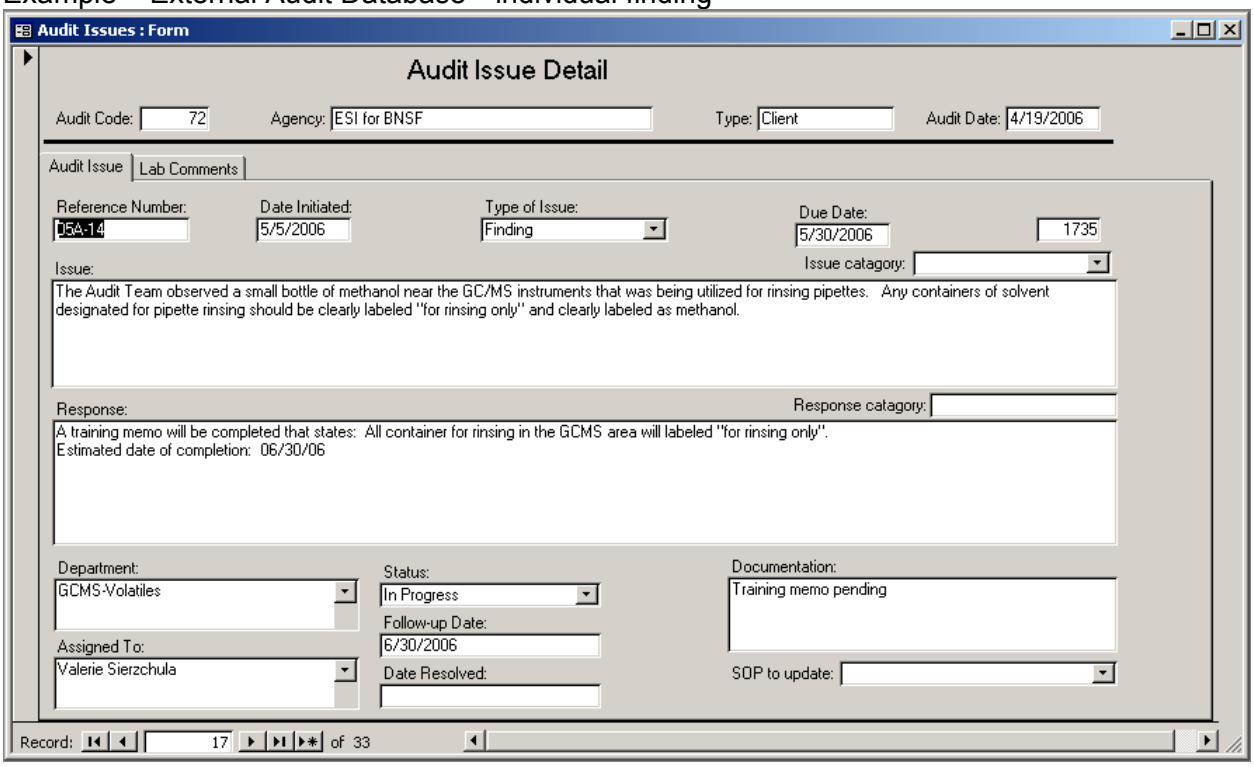
Item	Requirement	Ref.	Y	N	NA	Evidence/Comments	Follow Up
1	Does the laboratory have a corrective action program in place?	5.4.10.1					
2	Does the laboratory have a current corrective action SOP or is this information in the QA Manual?	5.4.10.1					
3	Do all laboratory personnel have documented training and access to initiate corrective actions?	5.4.10.1					
4	Are causes clearly identified by department, staff name, scope of issue (how many reports affected)?	5.4.10.6					
5	Is a root cause for the issue identified?	5.4.10.2					
6	Is a corrective action (plan) clearly described?						
7	Was the corrective action fully implemented?						
8	Is documentation (if applicable) completed as specifed by the corrective action (training, revised SOP, etc)						
9	Has a follow-up assessment been conducted to verify the corrective action was successful?						
10	Are corrective actions reviewed on a regular basis by management?	5.4.10.6a 5					
11	Is there a defined distribution flow for corrective action notification, review, closure, and follow-up?	5.4.10.6a					
12	Are non-conformances reviewed on a regular basis and used, if necessary, to initiate root cause corrective actions?						
13	Does the lab have a documented procedure for QC corrective action (i.e., documented within each method / parameter SOP or in the QA Manual)?	4.10.1					
14	***Verify Corrective Actions from previous systems audits. List Items:***						
15							
16							
17							

Auditor Signature:_____

Primary Reference(s): Corporate SOP CA-Q-S-002, Acceptable Manual Integration Practices
NELAC Standard, June 2003
DoD Quality Systems Manual, Version 3, January 2006
EPA Manual for the Certification of Laboratories Analyzing Drinking Water

Figure 16-3.

Example – External Audit Database—individual finding



SECTION 17

MANAGEMENT REVIEWS
(NELAC 5.4.14)

17.1 QUALITY ASSURANCE REPORT

A comprehensive QA Report shall be prepared each month by the laboratory's QA Department and forwarded to the Laboratory Director for review and comments. The final report shall be submitted to the Technical Directors and Operation as well as the appropriate Quality Director and General Manager. All aspects of the QA system are reviewed to evaluate the suitability of policies and procedures. At a minimum, the report content will contain the items listed below. During the course of the year, the Laboratory Director, General Manager or Corporate QA may request that additional information be added to the report.

The TestAmerica QA Report template is comprised of a discussion of three key QA issues facing the laboratory and ten specific sections (Figure 17-1):

- **Metrics:** Describe actions or improvement activities underway to address any outlying quality metrics that have been reported in the monthly Quality System Metrics Table.
- **SOPs:** Report SOPs that have been finalized and report status of any outstanding SOP reviews.
- **Corrective Actions:** Describe highlights and the most frequent cause for report revisions and corrective/preventive action measures underway. Include a discussion of any recalls handled at the lab level as per Section 6.2.2 in the Investigation/Recall SOP (SOP: CA-L-S-001). Include a section for client feedback and complaints. Include both positive and negative feedback. Describe the most serious client complaints and resolutions in progress.
- **MDLs and Control Limits:** Report which MDLs/ MDL verifications are due. Report the same for Control Limits.
- **Audits:** Report Internal and External Audits that were conducted. Include all relevant information such as which methods, by whom, corrective actions needed by when and discuss unresolved audit findings.
- **Performance Testing (PT) Samples:** Report the PT tests that are currently being tested with their due dates, report recent PT results by study, acceptable, total reported and the month and year.
- **Certifications:** Report on any certification programs being worked on by due date, packages completed. Describe any issues, lapses, or potential revocations.
- **Regulatory Updates:** Include information on new state or federal regulations that may impact the laboratory. Report new methods that require new instrumentation, deletion of methods, changes in sampling requirements and frequencies etc…
- **Miscellaneous:** Include any issues that may impact quality within the laboratory. This section is also used to communicate the status on any Management of Change Request Forms (CRFs) that have missed targeted due dates.
- **Next Month:** Report on plans for the upcoming month.

- **Lab Director Comments Section:** This section gives the Laboratory Director the opportunity to comment on issues discussed in the report and to document plans to resolve these issues. Unresolved issues that reappear in subsequent monthly reports must be commented on by the Laboratory Director.
- **Quality Systems Metrics Table:** The report also includes statistical results that are used to assess the effectiveness of the quality system. Effective quality systems are the responsibility of the entire laboratory staff. Each laboratory provides their results in a template provided by Corporate QA (Figure 17-2).

On a monthly basis, Corporate QA compiles information from all the monthly laboratory reports. The VP-QA/EHS prepares 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 Analytical Division Senior Management Team and General Managers.

17.2 ANNUAL MANAGEMENT REVIEW

The senior lab management team (Laboratory Director, Technical Directors, QA Manager, conducts an annual review 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. Corporate Operations and Corporate QA personnel may 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 review uses information generated during the preceding year to assess the “big picture” by ensuring that routine quality actions taken and reviewed on a monthly basis are not components of larger systematic concerns. The monthly review (refer to Section 17.1) 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 Management team 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),
- Review of the ACIL seal of excellence program performance.
- Compliance to the Ethics Policy and Data Integrity Plan. Including any evidence/incidents of inappropriate actions or vulnerabilities related to data Integrity.

The annual review includes the previous 12 months. Based on the annual review, 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)].

The QA Manual is also reviewed at this time and revised to reflect any significant changes made to the quality systems.

17.3 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. The 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.

The Chairman/CEO, President/CEO, COOs and Quality Directors receive a monthly report from the VP of Quality and EHS summarizing any current data integrity or data recall investigations as described in SOP No. CA-L-S-001. The General Manager's are also made aware of progress on these issues for their specific labs.

Figure 17-1.

Example - QA Monthly Report to Management

LABORATORY: x
PERIOD COVERED: Month/Year
PREPARED BY: x DATE: Month Day, Year
DISTRIBUTED TO: xx (Include LD, GM, QA Director, etc…)

THREE KEY ISSUES FOR MONTH:
Include a discussion of three key issues that were focused in on this month.
1. x
2. x
3. x

---

1. METRICS
Describe actions or improvement activities underway to address any outlying quality metrics.

2. SOPs

See Tab for SOP specifics.

The following SOPs were finalized (or reviewed for accuracy): (See Tab)

The following SOPs are due to QA: xx

In QA to complete: xx

3. CORRECTIVE ACTION

Highlights: xx

Revised Reports:
Describe the most frequent cause for report revisions and corrective/preventive action measures underway.

Data Investigations/Recalls (Corporate Data Investigation/Recall SOP) :
Include a discussion of any recalls handled at the lab level as Corp SOP.

Client Feedback and Complaints:
Include both positive and negative feedback.

Describe the most serious client complaints) and resolutions in progress.

4. MDLs AND CONTROL LIMITS

MDLs Due:

Control Limits Due:

5. AUDITS

INTERNAL AUDITS

Discuss Any Outstanding Issues (or Attach Summary):

EXTERNAL AUDITS
Discuss Any Outstanding Issues (or Attach Summary):

6. PT SAMPLES

The following PT samples are now in house (Due Dates):
xx

7. CERTIFICATIONS

Certification Packages Being Worked On (Include Due Date):
x

Describe any issues, lapses, or potential revocations.

8. REGULATORY UPDATE
Include information on new state or federal regulations that may impact the laboratory – new methods that require new instrumentation, deletion of methods, changes in sampling requirements or frequencies, …

9. MISCELLANEOUS
Include any issues that may impact quality within the laboratory.

10. NEXT MONTH
Items planned for next month.

LAB DIRECTOR COMMENTS AND PLANNED CORRECTIVE ACTIONS:	
LAB DIRECTOR REVIEW:	DATE:

Figure 17-2.

Example - Laboratory Metrics Categories

Reports for month
Reports revised due to lab error
% Revised Reports
# of Data Recall Investigations
# of Reports Actually Recalled
Corrective Action Reports
Corrective Action Reports still open
Total Number of Unresolved Open Corrective Action Reports
% of Unresolved Open Corrective Action Reports
# Reports independent QA reviewed
% QA Data Review: Reports
# Technical staff (Analysts/technicians, including Temps)
# of Analyst work product reviewed year-to-date
# of Analytical instruments w/electronic data file storage capability
# of Analytical instruments reviewed for data authenticity year-to-date
% Analyst/Instrument Data Authenticity Audits
 # Client Complaints
 # Client Compliments
# of planned internal audits
# of planned internal method audits performed year-to-date
% Annual Internal Audits Complete
# of Open Internal Audit Findings Past Due
Total Number of External Audit Findings
# of Open External Audit Findings Past Due
% External Audit Findings Past Due
# of PT analytes participated and received scores
# of PT analytes not acceptable
% PT Cumulative Score
 # PT Repeat Analyte Failures Cumulative (analyte failed more than once in 4 consecutive studies by PT Type) (only applies to failed analytes)
SOPs

SOPs Reviewed/revised within 24 months
Methods **or Administrative procedures** without approved SOPs
SOP Status
Method certification Losses due to performance/audit issues
Hold Time Violations due to lab error
Date of Last Comprehensive Ethics Training Session
 # Staff that haven't Received Comprehensive Ethics Training (>30 Days From Employment Date)
MDL Status (Good, Fair, or Poor) >90%, >70%, <70%
Training Documentation Records (Good, Fair, or Poor)
LQM Revision/review Date
QAM Updated to New Integrated Template
Last Annual Internal Audit Date (Opened, Closed)
Last Management QS Review Date
#SOPs required for 12 month review cycle (DOD *or drinking water)*
#SOPs for 12 month cycle/revised within 12 months *(Includes QS and Methods Listed in QSM)*
12 month % SOP Status *(Includes QS and Methods Listed in QSM)*

SECTION 18

PERSONNEL
(NELAC 5.5.2)

18.1 OVERVIEW

TestAmerica'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 Appendix 2.

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.

18.2 EDUCATION AND EXPERIENCE REQUIREMENTS FOR TECHNICAL PERSONNEL

TestAmerica makes every effort to hire analytical staff that posses 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. There are competent analysts and technicians in the industry who have not earned a college degree. 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

Specialty	Education	Experience
Technical Director - Microbiology	Bachelors degree in applied science with at least 16 semester hours in general microbiology and biology An advanced (MS, PhD.) degree may substitute for one year of experience	And 2 years of 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.

18.3 TRAINING

TestAmerica 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	Refer to EH&S Manual	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 20.

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 are maintained in their training file.
- Documentation of proficiency (refer to Section 20).
- 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's Training and Documentation SOP, IR-QA-TRAIN.

18.4 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 an Ethics Policy No. CA-L-P-001 and an Ethics Statement/Agreement (Appendix 1). All initial and annual training is documented by signature on the signed Ethics Policy and Code of Ethical Conduct 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 (Appendix 1)
- 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 19

ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS
(NELAC 5.5.3)

19.1 OVERVIEW

TestAmerica Irvine is a 45,000 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.

19.2 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 effect the results of environmental tests as required by the relevant specifications, methods, and procedures. Such environmental conditions include temperature and barometric pressure. These are monitored in relevant testing areas during the testing period.

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 (refer to Section 12).

Environmental conditions of the facility housing the computer network and LIMS are regulated to protect against raw data loss.

19.3 WORK AREAS

There is effective separation between neighboring areas when the activities therein are incompatible with each other. Examples include:

- Volatile organic analysis is performed in a separate room provided with positive air pressure.
- 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.

19.4 FLOOR PLAN

A floor plan can be found in Appendix 3.

19.5 BUILDING SECURITY

Building electronic keys are distributed to employees as necessary.

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 TestAmerica Irvine. 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.

Signs are posted in the laboratory designating employee only areas - "Authorized employees beyond this point".

SECTION 20.0

TEST METHODS AND METHOD VALIDATION
(NELAC 5.5.4)

20.1 OVERVIEW

TestAmerica Irvine 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.

20.2 STANDARD OPERATING PROCEDURES (SOPs)

TestAmerica Irvine 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 (refer to Section 6 on Document Control):

- All SOPs contain a revision number, effective date, and appropriate approval signatures. Controlled copies are available to all staff.
- Procedures for preparation, review, revision and control are incorporated by reference to SOPs: **CW-Q-S-002** (Writing a Standard Operating Procedure (SOP) and SOP **IR-QA-DOC** (Document Control and Review)
- 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.

20.3 LABORATORY METHODS MANUAL

For each test method, the laboratory shall have available the published referenced method as well as the laboratory developed SOP. Refer to the corporate SOP CW-Q-S-002 "Writing a Standard Operating Procedure" for content and requirements of technical and non-technical SOPs.

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.

20.4 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, etc..), 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.

20.4.1 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.

In general, TestAmerica Irvine follows procedures from the referenced methods shown below in 20.3.1.4.

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.

20.4.1.1 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:

- *Method 1664, Revision A: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM); Non-polar Material) by Extraction and Gravimetry, EPA-821-R-98-002, February 1999*
- *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*
- *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.*
- *Annual Book of ASTM Standards, American Society for Testing & Materials (ASTM), Philadelphia, PA.*
- *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*

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.

20.4.2 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.

20.4.2.1 A demonstration of capability is performed whenever there is a change in instrument type, method or personnel.

20.4.2.2 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 (refer to Section 15, Control of Records).

20.4.2.3 The laboratory must have an approved SOP, demonstrate satisfactory performance, and conduct a method detection limit 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).
- The reporting limit is set at or above the first standard of the curve for the analyte.
- 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.*
- Refer to Section 12 (Control of Non-Conforming Work).

20.4.3 Initial Demonstration of Capability (IDOC) Procedures

The laboratory's SOP IR-QA-TRAIN (Training and Documentation) describes in detail the process by which IDOCs are prepared, performed, evaluated, and documented.

20.4.3.1 The following criteria are to be met for any IDOC:

- The spiking standard used must be prepared independently from those used in instrument calibration.
- 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.
- 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).
- Using all of the results, calculate the mean recovery in the appropriate reporting units and the standard deviations for each parameter of interest.
- 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.
- 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.

20.4.3.2 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 20.4.3.3 above.
- Beginning with 20.4.3.3 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 20.4.3.1 above.

A certification statement (see Figure 20-1) 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.

20.5 LABORATORY DEVELOPED METHODS AND NON-STANDARD METHODS

Any new method developed by the laboratory must be fully defined in an SOP/Methods Manual (Section 20.2) 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. The information included in the checklist below (Figure 20-2) is needed before samples are accepted for analysis by a new method.

20.6 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. (From 2003 NELAC Standard)

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.

20.6.1 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.

20.6.1.1 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.

20.6.1.2 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. The laboratory determinations of MDLs are described in Section 20.6.

20.6.1.3 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 level at which both the presence of an analyte and its concentration can be reliably determined. 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.

20.6.1.4 Determination of Interferences

A determination that the method is free from interferences in a blank matrix is performed.

20.6.1.5 Determination of Range

Where appropriate, a determination of the applicable range of the method may be performed. In most cases, range is determined and demonstrated by comparison of the response of an analyte in a curve to established or targeted criteria. The curve is used to establish the range of quantitation and the lower and upper values of the curve represent upper and lower quantitation limits. Curves are not limited to linear relationships.

20.6.1.6 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.

20.6.1.7 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.

20.6.1.8 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.

20.7 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 20.7.10). 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.

20.7.1 MDL's are initially performed for each individual instrument and non-microbiological method analysis. Unless there are requirements to the contrary, the laboratory will use the highest calculated MDL for all instruments used for a given method as the MDL for reporting purposes. This MDL is not required for methods that are not readily spiked (e.g. pH, turbidity, etc.) or where the lab does not report values to the MDL. Titration and gravimetric methods where there is no additional preparation involved, the MDL is based on the lowest discernable unit of measure that can be observed.

20.7.2 MDL's must be run against acceptable instrument QC, including ICV's and Tunes. This is to insure that the instrument is in proper working condition and falsely high or low MDL's are not calculated.

20.7.3 Use only clean matrix which is free of target analytes (e.g.: Laboratory reagent water, Ottawa Sand) unless a project specific MDL is required in a field sample matrix.

20.7.4 The Reporting Limit (also may be referred to as Limit of Quantitation or LOQ) should generally be between 2 and 5 times the MDL. If the MDL is being performed during method development, use this guideline to determine the Reporting Limit for the analysis.

20.7.5 If a sample is diluted, the reported MDL is adjusted according to the dilution factor.

20.7.6 The calculated MDL cannot be greater than the spike amount.

20.7.7 If the most recent calculated MDL does not permit qualitative identification of the analyte then the laboratory may use technical judgment for establishing the MDL (e.g., calculate what level would give a qualitative ID, compare with IDL (20.7), spike at a level where qualitative ID is determined and assign that value as MDL, minimum sensitivity requirements, Standard deviation of method blanks over time, etc.). These alternate verification procedures are documented in the laboratory's MDL.SOP (Determination of Method Detection Limits).

20.7.8 Each of the replicate spikes must be qualitatively identifiable (e.g., appear in both columns for dual column methods, characteristic ions for GCMS mass spectra, etc). Manual integrations to force the baseline for detection are not allowed.

20.7.9 The initial MDL is calculated as follows:

$$MDL = t_{(n-1,\ 1-a\ =\ 0.99)} \times (\text{Standard Deviation of replicates})$$

where $t_{(n-1,\ 1-a\ =\ 0.99)}$ = 3.143 for seven replicates. (2.998 for eight)

20.7.10 Subsequent to the initial MDL determination, periodic MDL verification, confirmation or determinations may be performed by the procedure in 40 CFR Part 136, Appendix B or alternatively by other technically acceptable practices (e.g., method blanks over time, single standard spikes that have been subjected to applicable sample prep processes, etc.). The procedures utilized is documented in the laboratory SOP MDL.SOP (Determination of Method Detection Limts).

20.7.11 Because of the inherent variability in results outside of the calibration range, TestAmerica does not recommend the reporting of results below the lowest calibration point in a curve; however, it is recognized that some projects and agencies require the reporting of results below the RL. Any result that falls between the MDL and the Reporting limit, when reported, will be qualified as an estimated value.

20.7.12 Detections reported down to the MDL must be qualitatively identified.

20.7.13 MDLs and Reporting limits are adjusted in LIMs based on moisture content and sample aliquot size.

20.8 INSTRUMENT DETECTION LIMITS (IDL)

20.8.1 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.

20.8.2 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.

20.8.3 If IDL is > than the MDL, it may be used as the reported MDL.

20.9 VERIFICATION OF DETECTION AND REPORTING LIMITS

20.9.1 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 for single analyte analyses (e.g. most wet chemistry methods, Atomic Absorption, etc.) and 1-4 times the calculated MDL for multiple analyte methods (e.g. GC, GCMS, ICP, etc.). The analytes must be qualitatively identified or see section 20.6.7 for other options. 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. 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 (See 20.6.7). MDLs must be verified at least annually if an annual MDL study is not performed.

20.9.2 When a Reporting limit is established, it must be initially verified by the analysis of a low level standard or QC sample (LCS at 1-2 the reporting limit) and annually thereafter. Unless there are requirements to the contrary the acceptance criteria is ± 50%. The annual requirement is waved for methods that have an annually verified MDL.

20.10 RETENTION TIME WINDOWS

Most organic analyses and some inorganic analyses use chromatography techniques for qualitative and quantitative determinations. For every chromatography analysis 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.

For GC, HPLC and IC methods, there must be sufficient separation between analyte peaks so as to not misidentify analytes. In the mid-level standard, the distance between the valley and peak height cannot be any less than 25% of the sum of the peak heights of the analytes. This also applies to GCMS in the case where the two compounds share the same quantitation ion.

Note: Some analytes do not separate sufficiently to be able to identify or quantitate them as separate analytes (e.g. m-xylene and p-xylene) and are quantitated and reported as a single analyte (e.g. m,p-xylenes).

Once the analyst has determined that the instrument is in optimum working condition through calibration and calibration verification procedures, he or she uses a mid-range calibration or calibration verification standard to establish the retention times for each of the individual analytes in a method. The analyst makes three injections of the same standard over a 72-hour (24 hr period for 300.0) period, tabulating the retention times for each analyte for each of the three injections. The width of retention time window is normally the average absolute retention time ± 3 Standard Deviations. A peak outside the retention time window will not be identified by the computer as a positive match of the analyte of interest.

It is possible for the statistically calculated RT window to be too tight and need to be adjusted based on analyst experience. In these instances method default retention time windows may be used (e.g., for 8000 series methods a default of 0.03 minutes may be used, and EPA CLP 0.05

minutes is used). The same concept is applied when any peak outside of that window will not be identified by the computer as a positive match.

The calibration verification standard at the beginning of a run may be used to adjust the RT for an analyte. This is essentially re-centering the window but the size of the window remains the same. The RTs are verified when all analytes are within their RT windows and are properly identified.

20.11 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 and specific electrode response factors.

20.12 ESTIMATION OF UNCERTAINTY OF MEASUREMENT

20.12.1 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.

20.12.2 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.

20.12.3 The 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). 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.

20.12.4 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.

20.12.5 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.

20.13 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.

20.13.1 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 COMPSECU.SOP (Computer Security). The laboratory is currently running the Element which is a 3rd party 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 SQL which is an industry standard relational database platform. It is referred to as Database for the remainder of this section.

20.13.1.1 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.

  Note: "Commercial off-the-shelf software in use within the designed application range is considered to be sufficiently validated." *From NELAC 2003 Standard.* However, laboratory specific configurations or modifications are validated prior to use.

- In order to assure accuracy, all data entered or transferred into the LIMS data system goes through a minimum of two levels of review.
- The QA department performs random data audits to ensure the correct information has been reported.
- Changes to reports are documented using the non-conformance/corrective action database. Changed report files are named "revision_a", "revision_b", etc to clearly differentiate them from the originally reported file.

- Analytical data file security is provided through three policies.
  - The first policy forbids unauthorized personnel from using laboratory data acquisition computers.
  - The second policy is the implementation of network passwords and login names that restrict directory access.

- The third layer is maintained through the LIMS and includes the use of username/password combinations to gain access to the LIMS system, the fact that all data in the LIMS is associated with the user to added/reviewed the data, and the restriction of review authority of data.

- All software installations will be in accordance with any relevant copyright licensing regulations.
- All software installed on any computer within the laboratory must be approved by the Information Technology Department regional support technician assigned to the laboratory Shrink-wrapped or otherwise sealed OEM software that is directly related to instrument usage does not need approval but the Information Technology department must be notified of the installation.
- Anti-virus software shall be installed on all servers and workstations. The anti-virus software shall be configured to check for virus signature file and program updates on a daily basis and these updates will be pushed to all servers and workstations. The anti-virus software will be configured to clean any virus-infected file if possible, otherwise the file will be deleted. Disks and CDs brought from any outside source that are not OEM software must be scanned for viruses before being accessed.

- **Interlab LIMS Permissions Policy**
  - PURPOSE - The purpose of this policy is to provide a mechanism for maintaining the integrity of information contained in each laboratory's LIMS while providing the necessary access for information sharing to staff at other laboratory facilities.
  - DEFINITIONS - Host Laboratory: The laboratory facility that 'owns' the LIMS system or 'hosts' a project/job.
  - POLICIES

    (a) All permissions for the laboratory's LIMS system must only be granted by a representative of that laboratory.
    - If someone outside of the host lab needs permissions for Project Management or other uses, they must go through the Lab Director or his/her designated representative.
    - Permissions must never be granted without the knowledge of the host laboratory.

    (b) Only laboratory analytical or QA staff from the home laboratory may have edit permissions for laboratory analysis data.

    (c) Any changes made in laboratory's LIMS system:
    - Must be documented and traceable.
    - If made by staff of an affiliate lab, written permission from the home lab to make the changes (email approval is sufficient) is required.
    - No corrections may be made in another laboratories system without their knowledge.

    (d) Data qualifiers in laboratory reports must only be corrected, edited, etc. by the staff at the host laboratory.

    (e) Full analytical data "View" only permissions may be granted to outside Project Management and Sales staff. ~~Query~~ Search permissions may also be granted so status may be checked.

    (f) All qualifiers must be approved by QA staff before adding to standard reference (static) tables.

    (g) Please contact Corporate QA or IT staff if you have any questions regarding implementation or interpretation of this policy.

20.13.1.2 **Ensure Information Availability:** Protection against loss of information or service through scheduled back-ups, secure storage of media, line filter, Uninterruptible Power Supply (UPS), and maintaining older versions of software as revisions are implemented.

- Insured by timely backup procedures on reliable backup media, stable file server network architecture, and UPS protection
- UPS Protection:
  - Each fileserver is protected by an appropriate power protection/backup unit. In the event of a power outage, there is approximately 15-30 minutes of up-time for the servers prior to shutdown. This allows for proper shutdown procedures to be followed with the fileservers.
- File Server Architecture
  - All files are maintained on multiple Windows 2000 or newer servers which are secured physically in the Information Technology office. Access to these servers is limited to members of the Information Technology staff.
  - All supporting software is maintained for at least 5 years from the last raw data generated using that software. [Length of time is dependent on local regulations or client requirements (e.g., OVAP requires 10 years).]
- System Back-up Overview and Procedures
  - Data from both servers and instrument attached PC's are backed up and purged in compliance with the corporate back-up policy.
  - A Maintenance Plan has been defined to create a daily archive of all data within the LIMS database to a backup location. This backup is initiated automatically by either the database or back-up system.
  - Backup tapes will be stored in compliance with the corporate Data Backup Policy. Backup verifications are carried out in accordance with the corporate Data Backup Policy.
  - Instrument data back-ups are verified on a periodic basis by the QA department when performing electronic data audits. The audit takes place on data that has been moved to a back-up location ensuring that it has been moved.

20.13.1.3 Maintain Confidentiality: Ensure data confidentiality through physical access controls, and encryption of when electronically transmitting data.

- All servers are located in a secure area of the IT department offices. Access to the servers is limited to IT staff (Desktop Support, Director of LIMS support, Database administrator) and Lab Director.
- The company website contains SSL (Secure Socket Layer) encryption for secure website sessions and data transfers.
- The reporting portion of the LIMS system requires a project manager to enter their unique password anytime they create a report that displays a signature on it (.PDF).
- Electronic documents such as PDF files and electronic data deliverables will be made available to clients via the secure web site. The logon page for this web site contains an agreement that the customer must accept before they will be logged on which states that the customer agrees not to alter any electronic data made available to them.

- If electronic documents are made available outside of the web site, the customer must sign an agreement in advance that states they will not alter the data in any way.

20.13.2 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 entering the data in LIMS. The spreadsheets, or any other type of applicable documents, are signed by both the analyst and 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 CA-Q-S-002, *Acceptable Manual Integration Practices*.

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.

20.13.2.1 All raw data must be retained in the daily run sequence folder, computer file (if appropriate), and/or logbook. 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.

20.13.2.2 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. The units "mg/l" and "mg/kg" are the same as "parts per million (ppm)". The units "µg/l" and "µg/kg" are the same as "parts per billion (ppb)." For values greater than 10,000 mg/l, results can be reported in percent, i.e., 10,000 mg/l = 1%.

- Several environmental methods, such as color, turbidity, conductivity, use very specific, non-concentration units to report results (e.g., NTU, umhos/cm etc).
- Occasionally, the client requests that results be reported in units which take into account the measured flow of water or air during the collection of the sample. When they provide this information, the calculations can be performed and reported.

20.13.2.3 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, client sample results are reported to 2 significant figures and QC samples are reported to 3 significant figures on the final report.

20.13.2.4 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.

20.13.2.5 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.

20.13.3 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 13.
- 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 and QA Manager at the facility. The QA Manager controls all worksheets following the procedures in Section 6.

20.13.4 Review / Verification Procedures

Review procedures are outlined in several SOPs (LOGIN.SOP [Sample Control], DATAREV.SOP [General Data Review], PMDATA.SOP [Project Management Data Reporting, Validation and Distribution]) to ensure that reported data are free from calculation and transcription errors, 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. (**CA-Q-S-002**, Acceptable Manual Integration Practices) The general review concepts are discussed below, more specific information can be found in the SOPs.

20.13.4.1 The data review process at TestAmerica Irvine 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.

20.13.4.2 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 (see Appendix 7 for list of common data qualifiers). 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. Approximately 15% 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

20.13.4.3 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, Department Manager for further investigation. Corrective action is initiated whenever necessary.

20.13.4.4 The results are then entered or directly transferred into the computer database and a hard copy (or .pdf) is printed for the client.

20.13.4.5 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. The following are some examples of chemical relationships that are reviewed (if data is available):

- Total Results are $\geq$ Dissolved results (e.g. metals)

- Total Solids (TS) ≥ TDS or TSS
- TKN ≥ Ammonia
- Total Phosphorus ≥ Orthophosphate
- COD ≥ TOC
- Total cyanide ≥ Amenable Cyanide
- TDS ≥ individual anions

20.13.4.6 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. (*Also see section 26 on Reporting Results*). The accounting personnel also check the report for any clerical or invoicing errors. When complete, the report is sent out to the client.

20.13.4.7 A visual summary of the flow of samples and information through the laboratory, as well as data review and validation, is presented in Figure 20-3.

20.13.5 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 SOP CA-Q-S-002 as the guidelines.

20.13.5.1 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.

20.13.5.2 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.

20.13.5.3 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.

20.13.5.4 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.

Table 20-1
Laboratory Method SOPs by Department and Method Reference

DEPARTMENT	Method	TITLE	FILENAME
Administrative	Computer Security	COMPUTER SECURITY	COMPSECU.SOP
Administrative	Power Outage	POWER OUTAGES	POWEROUT.SOP
Administrative	Software	SOFTWARE MAINTENANCE	SOFTWARE.SOP
Extractions	CADHS LUFT Diesel	DIESEL EXTRACTION FOR SOIL, CA LUFT METHOD	DHSDIESEL.SOP
Extractions	EPA 3510C/EPA 625	EPA METHOD 3510C (BNA EXTRACTION BY SEPARATORY FUNNEL)	3510C_BNA.SOP
Extractions	EPA 3510C Diesel	EPA METHOD 3510C (DIESEL EXTRACTION FOR WATER)	3510_D.SOP
Extractions	EPA 3510C Pest/PCB	EPA METHOD 3510C (ORGANOCHLORINE PESTICIDES AND PCBS EXTRACTION FOR WATER)	3510_PR9.SOP
Extractions	EPA 3520C/EPA 625	EPA METHOD 3520C AND EPA METHOD 625 (CONTINUOUS LIQUID-LIQUID EXTRACTION)	3520C.SOP
Extractions	EPA 3545 Pest/PCB	EPA METHOD 3545 (PRESSURIZED FLUID EXTRACTION [PFE], PESTICIDE AND PCB EXTRACTION FOR SOIL)	3545_P.SOP
Extractions	EPA 3545 Semi-volatiles	EPA METHOD 3545 (PRESSURIZED FLUID EXTRACTION [PFE],SEMI-VOLATILE EXTRACTION FOR SOIL	3545_SV.SOP
Extractions	Na2SO4	PREPARATION OF SODIUM SULFATE FOR EXTRACTIONS	NA2SO4.SOP
GC-BTEX	EPA 8015/8020/CARB 410A	EPA METHOD 8015/8020, MODIFIED FOR AIR AND CARB METHOD 410A (BTEX, MTBE AND FUEL HYDROCARBONS AS GASOLINE)	8015AIR.SOP
GC-BTEX	EPA 8015B/8021B	GASOLINE RANGE ORGANICS (GRO) / BTEX AND MTBE	8015G.SOP
GC-BTEX	Mineral Spirits	GRO/BTEX/MTBE BY GC, ADDENDUM FOR DETERMINATION OF MINERAL SPIRITS (C8-C14) (EPA METHOD 8015B MOD.)	8015minsprt.SOP
GC-SEMI	EPA 8015B Diesel	EPA METHOD 8015B AND MODIFIED FOR DHS LUFT (TOTAL PETROLOLEUM HYDROCARBONS AS DIESEL)	8015D.SOP
GC-SEMI	EPA 8082/608	EPA METHOD 8082/608 (POLYCHLORINATED BIPHENYLS (PCBS) BY GC)	PCBs.SOP
GC-SEMI	EPA 8081A/608	ORGANOCHLORINE PESTICIDES BY GC (EPA METHODS 608 & 8081A)	PESTICIDES.SOP
GC-SEMI	EPA 8081A/608	ORGANOCHLORINE PESTICIDES BY GC (EPA METHODS 608 & 8081A) - Change Form ID - CF1	PESTICIDES.SOP-CF1
GCMS-SEMI	EPA 8270C MOD	1,4-DIOXANE BY 8270C MODIFIED SCAN MODE	14DIOX_8270C.SOP
GCMS-SEMI	827OC MOD	ADDENDUM FOR THE DETERMINATION OF DDT, DDD, DDE AND CHLOROBENZENE IN WATER AND METHYLENE CHLORIDE SOIL EXTRACTS	8270_DDT.SOP
GCMS-SEMI	Chloroacetaldeydes by GCMS	CHLORAL HYDRATE BY EPA 8270C SELECTIVE ION MONITORING (SIM) MODE	ChloralHydrate_8270Cr2.SOP
GCMS-SEMI	EPA 8270C/625	EPA METHOD 8270C (SEMI-VOLATILE ORGANIC COMPOUNDS)/EPA METHOD 625 (BASE/NEUTRALS AND ACIDS)	GCMS-SVOA.SOP
GCMS-SEMI	EPA 1625C MOD	NITROSAMINES BY GC/MS USING CHEMICAL IONIZATION (EPA 1625C MODIFIED)	IR-MSS-NITROSA
GCMS-VOL	EPA 8260B SIM	1,2,3-TRICHLOROPROPANE BY GAS CHROMATOGRAPHY/MASS SPECTOMETRY (GC/MS) SIM (SRL 524M-TCP, EPA 8260B SIM)	123TCP_R1.SOP
GCMS-VOL	EPA 8260B	EPA METHOD 8260B/624 (VOLATILE ORGANIC COMPOUNDS)	GCMS_VOA.SOP
GCMS-VOL	TPH by GCMS	TPH BY GCMS	GCMSTPH.SOP
GCMS-VOL	EPA 8260B MOD	VOLATILE ORGANIC COMPOUNDS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS) ADDENDUM FOR DETERMINATION OF 1,4-DIOXANE BY EPA 8260B MODIFIED	14DIOX.SOP
GCMS-VOL	EPA 5030B & 5035A	VOLATILE ORGANIC PREPARATION (EPA 5030B & 5035A)	IR-MSV-PREP
Health & Safety	Glass crusher	Glass Crusher	GLASSCR.SOP

DEPARTMENT	Method	TITLE	FILENAME
Health & Safety	Plastic shredder	PLASTIC SHREDDER	PLASTSH.SOP
Health & Safety	Safety Manual	SAFETY MANUAL & CHEMICAL HYGIENE PLAN	SMCHP.DOC
INORGANIC PREP	EPA 3050B	ACID DIGESTION FOR TOTAL METALS BY GFAA AND ICP IN SOIL (EPA METHOD 3050B)	3050B.SOP
INORGANIC PREP	EPA 3020A	ACID DIGESTION OF AQUEOUS SAMPLES AND EXTRACTS FOR TOTAL METALS BY GFAA (EPA METHOD 3020A)	3020A.SOP
INORGANIC PREP	EPA 3010A	ACID DIGESTION OF AQUEOUS SAMPLES AND EXTRACTS FOR TOTAL METALS BY ICP (EPA METHOD 3010A)	3010A.SOP
INORGANIC PREP	EPA 200.2/3005A	Acid Digestion of Water for Total Recoveralbe or Dissolved Metals by ICP and ICPMS	METPREP-W.SOP
INORGANIC PREP	EPA 1010	EPA METHOD 1010 (PENSKY-MARTENS CLOSED-CUP METHOD FOR DETERMINING IGNITABILITY)	1010.SOP
INORGANIC PREP	EPA 150.1/9040/9045/SM 4500H,B	EPA METHOD 150.1/ 9040B/ 9045C (ELECTROMETRIC pH)	150_1.SOP
INORGANIC PREP	SM 2120B	EPA METHOD 2120B (COLOR, COLORIMETRIC-PLATINUM-COBALT)	2120B.SOP
INORGANIC PREP	EPA 413.1	EPA METHOD 413.1 (TOTAL RECOVERABLE OIL AND GREASE FOR WATER)	413_1.SOP
INORGANIC PREP	EPA 413.2	EPA METHOD 413.2 (TOTAL RECOVERABLE OIL AND GREASE FOR WATER)	413_2.SOP
INORGANIC PREP	EPA 418.1	EPA METHOD 418.1 (TOTAL RECOVERABLE PETROLEUM HYDROCARBONS)	418_1.SOP
INORGANIC PREP	SM 3500Fe-D	FERROUS IRON BY SM 3500Fe-D	3500Fe_D.SOP
INORGANIC PREP	Glass Washing	GLASSWARE CLEANING	GLASS_E.SOP
INORGANIC PREP	EPA 1664A	GRAVIMETRIC DETERMINATION OF N-HEXANE EXTRACTABLE MATERIAL AND SILICA GEL TREATED N-HEXANE EXTRACTABLE MATERIAL IN WATER	1664A.SOP
INORGANIC PREP	Ignitability	IGNITABILITY IN SOIL	IGNITE.SOP
INORGANIC PREP	EPA 160.5	SETTLEABLE MATTER (EPA METHOD 160.5 / SM2540F)	IR-WET-SETT
INORGANIC PREP	SM 2710F	SPECIFIC GRAVITY BY MASS RATIO (SM2710F)	2710F.SOP
INORGANIC PREP	SM 2580B	STANDARD METHOD 2580B (OXIDATION REDUCTION POTENTIAL)	ORP.SOP
INORGANIC PREP	STLC TITLE 22, SECTION 66261.126, APPENDIX II)	STLC/WET EXTRACTION (TITLE 22, SECTION 66261.126, APPENDIX II)	STLC.SOP
INORGANIC PREP	EPA 1311/1312	TCLP & SPLP (EPA METHOD 1311 & 1312)	1311_1312.SOP
INORGANIC PREP	SM 2150B & EPA 140.1	THRESHOLD ODOR (SM 2150B & EPA 140.1)	IR-WET-ODOR
INORGANIC PREP	EPA 180.1	TURBIDITY, NEPHELOMETRIC (EPA METHOD 180.1 AND STANDARD METHOD 2130B)	180_1.SOP
METALS	EPA 200.9	DETERMINATION OF TRACE ELEMENTS BY STABILIZED TEMPERATURE GRAPHITE FURNACE AA (EPA METHOD 200.9 & STANDARD METHOD 3113)	200_9.SOP
METALS	EPA 9081A	EPA METHOD 9081A CATION-EXCHANGE CAPACITY OF SOILS (SODIUM ACETATE)	9081A.SOP
METALS	EPA 6010B/EPA 200.7	ICP METALS ANALYSES (EPA METHOD 6010B, EPA METHOD 200.7)	ICP.SOP
METALS	EPA 245.1/7470A/7471A	MERCURY, COLD-VAPOR ATOMIC ABSORPTION SPECTROMETRY (EPA METHODs 245.1/7470A/7471)	MERCURY.SOP
METALS	EPA 200.8	METALS BY ICP/MS (EPA METHOD 200.8)	200_8.SOP
METALS	EPA 6020	METALS BY ICP/MS (EPA METHOD 6020)	6020.SOP
METALS	CA DTSC 939-M	ORGANIC LEAD BY GRAPHITE FURNACE AA (CA DTSC 939-M)	ORG_PB_GFAA.SOP
PM	Data packages	DATA PACKAGE GENERATION	DATAPACK
PM	EDFs	EDF (ELECTRONIC DATA FORMAT)	EDF.SOP
PM	Client/Project set-up	PROJECT MANAGEMENT--CLIENT/PROJECT SET-UP	PMCLIENT.SOP
PM	Client communication	PROJECT MANAGEMENT--COMMUNICATION AND DOCUMENTATION	PMDOC.SOP

DEPARTMENT	Method	TITLE	FILENAME
PM	Data reporting	PROJECT MANAGEMENT--DATA REPORTING, VALIDATION AND DISTRIBUTION	PMDATA.SOP
PM	WIP packages	WELL INVESTIGATION PROGRAM (WIP) Package Generation	WIP.SOP
QA	Balances	BALANCE CALIBRATION VERIFICATION AND DOCUMENTATION	BAL.SOP
QA	BP GCLN	BP GCLN Technical Requirements	BPREQS.SOP
QA	Lot testing	CONTAINER AND REAGENT VERIFICATION BY LOT TESTING	LOTTEST.SOP
QA	Control Limits	CONTROL CHARTS AND STATISTICAL PROCESS CONTROL	CNTRLLIM.SOP
QA	Corrective Actions	CORRECTIVE ACTIONS	CAR.SOP
QA	Data Integrity	DATA INTEGRITY AND BUSINESS ETHICS PLAN	DIBEP.SOP
QA	Ethics Policy	DATA INTEGRITY AND ETHICAL PRACTICES POLICY AND PROCEDURE	DMA_ETHICS.SOP
QA	MDLs	DETERMINATION OF METHOD DETECTION LIMITS	MDL.SOP
QA	Documents	DOCUMENT CONTROL	DOCCNTRL.SOP
QA	ET Edwards	EARTH TECH/EDWARDS AFB PROJECT REQUIREMENTS	IR-QA-ETEDW.SOP
QA	Data Review	GENERAL DATA REVIEW	DATAREV.SOP
QA	ICOC	LEGAL CUSTODY PROCEDURES	LEGALCOC.SOP
QA	Logbooks	LOGBOOK DOCUMENTATION	LOGBOOK.SOP
QA	Manual Integration	MANUAL INTEGRATION AND DATA INTEGRITY	MANINT.SOP
QA	Pipets	PIPET CALIBRATION	PIP.SOP
QA	QA Manual	QUALITY ASSURANCE MANUAL	QAM
QA	QA Department	QUALITY ASSURANCE DEPARTMENT	QADR5.SOP
QA	Reagents and Standards	REAGENT AND STANDARD CONTROL AND DOCUMENTATION	STDCTRL.SOP
QA	Archiving	RECORD ARCHIVING	ARCHIV.SOP
QA	Storage Blanks	REFRIGERATOR STORAGE BLANKS	REFBLK.SOP
QA	Sig Figs	SIGNIFICANT FIGURES	SIGFIGS.SOP
QA	Subsampling	SUBSAMPLING	SUBSAMP.SOP
QA	Thermometers	THERMOMETER CALIBRATION, TEMPERATURE MONITORING, AND DOCUMENTATION	THERMA.SOP
QA	Training	TRAINING AND DOCUMENTATION	TRAINING.SOP
QA	Qualifiers	USE OF DATA QUALIFIERS	DATAQUAL.SOP
Sample Control	Bottle Prep	BOTTLE PRESERVATION	BTLPRP.SOP
Sample Control	Courier	COURIER	COURIER.SOP
Sample Control	Field Sampling	FIELD SAMPLING	FIELD.SOP
Sample Control	Manual Entry	MANUAL ENTRY OF SAMPLES FOR SAMPLE CONTROL	MANUALOG.SOP
Sample Control	Sample Control	SAMPLE CONTROL	LOGIN.SOP
WETCHEM	EPA 305.1	ACIDITY, TITRIMETRIC (EPA METHOD 305.1)	305_1.SOP
WETCHEM	EPA 3060A	ALKALINE DIGESTION PROCEDURE FOR HEXAVALENT CHROMIUM IN SOILS	3060A.SOP
WETCHEM	EPA 310.1/SM 2320B	ALKALINITY BY SM2320B, EPA METHOD 310.1	2320B.SOP
WETCHEM	EPA 350.3/SM 4500 NH3	AMMONIA POTENTIOMETRIC, ION SELECTIVE ELECTRODE	350_3r6.SOP
WETCHEM	EPA 405.1/SM 5210B	BIOCHEMICAL OXYGEN DEMAND / CARBONACEOUS BIOLOGICAL OXYGEN DEMAND (EPA METHOD 405.1/SM 5210B)	405_1.SOP
WETCHEM	EPA 7199/218.6	Determination of Hexavalent Chromium by Ion Chromatography--EPA Methods 7199 and 218.6	Cr6IC.SOP
WETCHEM	EPA 314.0	Determination of Perchlorate by Ion Chromatography--EPA 314.0	314_0.SOP

DEPARTMENT	Method	TITLE	FILENAME
WETCHEM	EPA 314.0 Modified	EPA 314.0 MOD. (DETERMINATION OF 4-CHLOROBENZENESULFONIC ACID (PCBSA) BY ION CHROMATOGRAPHY)	PCBSA.SOP
WETCHEM	EPA 160.2/SM 2540D	EPA METHOD 160.2/SM 2540D (TOTAL SUSPENDED SOLIDS; NON-FILTERABLE RESIDUE)	160_2.SOP
WETCHEM	EPA 160.3/SM 2540B	EPA METHOD 160.3 (TOTAL SOLIDS / PERCENT SOLIDS / PERCENT MOISTURE, GRAVIMETRIC, DRIED AT 103-105 C)	160_3.SOP
WETCHEM	EPA 160.4/SM 2540E	EPA METHOD 160.4/SM2540E (FIXED AND VOLATILES RESIDUE IN WATERS)	IR-WET-TVS
WETCHEM	EPA 300.0/9056	EPA METHOD 300.0 and EPA SW9056 (THE DETERMINATION OF INORGANIC ANIONS BY ION CHROMATOGRAPHY)	300_0.SOP
WETCHEM	EPA 300.1	EPA METHOD 300.1 (THE DETERMINATION OF INORGANIC ANIONS BY ION CHROMATOGRAPHY)	300_1.SOP
WETCHEM	EPA 330.5	EPA METHOD 330.5 (RESIDUAL CHLORINE)	330_5.SOP
WETCHEM	EPA 340.2/SM 4500F	EPA METHOD 340.2/SM 4500F (FLUORIDE BY POTENTIOMETRIC, ION SELECTIVE ELECTRODE)	340_2.SOP
WETCHEM	EPA 360.1/SM 4500O-G	EPA METHOD 360.1 / STANDARD METHOD 4500-O-G (DISSOLVED OXYGEN)	4500_OG.SOP
WETCHEM	EPA 365.3	EPA METHOD 365.3 (TOTAL PHOSPHORUS)	365_3.SOP
WETCHEM	EPA 410.4	EPA METHOD 410.4 (CHEMICAL OXYGEN DEMAND)	410_4.SOP
WETCHEM	EPA 415.1/9060/SM 5310B	EPA METHOD 415.1/SM 5310B OR EPA METHOD SW 9060 (TOTAL ORGANIC CARBON)	IR-WET-TOC
WETCHEM	EPA 420.1/9065	EPA METHOD 420.1/9065 (PHENOLICS, TOTAL RECOVERABLE)	420_1.SOP
WETCHEM	SM 5540C	EPA METHOD 5540C (ANION SURFACTANTS AS METHYLENE BLUE ACTIVE SUBSTANCES)	5540C.SOP
WETCHEM	EPA 7196A/SM 3500CR-D/EPA 3060A	EPA METHOD 7196A/STANDARD METHODS 3500-CR D (HEXAVALENT CHROMIUM, COLORIMETRIC + ALKALINE DIGEST (EPA 3060A)	7196A.SOP
WETCHEM	EPA 9030/9034/SM 4500S-F	EPA METHOD 9030/9034 / SM 4500S-F - ACID SOLUBLE/INSOLUBLE SULFIDES	9030_34.SOP
WETCHEM	EPA 9010B/9014/335.2	EPA METHODS 9010B, 9014 AND EPA 335.2 (TOTAL CYANIDE IN SOIL AND WATER)	9010_14.SOP
WETCHEM	EPA 130.2/SM 2340C	HARDNESS BY TITRATION EPA 130.2/SM2340C	2340c.SOP
WETCHEM	Various	Inorganic Calculations for Ion Balance, Langlier, Aggressive Index, Hardness, Unionized Sulfide, Larson-Skold Index, Sodium Absorption Ratio, Salinity	INORG_CALC.SOP
WETCHEM	LACSD 258	MERCAPTANS, TOTALS (LACSD 258)	258.SOP
WETCHEM	EPA 350.2/SM4500NH3 E	NITROGEN AMMONIA (TITRIMETRIC) (EPA METHOD 350.2/SM4500-NH3-B,E)	350_2r2.SOP
WETCHEM	EPA 120.1/SM 2510B	SPECIFIC ELECTRICAL CONDUCTANCE (EPA METHOD 120.1 / STANDARD METHOD 2510B)	120_1.SOP
WETCHEM	SM 2540G	STANDARD METHOD 2540G (TOTAL FIXED AND VOLATILE SOLIDS IN SOLIDS AND SEMISOLIDS)	2540G.SOP
WETCHEM	SM 4500CN-G	STANDARD METHOD 4500-CN-G/EPA 335.1/9010B (CYANIDES, AMENABLE TO CHLORINATION)	4500_CNG.SOP
WETCHEM	SM 4500CN-B,C,E	STANDARD METHOD 4500-CN~ -B,C,E (CYANIDES, TOTAL)	4500_CN.SOP
WETCHEM	SM 4500CO2	STANDARD METHOD 4500-CO2 (TITRIMETRIC METHOD FOR FREE CARBON DIOXIDE)	4500_CO2.SOP
WETCHEM	SM 4500CN-I	STANDARD METHODS 4500-CN, I - WEAK ACID DISSOCIABLE CYANIDE	4500_CNI.SOP
WETCHEM	EPA 376.2/SM 4500S2-	SULFIDE, COLORIMETRIC, METHYLENE BLUE (STANDARD METHOD 4500 S2-, EPA 376.2)	4500_S.SOP
WETCHEM	LACSD 253B	THIOSULFATE BY TITRATION (LACSD 253B)	S2O3.SOP
WETCHEM	SM5310C	TOTAL AND DISSOLVED ORGANIC CARBON (STANDARD METHOD 5310C)	5310C.SOP
WETCHEM	EPA 160.1/SM 2540C	TOTAL DISSOLVED SOLIDS, FILTERABLE RESIDUE (EPA METHOD 160.1/SM2540C)	IR-WET-TDS

DEPARTMENT	Method	TITLE	FILENAME
WETCHEM	SM4500-Norg-C	TOTAL KJELDAHL NITROGEN	4500NORG_C.SOP

Figure 20-1a.
Example - Demonstration of Capability Checklist

TestAmerica Irvine
Demonstration of Capability Checklist
Initial / Annual
(Circle one)

Employee: _____ Procedure(s): _____

Job Title: _____ Matrix: _____

Department: _____ SOP Name/Revision: _____

	Task	**Initials / Date Completed**
	Initial DOC Only	
1	Employee has read and understands the published procedure(s). (i.e. pH published methods: EPA 9040B, EPA 150.1 & SM 4500)	_____/_____
2	Employee has read, understands and agrees to follow the applicable SOP(s) without deviation.	_____/_____
3	Using the SOP as a ***step-by-step*** reference, the trainer has demonstrated the entire procedure to the Employee. *If any inaccuracies or contradictions in the SOP are discovered at this time, notify the area Supervisor and the QA Manager before proceeding further.*	_____/_____
4	Employee has performed the procedure under the direct supervision of an experienced staff member. **(including standard and reagent preparation and calibration where applicable)**	_____/_____
5	Employee has independently performed the procedure and results have been reviewed and confirmed by experienced staff member.	_____/_____
	QA only (*Note when the training took place.*)	
6	Trainer has completed a DOC for this method.	_____/_____
7	Trainer has read the Training SOP.	_____/_____
8	Employee has been trained on the Manual Integration and Data Integrity SOP (MANINT.SOP). Analysts only	_____/_____
7	Employee has been trained on Ethics and Data Integrity.	_____/_____
8	Employee has demonstrated capability by generating acceptable results on: _____ (4 LCS replicates, PT sample, Blind QC, etc.)	_____/_____

The employee named above has successfully demonstrated proficiency to perform the above mentioned procedure, maintain applicable QA/QC requirements, and report results on his or her own.

Employee Signature:_____ Date:_____

Trainer Signature (*if applicable*): _____ Date:_____

Supervisory Signature:_____ Date:_____

Lab Director/QA approval:_____ Date:_____

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rev.7, 10/17/07

Figure 20-1b.
Example - Demonstration of Capability Document

DEMONSTRATION OF CAPABILITY CERTIFICATION STATEMENT

Date: **Page 25 of 284**
Laboratory Name:
Laboratory Address:
Analyst(s) Name(s):

Matrix:
SOP# and Rev#:
Parameter:

We, the undersigned, CERTIFY that:

1. The analysts identified above, using the cited test method(s), which is in use at this facility for the analyses of samples under the National Environmental Laboratory Accreditation Program, have met the Demonstration of Capability.

2. The test method(s) was performed by the analyst(s) identified on this certification.

3. A copy of the test method(s) and the laboratory-specific SOPs are available for all personnel on-site.

4. The data associated with the demonstration capability are true, accurate, complete, and self explanatory.[1]

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 assessors.

Technical Director's Name and Title	Signature	Date
Quality Assurance Manager	Signature	Date

[1] True: Consistent with supporting data.
Accurate: Based on good laboratory practices consistent with sound scientific principles/practices.
Complete: Includes the results of all supporting performance testing.
Self-Explanatory: Date properly labeled and stored so that the results are clear and require no additional explanation.

Figure 20-2.

Example - New Method / Additional Analyte Checklist

New Method / Additional Analyte Checklist

The following items are **required** to be completed prior to the acceptance of client samples. Fill in any blanks that do not apply with "NA". Provide associated instrument QC when samples or QC samples are analyzed (includes run log).

New Method _____ Added Analytes _____

1_____ Standard Operating Procedure
- Note: For additional analytes, a **ROMD [or whatever an internal communication memo is named in your lab]** can be used to add the analytes, include RL and matrix.
  - _____ Analysis SOP
  - _____ Preparation SOP
  - _____ SOP for any other relevant process
  - _____ Pages from any applicable logbooks (instrument, standards, etc)

2_____Evaluation of Selectivity. As applicable: e.g. Retention Time Window Study, second column confirmation, Interelement correction checks, spectral or fluorescence profiles, etc.

3_____ Initial Calibration Curve (Include Tune verification or similar (e.g. degradation checks) if applicable)

4_____ Method Detection Limit (MDL) Study (summary and raw data)
- _____ Water
- _____ Soil
- _____ Other

5_____ Real Sample and MS, MSD ***(CA ELAP Requirement)***
- Tap Water for water only methods
- Local Soil sample for SW-846 methods (if applying for soil or soil/water)
- Local water sample may be used in lieu of tap water if it is a non- drinking water method
- Does not have to contain the target analytes

6_____ Reporting Limit Verification standard
- Spike a blank matrix at the RL and process through the entire method. MDL study should be able to be used if recovery is good. Note the spike level(s) and recovery(~~y~~ies)

7_____ Demonstration of Capability (DOC) per analyst (Precision and Accuracy (P&A) verification)
- 4 LCS for each matrix – most acceptance criteria are in the methods. The MDL study may be used if DOC criteria are met.
- Non-Standard methods – 3 x (1 LCS at LOQ-25%, 50%, 75% of the calibration range + Blank) prepared each day. (see NELAC Chpt 5, appendix C.3.3 (b))

8_____ Acceptable PT sample(s) if available

Notes: PT sample required for all new methods
PT sample required for all new analytes under NELAP

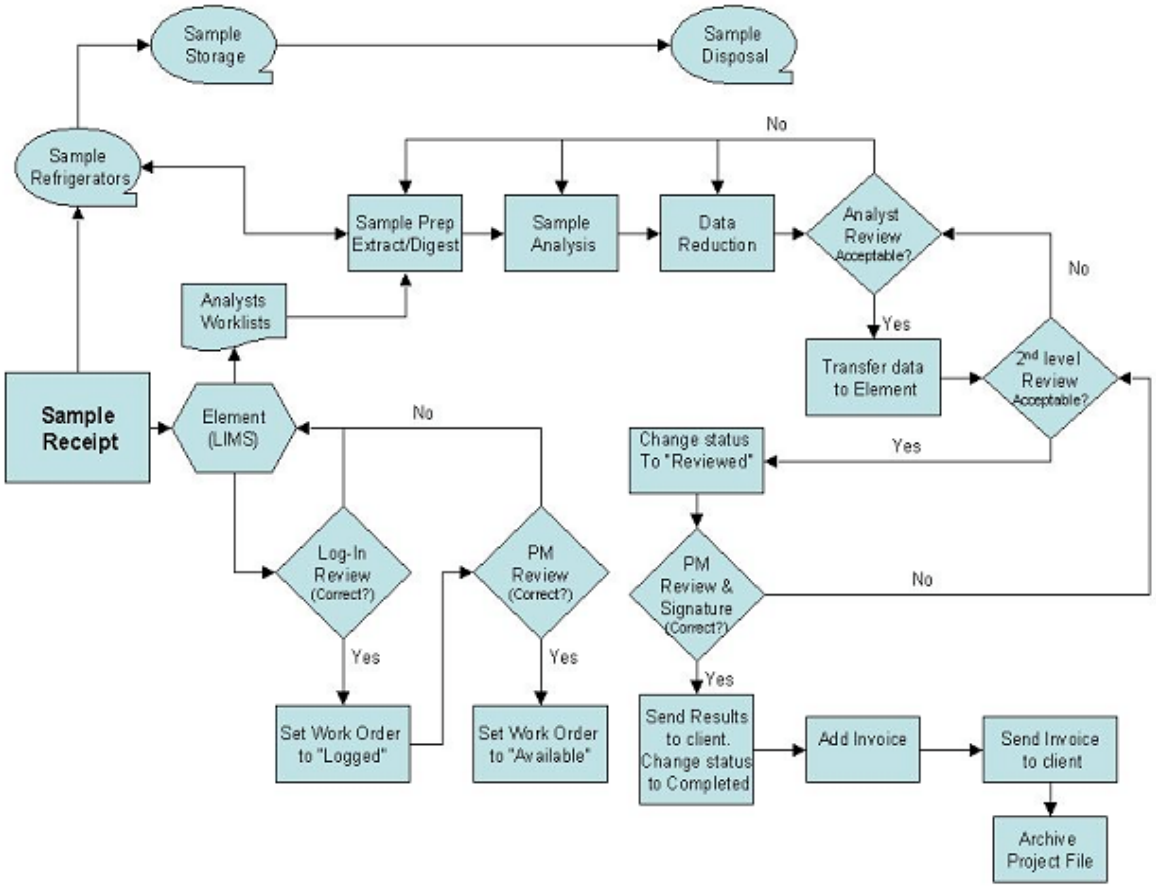
Submitted by _____ Date _____

9_____ Certification/Approval from Regulatory Agency where available.

QA Review / Acceptance _____ Date _____

Figure 20-3.

Work Flow



SECTION 21

EQUIPMENT (AND CALIBRATIONS
(NELAC 5.5.5)

21.1 OVERVIEW

TestAmerica 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 and are summarized in Appendix 4 of the QA manual. A list of laboratory equipment and instrumentation is presented in Table 21-1.

Equipment is only operated by authorized and trained personnel. Manufacturer instructions for equipment use are readily accessible to all appropriate laboratory personnel.

21.2 PREVENTIVE MAINTENANCE

21.2.1 TestAmerica Irvine follows a well-defined 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.

21.2.2 Routine preventive maintenance procedures and frequency, such as lubrication, 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.

21.2.2.1 Calibrations, routine maintenance, and adjustments are part of the analysts' and Department Managers' responsibilities. However, service contracts may be in place for some instruments to cover any major repairs.

21.2.2.2 High purity gases, reagents, and spare parts are kept on hand to minimize repair time and optimize instrument performance.

21.2.3 Table 21-2 summarizes the schedule for 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 also be 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.)

21.2.4 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.

21.2.4.1 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.

21.2.4.2 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.).

21.2.4.3 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.

21.2.5 In addition, the maintenance records contain:

- The identification of the instrument/equipment (instrument's Serial Number and Model Number)
- The date the instrument/equipment was put into use.
- If available, the condition when the instrument was received (e.g. new, used, reconditioned).
- Routine maintenance procedures and frequency or a reference to their location in the method SOP(s).

21.2.6 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 (refer to Sections 12 and 13).

21.2.7 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 using the procedures outlined in Section 8.

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.

21.3 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, field sampling devices, 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.

21.3.1 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 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. The laboratory SOP BAL.SOP (Balance Calibration, Verification and Documentation) covers these procedures in greater detail.

21.3.2 pH, Conductivity, and Turbidity Meters

The pH meters used in the laboratory are accurate to $\pm$ 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.

21.3.3 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 has increments of 0.2 ºC, and has a range applicable to all 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 laboratory's SOP THERMA.SOP (Thermometer Calibration/Temperature Monitoring and Documentation).

21.3.4 Refrigerators/Freezer Units, Waterbaths, Ovens and Incubators

The temperatures of all refrigerator units and freezers used for sample and standard storage are monitored each working day.

Ovens, waterbaths and incubators are monitored on days of use.

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.

21.3.5 Autopipettors, Dilutors, and Syringes

Mechanical volumetric dispensing devices including burettes (except Class A Glassware) are checked for accuracy at least quarterly. Glass micro-syringes with volumes of 500 µL or greater are checked for accuracy every six months.

The laboratory maintains a sufficient inventory of autopipettors, and dilutors of differing capacities that fulfill all method requirements.

These devices are given unique identification numbers, and the delivery volumes are verified gravimetrically, at a minimum, on a quarterly basis (every six months for applicable syringes).

For those dispensers that are not used for analytical measurements, a label is applied to the device stating that it is not calibrated. Any device not regularly verified can not be used for any

quantitative measurements. See PIP.SOP (Pipet Calibration) for more details on pipettor, syringe, and dispenser calibration procedures.

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.

21.3.6 Field Sampling Devices (Isco Auto Samplers)

Each Auto Sampler (ISCO) is assigned a unique identification number in order to keep track of the calibration. This number is also recorded on the sampling documentation.

The Auto Sampler is calibrated monthly by setting the sample volume to 100ml and recording the volume received. The results are filed in a logbook/binder. The Auto Sampler is programmed to run three (3) cycles and each of the three cycles is measured into a graduated cylinder to verify 100ml are received.

If the RSD (Relative Standard Deviation) between the 3 cycles is greater than 10%, the procedure is repeated and if the result is still greater than 10%, then the Auto Sampler is taken out of service until it is repaired and calibration verification criteria can be met. The results of this check are kept in a logbook/binder.

21.4 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.

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 (Avg 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 13).

Note: Instruments are calibrated initially and as needed after that and at least annually.

21.4.1 CALIBRATION STANDARDS

Calibration standards are prepared using the procedures indicated in the Reagents and Standards section of the determinative method SOP. However, the general procedures are described below.

21.4.1.1 For each analyte and surrogate (if applicable) of interest, prepare calibration standards at the minimum number of concentrations as stated in the analytical methods. If a reference or mandated method does not specify the number of calibration standards, the minimum number is three, not including blanks or a zero standard. All of the standard solutions are prepared using Class A volumetric glassware, calibrated pipettes, and/or microsyringes and appropriate laboratory quality solvents and stock standards.

21.4.1.2 Standards for instrument calibration are obtained from a variety of sources. All standards are traceable to NIST whenever possible. Dilution standards are prepared from stock standards purchased from commercial suppliers. The laboratory uses its LIMS to document the following standard information: department, concentration, date of receipt, date of standard preparation, expiration date, any dilutions made, lot number, supplier, type of solvent and a unique code number to identify the standard.

21.4.1.3 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).

21.4.1.4 The other concentrations define the working range of the instrument/method or correspond to the expected range of concentrations found in actual samples that are also within the working range of the instrument/method. Results of samples not bracketed by initial instrument calibration standards (within calibration range to 3 significant figures) must be reported as having less certainty, e.g., defined qualifiers or flags (additional information may be included in the case narrative). The lowest calibration standard must be at or below the reporting limit. The exception to these rules is ICP methods or other methods where the referenced method does not specify two or more standards.

21.4.1.5 Given the number of target compounds addressed by some of the organic methods, it may be necessary to prepare several sets of calibration standards, each set consisting of the appropriate number of solutions at different concentrations. The initial calibration will then involve the analysis of each of these sets of the appropriate number of standards.

21.4.1.6 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.

21.4.2 CALIBRATION FOR ORGANIC METHODS (GC, HPLC, GC/MS)

21.4.2.1 Many of the organic analytical methods utilize an internal standard calibration (GCMS and some GC). Because of the complex nature of the multipeak chromatograms produced by the method, some instruments necessitate the use of external standard calibration (most GC and HPLC). Surrogate compounds are included in the calibration processes for all appropriate organic analyses. For more details on the calibration types listed below, refer to SOP No. CA-Q-S-005, Calibration Curves.

21.4.2.2 Once the operating parameters have been established according to the method, each instrument is calibrated for the appropriate method. The analyst prepares five or more standard solutions at various concentrations containing all of the analytes of interest, internal standards, and surrogates that are appropriate for the method. Note: There are a several EPA methods that have different requirements and are exceptions (e.g. EPA 547) where a minimum of 3 calibration standards are prepared and analyzed.

21.4.2.3 The standard solutions are introduced into the instrument in the same manner as samples are; whether it be by direct injection, by headspace analysis, or by purge and trap. The calibration factor (CF) for methods that use external standards, and the response factor (RF) for methods that use internal standards are calculated for the five standards.

- External standard calibration involves comparison of instrument responses from the sample to the responses from the target compounds in the calibration standards. Sample peak areas (or peak heights) are compared to peak areas (or heights) of the standards. The ratio of the response to the amount of analyte in the calibration standard is defined as the Calibration factor (CF).

- Internal standard calibration involves the comparison of instrument responses from the target compounds in the sample to the responses of specific standards added to the sample or sample extract prior to injection. The ratio of the peak area (or height) of the target compound in the sample or sample extract to the peak area (or height) of the internal standard in the sample or sample extract is compared to a similar ratio derived for each calibration standard. The ratio is termed the response factor (RF), and may also be known as a relative response factor in other methods.

In many cases, internal standards are recommended. These recommended internal standards are often brominated, fluorinated, or stable isotopically labeled analogs of specific target compounds, or are closely related compounds whose presence in environmental samples is highly unlikely. The use of specific internal standards is available in the method SOP.

Whichever internal standards are employed, the analyst needs to demonstrate that the measurement of the internal standard is not affected by method analytes and surrogates or by matrix interferences. In general, internal standard calibration is not as useful for GC and HPLC methods with non-MS detectors because of the inability to chromatographically resolve many internal standards from the target compounds. The use of MS detectors makes internal standard calibration practical because the masses of the internal standards can be resolved from those of the target compounds even when chromatographic resolution cannot be achieved.

When preparing calibration standards for use with internal standard calibration, add the same amount of the internal standard solution to each calibration standard, such that the concentration of each internal standard is constant across all of the calibration standards, whereas the concentrations of the target analytes will vary. The internal standard solution will contain one or more internal standards and the concentration of the individual internal standards may differ within the spiking solution (e.g., not all internal standards need to be at the same concentration in this solution). The mass of each internal standard added to each sample extract immediately prior to injection into the instrument or to each sample prior to purging must be the same as the mass of the internal standard in each calibration standard. The volume of the solution spiked into sample extracts should be such that minimal dilution of the extract occurs (e.g., 10 uL of solution added to a 1 mL final extract results in only a negligible 1% change in the final extract volume which can be ignored in the calculations).

An ideal internal standard concentration would yield a response factor of 1 for each analyte. However, this is not practical when dealing with more than a few target analytes. Therefore, as a general rule, the amount of internal standard should produce an instrument response (e.g., area counts) that is no more than 100 times that produced by the lowest concentration of the least responsive target analyte associated with the internal standard. This should result in a minimum response factor of approximately 0.01 for the least responsive target compound. Refer to SOP No. CA-Q-S-005, Calibration Curves, for specific calculations.

21.4.2.4 Policies regarding the use of calibration standard results for creating the calibration curve are as follows:

- A low calibration standard may be excluded from the calibration if the signal-to-noise ratio or spectral criteria are not suitable. The reporting level must be elevated to be the lowest calibration standard used for calibration.

- The upper calibration standard may be excluded if it saturates the detector or is obviously becoming non-linear. Any sample exceeding the upper standard used in the calibration must be diluted and re-analyzed.
- Mid-calibration standards may not be excluded unless an obvious reason is found, i.e., cracked vial, incorrectly made, etc. The failed standard should be re-run immediately and inserted into the initial calibration. If not useful, recalibration is required.

21.4.2.5 Percent RSD Corrective Action

Given the potentially large numbers of analytes that may be analyzed in some methods, it is likely that some analytes may exceed the acceptance limit for the RSD for a given calibration. In those instances, the following steps are recommended, but not required.

21.4.2.5.1 The first step is generally to check the instrument operating conditions. This option will apply in those instances where a linear instrument response is expected. It may involve some trade-offs to optimize performance across all target analytes. For instance, changes to the operating conditions necessary to achieve linearity for problem compounds may cause the RSD for other compounds to increase, but as long as all analytes meet the RSD limits for linearity, the calibration is acceptable.

21.4.2.5.2 If the RSD for any analyte is greater than the applicable acceptance criteria in the applicable analytical method (see also Appendix 4), the analyst may wish to review the results (area counts, calibration or response factors, and RSD) for those analytes to ensure that the problem is not associated with just one of the initial calibration standards. If the problem appears to be associated with a single standard, that one standard may be reanalyzed and the RSD recalculated. Replacing the standard may be necessary in some cases.

21.4.2.5.3 A third alternative is to narrow the calibration range by replacing one or more of the calibration standards with standards that cover a narrower range. If linearity can be achieved using a narrower calibration range, document the calibration linearity, and proceed with analyses. The changes to the upper end of the calibration range will affect the need to dilute samples above the range, while changes to the lower end will affect the overall sensitivity of the method. Consider the regulatory limits or action levels associated with the target analytes when adjusting the lower end of the range.

Note: When the purpose of the analysis is to demonstrate compliance with a specific regulatory limit or action level, the laboratory must ensure that the method quantitation limit is at least as low as the regulatory limit or action level.

21.4.2.6 Alternatively, the least squares regression may be used to determine linearity. A five point line must result in a correlation coefficient (r) of 0.990 or better using the least squares method to be considered acceptable. In many cases it may be preferred that the curves be forced through zero (not to be confused with including the origin as an additional data point, which is not allowed). **Note:** EPA method 8000B does not allow forcing through zero however the agency has revaluated this position and has since changed this stance to allow forcing through zero. In addition, from EPA Method 8000C: "However, the use of a linear regression or forcing the regression through zero may NOT be used as a rationale for reporting results below the calibration range demonstrated by the analysis of the standards.").

21.4.2.7 Instead of a linear curve model (either Average RF or least squares regression), a second order curve (Quadratic) may be used (and preferred) as long as it contains at least six data points. As a rule of thumb, if there is a consistent trend in RFs (or CFs) in the calibration curve, either up or down, then quadratic curve fit may be indicated as the preferred calibration routine for that analyte. The coefficient of determination (COD or r^2) for the quadratic curve must be at least 0.99 for it to be considered acceptable. For more details on the calculations see Calibration Curve SOP CA-Q-S-005. Some limitations on the use of Quadratic Curve fits:

21.4.2.7.1 Care MUST be exercised to assure that the results from this equation are real, positive, and fit the range of the initial calibration.

21.4.2.7.2 They **may not** be used to mask instrument problems that can be corrected by maintenance. (Not to be used where the analyte is normally found to be linear in a properly maintained instrument).

21.4.2.7.3 They **may not** be used to compensate for detector saturation. If it is suspected that the detector is being saturated at the high end of the curve, remove the higher concentration standards from the curve and try a 1st order fit or average RF.

21.4.3 Calibration for Inorganic Analyses

EPA Method 7000 from EPA SW-846 is a general introduction to the quality control requirements for metals analysis. For inorganic methods, quality control measures set out in the individual methods and in the *Standard Methods for the Examination of Water and Wastewater* (20th Edition) may also be included. Standard Operating Procedures for the analysis and the quality control documentation measures are kept in each department's SOP binder.

In general, inorganic instrumentation is calibrated with external standards. Some exceptions would be Inductively Coupled Plasma (ICP), Inductively Coupled Plasma Mass Spec (ICPMS), and Ion Chromatography Mass Spec (ICMS). These analyses may use an internal standard to compensate for viscosity or other matrix effects. While the calibration procedures are much the same for inorganics as they are for organics, CF's or RF's are not used. The calibration model in 21.4.2.6 is generally used for most methods, however in some instances the model from section 21.4.2.7 may be used. A correlation coefficient (r) of 0.995 or greater must be used to accept a calibration curve generated for an inorganic procedure. Correlation coefficients are determined by hand-held scientific calculators or by computer programs [state what your lab uses] and documented as part of the calibration raw data. Coefficients of calibration curves used for quantitation must be documented as part of the raw data. Curves are not allowed to be stored in calculator memories and must be written on the raw data for the purposes of data validation.

21.4.3.1 "Calibrations" for titrimetric analyses are performed by standardizing the titrants against a primary standard solution. See specific methods in *Standard Methods for the Examination of Water and Wastewater* (20th Edition) for more information.

21.4.3.2 Spreadsheets that are used for general chemistry calculations must have all cells containing calculations locked to prevent accidental changes to the calculations.

21.4.3.3 Instrument technologies (e.g. ICP) with validated techniques from the instrument manufacturer or other methods using a zero point and single point calibration require the following:

21.4.3.3.1 The instrument is calibrated using a zero point and a single point calibration standard.

21.4.3.3.2 The linear range is established by analyzing a series of standards, one at the reporting limit (RL).

21.4.3.3.3 Sample results within the established linear range do not need to be qualified.

21.4.3.3.4 The zero point and single standard is run daily with each analytical batch.

21.4.3.3.5 A standard at the RL is analyzed daily with each analytical batch and must meet established acceptance criteria.

21.4.3.3.6 The linearity is verified at a frequency established by the manufacturer or method.

21.4.4 Calibration Verification

The calibration relationship established during the initial calibration must be verified at periodic intervals 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, and is not appropriate nor permitted in SW-846 chromatographic procedures for trace environmental analyses.

21.4.4.1 Generally, the initial calibrations must be verified at the beginning of each 12-hour analytical shift during which samples are analyzed. (Some methods may specify more or less frequent verifications). The 12-hour analytical shift begins with the injection of the calibration verification standard (or the MS tuning standard in MS methods). The shift ends after the completion of the analysis of the last sample or standard that can be injected within 12 hours of the beginning of the shift.

21.4.4.2 A continuing instrument calibration verification (CCV) must be repeated at the beginning and, for methods that have quantitation by external calibration models, at the end of each analytical batch. Some methods have more frequent CCV requirements see specific SOPs. Most Inorganic methods require the CCV to be analyzed after ever 10 samples.

21.4.4.3 The acceptance limits for calibration verifications can be found in each method SOP. As a rule of thumb: GCMS $\pm$ 20%, GC and HPLC $\pm$ 15%, Inorganics: $\pm$ 10 or 15%. Actual methods may have wider or tighter limits; see the method SOP for specifics.

21.4.4.4 If the response (or calculated concentration) for an analyte is within the acceptance limits of the response obtained during the initial calibration, then the initial calibration is considered still valid, and the analyst may continue to use the CF, RF or % drift values from the initial calibration to quantitate sample results.

21.4.4.5 If the response (or calculated concentration) for any analyte varies from the mean response obtained during the initial calibration by more than the acceptance criteria, then the initial calibration relationship may no longer be valid. If routine corrective action procedures fail to produce a second consecutive (immediate) calibration verification within acceptance criteria, then either the laboratory has to demonstrate performance after corrective action with two consecutive successful calibration verifications, or a new initial instrument calibration must be performed. However, sample data associated with an unacceptable calibration verification may be reported as qualified data under the following special conditions:

21.4.4.5.1 When the acceptance criteria for the calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise, the samples affected by the unacceptable calibration verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted.

21.4.4.5.2 When the acceptance criteria for the calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise, the samples affected by the unacceptable verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted. Alternatively, a reporting limit standard may be analyzed to demonstrate that the laboratory can still support non-detects at their reporting limit.

21.4.4.6 Verification of Linear Calibrations

Calibration verification for linear 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. Use the equations below to calculate % Drift or % Difference, depending on the procedure specified in the method SOP. 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.

The Percent Difference is calculated as follows:

$$\% \text{ Difference} = \frac{(CF(v) \text{ or } RF(v)) - (\text{Avg. CF or RF})}{(\text{Avg. CF or RF})} \times 100$$

Where: CF(v) or RF(v) = CF or RF from verification standard

Avg. CF or RF = Average CF or RF from Initial Calibration.

The Percent Drift is calculated as follows:

$$\% \text{ Drift} = \frac{\text{Result} - \text{True Value}}{\text{True Value}} \times 100$$

The Percent Recovery is calculated as follows:

$$\% \text{ Recovery} = \frac{\text{Result}}{\text{True Value}} \times 100$$

21.4.4.7 Verification of a Non-Linear Calibration

Calibration verification of a non-linear calibration is performed using the percent drift or percent recovery calculations described in 21.4.4.6 above.

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.

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 laboratory's SOP for the specific method.

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).

21.5 POLICY ON 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 will not be reported as a TIC. If the compound is reported on the same form as true TICs, it must 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. See SOPs IR-MSV-8260 and IR-MSS-8270 for guidelines on making tentative identifications

21.5.1 The following guidelines for making tentative identifications are taken from EPA SW846 III edition, method 8260B.

21.5.1.1.1 Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.

21.5.1.1.2 The relative intensities of the major ions should agree within ± 20%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 30 and 70%).

21.5.1.1.3 Molecular ions present in the reference spectrum should be present in the sample spectrum.

21.5.1.1.4 Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.

21.5.1.1.5 Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting peaks. Data system library reduction programs can sometimes create these discrepancies.

21.5.1.1.6 The concentration of any non-target analytes identified in the sample (see above) should be estimated. The same formulae as calibrated analytes should be used with the following modifications: The areas A_x and A_{is} should be from the total ion chromatograms, and the RF for the compound should be assumed to be 1.

21.5.1.1.7 The resulting concentration should be reported indicating: (1) that the value is an estimate, and (2) which internal standard was used to determine concentration. Use the nearest internal standard free of interferences.

21.5.1.2 For general reporting if TICs are requested, the ten (10), largest non-target analyte peaks whose area count exceeds 10% of the nearest internal standard will be termed “Tentatively Identified Compounds” (TICs). More or fewer TICs may be identified based on client requirements.

21.5.1.3 TIC Reporting Limits

In general Reporting limits cannot be specified because of the unknown nature of the TIC. Any reporting limit that is reported can only be evaluated as an estimate as the quantitation is based on the assumption that the TIC responds exactly as the IS responds which is most likely not the case. In general, it is not recommended to set a Reporting limit at too low of a concentration as it gives a false impression.

TICs that meet the above identification criteria (Section 21.5.1) at 10% area of the IS: The RL would be 10% of the concentration of the internal standard used for quantitation. (e.g. 2.5 ug/L for 8260B, 4.0 ug/L for 8270C). In general, if the 10% area criteria is not met, the TIC RLs should be set at a level approximately 5x the level of the poorest performer in the analysis.

If a compound meets the TIC criteria, the reporting limit will reflect the ratio between the TIC and the IS or 5x the level of the poorest performer whichever is lower.

21.6 POLICY ON 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.

21.6.1 The concentration of the BFB or DFTPP must be at or below the concentrations that are referenced in the analytical methods. Part of the purpose of the tune is to demonstrate sensitivity and analyzing solutions at higher concentrations does not support this purpose. Tune failures may be due to saturation and a lower BFB/DFTPP concentration may be warranted.

21.6.2 Tune evaluations usually utilize the "Autofind" function and are set up to look at the apex +/- 1 scan and average the three scans. Background correction is required prior to the start of the peak but no more than 20 scans before. Background correction cannot include any part of the target peak.

21.6.3 Other Options or if Auto Tune Fails:

21.6.3.1 Sometimes the instrument does not always correctly identify the apex on some peaks when the peak is not perfectly shaped. In this case, manually identify and average the apex peak +/- 1 scan and background correct as in 21.6.4 above. This is consistent with EPA 8260 and 8270.

21.6.3.2 Or the scan across the peak at one half peak height may be averaged and background corrected. This is consistent with Standard Methods 6200, EPA 624 and EPA 625.

21.6.3.3 Adjustments such as adjustments to the repeller and ion focus lenses, adjusting the EM Voltage, etc. may be made prior to tune verification as long as all of the subsequent injections in the 12 hour tune cycle are analyzed under the same MS tune settings and it is documented in the run sequence log and/or maintenance log that an adjustment was made. Excessive adjusting (more than 2 tries) without clear documentation is not allowed. Necessary maintenance is performed and documented in instrument log.

21.6.3.4 A single scan at the Apex (only) may also be used for the evaluation of the tune. For SW 846 and EPA 600 series methods, background correction is still required.

21.6.3.5 Cleaning the source or other maintenance may be performed and then follow steps for tune evaluation above. Note: If significant maintenance was performed, see methods 8000B or 8000C then the instrument may require recalibration prior to proceeding.

21.6.4 Tune evaluation printouts must include the chromatogram and spectra as well as the Tune evaluation information. In addition, the verifications must be sent directly to the printer or pdf file (no screen prints for DFTPP or BFB tunes). This ability should be built into the instrument software.

21.6.5 Since the limits are expressed in whole percentages, the results may be rounded to whole percentage before comparing to criteria when assessing the tune verification against the tune requirements. However, the comparison to the criteria is usually done automatically by the software and if the printout says “Fail” then there would have to be documentation of the hand calculation on the raw data and comparison to the criteria if the lab intends to still accept the tune. In most cases the analyst is better off performing an adjustment and rerunning the tune standard.

21.6.6 All MS tune settings must remain constant between running the tune check and all other samples. It is recommended that a separate tune method not be used, however a separate method may be used as long as the MS conditions between the methods are the same as the sample analysis method and tracked so any changes that are made to the analysis method are also made to the tune method.

Table 21-1. Laboratory Equipment and Instrumentation

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Accelerated Solvent Extractor	Dionex	ASE 200	96040278	2000	NEW
Accelerated Solvent Extractor	Dionex	ASE 200	120362	2001	NEW
Accelerated Solvent Extractor	Dionex	ASE 200	97040463	2001	NEW
Accelerated Solvent Extractor	Dionex	ASE 200	96090216	2001	NEW
Accelerated Solvent Extractor	Dionex	ASE 200	99120782	2002	NEW
Accelerated Solvent Extractor	Dionex	ASE 200E	07090745	2007	NEW
Accelerated Solvent Extractor	Dionex	ASE 200E	07090746	2007	NEW
Air Concentrator	Entech	2000		1993	NEW
Ammonia Probe	Orion	96-12			Footnote 1
Atomic Absorption Spectrophotometer	Perkin Elmer	SIMAA 6000	5016	1995	NEW
Auto sampler	Dionex	AS40	98050117	2007	NEW
Auto Sampler (Archon)	O.I. Analytical	4552	12243	2001	NEW
Auto Sampler (Archon)	Varian	Archon	14636	2006	NEW
Auto Sampler (Archon)	Varian	Archon	14633	2006	NEW
Auto Sampler (Archon)	Varian	Archon	14634	2006	NEW
Auto Sampler (Archon)	Varian	Archon	14632	2006	NEW
Auto Sampler (Archon)	Varian	Archon	13171	2006	NEW
Auto Sampler (Archon)	Varian	Archon	14638	2006	NEW
Auto Sampler (Archon)	O.I. Analytical	4552	14418	2004	NEW
Auto Sampler (Archon)	Varian	Archon	14407	2006	NEW
Auto Sampler (Archon)	O.I. Analytical	4552	14417	2006	NEW
Auto Sampler (Archon)	Varian	Archon	14418	2006	NEW
Auto Sampler (Archon)	Varian	Archon	14195	2006	NEW
Auto Sampler (Archon)	Varian	Archon	13388	2006	NEW

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Auto Sampler (Archon)	Archon		14411	2006	NEW
Auto Sampler (Archon)	Varian	Archon	14492	2006	NEW
Auto Sampler (Archon)	Varian	Archon	14637	2006	NEW
Auto Sampler (Archon)	Varian	Archon	14639	2006	NEW
Auto Sampler (Archon)	Varian	Archon	13389	2006	NEW
Auto Sampler (DPM)	O.I. Analytical	MPM 16		1993	NEW
Auto Sampler (DPM)	O.I. Analytical	MPM 16		1997	NEW
Auto Sampler (DPM)	O.I. Analytical	MPM/DPM 16		1993	NEW
Auto Sampler (DPM)	O.I. Analytical	MPM 16		1992	NEW
Auto Sampler (DPM)	O.I. Analytical	MPM-16		1993	NEW
Auto Sampler (DPM)	O.I. Analytical	DPM 16		2003	NEW
Auto Sampler (DPM)	O.I. Analytical	MPM 16			Footnote 1
Auto Sampler for GC	Hewlett Packard	7673A			Footnote 1
Auto Sampler for GC	Hewlett Packard	7673B			Footnote 1
Auto Sampler for GC	Hewlett Packard	7673B			Footnote 1
Auto Sampler for GC	Hewlett Packard	7673A			Footnote 1
Auto Sampler for GC	LEAP				
Auto Sampler for GC	Hewlett Packard	7673B			Footnote 1
Auto Sampler for GC	Agilent	7683			Footnote 1
Auto Sampler for GC	Hewlett Packard	18596M			Footnote 1
Auto Sampler for GC	Agilent	7683			Footnote 1
Auto Sampler for GC	Hewlett Packard	7673			Footnote 1
Auto Sampler for GC	Hewlett Packard	7673			Footnote 1
Auto Sampler for GC	Hewlett Packard	7673B		1993	NEW
Auto Sampler for GC	Hewlett Packard	7673B		1995	NEW

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Auto Sampler for GC	Hewlett Packard	7673B		1993	NEW
Auto Sampler for GC	Agilent	7683		2003	NEW
Auto Sampler for GC	Agilent	7683		2005	NEW
Auto Sampler for GC	Hewlett Packard	7673B		1993	NEW
Auto Sampler for GC	Agilent	7683B	CN63340749	2006	NEW
Auto Sampler for GC	Hewlett Packard	18593B	3120A26939	1992	NEW
Auto Sampler for GC	Agilent	7683	CN42637490		Footnote 1
Auto Sampler for GC	Agilent	G2614A	CN55237971		Footnote 1
Auto Sampler for IC	Dionex	AS			Footnote 1
Auto Sampler for IC	Dionex	AS	96060542		Footnote 1
Auto Sampler for IC	Dionex	AS	3080145		Footnote 1
Auto Sampler for IC	Dionex	AS	3080145		Footnote 1
Auto Sampler for IC	Dionex	AS50	0411004Y	2002	NEW
Auto Sampler for IC	Dionex	AS50	99010302	2005	NEW
Auto Sampler for IC	Dionex	AS40	932811		Footnote 1
Auto Sampler for IC	Dionex	AS40	06110242	2007	NEW
Auto Sampler for IC	Dionex	AS50	00100242		Footnote 1
Auto Sampler for Metals	Perkin Elmer	AS-72	1464	1995	NEW
Auto Sampler for Metals	Perkin Elmer	CETAC	060019ASX	2001	NEW
Auto Sampler for Metals	Perkin Elmer	AS 91	913S3040101	1997	NEW
Auto Sampler for Metals	Perkin Elmer	AS 93	1075	2002	NEW
Auto Sampler for Metals	Perkin Elmer	AS 90	3380	1995	NEW
Auto Sampler for Metals	Perkin Elmer	CETAC	080002ADX	2004	NEW
Auto Sampler for Metals	Perkin Elmer	AS 91	6060	1995	NEW
Auto Sampler for Metals	Perkin Elmer	AS 91	3023	2006	NEW

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Autosampler	Agilent	G2614A	CN55237964	2007	NEW
Block Digestor	Bioscience	163-466T		1997	NEW
Block Digestor	Bioscience	2091B1		1997	NEW
BOD auto-analyzer	ManTech	BODAssayPlus			Footnote 1
BOD Incubator	Fisher		00037-090-00		Footnote 1
BOD Incubator	??				Footnote 1
BOD probe	Jenco				Footnote 1
Centrifuge	IEC	--	3634P-14		Footnote 1
Centrifuge	Fisher Scientific	AccuSpin 300	603101639	2003	NEW
Centrifuge	Precision	Durafuge 100	40317924	2003	NEW
Centrifuge	International Centrifuge Co.	HN	98323M-1		Footnote 1
COD Reactor	Bioscience Inc.	2091B1	34613302		Footnote 1
COD Reactor	Bioscience Inc.	163-466T	COD-T349		Footnote 1
Concentrator	O.I. Analytical	4560		1999	NEW
Conductivity Probe	Yellow Springs	32	COD0031		Footnote 1
Conductivity/Dissolved Oxygen Probe	Corning	M90	001253		Footnote 1
Cyanide Distillation Unit	Andrews Glass	MIDI System	MCVA13908221		Footnote 1
Cyanide Distillation Unit	Andrews Glass	MIDI System	33212579		Footnote 1
Digestion Unit	Gerhardt	Kjeldatherm KB	4062216	2007	NEW
Distillation Unit	Gerhardt	Vapodist30	VAP005617	2007	NEW
Drying Oven	Fisher		40200001		Footnote 1
Drying Oven	Fisher	630G	800121		Footnote 1
Drying Oven	Lab Line				Footnote 1
Drying Oven	Scientific Products	DX-61	194002		Footnote 1
Drying Oven	Fisher	630G	801N0001		Footnote 1
Fixed Wavelength Infrared Spectrophotometer	Foxboro	Miran1FF	2592	1997	NEW
Fixed Wavelength Infrared Spectrophotometer	Foxboro	Miran1FF	2733		Footnote 1

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Flashpoint Tester	Koehler	K-162		1992	NEW
Fluoride Probe	Orion	96-09	9609BN		Footnote 1
Gas Chromatograph	Agilent	6890N	US10423014		Footnote 1
Gas Chromatograph	Agilent	6890N	CN10551059	2007	NEW
Gas Chromatograph (Dual ECD)	Hewlett Packard	5890 Series II	3223A43015		Footnote 1
Gas Chromatograph (Dual ECD)	Hewlett Packard	5890 Series II	336A51142		Footnote 1
Gas Chromatograph (Dual ECD)	Hewlett Packard	5890Series II	2750A15311		Footnote 1
Gas Chromatograph (Dual ECD)	Agilent	6890	US10215019		Footnote 1
Gas Chromatograph (Dual ECD)	Agilent	6890N	US10250081		Footnote 1
Gas Chromatograph (Dual ECD)	Hewlett Packard	5890 Series II	3235A45184		Footnote 1
Gas Chromatograph (Dual ECD)	Agilent	6890N	CN10551052		Footnote 1
Gas Chromatograph (Dual FID)	Hewlett Packard	5890 Series II	3126A36534		Footnote 1
Gas Chromatograph (Dual FID)	Hewlett Packard	5890 Series II	3133A37568		Footnote 1
Gas Chromatograph (Dual FID)	Hewlett Packard	5890II	3235A44731		Footnote 1
Gas Chromatograph (Dual FID)	Hewlett Packard	5890 Series II	2950A26022		Footnote 1
Gas Chromatograph (ECD)	Hewlett Packard	5890 Series II	3203A40480		Footnote 1
Gas Chromatograph (FID)	Hewlett Packard	5890 Series II	3126A36955	1997	NEW
Gas Chromatograph (FID)	Hewlett Packard	5890 Series II			Footnote 1

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Gas Chromatograph (FID/PID)	Hewlett Packard	5890 Series II	3203A40477	1993	NEW
Gas Chromatograph (FID/PID)	Hewlett Packard	5890 Series II	3203A41169	1993	NEW
Gas Chromatograph (FID/PID)	Hewlett Packard	5890A	2750A15898	1997	NEW
Gas Chromatograph (FID/PID)	Hewlett Packard	5890 Series II	3223A42733	1993	NEW
Gas Chromatograph (FID/PID)	Hewlett Packard	5890 Series II	3223A60064	1993	NEW
Gas Chromatograph (FID/PID)	Hewlett Packard	5890 Series II	3336A60064	1993	NEW
Gas Chromatograph (FID/PID)	Hewlett Packard	5890 Series II	3033A33301	1998	NEW
Gas Chromatograph (FID/PID)	Hewlett Packard	5890 Series II	3336A60066	1997	NEW
Gas Chromatograph (FID/PID)	Hewlett Packard	5890 Series II			Footnote 1
Gas Chromatograph (FID/PID/ELCD)	Hewlett Packard	5890 Series II	3203A40699	1993	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	6890/5973A	US00007750	2001	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	6890/5973A	US00022931	2000	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	6850/5973N	US00001207	2001	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	6850/5973	US00001206	2001	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	6850/5973N	US01874908	2002	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	6850/5973N	US10440793	2002	NEW

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Gas Chromatograph/Mass Spectrometer	Agilent	6850/5973N	US00002860	2003	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	6890N/5973	US00034262	2004	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	6890N/5973	CN10318006	2004	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	6890N/5973	CN10318007	2004	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	6890N/5973		2006	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	6890N/5973		2005	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	5890II/5972		1997	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	6890N/5973		2000	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	6890/5973A	US00020097	1999	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	5890Ser.II/5971	3140A39653	1993	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	5890Ser.II/5972	3235A46723	1995	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	5890Ser.II/5971	3133A37717	1993	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	6890/5973	US10130035	2003	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	6890N/5973	US10341048	2005	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	5890Ser.II/5971	3033A30488	1993	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	5890Ser.II	3033A32428	1987	NEW

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Gas Chromatograph/Mass Spectrometer	Hewlett Packard				Footnote 1
Gas Chromatograph/Mass Spectrometer	Agilent	6890N/5973	US10206070/A12019	2006	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	6890N/5973N	US10222064/A13016	2006	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	5975B/6890N	US62724086/CN10636107	2006	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	6890N/5973		2001	NEW
Gas Chromatograph/Mass Spectrometer	Hewlett Packard	5890IIB/5971A	2921A24077/3188A02848	1992	NEW
Gas Chromatograph/Mass Spectrometer	Agilent	6890/5973	CN10427051/US41720775	2007	NEW
Hot Block	Environmental Express				Footnote 1
Hot Block	Environmental Express				Footnote 1
Hot Block	Environmental Express				Footnote 1
Hot Block	Environmental Express				Footnote 1
Hot Block	Environmental Express				Footnote 1
Hot Block	Environmental Express				Footnote 1
Hot Plate	??				Footnote 1
Hot Plate	??				Footnote 1
Inductively Coupled Plasma Spectrophotometer/MS	Perkin Elmer	ELAN6100E	1650004	2001	NEW
Inductively Coupled Plasma Spectrophotometer/MS	Perkin Elmer	ELAN6100E	G1970008	2004	NEW
Inductively Coupled PlasmaSpectrophotometer	Perkin Elmer	Optima 3000	069N4092201	1997	NEW

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Inductively Coupled PlasmaSpectrophotometer	Perkin Elmer	Optima 4300	077N1100901	2002	NEW
Inductively Coupled PlasmaSpectrophotometer	Perkin Elmer	Optima 5300DV	077N5112802	2006	NEW
Injector	Agilent	7683 series	CN55130059	2007	NEW
Injector Tower	Hewlett Packard	7673			Footnote 1
Ion Chromatograph	Dionex	DX 500	98060923	1996	NEW
Ion Chromatograph	Dionex	DX 100	40452	1997	NEW
Ion Chromatograph	Dionex	DX 600	139082221	2002	NEW
Ion Chromatograph	Dionex	ICS-1000	03110585	2002	NEW
Ion Chromatograph	Dionex	CD25A	01060463	2005	NEW
Ion Chromatograph	Dionex	AD25	01050864	2007	NEW
Ion Chromatograph	Dionex	CD25-1	00070432	2002	NEW
Ion Chromatograph	Dionex	LC20	94010215	2007	NEW
Ion Chromatograph (with UV/VIS)	Dionex	DX 500	94120366	2000	NEW
Ion Chromatograph/Mass spectrometer	Metrohm/Agilent /	LC30-1/LC110/IC800		2005	NEW
Kiln	Cress	E2418	0503DD	2005	NEW
Mercury Analyzer	Perkin Elmer	FIMS 400	4109	1995	NEW
Mercury Analyzer	Perkin Elmer	FIMS 400	4167	1995	NEW
Orbital shaker	Lab-Line	--			Footnote 1
pH Meter	Beckman	Phi - 40			Footnote 1
pH Meter	Beckman	Phi - 40			Footnote 1
pH Meter	Beckman	Phi - 32			Footnote 1
pH Meter	Mettler Toledo	SevenEasy	1227116127		
pH Probe	Orion	91-56	9156000		Footnote 1
pH Probe	Orion	91-56			Footnote 1

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Purge & Trap Concentrator	O.I. Analytical	4460A		1992	NEW
Purge & Trap Concentrator	O.I. Analytical	4460A		1993	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		1993	NEW
Purge & Trap Concentrator	O.I. Analytical	4460A		1997	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		1993	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		1992	NEW
Purge & Trap Concentrator	O.I. Analytical	4460A		1993	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		1998	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2001	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2000	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2001	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2001	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2002	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2002	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2003	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2004	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2004	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2004	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2006	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2005	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2000	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		1997	NEW
Purge & Trap Concentrator	O.I. Analytical	4460A			Footnote 1
Purge & Trap Concentrator	O.I. Analytical	4560	H351460339	2006	NEW
Purge & Trap Concentrator	O.I. Analytical				Footnote 1

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Purge & Trap Concentrator	O.I. Analytical	4560	E324406	2006	NEW
Purge & Trap Concentrator	O.I. Analytical	4560		2001	NEW
Purge and Trap Water/Soil AutoSampler	O.I. Analytical	4552		1993	NEW
Purge and Trap Water/Soil AutoSampler	EST	8100		2006	NEW
Rapid Vap	Labconco		266435		Footnote 1
Rapid Vap	Labconco		705319		Footnote 1
Rapid Vap	Labconco		21098412F		Footnote 1
Rapid Vap	Labconco		010194458E		Footnote 1
Rapid Vap	Labconco	7910000	040824527		Footnote 1
Rotator	N/A				Footnote 1
Rotator	N/A				Footnote 1
Rotator	N/A				Footnote 1
Rotator	N/A				Footnote 1
SPE-Controller	Horizon Technology	SPE-DEX	020357		Footnote 1
SPE-Extractor	Horizon Technology	SPE-DEX 4790	030359		Footnote 1
SPE-Extractor	Horizon Technology	SPE-DEX 4790	030360		Footnote 1
TOC Analyzer	Shimadzu	TOC-5000A	33N01036A	1998	NEW
TOC Analyzer w/AS	Tekmar-Dohrmann	Phoenix 8000	US02106006	2002	NEW
TOC Autosampler	Shimadzu	ASI-500A-H-P	33212579	1998	NEW
TOC Soil Sampler Module	Shimadzu	SSM-5000A	34613302	1998	NEW
Turbidity Meter	HF Instruments	DRT-100B	24942		Footnote 1
Turbidity Meter	Orbeco-Hellige	965-10A	4389	2007	NEW
Turbidity Meter	Orbeco-Hellige	965	5078	2007	NEW
Turbo Vap	Zymark		04053		Footnote 1
Turbo Vap	Zymark	--			Footnote 1
Turbo Vap II	Zymark		04516		Footnote 1

Instrument/ Equipment	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Turbo Vap II	Zymark		04272		Footnote 1
Turbo Vap II	Zymark		TV0239N11193		Footnote 1
Turbo Vap LV	Caliper LifeSciences	103200/2	TV0429N12434		Footnote 1
Turbo Vap LV	Caliper LifeSciences	103200/2	TV0429N12435		Footnote 1
UV/VS Spectrometer	Thermospectronic	Genesys20		2002	NEW

[1]Although equipment is operational and calibration maintained, this information is not available.

Table 21-2. Schedule of Routine Maintenance

Instrument	Procedure	Frequency
Graphite Furnace (GFAA)	Inspect graphite tube Inspect contact rings Clean windows Align lamp	Daily Daily Daily Daily
Mercury Analyzer	Check tubing for wear Fill rinse tank with 10% HCl Fill reductant bottle with 10% Stannous Chloride	Daily Daily Daily
ICP	Check/replace pump tubing Check liquid argon supply Check fluid level in waste container Check/clean/replace filters Check torch Clean torch and nebulizer	Daily/as needed Daily Daily Daily/as needed Daily As needed
ICP MS	Check/replace pump tubing Inspect torch and injector cones Clean/replace ion lens Replace torch o-rings Check/replace gas filters Change rough pump oil Check chiller water level	Daily/as needed Daily As needed As needed As needed As needed Weekly
UV-Vis Spectrophotometer	Clean sample holder Precision check/alignment of flow cell Wavelength verification check	As required As required Semi-annually
Gas Chromatograph/Mass Spectometer (GCMS)	Bake trap (VOC only) Clean source Check/change vacuum pump oil Clean injectors; replace liners (SVOC only) Replace column Clean cooling fan grills	Daily As needed Annually, as needed Daily As needed Semiannually

Instrument	Procedure	Frequency
Gas Chromatograph (GC)	Change septum Check gases Replace or clip column Clean injectors; replace liners Clean cooling fan grills	As needed Daily As needed As needed Semiannually
Electron Capture Detector (ECD)	Detector wipe test (Ni-63) Detector cleaning	Semi-annually Sent out, as needed
Flame Ionization Detector (FID)	Detector cleaning	As required
Flame Photoionization Detector (FPD)	Clean and/or Replace Lamp	As required
Photoionization Detector (PID)	Change O-rings Clean lamp window	As required As required
Ion Chromatograph (IC)	Replace column disks Change guard columns Check pump seals Replace tubing Replace suppressor Check fluid level in waste container Clean cooling fan grills	As required As required As required As required As required Daily Semiannually
Balances	Class “S” traceable weight check Clean pan and check if level Outside calibration service	Daily, when used Daily At least Annually
Conductivity Meter	0.01M KCl calibration Conductivity cell cleaning	Daily As required
Turbidimeter	Check light bulb Clean sample holder	Daily, when used Daily, when used
Deionized/Distilled Water	Daily conductivity check Check deionizer light Monitor for VOA’s System cleaning Replace cartridge & large mixed bed resins	Daily Daily As required As required As required
Drying Ovens	Temperature monitoring Temperature adjustments	When used As required
Refrigerators/ Freezers	Temperature monitoring Temperature adjustment Defrosting/cleaning	Daily As required As required
pH/Specific Ion Meter	Calibration/check slope Clean electrode	Daily As required
BOD Incubator	Temperature monitoring Incubator cleaning	Daily As required
Centrifuge	Check brushes and bearings	As needed
Water baths	Temperature monitoring Water replaced	Daily Monthly or as needed
Automated Solvent Extraction units (ASE)	Check solvent reservoirs Check tubing	Daily Daily

Instrument	Procedure	Frequency
TurboVaps	Check gas lines Check water level Calibrate temperature	Daily Daily Annually
Total Organic Carbon Analyzer	Check gas flow Check reagent reservoir levels Replace o-rings Check autosampler needle Replace scrubbers Replace catalyst	Daily Daily As needed Daily Annually As needed
Automated Analyzer	Clean sampler Check all tubing Clean detector Clean optics and cells	Daily Daily Daily Daily
Infrared Spectrophotometer (IR)	Clean lens/optimize	As needed
Flashpoint Apparatus	Check gas line for leaks Check stirrer speed	Daily Annually
Rotators	Verify rotation speed	Annually

Table 21-3. Periodic Calibration

Instrument	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Analytical Balance	Accuracy determined using weights calibrated against ASTM Class 1 NIST-traceable weights. Minimum of 2 standards bracketing the weight of interest. Inspected and calibrated by an accredited vendor annually.	Daily	± 3 digits at smallest (rightmost) display	Clean, check level, insure lack of drafts, and that unit is warmed up, recheck. If fails, call service.
Top Loading Balance	Accuracy determined using weights calibrated against ASTM Class 1 NIST-traceable weights. Minimum of 2 standards bracketing the weight of interest. Inspected and calibrated by an accredited vendor.	Daily	± 3 digits at smallest (rightmost) display	Clean, check level, insure lack of drafts, and that unit is warmed up, recheck. If fails, call service.
Reference ASTM Class 1 NIST-traceable Weights	Accuracy determined by accredited weights and measurement laboratory.	1 year	As per ASTM Class 1 specifications	Replace.

Instrument	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Daily laboratory weights	Verified against laboratory's ASTM Class 1 reference set	1 year	±0.1mg of expected or less than lowest weight the balance can read	Replace
NIST-Traceable Thermometer	Accuracy determined by accredited measurement laboratory.	5 years	As per certificate.	Replace.
Thermometer, glass	Against NIST-traceable thermometer	Yearly at appropriate temperature range for intended use	Correction factor of ± 2°C	Replace
Thermometer, digital	Against NIST-traceable thermometer	Quarterly at appropriate temperature range for intended use.	Correction factor of ± 2°C	Replace
InfraRed Temperature Guns	Against NIST-traceable thermometer	Quarterly at appropriate temperature range for intended use.	Correction factor of ± 2°C	Repair/replace
Refrigerator	Temperature checked using NIST-traceable thermometer.	Daily. If out of range, check again a few hours later and document	>0 to 6°C	Adjust. Repair. While waiting for repair, seal door, attach "Out of Service" sign, move items to functional unit. Notify supervisor.
Freezer	Temperature checked using NIST-traceable thermometer	range, check again a few hours later and document	-10 to -20°C	Adjust. Repair. While waiting for repair, seal door, attach "Out of Service" sign, move items to functional unit. Notify supervisor.
Oven	Temperature checked using NIST-traceable thermometer.	When in use.	104 ± 1°C (drying) 180 ± 2°C (TDS)	Adjust. Replace.
Incubator	Temperature checked using NIST-traceable thermometer.	When in use.	BOD: 20 ± 1.0°C	Adjust. Replace.
Water Bath	Temperature checked using NIST-traceable thermometer.	When in use.	± 2°C	Adjust. Replace.

Instrument	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Volumetric Dispensing Devices (Eppendorf ® pipette, automatic dilutor or dispensing devices)	One delivery by weight. Using DI water, dispense into tared vessel. Record weight with device ID number.	Monthly	± 2% Calculate accuracy by dividing weight by stated volume times 100 for percent.	Adjust. Replace.
Glass Microliter Syringes	None	Accuracy must be initially de-monstrated if syringe was not received with a certifi-cate attesting to established accuracy.	± 1%	Not applicable.
Conductivity Meter	Cell impedance calibrated with two KCl standards.	Each use.	2nd source verfied within vendor-specified limits	Recalibrate.
Deionized Water	Check in-line conductivity meter on system with conductivity meter in Inorganics Department.	Weekly	<1 µmhos/cm^2	Record on log. Report discrepancies to QA Director.

Table 21-4. Preventive Maintenance Procedures For Field Equipment

Instrument/ Equipment Type	Activity	Frequency	Maintenance
Automatic Sampler – ISCO 3710/3910	Check tubing and connections through pump head	Before and after use	Replace tubing when necessary
	Check battery power and program	Before and after use	Replace battery when necessary
	Clean tubing in pump head	After each use	Replace pump head tubing when necessary
	Clean tubing for sample collection	After each use	---
	Check functionality – manual sample; program sample	Prior to use	---
	Check sample container for breakage, etc.	Prior to use	Replace if needed
YSI 3000 – Depth Meter, Temperature, and Conductivity	Check battery	Before and after use	Replace batteries when necessary
	Check cable	Before and after use	Send for repair
	Check probe	Before and after use	Send for repair
	Check LCD	Before and after use	Send for repair
Bailers – Miscellaneous sizes	Check ball valve for overall condition	Prior to use	Clean/replace accordingly

Instrument/ Equipment Type	Activity	Frequency	Maintenance
	Check rope	Before, during and after use	Retie or replace as necessary
	Clean inside and out	Before and after use	---
Residual Chlorine – HACH Kit	Check battery	Before and after use	Replace batteries when necessary
	Inspect glass cells	Before and after use	Replace as necessary
	Clean glass cells	Prior to use	---
Residual Chlorine – HACH Kit	Inspect cell holder	Before and after use	Remove obstructions, if present
	Check expiration dates of reagents	Prior to use	Remove and reorder as necessary
	Inspect ampules for cracks	Before and after use	Replace as necessary
Dissolved Oxygen – HACH Kit	Check battery	Before and after use	Replace batteries when necessary
	Inspect cell holder	Before and after use	Remove obstructions, if present
	Inspect rubber ampule cover	Before and after use	Replace as necessary

SECTION 22

MEASUREMENT TRACEABILITY
(NELAC 5.5.6)

22.1 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. 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. The following definitions are provided by the American Association for Laboratory Accreditation (A2LA):

"Traceability is the property of a measurement result whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons, each step in the chain having stated uncertainties." There are six essential elements:

- An unbroken chain of comparison
- A calculated measurement uncertainty for each step in the chain to allow for an overall uncertainty calculation
- Documentation of each step in each calibration report
- All steps in the chain are performed by individuals with evidence of technical competence and accredited by a recognized accreditation body
- Reference to International Standard (SI) units
- Recalibration at appropriate intervals to preserve traceability

Calibration is defined as "determining and documenting the deviation of the indication of a measuring instrument (or the stated value of a material measure) from the conventional 'true' value of the measurand."

Uncertainty is defined as "a parameter associated with the result of a measurement that characterizes the dispersion of the value that could reasonably be attributed to the measurand." Measurement of Uncertainty is discussed is Section 20 of this QA Manual.

22.2 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. Refer to Section 21 for calibration of weights and thermometers.

22.3 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, 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. (Refer to Section 9 for additional information on purchasing). 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 Table 9-1 in Section 9 for general storage requirements and Table 22-1 for additional storage information. Please refer to method SOPs "Standards and Reagents" section for additional details. For safety requirements, please refer to method SOPs and the laboratory Environmental Health and Safety Manual.

22.4 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 SOP No. 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 by each laboratory department. 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 the laboratory's SOP IR-QA-STD (Reagent and Standard Preparation, Control, and Documentation) as well as method specific SOPs.

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.

22.4.1 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 within the LIMS:

- Standard ID
- Description of Standard
- Department
- 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 (with the exception of metals working standards which are prepared daily and documented in a controlled logbook) 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.

22.4.2 All standards, reagents, and reference materials must be clearly labeled with a minimum of the following information:

- Expiration Date
- Standard ID Code (from LIMS or logbook)
- Special Health/Safety warnings if applicable

22.4.3 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; and 3) according to Table 22-1.

Table 22-1.

Standard Sources and Preparation

Method Group	Source*	How Received	Stock Storage	Preparation	Intermediate & Working Standard Storage	Frequency
Metals	SPEX; Environmental Express	1000 ppm Solutions	Room Temperature	Working standards from stock	Room Temperature	Daily
Wet Chemistry	Ricca; Spectrum:ERA	Solutions	Refrigerate	As received	Refrigerate	Various
Volatile Organics	Absolute; Restek	Ampoule/ Solutions	Freezer (-10°C)	Working standards from stock	Refrigerate	Monthly; Gas, weekly
Semi-Volatile Organics	Absolute; Restek	Ampoule/ Solutions	Refrigerate or Room temp.	Working standards from stock	Refrigerate	Monthly
Infrared Spec-trophotometry	Aldrich; Sigma	Pure Reagent	Room Temperature	Working standards from stock	Refrigerate	Six months

*Or equivalent

SECTION 23.0

SAMPLING
(NELAC 5.5.7)

23.1 OVERVIEW

TestAmerica Irvine provides sampling services. Sampling procedures are described in the SOP FIELD.SOP (Field Sampling).

23.2 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. Additionally, TestAmerica Irvine lot tests all 40-millilter VOA vials for volatile organics by GCMS and all polyethylene bottles for common anions and trace-level metals.

23.2.1 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

23.2.2 Preparing Container Orders

When new containers arrive at the laboratory, the lot numbers for VOA vials are checked against the list of laboratory-approved lots. For polyethylene bottles, the date of receipt is recorded on the box(es) and randomly selected bottles of each unpreserved size and each nitric-preserved size are submitted for metals and anion analysis. Upon request, the containers are then sent to clients for use in collecting samples. The shipping date, type and number of containers are maintained on file by the lab. Shipping personnel insure that container stock is rotated so that “first in” is “first out.” When a client requests containers, a client services representative creates a container request in LIMS; it is then stored permanently in LIMS with a unique container order number. Copies of the container request are printed for the shipping department. One copy goes to the client with the containers; one copy is filed in the shipping department. See the laboratory’s SOP LOGIN.SOP (Sample Control) and LOTTEST.SOP (Container and Reagent Verification by Lot Testing) for more details.

The laboratory also provides EnCore, TerraCore or other soil sampling devices when requested.

If containers are provided directly to the client from the manufacturer or from other sources, the laboratory will not be responsible for any of the above records.

23.3 FIELD QUALITY CONTROL (QC)

Common field quality control samples are defined in the following paragraphs. The frequency of field quality control samples should be specified in the site specific Quality Assurance Project Plan (QAPP) or by the client. TestAmerica provides trip blanks for VOC analysis with the sample containers for all volatile organic analyses. Blanks generated in the field will be analyzed along with the field samples (exception soil samples where the blank is aqueous).

23.3.1 Equipment Blank / Rinsate Blank - The equipment blank, sometimes referred to as a rinsate blank, is a sample of the water used to decontaminate sampling equipment. The source water should be as free of target analytes as possible. An aliquot of this water is poured over or through the sample collection device after decontamination, collected in a sample container, preserved with appropriate reagents, and returned to the laboratory. This serves as a check on sampling device cleanliness, and will also be affected by the site and sample handling conditions evaluated by the other types of blanks. The sampling time for the equipment blank should begin when the equipment is rinsed and the water is collected.

23.3.2 Field Blank - The field blank is water that is as free of target analytes as possible and from the same source as the equipment blank. The water is poured into a sampling container at the sampling site, preserved with the appropriate reagents, and returned to the laboratory. This serves as a check on reagent and environmental contamination. The sampling time for the field blank should be when the blank is prepared in the field.

23.3.3 Trip Blank - The trip blank pertains to volatile analysis only. This serves as a check on sample contamination originating from sample transport, sample container contamination, shipping and storage, or from certain site conditions. Trip blanks are often referred to as travel blanks. They are prepared using pre-cleaned sample containers. They are filled with organic-free water (the source of the organic free water is the same source of water used to prepare volatile standards, method blanks, LCS and sample dilutions), sealed and taken into the field with the empty containers which will be used for sampling. The recommended frequency is one trip blank per cooler (in duplicate or triplicate), per volatiles method. Unless otherwise specified, the sampling time for the trip blank is the time of receipt at the laboratory (When the “Trip” ends).

23.3.4 Field Duplicates - Field duplicates are replicate samples collected from the same sampling point or location during a field collection event. This control sample is used to demonstrate the ability of both the sampling and analytical process to generate data of acceptable precision.

23.4 DEFINITION OF HOLDING TIME

The date and time of sampling documented on the chain-of-custody (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.

23.4.1 Semi-Volatile - Holding times for sample preparation for semi-volatile organics are measured from the sampling date until the day solvent contacts the sample. Holding times for analysis are measured from the date of initiation of extraction to the time of injection into the gas chromatograph.

23.4.2 Volatiles - Holding times for volatile organics are measured from the date (and time where applicable) of sampling to the date and time of injection into the gas chromatograph. The time of initiation of purging is considered the injection time, but data systems record the start of the chromatographic run rather than the start of purging. Hence, if a sample is so near expiration that the start-of-purging time rather than the chromatographic run time is needed to document the integrity of the sample; the analyst must observe and record the start-of-purging time in the instrument log. Extractions, e.g. for high level soils, must be completed in time to allow for analysis to be initiated within the maximum allowable holding time.

23.4.3 Inorganics - For inorganic and metals analysis, the preparation/digestion/distillation must be started within the maximum holding time as measured from the sampling date (and time where applicable).

23.5 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 required holding times (refer to Tables 23-1 to 23-7) 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.

23.6 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. In that regard the following guidelines apply to analysts:

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.

23.6.1 For water samples, before taking each aliquot for analysis, invert the sample container end-over-end three times and immediately pour off the aliquot. Especially when suspended solids are present, adequate mixing of the sample is extremely important.

23.6.2 For solid samples, when volatile organics are not requested, if the solid can be mixed, stir before removing the aliquot. Mix more than is needed for the analysis to be performed (e.g. if 30 g are needed, mix 50-100 g, if 1 g is needed, mix 20 g, etc…).

- If the solid cannot be easily mixed: After thoroughly mixing the sample within the sample container or, for non-organic methods, the sample can be transferred to a wip bag (or other suitable plastic bag) for manual mixing, a sub-sample from various quadrants and depths of the sample are taken to acquire the required sample weight.
- For soil samples, avoid debris in the subsample aliquot as much as possible (e.g. gravel, sticks, roots and grass); note this information in the sample preparation record.
- If the solid is extremely heterogeneous, and the client has given no instructions, utilize the following technique: separate the like materials into groups on a clean surface and take portions of masses from each group, proportional to their contribution to the original sample, to make a composite. Record in detail exactly how the composite was created. For very unusual samples, consult with the QA department or Department Manager.

NOTE: Subsampling is addressed in greater detail in SUBSAMP.SOP (Subsampling).

23.6.3 For solid samples, when volatile organics analysis is requested, the sample should be manipulated as little as possible. In most cases, the sample will arrive already preserved or in an EnCore™ sampler of the correct mass (requiring quick preservation of the entire amount). If the client requests volatiles on a solid sample which has been collected in a jar and is in a common container from which aliquots for other test methods must be taken, login should deliver the container to the volatiles department for preparing a proper aliquot prior to any other aliquots being taken out.

23.6.4 For multiphasic samples, the client should instruct the laboratory as to the intent of the testing and how to handle the sample. If the entire sample is to be accounted for, and the phases do not mix easily with inversion/stirring, such that a representative aliquot can be taken, the analyst should record the percent by volume of each phase. The analysis must be conducted on each phase separately; the final results are combined mathematically, weighting the individual phase results by volume. One exception to this procedure is the situation addressed in the TCLP and SPLP methods for wastes containing free liquids. However, if the leachate and final filtrate are not miscible, it is necessary to combine mathematically the concentrations of the two (or more) solutions by volume.

Tables 23-1 to 23-7 detail holding times, preservation and container requirements, and sample volumes for SDWA and NPDES methods. ***Please note****: the holding times are program specific and different programs may have different holding times for equivalent methods (e.g., there are difference in Holding times for many Organic analytes between SDWA and NPDES. RCRA methods may also be different.)*

Table 23-1.
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	14 days	500 mL
Fluoride	Plastic/Glass	None	None	None	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	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	$Na_2S_2O_3$	14 days	3 X 40 mL
Volatile Organic Compounds	Glass[8]	4ºC	HCl to pH <2 $Na_2S_2O_3$ or Ascorbic acid[9]	14 days	3 X 40 mL
EDB, DBCP, 1,2,3-TCP (EPA 504.1)	Glass[8]	4ºC	$Na_2S_2O_3$	14 days	3 X 40 mL
Organochlorine Pesticides/PCBs (EPA 505)[10]	Glass[8]	4ºC	$Na_2S_2O_3$	14 days[11]	3 X 40 mL
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
Semivolatiles (EPA 525.2)	Glass-Amber[8]	4ºC	HCl to pH <2 $Na_2S_2O_3$[9]	14 days[13]	1 L

PARAMETER	CONTAINER	PRESERVATION[1,2] Temp.[23]	Chemical	HOLDING TIME[3]	SAMPLE VOLUME
N-Methylcarbamoyloxamines and N-Methcarbamates (EPA 531.1)	Glass[8]	4ºC	$Na_2S_2O_3$, Monochloroacetic Acid buffer to pH<3	28 days	3 X 60 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

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: 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 bed 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 $Na_2S_2O_3$ prior to acidification.
10. Heptaclor 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.

Key to Table

15. 7 days until derivitation. 1 day after derivatation.
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 $\leq 4^{o}$ C
23. 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.

Table 23-2
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 % $Na_2S_2O_3$[5]	6 hours	100 mL
Fecal Streptococci	Plastic/Glass	10ºC	0.0008 % $Na_2S_2O_3$[5]	6 hours	100 mL
Enterococci	Plastic/Glass	10ºC	0.0008 % $Na_2S_2O_3$[5]	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°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°C temperature has not been exceeded.
6. Should only be used in the presence of residual chlorine.

Table 23-3
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	Plastic/Glass	≤ 6ºC	NaOH to pH >12, 0.6 g ascorbic Acid[7]	14 days	100 mL
Cyanide -Amenable	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 dys / 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	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.
8. H_2SO_4 to a pH <2 is also acceptable.
9. Except Mercury and Hexavalent Chromium.
10. Samples should be filtered on site before adding HNO_3 preservative for dissolved metals.
11. Samples collected for determination of trace level mercury (100 ng/L) using EPA 1631 must be collected in tightly capped fluoropolymer 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.

Table 23-4
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
Nitosamines[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.
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 analyze 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 ajust 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 23-5.
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 23-6.
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	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	0.0008 % $Na_2S_2O_3$[7]	7 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
Nitrosomines	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	7 days[8]	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.

Table 23-7.
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	24 hours	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	14 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
Nitrosomines	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	14 days[3]	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.

Table 23-8.
Holding Times, Preservation and Container Requirements: Air Samples

PARAMETER	CONTAINER [1]	PRESERVATION Temp.	PRESERVATION Chemical	HOLDING TIME[2]	SAMPLE WEIGHT
Volatile Organics	Summa Cannister	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 24

HANDLING OF SAMPLES
(NELAC 5.5.8)

Sample management procedures at TestAmerica Irvine ensure that sample integrity and custody are maintained and documented from sampling/receipt through disposal.

24.1 CHAIN OF CUSTODY (COC)

The COC form is the written documented history of any sample and can be 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 24-1.

24.1.1 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 24-1). 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 (e.g. FedEx) are not required to sign the COC form. The COC is usually kept in the sealed sample cooler. The receipt from the courier is attached to the COC and kept with the entire project file.

24.1.2 Legal / Evidentiary Chain-of-Custody

If samples are identified for legal/evidentiary purposes on the COC, login will complete the custody seal (Figure 24-2), retain the shipping record with the COC, and initiate an internal COC (Figure 24-3) for laboratory use by analysts and a sample disposal record (Figure 24-4).

24.2 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 the following sections.

24.2.1 Laboratory Receipt

(See LOGIN.SOP (Sample Control) for more details on sample receipt procedures)

When samples arrive at the laboratory, sample receiving personnel inspect the coolers and samples. On a client-specific basis, a Project Receipt Checklist may be filled out to document custody seals, cooler temperatures, preservation, and notifications of discrepancy. See Figure 24-6. The integrity of each sample must be determined by comparing sample labels or tags with the COC and by visual checks of the container for possible damage. Any non-conformance, irregularity, or compromised sample receipt must be documented on a Notification of Discrepancy Form (NOD). See Figure 24-7. Discrepancies are forwarded to the Project Manager and are brought to the immediate attention of the client. The COC, shipping documents, documentation of any non-conformance, irregularity, or compromised sample receipt, record of client contact, and resulting instructions become part of the project record.

24.2.1.1 Inspection of samples include a check for:

- Complete documentation to include sample identification, location, date and time of collection, collector's name, preservation type, sample type and any additional comments concerning the samples.
- Complete sample labels to include unique identification in indelible ink.
- Use of appropriate sample containers (see Section 23)

- Adherence to holding times as specified in the test method and/or summarized in Section 23.
- Adequate sample volume for required analyses (see Section 23).
- Damage or signs of contamination to sample container. Volatile vials are also inspected for headspace

24.2.1.2 Check and record the temperature of the samples, temperature blanks, that require thermal preservation.

- Samples shall be deemed acceptable if arrival temperature is just above freezing and less than or equal to 6.0° C. Samples that are hand-delivered immediately after collection may not be at the required temperatures; however, if there is evidence that the chilling process has begun, such as the arrival on ice, the samples shall be considered acceptable. This will be documented on the COC **.**
- If the samples were shipped in ice and solid ice is still present and in direct contact with samples, report the samples as "received on ice." Direct contact means samples must be surrounded by ice cubes or crushed ice. Ice present in a plastic bottle or other container does not constitute direct contact. Samples shipped with only “blue ice” may not be reported as “received on ice”.

24.2.1.3 Verify sample preservation as specified in the test method by inspection of the preservation listed on the container. Actual pH is verified by the laboratory at the time of analysis and documented on a benchsheet or runlog. Chlorine is checked at the time of analysis on samples requiring extractable organics, BOD, TOX, cyanide, fluoride, ammonia, TKN, CBOD and Nitrate; presence or absence is recorded.

24.2.1.4 After inspecting the samples, the sample receiving personnel sign and date the COC form, make any necessary notes of the samples' conditions and store them in appropriate refrigerators or storage locations.

24.2.1.5 If samples are received without a COC, TestAmerica will provide a generic COC form to be completed by the client when the samples are brought to the laboratory. The client is always provided with a copy of the completed COC form for their records.

24.2.1.6 If analyses with short holding times are requested, the dates and times are inspected to ensure that holding times have not already expired.

24.2.1.7 Samples received after normal working hours are left in their coolers and placed in the walk-in refrigerator**.** The person receiving the samples must record the date and time received, the presence or absence of ice and custody seals, the temperature of samples, presence and type of packing material, and initials.

24.2.1.8 Any deviations from the checks described in Section 24.2.1 that question the suitability of the sample for analysis, or incomplete documentation as to the tests required will be resolved by consultation with the client. If the sample acceptance criteria (Section 24.3) are not met, the laboratory shall either:

- Retain all correspondence and/or records of communications with the client regarding the disposition of rejected samples , or

- Fully document any decision to proceed with sample analysis that does not meet sample acceptance criteria.

24.2.2 Sample Log-in

All samples that are received by the laboratory are logged into the LIMS to allow the laboratory to track and evaluate sample progress. Each group of samples that are logged in together (typically one project from a given client/sampling event) is assigned a unique job number. Within each job, each sampling point (or sample) receives a unique number. Sample numbers are generated sequentially over time, and are not re-assigned. A sample may be composed of more than one bottle since different preservatives may be required to perform all analyses requested. Even if multiple containers are received for a single sample, each container is uniquely identified with an alphabetic letter added to the sample number. The LIMS generates sample labels that are attached to each bottle for a given sample.

Each job/set of samples is logged into LIMS with a minimum of the following information:

- Client Name, Project Name, Address, Phone, Fax, Report to information, invoice to information (most of this information is “default information” that is stored in the LIMS).
- Date and time sampled;
- Date and time received;
- Job and/or project description, sample description;
- Sample matrix, special sample remarks;
- Reporting requirements (i.e., QC level, report format, invoicing format);
- Turn-around-time requirements;
- Parameters (methods and reporting limits or MDLs are default information for a given parameter)

24.3 SAMPLE ACCEPTANCE POLICY

The laboratory has a written sample acceptance policy (Figure 24-5) 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 and necessary QC;
- samples must be preserved according to the requirements of the requested analytical method;
- sample holding times must be adhered to;
- all samples submitted for water/solid Volatile Organic analyses must have a Trip Blank submitted at the same time;
- 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.

24.4 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. (Exception: preserved metals samples are stored at room temperature.) 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. See REFBLANK.SOP (Refrigerator Storage Blank) for more details.

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 three weeks after analysis, which meets or exceeds most sample holding times. After two to four weeks the samples are moved to dry room temperature, sample archive area where they are stored for an additional three weeks before they are disposed of. This six week holding period allows samples to be checked if a discrepancy or question arises. Special arrangements may be made to store samples for longer periods of time. This extended holding period allows additional metal analyses to be performed on the archived sample and assists clients in dealing with legal matters or regulatory issues.

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.

24.5 HAZARDOUS SAMPLES AND FOREIGN SOILS

To minimize exposure to personnel and to avoid potential accidents, hazardous and foreign soil samples are stored in an isolated area designated for hazardous waste only. For any sample that is known to be hazardous at the time of receipt or, if after completion of analysis the result exceeds the acceptable regulatory levels, a Hazardous Sample Notice must be completed by the analyst. This form may be completed by Sample Control, Project Managers, or analysts and must be attached to the report. The sample itself is clearly marked with a red stamp, stamped on the sample label reading “HAZARDOUS” or “FOREIGN SOIL” and placed in a colored and/or marked bag to easily identify the sample. The date, log number, lab sample number, and the result or brief description of the hazard are all written on the Hazardous & Foreign Soil Sample Notice. A copy of the form must be included with the original COC and Work Order and the original must be given to the Sample Control Custodian. Analysts will notify Sample Control of any sample determined to be hazardous after completion of analysis by completing a

Hazardous Sample Notice. All hazardous samples are either returned to the client or disposed of appropriately through a hazardous waste disposal firm that lab-packs all hazardous samples and removes them from the laboratory. Foreign soil samples are sent out for incineration by a USDA-approved waste disposal facility.

24.6 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). For sample shipments which include water/solid volatile organic analyses, a trip blank is enclosed when required by method specifications or state or regulatory programs. 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.

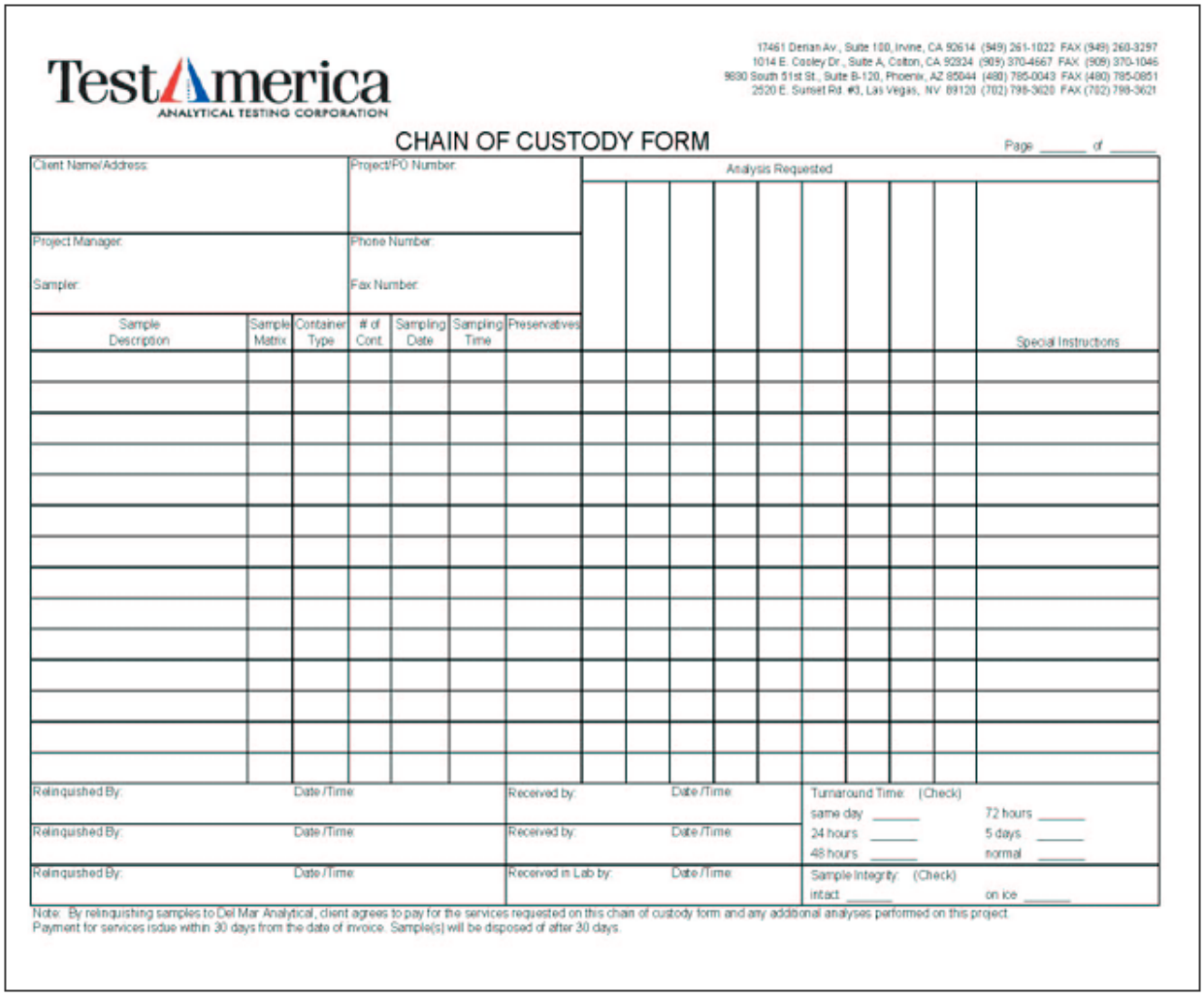
24.7 SAMPLE DISPOSAL

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 as documented in the laboratory's Chemical Hygiene Plan. All procedures in the laboratory Environmental, Health and Safety Manual are followed during disposal. Samples are normally maintained in the laboratory no longer than six weeks 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.

If a sample is part of a known litigation, the affected legal authority, sample data user, and/or submitter of the sample must participate in the decision about the sample's disposal. All documentation and correspondence concerning the disposal decision process must be kept on file. Pertinent information includes the date of disposal, nature of disposal (such as sample depletion, hazardous waste facility disposal, return to client), names of individuals who conducted the arrangements and physically completed the task. The laboratory will remove or deface sample labels prior to disposal unless this is accomplished through the disposal method (e.g., samples are incinerated). A Waste Disposal Record (Figure 24-4) should be completed.

Figure 24-1.

Example: Chain of Custody (COC)



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17461 Derian Av., Suite 100, Irvine, CA 92614 (949) 261-1022 FAX (949) 260-3297
1014 E. Cooley Dr., Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
9830 South 51st St., Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785-0851
2620 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

CHAIN OF CUSTODY FORM

Page _____ of _____

Client Name/Address:	Project/PO Number:	Analysis Requested
Project Manager:	Phone Number:	
Sampler:	Fax Number:	

Sample Description	Sample Matrix	Container Type	# of Cont.	Sampling Date	Sampling Time	Preservatives									Special Instructions

Relinquished By:	Date /Time:	Received by:	Date /Time:	Turnaround Time: (Check)	
				same day _____	72 hours _____
Relinquished By:	Date /Time:	Received by:	Date /Time:	24 hours _____	5 days _____
				48 hours _____	normal _____
Relinquished By:	Date /Time:	Received in Lab by:	Date /Time:	Sample Integrity: (Check)	
				intact _____	on ice _____

Note: By relinquishing samples to Del Mar Analytical, client agrees to pay for the services requested on this chain of custody form and any additional analyses performed on this project. Payment for services is due within 30 days from the date of invoice. Sample(s) will be disposed of after 30 days.

Figure 24-2.

Example: Custody Seal

Figure 24-3.

Example: Internal Chain of Custody (COC)

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17461 Derian Avenue, Suite 100 Irvine, CA 92614 (949) 261-1022 fax:(949) 260-3297

WORK ORDER
IPL2715

Client:
Client Code:
Project Manager:

Project Name:
Project Number:
Printed:

Internal Sample Custody

Refrigerator ID:

Sample	In	Out	In	Out	In	Out	In	Out	Archived	Disposed
IPL2715-01G										
IPL2715-01H										
IPL2715-01I										
IPL2715-01L										
IPL2715-01M										
IPL2715-01P										
IPL2715-01Q										
IPL2715-01R										
IPL2715-01S										
IPL2715-01T										

Reviewed By _____ Date _____ Time _____

12/28/2006 10:08:48AM
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Figure 24-4.

Example: Sample Disposal Record

SAMPLE ARCHIVE/DISPOSAL TRACKING FORM

Month/Year: ______________________

Matrix: ______________________

SAMPLE NUMBERS		DATE REMOVED	INITIALS	DATE DISPOSED	INITIALS	COMMENTS
STARTING	ENDING					

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Figure 24-5a.

Example: Sample Acceptance Policy, page 1

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Sample Acceptance Policy

All incoming work will be evaluated against the criteria listed below. Where applicable, data from any samples that do not meet the criteria listed below will be noted on the laboratory report defining the nature and substance of the variation. In addition the client will be notified either by telephone, fax or e-mail ASAP after the receipt of the samples.

1) Samples must arrive with labels intact with a Chain of Custody filled out completely. The following information must be recorded.
   - Client name, address, phone number and fax number (if available)
   - Project name and/or number
   - The sample identification
   - Date, time and location of sampling
   - The 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 date and time of receipt must be recorded between the last person to relinquish the samples and the person who receives the samples in the lab, and they must be exactly the same.
   - **Information must be legible**

2) Samples must be properly labeled.
   - Use durable labels (labels provided by TestAmerica are preferred)
   - Include a unique identification number
   - Include sampling date and time & sampler ID
   - Include preservative used.
   - Use indelible ink
   - **Information must be legible**

3) Proper sample containers with adequate volume for the analysis and necessary QC are required for each analysis requested. See TA Sample Container Guide.

4) Samples must be preserved according to the requirements of the requested analytical method (See TA Sample Container Guide). Most analytical methods require chilling samples to 4^{0} C (other than water samples for metals analysis). For these methods, the criteria are met if the samples are chilled to below 6^{0} C and above freezing (0^{0}C). For methods with other temperature criteria (e.g. some bacteriological methods require $\leq$ 10 ^{0}C), the samples must arrive within $\pm$ 2^{0} C of the required temperature or within the method specified range. **Note:** Samples that are hand delivered to the laboratory immediately after collection may not have had time to cool sufficiently. In this case the samples will be considered acceptable as long as there is evidence that the chilling process has begun (arrival on ice).

Continued on other side.

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Figure 24-5b.

Example: Sample Acceptance Policy, page 2

- Chemical preservation (pH) will be verified prior to analysis and the project manager will be notified immediately if there is a discrepancy. If analyses will still be performed, all affected results will be flagged to indicate improper preservation.

- For Volatile Organic analyses in drinking water (Methods 502.2 or 524.2). Residual chlorine must be neutralized prior to preservation. If there is prior knowledge that the samples are not chlorinated, state it on the COC and use the VOA vials pre-preserved with HCl. The following are other options for a sampler and laboratory where the presence of chlorine is not known:
  - 1. Test for residual chlorine in the field prior to sampling.
    - If no chlorine is present, the samples are to be preserved using HCl as usual.
    - If chlorine is present, add either ascorbic acid or sodium thiosulfate prior to adding HCl.
  - 2. Use VOA vials pre-preserved with sodium thiosulfate or ascorbic acid and add HCl after filling the VOA vial with the sample.

5) Sample Holding Times
   - TestAmerica will make every effort to analyze samples within the regulatory holding time. Samples must be received in the laboratory with enough time to perform the sample analysis. Except for short holding time samples (< 48hr HT) sample must be received with at least 48 hrs (working days) remaining on the holding time for us to ensure analysis.

   - Analyses that are designated as "field" analyses (Odor, pH, Dissolved Oxygen, Disinfectant Residual; a.k.a. Residual Chlorine, and Redox Potential) should be analyzed ASAP by the field sampler prior to delivering to the lab. However, if the analyses are to be performed in the laboratory, TestAmerica will make every effort to analyze the samples within 24 hours from receipt of the samples in the testing laboratory. Samples for "field" analyses received after 4:00 pm on Friday or on the weekend will be analyzed no later than the next business day after receipt (Monday unless a holiday). Samples will remain refrigerated and sealed until the time of analysis. The actual times of all "field" sample analyses are noted on the "Short Hold Time Detail Report" in the final report. Only samples analyzed outside of these criteria will be qualified on the final report with an 'H' to indicate holding time exceedance.

6) All samples submitted for Volatile Organic analyses must have a Trip Blank submitted at the same time. TestAmerica will supply a blank with the bottle order.

7) The project manager will be notified if any sample is received in damaged condition TestAmerica will request that a sample be resubmitted for analysis.

8) Recommendations for packing samples for shipment.

   - Pack samples in Ice rather than "Blue" ice packs.

   - Soil samples should be placed in plastic zip-lock bags. The containers often have dirt around the top and do not seal very well and are prone to intrusion from the water from melted ice.

   - Water samples would be best if wrapped with bubble-wrap or paper (newspaper, or paper towels work) and then placed in plastic zip-lock bags.

   - Fill extra cooler space with bubble wrap.

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Updated January 31, 2008

Figure 24-6.

Example: Cooler Receipt Form

TestAmerica
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Project Receipt Checklist
(Single Cooler)

Client Name: _____ Project: _____

Received by: _____ Date/Time Received: _____

Delivered by : ☐ Client ☐ TA ☐ DHL ☐ Fed Ex ☐ UPS ☐ Other _____

Custody Seal and Temperature	**Initial / Date**
Custody Seal Status Cooler: ☐Intact ☐Broken ☐None	
Custody Seal Status Samples: ☐Intact ☐Broken ☐None	
Custody Seal #(s): _____ ☐No Seal #	
Sampler Signature on COC ☐ Yes ☐No ☐N/A	
Therm # ____ Correction Factor _____°C	
Temperature - **BLANK** _____°C _____ CF = _____°C	
Cooler #1 ID _____	
Samples outside temperature criteria but received within 6 hours of final sampling ☐ Yes ☐N/A	

Sample Fraction Listing and Preservation Check
Completed: ☐ Yes ☐N/A _____
See attached Summary

Notification of Discrepancy (NOD) form
Anomalies: ☐ Yes ☐N/A _____
If, YES, see attached NOD form

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09/18/07

Figure 24-7.

Example: Notification of Discrepancy Form (NOD)

TestAmerica
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NOTIFICATION OF DISCREPANCY

DATE: _____ TIME: _____ PM: _____ SC INITIALS: _____

CLIENT/PROJECT NAME:

Rush/Short Hold? ☐ Yes ☐ No | WORK ORDER #:

☐ Project Not Set Up in Element ☐ New Client ☐ COC Received ON HOLD
☐ Analysis Requested on COC – Not Listed for Project in Element
PM To Add Analysis: _____
☐ Clarification of Analysis: _____
☐ Hold Time Expired: (Analysis) _____
☐ Turnaround Time Not Checked: _____
☐ Did Not Receive Sample(s) Listed on COC: _____
_____
☐ Received Extra Sample(s) Not Listed on COC: _____
_____
☐ Sample Collector's name missing on COC: _____
☐ Sample Description(s) or Date/Time Sampled Do Not Match COC:
_____
_____
_____
☐ Improper Preservative: _____
☐ VOAs have headspace (bubble>6mm): _____
☐ Sample Received Broken: _____
☐ Improper Temperature (_____°) (Comments): _____
☐ Insufficient Sample Volume: _____
☐ Other:
_____
_____
_____
_____

PROJECT MANAGER RESOLUTION: (Date & Time when returned to SC)

Approval By: Date: Time:

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SECTION 25.0

ASSURING THE QUALITY OF TEST RESULTS
(NELAC 5.5.9)

25.1 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 21, 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.

25.2 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.

25.3 NEGATIVE CONTROLS

25.3.1 **Method Blanks** are used to assess preparation and analysis for possible contamination during the preparation and processing steps.

25.3.1.1 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.

25.3.1.2 The method blank goes through all of the steps of the process (including as necessary: filtration, clean-ups, etc.).

25.3.1.3 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.

25.3.1.4 Evaluation criteria and corrective action for method blanks is defined in the specific standard operating procedure for each analysis. Generally, corrective action is taken if the concentration of a target analyte in the blank is at or above the reporting limit as established by the method or regulation:

- The source of contamination is investigated

- Measures are taken to minimize or eliminate the source of the contamination
- Affected samples are reprocessed or the results are qualified on the final report.

25.3.2 **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.

25.3.3 **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.

25.3.4 **Trip Blanks** are required to be submitted by the client with each shipment of samples requiring aqueous and solid volatiles analyses. A trip blank 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. Trip Blanks are also sometimes referred to as Travel Blanks.

25.3.5 **Field Blanks** 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)

25.3.6 **Equipment Blanks** 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)

25.3.7 **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 (refer to section 24.)

25.3.8 **Field blanks**, equipment blank and trip blanks, when received, are analyzed in the same manner as other field samples. When known, blanks 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".

25.4 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 and in Appendix 4 for select methods.

25.4.1 Method Performance Control - Laboratory Control Sample (LCS)

25.4.1.1 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.

25.4.1.2 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.

25.4.1.3 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.).

25.4.1.4 As stated in the opening of this section, the LCS goes through all of the steps of the process (including as necessary: filtration, clean-ups, etc.).

25.4.1.5 The specific frequency of use for LCS during the analytical sequence is defined in the specific standard operating procedure for each analysis (see Appendix 4). It is generally 1 for each batch of samples; not to exceed 20 environmental samples.

25.4.1.6 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.

25.4.1.6.1 For methods that have 1-10 target analytes, spike all components.

25.4.1.6.2 For methods that include 11-20 target analytes, spike at least 10 or 80%, whichever is greater.

25.4.1.6.3 For methods with more than 20 target analytes, spike at least 16 components.

25.4.1.6.4 Exception: Due to analyte incompatibility in pesticides, Toxaphene and Chlordane are only spiked at client request based on specific project needs.

25.4.1.6.5 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.

25.4.1.7 **Accuracy Calculation**: Percent Recovery (%R) Calculation (applies to LCS, CCV, Surrogates, and Matrix Spikes.

$$\%R = \frac{AV}{TV} \times 100$$

Where: AV = Analyzed Value
TV = True Value

25.5 SAMPLE MATRIX CONTROLS

25.5.1 Matrix Spikes (MS)

25.5.1.1 The Matrix spike is 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.

25.5.1.2 An MS is essentially a sample fortified with a known amount of the test analyte(s). 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.

25.5.1.3 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 of the listed components (see LCS analytes 25.4.1.6 above) 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.

25.5.1.4 The percent recovery calculation for matrix spikes is essentially the same as the calculation shown in 25.2.1.7 except that:

AV = Sp – Sa

Where: Sp = Spike result
Sa = Sample result

25.5.2 Surrogate Spikes

25.5.2.1 Surrogate Spikes 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.

25.5.2.2 Surrogate compounds 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 (also refer to Section 25.5). 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.

25.5.3 Duplicates

25.5.3.1 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. Duplicate samples are usually analyzed with methods that do not require matrix spike analysis. 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.

25.5.3.2 **Precision Calculation** (Relative Percent Difference - RPD)

$$RPD = \frac{|S - D|}{\frac{(S + D)}{2}} \times 100$$

Where: S=Sample Concentration
D=Duplicate Concentration

25.5.4 Internal Standards

25.5.4.1 In most organic analyses, internal standards are spiked into all environmental and quality control samples (including the initial calibration standards). An internal standard is also used with some metals analyses. It is added to sample extracts after the extraction (post-prep). The acceptance criteria in most methods are 50% to 200% of the responses in the mid-point of the corresponding calibration curve. Consult the method-specific SOPs for details on the internal standard compounds, calculations and acceptance criteria.

25.5.4.2 When the internal standard recoveries fall outside these limits, if there are not obvious chromatographic interferences, reanalyze the sample to confirm a possible matrix effect. If the recoveries confirm or there was obvious interference, results are reported from the original analysis and a qualifier is added. If the reanalysis meets internal standard recovery criteria, the second run is reported (or both are reported if requested by the client).

25.6 ACCEPTANCE CRITERIA (CONTROL LIMITS)

25.6.1 Each individual analyte in the LCS, MS, or Surrogate Spike are evaluated against the control limits as published in the test method. Where there are no established acceptance criteria, the laboratory calculates control limits with the use of control charts or, in some cases, utilizes client project specific or regulatory mandated 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.

25.6.2 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 (e.g. EPA SW846 8000 series methods). Control limits are established per method (as opposed to per instrument) regardless of the number of instruments utilized.

25.6.2.1 The lab should consider the effects of the spiking concentration control limits, and to avoid censoring of data. The acceptance criteria for recovery and precision are often a function of the spike concentration used. Therefore, caution must be used when pooling data to generate control limits.

25.6.2.2 Not only should the results all be from a similar matrix, but the spiking levels should also be approximately the same (within a factor of 2). Similarly, the matrix spike and surrogate results should all be generated using the same set of extraction, cleanup and analysis techniques. For example, results from solid samples extracted by ultrasonic extraction are not mixed with those extracted by Soxhlet.

25.6.2.3 The laboratory should try and avoid discarding data that do not meet a preconceived notion of acceptable performance. This results in a censored data set, which, when used to develop acceptance criteria, will lead to unrealistically narrow criteria. For a 99% confidence interval, 1 out of every 100 observations likely will still fall outside the limits. For methods with long analyte lists this may mean occasional failures every batch or two. While professional judgment is important in evaluating data to be used to develop acceptance criteria, specific results are not discarded simply because they do not meet one's expectations. However, data points shall be discarded if they were the result of human or mechanical error or sample concentration exceeded spike level by > 4x.

25.6.3 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).

25.6.3.1 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).

25.6.3.2 In-house limits cannot be any wider than those mandated in a regulated analytical method.

25.6.3.3 The lowest acceptable recovery limit will be 10% (the analyte must be detectable). Exception: The lowest acceptable recovery limit for Benzidine will be 5% and the analyte must be detectable.

25.6.3.4 The maximum acceptable recovery limit will be 150%.

25.6.3.5 The maximum acceptable RPD limit will be 35% for waters and 40% for soils. The minimum RPD limit is 10%.

25.6.3.6 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.

25.6.4 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.

25.6.4.1 The QA department generates a Quality Control Limit Summary that contains tables that summarize the precision and accuracy acceptability limits for analyses performed at TestAmerica Irvine. This summary includes an effective date, is updated each time new limits are generated and is located in the QA directory of the laboratory computer network. Unless otherwise noted, limits within these tables are laboratory generated. 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.

25.6.5 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 13) is also initiated if an LCS exceeds the acceptance limits. Sample results may be qualified and reported without reanalysis if:

25.6.5.1 The analyte results are below the reporting limit and the LCS is above the upper control limit.

25.6.5.2 If the analytical results are above the relevant regulatory limit and the LCS is below the lower control limit.

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25.6.6 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 Appendix 4 and in Section 13.

25.6.7 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.

25.7 METHOD DETECTION LIMITS (MDLs)

MDLs, calculated as described in Section 20.7, are updated or verified annually, or more often if required by the method.

25.8 ADDITIONAL PROCEDURES TO ASSURE QUALITY CONTROL

25.8.1 The laboratory has written procedures to assure the accuracy of the test method including calibration (see Section 21), use of certified reference materials (see Section 22) and use of PT samples (see Section 16).

25.8.2 A discussion regarding MDLs, Limit of Detection (LOD) and Limit of Quantitation (LOQ) can be found in Section 20.

25.8.3 Use of formulae to reduce data is discussed in the method standard operating procedures and in Section 21.

25.8.4 Selection of appropriate reagents and standards is included in Section 9 and 22.

25.8.5 A discussion on selectivity of the test is included in Section 5.

25.8.6 Constant and consistent test conditions are discussed in Section 19.

25.8.7 The laboratories sample acceptance policy is included in Section 24.

25.8.8 A listing of the type of test result correlations that are looked at during report review (e.g. Total Chromium should be greater or equal to Hexavalent Chromium) is included in Section 20.13.4.5.

SECTION 26.0

REPORTING RESULTS
(NELAC 5.5.10)

26.1 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 a conflict between the client requested formats and accreditation requirements or data usability information, accreditation requirements and data usability information will take precedence over client requests. 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 20.

26.2 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 on laboratory letterhead, reviewed, and signed by the appropriate project manager. At a minimum, the standard laboratory report shall contain the following information:

26.2.1 A report title (e.g. Analytical Report For Samples) with a "sample results" column header.

26.2.2 Each report page printed on company letterhead, which includes the laboratory name, address and telephone number.

26.2.3 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.

26.2.4 A copy of the chain of custody (COC).

- Any COCs involved with Subcontracting are included.

- In most cases, the applicable COC is not paginated but is an integral part of the report. If the COC is not a paginated portion of the report then there will be a statement on the front of the report to effect of "The Chain of Custody, X page(s), is included and is an integral part of this report.". The number of pages of the CoC (X) is entered into Element so that it is correct for each 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).

26.2.5 The name and address of client and a project name/number, if applicable.

26.2.6 Client project manager or other contact

26.2.7 Description and unambiguous identification of the tested sample(s) including the client identification code.

26.2.8 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.

26.2.9 Date reported or date of revision, if applicable.

26.2.10 Method of analysis including method code (EPA, Standard Methods, etc).

26.2.11 Reporting limit.

26.2.12 Method detection limits (if requested)

26.2.13 Definition of Data qualifiers and reporting acronyms (e.g. ND).

26.2.14 Sample results.

26.2.15 QC data consisting of method blank, surrogate, LCS, and MS/MSD recoveries and control limits.

26.2.16 Condition of samples at receipt including temperature (noted on COC.) This may also be accomplished in a narrative or by attaching sample login sheets (Refer to Sec. 26.2.4 – Item 3 regarding additional addenda).

26.2.17 A statement expressing the validity of the results, that the source methodology was followed and all results were reviewed for error.

26.2.18 A statement to the effect that the results relate only to the items tested and the sample as received by the laboratory.

26.2.19 A statement that the report shall not be reproduced except in full, without prior express written approval by the laboratory coordinator.

26.2.20 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. For applying an electronic signature refer to the Electronic Signature Policy (Section 26.4).

26.2.21 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. Examples: At the time of analysis the laboratory was in compliance with the current NELAC standards and held accreditation for all analyses performed unless noted by a qualifier. The labs accreditation number is _____. OR The report meets all applicable NELAC standards and shall not be reproduced except in full, without the written approval of the laboratory.

26.2.22 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.

26.2.23 When Soil samples are analyzed, a specific identification as to whether soils are reported on a “wet weight” or “dry weight” basis.

26.2.24 Appropriate laboratory certification number for the state of origin of the sample, if applicable.

26.2.25 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, or how your lab identifies it), and that a complete report will follow once all of the work has been completed.

26.2.26 Any out of network subcontracted analysis results are provided as a separate report on the official letterhead of the subcontractor. All in-network subcontracting is clearly identified on the report as to which laboratory performed a specific analysis.

26.3 REPORTING LEVEL OR REPORT TYPE

TestAmerica Irvine 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 26.2 above plus summary information, including results for the method blank reported to the laboratory MDL, 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, and relevant calibration information. No raw data is provided.
- Level IV 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 diskette deliverable form. 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 26.7.

26.3.1 Electronic Data Deliverables (EDDs)

EDDs are routinely offered as part of TestAmerica's services. TestAmerica Irvine 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.

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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.

26.4 ELECTRONIC REPORTING AND SIGNATURE POLICY

Following the lead of the Federal Paperwork Reduction Act, TestAmerica has implemented policies and procedures to help reduce paper usage. One of these procedures is to generate final reports and provide them to clients in pdf format.

Laboratory Director appointed representatives may approve final reports using an electronic signature that is applied to the report at the time of generation. This policy is prepared to state that the electronically applied signatures on TestAmerica Analytical Testing Corp. reports are as legally binding as a handwritten "wet signature". This policy is intended to prevent the possibility of non-repudiation (denial that an individual signed the document) and to insure authenticity and security. In order to ensure the electronic signatures are valid and unequivocally represent the identity of the signer, TestAmerica uses 21 CFR Part 11 "Electronic Records; Electronic Signatures" from the FDA as well as EPA's procurement policy (EPS 00-01) as guidance documents for this policy.

In order to ensure authenticity of the reports, the following conditions must be met:

26.4.1 Report Content

- State that the report was electronically signed.
- The printed name and title of the signer must be underneath the signature

- The date and time when the signature was executed is represented in the "Report Issued" entry on the cover page of the report.

- The meaning of the signature: (e.g. reviewed and approved)

In order to insure the integrity of the signatures, the following security features have been implemented.

26.4.2 General Requirements

- The identity of the signatory must be verified before an electronic signature can be created for that person.

- Each electronic signature shall be unique to a single individual and shall not be reused by or assigned to another individual

- Persons using an electronic signature shall certify that the electronic signatures in the system are intended to be the legally binding equivalent to their traditional handwritten signature. On this certification, the signatory will state that their passwords are to remain completely confidential and can only be used by the genuine owner of the password and the sign-off may not take place until each page has been viewed. Refer to Figure 26-1.

26.4.3 Components and Controls

Two distinct identification components are utilized for each individual. The components are a) user name b) password. Each signing will require the entry of the username and the password must be reentered. The signatures may not be copied, excised or transferred from the report by ordinary means.

The report may not be changed once the signature has been applied and the pdf files are stored on the file server with security as well as password protected to ensure no changes may be made to the file.

In the case where a client requests that the pdf be unsecure so that the report may be inserted into their reports, the client must sign an agreement stating that they will not alter the report. This can be achieved by requiring agreement each time it is accessed on the web or by signing off on an agreement (refer to Figure 26-2). The lab can determine the best approach for this to be done:

- On a report by report basis
- On a client basis (all reports to a client would be an exception)
- On a project basis (all reports for a project would be an exception

Pdf reports must be backed up on a Magnetic tape or other durable storage media (e.g., DVD) and maintained secure for up to 5 years.

26.5 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. Refer to Appendix 7 for a list of the laboratory's standard footnotes and qualifiers.

26.5.1 Numeric results with values outside of the calibration range, either high or low are qualified as 'estimated'.

26.5.2 Where quality system requirements are not met, a statement of compliance/non-compliance with requirements and/or specifications, 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.

26.5.3 Where applicable, a statement on the estimated uncertainty of measurements; information on uncertainty is needed when a client's instructions so require.

26.5.4 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.

26.6 ENVIRONMENTAL TESTING OBTAINED FROM SUBCONTRACTORS

If TestAmerica Irvine is not able to provide the client the requested analysis, the samples would be subcontracted following the procedures outlined in Section 8.

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 the TestAmerica network are reported to the client on the subcontract laboratory's original report stationary and the report includes any accompanying documentation.

26.7 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.

26.7.1 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 the 1-800-765-0980 (or for e-mails: please notify us immediately by e-mail or by phone (1-800-765-0980) and delete this material from any computer).

26.8 FORMAT OF REPORTS

The format of reports are designed to accommodate each type of environmental test carried out and to minimize the possibility of misunderstanding or misuse.

26.9 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 13).

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 "Revision". The revised report will have the word "revised" or "amended" next to the date rather than the word "reported".

When the report is re-issued, a notation of "revised " 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.

26.10 POLICIES ON CLIENT REQUESTS FOR AMENDMENTS

26.10.1 Sample Reanalysis Policy

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 arrangements for reanalysis protocols can be established.

- Homogenous samples: If a reanalysis agrees with the original result to within the RPD limits for MS/MSD or Duplicate analyses, or within $\pm$ 1 reporting limit for samples $\leq$ 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 QA Manager or Laboratory Director if unsure.

26.10.2 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.

26.10.3 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.

Figure 26-1.

Read and Understand Memo for
Electronic Reporting and Electronic Signatures Policy

I have read and understand the TestAmerica Policy on Electronic Reporting and Electronic Signatures and agree to follow procedures stated in this document. Futhermore, I agree to maintain my password secure and confidential and will not divulge this password to anyone. I am aware that my electronic signature is as legally binding as that of my signature signed with a pen. I will not apply my signature until I have reviewed each page.

Employee:

Signature: _____

Date: _____

Return this signed form to HR within 5 days for filing in your Personnel File

Figure 26-2.

AGREEMENT FOR ELECTRONIC REPORTS

TestAmerica provides laboratory services and certified lab reports ("Reports") to the undersigned client ("Client"). Client desires to receive the Reports in both written hard copy and electronic format. Both TestAmerica and the Client desire to protect and preserve the integrity of the Reports.

TestAmerica agrees to provide Client with the Reports in both hard copy and electronic format. Client agrees to accept all responsibility for and indemnify and hold TestAmerica harmless from all claims or demands from third parties, including attorneys' fees and costs incurred by TestAmerica, due to alterations or deletions to the Reports by Client, or the use of incomplete Reports by Client.

Client agrees not to alter any Reports whether in the hard copy or electronic format and to use reasonable efforts to preserve the Reports in the form and substance originally provided by TestAmerica.

Date: _____Company Name: _____

Completed By: _____

Title/Position: _____

Client Signature: _____ _____

Date: _____Company Name: _____TestAmerica Location

Received By: _____

Title/Position: _____

Signature: _____

Please sign and FAX to xxx-xxx-xxxx

Appendix 1.

TESTAMERICA
ETHICS POLICY No. CA-L-P-001

Refer to CA-L-P-001 for complete policy.

TestAmerica
EMPLOYEE ETHICS STATEMENT

I understand that TestAmerica is committed to ensuring the highest standard of quality and integrity of the data and services provided to our clients. I have read the Ethics Policy of the Company.

- *With regard to the duties I perform and the data I report in connection with my employment at the Company, I agree that:*
- *I will not intentionally report data values that are inconsistent with the actual values observed or measured.*
- *I will not intentionally report the dates, times, sample or QC identifications, or method citations of data analyses that are not the actual dates, times, sample or QC identifications, or method citations.*
- *I will not intentionally misrepresent another individual's work as my own or represent my own work as someone else's.*
- *I will not intentionally misrepresent any data where data does not meet Method or QC requirements. If it is to be reported, I will report it with all appropriate notes and/or qualifiers; I shall not modify data (either sample or QC data) unless the modification can be technically justified through a measurable analytical process, such as one deemed acceptable to the laboratory's Standard Operating Procedures, Quality Assurance Manual or Technical Director. All such modifications must be clearly and thoroughly documented in the appropriate laboratory notebooks/worksheets and/or raw data and include my initials or signature and date.*
- *I shall not make false statements to, or seek to otherwise deceive, members of Management or their representatives, agents, or clients/customers. I will not, through acts of commission, omission, erasure, or destruction, improperly report measurement standards, quality control data, test results or conclusions.*
- *I shall not compare or disclose results for any Performance Testing (PT) sample, or other similar QA or QC requirements, with any employee of any other laboratory, including any other TestAmerica laboratory, prior to the required submission date of the results to the person, organization, or entity supplying the PT sample.*
- *I shall immediately inform my supervisor or other member of management regarding any intentional or unintentional reporting of my own inauthentic data. Such report shall be given both orally and in writing to the supervisor or other member of management contacted and to the local Quality Assurance Manager. The Quality Assurance Manager will initial and date the information and return a copy to me. I shall not condone any accidental or intentional reporting of inauthentic data by other employees and will immediately report its occurrence. If I have actual knowledge of such acts committed by any other employees, and I do not report such information to designated members of Management, it shall be considered as serious as if I personally committed the offense. Accordingly, in that event, I understand that I may be subject to immediate termination of employment.*
- *I understand that if any supervisor, manager, or representative of TestAmerica management instructs, requests, or directs me to perform any of the aforementioned improper laboratory practices, or if I am in doubt or uncertain as to whether or not such laboratory practices are proper, I will not*

comply. In fact, I must report such event to all appropriate members of Management including, but not limited to, the Lab Director, all supervisors and managers with direct line reporting relationship between me and the Lab Director, and the local Quality Assurance representative, excluding such individuals who participated in such perceived improper instruction, request, or directive. In addition, I may contact Corporate Quality Assurance / Ethics Compliance Officer(s) for assistance.

- *I understand the critical importance of accurately reporting data, measurements, and results, whether initially requested by a client, or retained by TestAmerica and submitted to a client at a later date, or retained by TestAmerica for subsequent internal use;*
- *I will not share the pricing or cost data of Vendors or Suppliers with anyone outside of the TestAmerica family of companies.*
- *I shall not accept gifts of a value that would adversely influence judgment.*
- *I shall avoid conflicts of interest and report any potential conflicts to the management (e.g. employment or consulting with competitors, clients, or vendors).*
- *I shall not participate in unfair competition practices (e.g. slandering competitors, collusion with other labs to restrict others from bidding on projects).*
- *I shall not misrepresent certifications and status of certifications to clients or regulators.*
- *I shall not intentionally discharge wastes illegally down the drain or onto the ground.*
- *I understand that any attempt by management or an employee to circumvent these policies will be subject to disciplinary action.*

As a TestAmerica employee, I understand that I have the responsibility to conduct myself with integrity in accordance with the ethical standards described in the Ethics Policy. I will also report any information relating to possible kickbacks or violations of the Procurement Integrity Act, or other questionable conduct in the course of sales or purchasing activities. I will not knowingly participate in any such activity and will report any actual or suspected violation of this policy to management.

I understand that if my job includes supervisory responsibilities, I shall not instruct, request, or direct any subordinate to perform any laboratory practice which is unethical or improper. Also, I shall not discourage, intimidate, or inhibit an employee who may choose to appropriately appeal my supervisory instruction, request, or directive which the employee perceives to be improper, nor retaliate against those who do.

The Ethics Policy has been explained to me by my supervisor or at a training session, and I have had the opportunity to ask questions if I did not understand any part of it. I understand that any violation of this policy subjects me to disciplinary action, which can include termination of my employment. In addition, I understand that any violation of this policy which relates to work under a government contract or subcontract could also subject me to the potential for prosecution under federal law.

EMPLOYEE SIGNATURE _____ Date _____

Supervisor/Trainer: _____ Date _____

TestAmerica
CONFIDENTIALITY AND PROPRIETARY INFORMATION AGREEMENT

TestAmerica and their predecessors, in their businesses, have developed and use commercially valuable technical and non-technical information and to guard the legitimate interests of TestAmerica and its clients, it is necessary to protect certain information as confidential and proprietary.

I, _____ , understand and acknowledge that during the term of my employment by TestAmerica, I will be privy to and entrusted with certain confidential information and trade secrets of TestAmerica and its clients.

Confidential information and trade secrets include, but are not limited to: customer and client lists; price lists; marketing and sales strategies and procedures; operational and equipment techniques; standard operating procedures; business plans and systems; quality control procedures and systems; special projects and technological research, including projects, research and reports for any government entity or client; client's plans and processes; client's manner of operation; the trade secrets of clients; client's data; vendor or supplier pricing; employee lists and personal information, and any other records, data, files, drawings, inventions, discoveries, applications, or processes which are not in the public domain.

I agree as follows:

1. I will not in any way, during the term of my employment, or at any time thereafter, except as authorized in writing by the Legal Department of TestAmerica or the client where client data is involved, disclose to others, use for my own benefit, remove from TestAmerica's premises (except to the extent off-site work is approved by my supervisor), copy or make notes of any confidential information and/or trade secrets of TestAmerica or its clients, excepting only that information which may be public knowledge. Technical and business information of any previous employer or other third party which I may disclose to TestAmerica shall be limited to that which was acquired legitimately and disclosed to me without restriction as to secrecy.

2. I agree that all inventions (whether or not patentable) conceived or made by me during the period of my employment by TestAmerica shall belong to TestAmerica, provided such inventions grow out of my work for TestAmerica and are related to the business of TestAmerica. I agree to disclose and assign such inventions to TestAmerica. In California, this provision shall not apply to any invention which qualifies fully under Section 2870 of the California Labor Code.

3. On termination of my employment from TestAmerica, I will deliver to TestAmerica all documents, records, notes, data, memoranda, files, manuals, equipment and things of any nature which relate in any way to confidential information and/or trade secrets of TestAmerica or its clients and which are in my possession or under my control.

4. I agree that during the period of my employment and for one (1) year from and after the termination (for any reason) of my employment with TestAmerica, I shall not directly or indirectly (without first obtaining the written permission of TestAmerica), recruit for employment, or induce to terminate his or her employment with TestAmerica, any person who is an active employee of TestAmerica on the last day of my employment with TestAmerica.

5. I acknowledge that if I were to breach any provision of this Confidentiality Agreement, money damages will be inadequate, and I hereby agree that TestAmerica shall be entitled, where appropriate, to specific performance and/or injunctive relief (i.e. to require me to comply with this Agreement). I further acknowledge that the willingness of TestAmerica to hire me or to continue my employment constitutes full and adequate consideration for the agreements, and obligations to which I have agreed as set forth in this document.

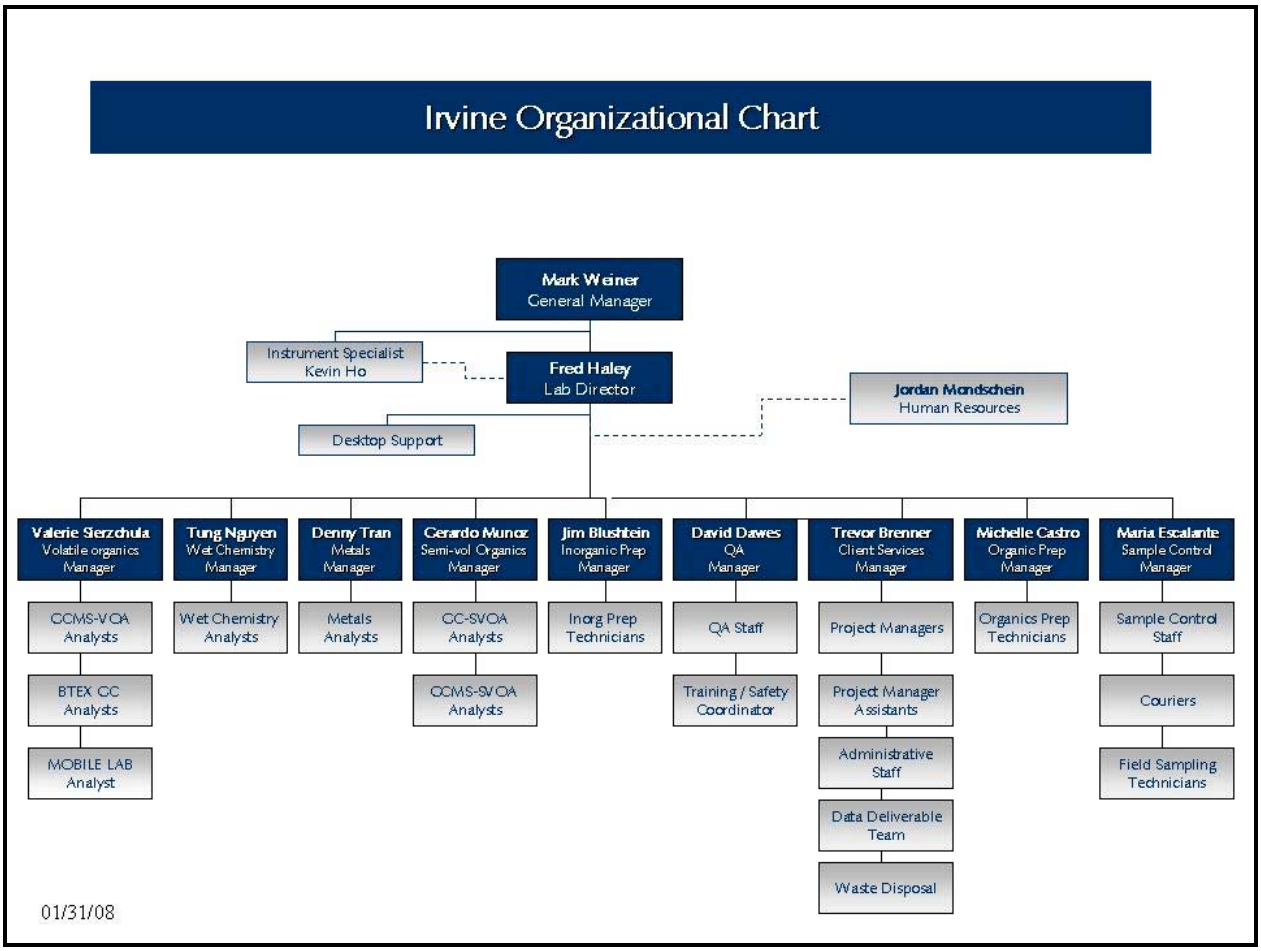
I have executed this Agreement, intending to be legally bound.

_____	_____	_____
Printed Name	*Signature*	*Date*

Appendix 2.

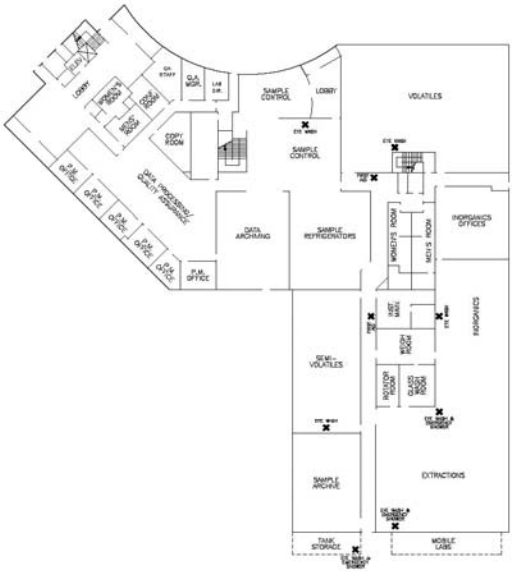
Example Laboratory Organization Chart

(The most current chart can be obtained from the QA Manager or Lab Director)



Appendix 3.

Laboratory Floor Plan



FIRST FLOOR
IRVINE LABORATORY

SECOND FLOOR
CORPORATE OFFICES

Appendix 4: Summary of Calibration and QC Procedures

The following tables are summaries of select method-specified calibration and QC requirements for select laboratory methods. For more information, actual limits, and any method-deviations, please see the current revision of the laboratory's SOP.

QC Acceptance Criteria for Method EPA 8260B

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
EPA 8260B	Volatile Organic Compounds	BFB tuning	Prior to initial calibration and calibration verification	Table 2 criteria met (Method 8260B – Table4)	Retune instrument and verify
		5-point initial calibration for all analytes. (6-point for quadratic regression)	Initial calibration prior to sample analysis.	SPCCs minimum RFs: > 0.10 (BF, CM, DM) and > 0.30 (CB, TE). %RSD of RFs: < 30(for CCCs, Ketone and Alcohols); < 15for others. Calibration Curve (If %RSD > 15): coefficient factor, r > 0.99	Correct problem then repeat initial calibration.
		Retention time window calculated for each analyte	Each initial calibration and calibration verifications	± 3 times standard deviation for each analyte retention time from 72-hour study	Correct problem then reanalyze all samples analyzed since the last retention time check
		2nd source Calibration verification (same as LCS)	Daily, before sample analysis and every 12 hours of analysis time	SPCCs minimum RFs met. CCCs: < 20% drift from initial calibration. Others: in-house recovery limits.	Correct problem then repeat initial calibration
		Method blank	One per analytical batch of 20 samples	No analytes detected ≥ RL.	Correct problem and re-analyze method blank and all samples processed with the contaminated blank unless sample results are

QC Acceptance Criteria for Method EPA 8260B

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
					ND for the contamination compound or sample results are > 20 times the level found in the blank
		LCS for all analytes (2nd source)	One LCS per analytical batch	In-house statistical limits	If sufficient sample is available for re-analysis, correct problem and re-analyze the LCS and all samples in the affected analytical batch unless samples are ND for the affected compound(s) and LCS is biased high
EPA 8260B	Volatile Organic Compounds	MS/MSD	One MS/MSD per every 20 project samples per matrix	In-house statistical limits	Qualifier to indicate matrix interfernce
		Internal standard	Every sample, calibration check, method blank, LCS, MS/MSD	Retention time within ±30 seconds from last mid-point calibration standard Absolute areas within 50-200% of level in last mid-point calibration standard	Determine, correct problem and re-analyze samples
		Surrogate spike	Every sample, calibration check, method blank, LCS, MS/MSD	In-house statistical limits	Determine, correct problem and re-analyze samples. For matrix effect, flag result accordingly. For other causes, fill out a CAR
		MDL study	One full MDL run originally. Verification every quarter.	MDLs established per 40CFR – Part 136	None

QC Acceptance Criteria for Method EPA 8260B					
Method	**Applicable Parameter**	**QC Check**	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
		Initial Demonstration of Capability (4 replicates of LCS)	Once per analyst	Average recovery and precision within in-house statistical limits	Recalculate results; determine and correct problem with the system and then rerun demonstration for those analytes that did not meet criteria

QC Acceptance Criteria for Method EPA 8270C					
Method	**Applicable Parameter**	**QC Check**	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
EPA 8270C	Volatile Organic Compounds	DFTPP tuning	Prior to initial calibration and calibration verification	Table 3 of method 8270C DDT degradation < 20%, Benzidine and Pentachlorophenol tailing factors < 3 and < 5 respectively	Retune instrument and verify
		5-point initial calibration for all analytes. (6-point for quadratic regression)	Initial calibration prior to sample analysis.	SPCCs minimum RFs: > 0.05 %RSD of RFs: < 30(for CCCs); < 15 for others. Calibration Curve (If %RSD > 15): coefficient factor, r > 0.99	Correct problem then repeat initial calibration.
		Retention time window calculated for each analyte	Each initial calibration and calibration verifications	± 3 times standard deviation for each analyte retention time from 72-hour study	Correct problem then reanalyze all samples analyzed since the last retention time check
		2nd source Calibration verification (same as LCS)	Once, after ICAL	SPCCs minimum RFs met. CCCs: < 20% drift from initial calibration. Others: in-house recovery limits.	Correct problem then repeat initial calibration
		Method blank	One per analytical	No analytes detected ≥ RL.	Correct problem, re-extract and/or re-analyze

QC Acceptance Criteria for Method EPA 8270C

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
			batch of 20 samples		method blank and all samples processed with the contaminated blank unless sample results are ND for the contamination compound or sample results are > 20 times the level found in the blank
		LCS for all analytes (2nd source)	One LCS per analytical batch	In-house statistical limits	If sufficient sample is available for re-analysis, correct problem and re-analyze the LCS and all samples in the affected analytical batch unless samples are ND for the affected compound(s) and LCS is biased high
		MS/MSD	One MS/MSD per every 20 project samples per matrix	In-house statistical limits	Qualifier to indicate matrix interfernce
		Internal standard	Every sample, calibration check, method blank, LCS, MS/MSD	Retention time within ±30 seconds from last mid-point calibration standard Absolute areas within 50-200% of level in last mid-point calibration standard	Determine, correct problem and re-analyze samples
		Surrogate spike	Every sample, calibration check, method blank, LCS, MS/MSD	In-house statistical limits	Determine, correct problem and re-analyze samples. For matrix effect, flag result accordingly. For other causes, fill out a CAR
		MDL study	One full MDL run originally. Verification every quarter.	MDLs established per 40CFR – Part 136	None

QC Acceptance Criteria for Method EPA 8270C					
Method	**Applicable Parameter**	**QC Check**	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
		Initial Demonstration of Capability (4 replicates of LCS)	Once per analyst	Average recovery and precision within in-house statistical limits	Recalculate results; determine and correct problem with the system and then rerun demonstration for those analytes that did not meet criteria

QC Acceptance Criteria for Method EPA 8081A

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
EPA 8081A	DDT, BHC and other Organochlorine Pesticides	5-point initial calibration for all analytes.	Initial calibration prior to sample analysis.	%RSD of RFs (or Average of %RSD): < 20 for all compounds Calibration Curve (If %RSD > 20 and <50): Correlation coefficient, r > 0.99	1. % RSD may be used if the average % RSD of all compounds is 20% and sample results are ND for any target compound with %RSD > 20% 2. Correct problem then repeat initial calibration
		Second-source calibration verification for all analytes	Once per five-point initial calibration	All target analytes within ±15% of expected value	1. If the average recovery of all compounds is within 15% and sample results are ND, then the results will be reported with an additional form indicating the individual compounds exceeding the 15% limit 2. Otherwise, correct problem then repeat initial calibration
		Retention time window calculated for each analyte	Every 6 months	± 3 times standard deviation for each analyte retention time from 72-hour study	None
		Continuing calibration verification	After every 20 samples and at the end of the analysis sequence	All target analytes within ±15% of expected value and all compounds correctly identified by RT	1. If the average recovery of all compounds is within 15% and sample results are ND, then the results will be reported with an additional form indicating the individual compounds exceeding the 15% limit.

QC Acceptance Criteria for Method EPA 8081A

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
					2. Correct problem then repeat initial calibration verification and reanalyze all samples since last successful calibration verification.
EPA 8081A	DDT, BHC and other Organochlorine Pesticides	Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all associated samples unless sample results are ND for the contamination compound or sample results are >x 10 times the level found in the blank
		LCS for all analytes	One LCS per analytical batch	In-house statistical limits	If sufficient sample is available for re-extraction correct problem then reprep and analyze the LCS and all samples in the affected analytical batch unless samples are ND for the affected compound(s) and LCS is biased high
		Surrogate spike	Every sample, spiked sample, standard, and method blank	In-house statistical limits	1. Re-analyze the sample one time. Evaluate data and, if matrix effects are indicated, report results and Flag surrogate recovery 2. If sample is available for re-extraction, correct problem then re-extract and analyze samples 3. Otherwise report results with a corrective action report indicating the cause of the problem
		MS/MSD	One MS/MSD per every 20 project samples per matrix	In-house statistical limits	Qualify samples to indicate matrix interference

QC Acceptance Criteria for Method EPA 8081A

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
		MDL study	One full MDL run originally. Verified every quarter	MDLs established per 40CFR – Part 136	None
		Initial Demonstrattion of Capability (4 replicates of LCS)	Once per analyst	Average recovery and precision within in-house statistical limits	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria

QC Acceptance Criteria for Method EPA 8082

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
EPA 8082	PCBs	Minimum 5-point initial calibration Aroclors 1016 and 1260 (Additional 3-point calibrations are to be created and maintained whenever other Aroclors are identified in samples	Initial calibration prior to sample analysis.	%RSD of RFs : ≤ 20 for each compound Calibration Curve (If %RSD > 20): Linear, NOT forced through zero, r ≥ 0.990	Correct problem then repeat initial calibration.
		Retention time window calculated for each analyte	Each initial calibration	± 3 times standard deviation for each analyte retention time from 72-hour study	None

QC Acceptance Criteria for Method EPA 8082

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
		Second-source calibration verification for all analytes	Once per initial calibration	All analytes within ±15% of expected value	4. Re-analyze once to confirm. 5. Correct problem then repeat initial calibration.
		Retention time window check	All CCVs	Each congener is within established absolute RT window	Determine the cause, correct the problem and reanalyze all affected samples.
		Continuing calibration verification	After every 10-20 samples and at the end of the analysis sequence	All analytes within ±15% of expected value	1. If the ICV/CCV result is > 115% of the expected value and all samples are ND for the compound then report the results with a CAR and flag the results with a 'C' qualifier. 2. If the CCV result is < 85% of the expected value, reanalyze the samples against an acceptable calibration curve one time. 3. If the CCV fails again due to matrix interference and the sample is ND or a hit, report results with a CAR and flag 'C4'. If there is a PCB hit in the sample at or below the RL, then analyze a standard at the RL. If the area count of the sample is < the area count of the RL standard, report as ND and flag 'C4.'
		Second Column Confirmation	Every sample	Results agree within 40%	If the second column does not agree within 40% but still confirms the presence of the analyte then confirmation is qualitative. The higher result must be reported or the sample reanalyzed under a new calibration or on another instrument
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all associated samples unless sample results are ND for the contamination compound or sample results are **>** x20 times the level found in the blank

QC Acceptance Criteria for Method EPA 8082

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
		LCS for all analytes	One LCS per analytical batch	In-house statistical limits	If sufficient sample is available for re-extraction correct problem then reprep and analyze the LCS and all samples in the affected analytical batch unless samples are ND for the affected compound(s) and LCS is biased high
		Surrogate spike	Every sample, spiked sample, standard, and method blank	In-house statistical limits	2. Re-analyze the sample one time. Evaluate data and, if matrix effects are indicated, report results and Flag surrogate recovery 3. If sample is available for re-extraction, correct problem then re-extract and analyze samples 6. Otherwise report results with a corrective action report indicating the cause of the problem
		MS/MSD	One MS/MSD per every 20 project samples per matrix	In-house statistical limits	Qualify samples to indicate matrix interference
		MDL study	One full MDL run originally. Verified every quarter	MDLs established per 40CFR – Part 136	None
		Initial Demonstrattion of Capability (4 replicates of LCS)	Once per analyst	Average recovery and precision within in-house statistical limits	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria

QC Acceptance Criteria for Method EPA 8015

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
EPA 8015	Volatile Fuel Hydrocarbons (VFH, C6-C12)	5-point initial calibration	Initial calibration prior to sample analysis.	20% RSD for calibration point RFs	Correct problem then repeat initial calibration
		Second-source calibration verification (ICV/CCV)	Initially and every 12 hours or 10 samples	±15% of expected value	7. Re-analyzed once 8. Correct problem and re-analyze all affected samples.
		Retention time window calculated for each analyte	Every 6 months	± 3 times standard deviation for each analyte retention time from 72-hour study	None
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all associated samples unless sample results are ND for the contamination compound or sample results are >20 times the level found in the blank
		LCS for all analytes	One LCS per analytical batch	In-house statistical limits	If sufficient sample is available, correct problem and analyze the LCS and all samples in the affected analytical batch unless samples are ND and LCS is biased high
		Surrogate spike	Every sample, spiked sample, standard, and	In-house statistical limits	3. Evaluate secondary surrogate. 4. If matrix effects are indicated, report results

QC Acceptance Criteria for Method EPA 8015

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
			method blank		and flag surrogate recovery
		MS/MSD	One MS/MSD per every 20 project samples per matrix	In-house statistical limits	Qualify samples to indicate matrix interference
		MDL study	One full MDL run originally. Verified every quarter	MDLs established per 40CFR – Part 136	None
EPA 8015	Volatile Fuel Hydrocarbons (VFH, C6-C12)	Initial Demonstrattion of Capability (4 replicates of LCS)	Once per analyst	Average recovery and precision within in-house statistical limits	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria

QC Acceptance Criteria for Method EPA 6010B

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
EPA 6010B	ICP Metals	Initial multipoint calibration (minimum 3 standards and a blank)	Daily initial calibration prior to sample analysis	Correlation coefficient ≥0.995 for linear regression	Correct problem then repeat initial calibration
		2nd source initial calibration verification	Immediately after initial calibration	All analytes within ±10% of expected value	1) Reanalyze once 2) If still out, correct problem then repeat initial calibration
		Calibration blank	After every 10 samples and at end of the analysis sequence	No analytes beyond ≥ ±RL	Reanalyze the blank. If it still fails, correct problem then analyze calibration blank and previous 10 samples unless sample results >10 times the absolute level found in the blank
		Continuing calibration verification (Instrument Check Standard)	After every 10 samples and at end of the analysis sequence	All analyte(s) within ±10% of expected value	Repeat calibration and reanalyze all samples since last successful CCV
		Interference check solution (ICSA)	At least weekly, before sample analysis	Interfering elements (Al, Ca, Fe, Mg) within ±20% of expected value . Target elements: ±2 Reporting Limit.	Dilute ICSA and/or samples
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank unless sample results are ND for the contaminatate compound or sample results are > x 10 times the level found in the blank

QC Acceptance Criteria for Method EPA 6010B

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
		LCS for all elements	One LCS per analytical batch	All elements within ±20% of expected value	If sufficient sample is available for re-extraction correct problem then reprep and analyze the LCS and all samples in the affected analytical batch unless samples are ND for the affected element(s) and the LCS is biased high
		MS/MSD	One MS/MSD per every 20 project samples per matrix	Within 75-125% of expected results	None
		Internal standard	Each sample	Within 30-120% of the intensity level in the initial calibration standard	Correct problem and/or dilute sample
		MDL study	One full MDL run originally. Verification every quarter	MDLs established per CFR 40 – Part 136	None
		Initial Demonstrtion of Capability (4 replicates of LCS)	Once per analyst	Average and precision within in-house statistical limits	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria

Summary of Calibration and QC Procedures for Method EPA 6020

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
EPA 6020	ICPMS Metals	Pre-calibration mass tuning & performance check	Daily, before initial calibration	See ICPMS – Mass tuning and performance check	Correct problem then retune instrument and verify
		Initial multipoint calibration (3 standards and a blank in triplicate)	Daily initial calibration prior to sample analysis	Correlation coefficient $\geq$0.995 for linear regression	Correct problem then repeat initial calibration
		2nd source initial calibration verification (ICV)	Immediately after initial calibration	All analytes within $\pm$10% of expected value	1) Reanalyze once 2) If still out, correct problem then repeat initial calibration
		Calibration blank (ICB / CCB)	After ICV and CCV	No analytes $\geq \pm$RL	Reanalyze the blank. If it still fails, correct problem then analyze calibration blank and previous 10 samples unless sample results are >10x the absolute level found in the blank
		Interference check solution (ICSA / ICSAB)	Daily, before sample analysis and every 12 hours	Target elements: within $\pm$5ppb (Zn: 15ppb) in ICSA and $\pm$30% (Zn: $\pm$50%) of expected value in ICSAB. Interfering elements: NA (above linear range)	Terminate analysis; correct problem; reanalyze ICS; reanalyze all affected samples
		Continuing calibration verification (CCV)	After every 10 samples and at the end of the analysis sequence	All analytes within $\pm$10% of expected value	Repeat calibration and reanalyze all samples since last successful calibration
		LCS for all elements	One LCS per	All elements within $\pm$20% of expected value	If sufficient sample is available for re-extraction

Summary of Calibration and QC Procedures for Method EPA 6020

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
			analytical batch of 20 samples		correct problem then reprep and analyze the LCS and all samples in the affected analytical batch unless samples are ND for the affected element(s) and the LCS is biased high
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank unless sample results are ND for the contaminatate compound or sample results are > 10 times the level found in the blank
		MS/MSD	One MS/MSD per analytical batch	Within 75-125% of expected results	Perform Post-digestion spike
		Post-digestion spike	When MS/MSD fails	Within 75-125% of expected results	Qualifier to indicate matrix interference. Issue a CAR for other causes
		Internal standard	Each sample	Within 30-120% of the intensity level in the initial calibration standard	Correct problem and/or dilute sample
		Initial Demonstration of Capability (4 replicates of LCS)	Once per analyst	Average recovery of all elements within ±20% of expected value and precision within 20%	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria
		IDL Study	Quarterly	IDLs calculated from the average standard deviations of three blanks run on three non-consecutive days (each blank run 7 consecutive times)	None
		MDL study	Biannually	MDLs established per CFR 40 – Part 13	None

QC Acceptance Criteria for Method EPA 300.0

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
EPA 300.0	Common Anions	Multipoint calibration for all analytes (minimum 3 standards and one calibration blank)	Initial calibration prior to sample analysis	Correlation coefficient ≥0.995 for linear regression	Correct problem then repeat initial calibration
		Second-source calibration verification	Once per multipoint calibration	All analytes within ±10% of expected value	Correct problem then repeat initial calibration
		Retention time window calculated for each analyte	Annually	± 3 times standard deviation for each analyte retention time from 72-hour study	Correct problem then reanalyze all samples analyzed since the last retention time check
		Instrument Performance Check (IPC)	Daily, before sample analysis or when elutent is changed	All analytes within ±10% of expected value	Correct problem then repeat initial calibration
		Continuing calibration verification (CCV)	After every 10 samples and at the end of the analysis sequence (second source standard)	All analytes within +/- 10% of excepted value	1. Correct problem then repeat initial calibration verification and reanalyze all samples since last successful calibration verification 2. If the recovery is > 110% and sample results are ND results may be reported without re-analysis
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank unless sample results are ND for the contamination compound or sample results are > 10 times the level found in the blank

QC Acceptance Criteria for Method EPA 300.0

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
		LCS for all analytes. ICV or CCVs are reported as LCS since it is a second source standard.	One LCS per analytical batch	All analytes within +/- 10% of excepted value	If sufficient sample is available for re-extraction correct problem then reprep and analyze the LCS and all samples in the affected analytical batch unless samples are ND and LCS is biased high.
		MS/MSD	One MS/MSD per every 20 project samples per matrix	In-house statistical limits	None
		Initial Demonstration of Capability (4 replicates of LCS)	Once per analyst	Average recovery within +/- 10% of expected value and precision within $\pm$20%	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria
		MDL study	One full MDL run originally. Verified quarterly.	MDLs established per 40CFR – Part 136	None

Acceptance Criteria for Method EPA 7470A/7471A - Mercury

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
EPA 7470A/ 7471A	Mercury	Initial calibration (5 points and a blank)	Daily	Linear regression and forced through zero curve , r $\geq$ 0.995	Correct problem and repeat calibration
		2nd source initial calibration verification (ICV)	Immediately after calibration	Recovery within 90-110% of expected value	Reprep and re-analyze ICV. If still outs, reprep calibration standards and re-calibrate
		Calibration Blank (ICB and CCB)	After ICV and CCV	Free of mercury or below reporting limit	Re-analyze samples bracketed by affected ICB and/or CCBs unless results are not detected or >10x the level found in the calibration blank
		Method blank	One per analytical batch of 20 samples	Free of mercury or below reporting limit	Re-digest and re-analyze the batch unless sample results are not detected or >10x the level found in the method blank
		LCS	One per analytical batch of 20 samples	Within in-house statistical limits	Re-digest and re-analyze the batch unless sample results are not detected and LCS is biased high
		MS / MSD	One MS/MSD set per batch	Within in-house statistical limits	Qualify samples to indicate matrix interference or issue a CAR for other causes
		Continuous calibration verification (CCV)	After every 10 sample analysis	Recovery within 80-120%	Re-analyze all samples bracketed by non-compliant CCVs
		MDL	One full MDL study originally. Verified quarterly	Established per 40CFR – Part 136	None
		Initial Demonstration of Capability (4 replicates of LCS)	Per analyst	Average recovery within in-house statistical limits	Correct problem and repeat the process

QC Acceptance Criteria for Method EPA 7196A – Hexavalent Chromium

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
EPA 7196A/ SM 3500Cr D	Hexavalent Chromium (Cr+6)	Initial Calibration (4-point and a blank)	Daily	Correlation coefficient (r) > 0.995	Reprep standards and recalibrate
		2nd source calibration verification (ICV)	Immediately after calibration	Recovery within 90-110% of expected value	Reprep, rerun and verify result. Otherwise recalibrate
		Continuing calibration verification (CCV)	Every 10 samples and at end of run	EPA 7169A: recovery within 80-120% SM 3500Cr D: recovery within 90-110%	Reanalyzed once. If still fails, recalibrate and reanalyze all samples bracketed by the failed CCV.
		LCS	One per analytical batch	Recovery within in-house statistical limits	Correct problem, re-extract and rerun all associated samples unless sample results are not detected and LCS is biased high
		MS/MSD-soluble	One MS/MSD per analytical batch	Recovery within in-house statistical limits	Perform a post-digestion spike (PDS). Perform a PDS on all samples with results above the RL. If PDS ≥ 85% then flag as matrix interference (MI). If <85 and ≥ 50%, dilute and re-analyze if dilution still >RL otherwise use PDS as single-point MSA and flag as MI (no MSA for SM3500). If <50%, dilute and reanalyze with PDS and flag as MI
		MS-insoluble	One MS per analytical batch (SOILS ONLY)	Recovery within in-house statistical limits	Perform a post-digestion spike (PDS)
		MDL study	One full MDL study originally, reviewed after significant instrument maintenance or method modification	Established per 40 CFR – Part 136	None
		Initial Demonstration of Capability (4 replicates	One per analyst	Average recovery and RSD within in-house statistical limits	Identify, correct problem and repeat process

QC Acceptance Criteria for Method EPA 7196A – Hexavalent Chromium					
Method	**Applicable Parameter**	**QC Check**	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
		of LCS)			

QC Acceptance Criteria for Method EPA 9014 - Cyanide					
Method	**Applicable Parameter**	**QC Check**	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
9014	Cyanide	Initial Calibration 5-point and a blank)	Daily, prior to sample analysis	Linear regression, r >= 0.995	Correct problem then repeat initial calibration
		2nd source initial and continuous calibration verification (ICV / CCV)	Immediately after calibration and after every 10 samples	Within ±15% of expected value	Re-prepare / re-run ICV or CCV and verify recovery. Otherwise, recalibrate and re-run samples not bracketed between compliant CCVs
		Method blank (distilled)	One per analytical batch of 20 samples	Not detected or below Reporting Limit	Redistill method blank and all associated samples, unless sample results are not detected or > 10x the blank level
		LCS (distilled)	One LCS per analytical batch	Within ± 10% of the undistilled standard and true value	Correct the problem and redistill all associated samples, unless LCS is biased high and samples are not detected
		MS / MSD	One MS / MSD per analytical batch	Within in-house statistical limit	Qualify sample to indicate matrix interference

QC Acceptance Criteria for Method EPA 9014 - Cyanide

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
		MDL	Initially and after extensive instrument maintenance	Established per 40CFR – Part 136	None
		Demonstration of Capability (4 replicates of QC check)	Per analyst	Within in-house statistical limits	Identify, correct problem and repeat process

Appendix 5. 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)

Assessment:
The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of NELAC). (NELAC)

Assessment Criteria:
The measures established by NELAC and applied in establishing the extent to which an applicant is in conformance with NELAC requirements. (NELAC)

Assessment Team:
The group of people authorized to perform the on-site inspection and proficiency testing data evaluation required to establish whether an applicant meets the criteria for NELAP accreditation. (NELAC)

Assessor:
One who performs on-site assessments of accrediting authorities and laboratories’ capability and capacity for meeting NELAC requirements by examining the records and other physical evidence for each one of the tests for which accreditation has been requested. (NELAC)
Audit:

A systematic evaluation to determine the conformance to quantitative and qualitative specifications of some operational function or activity. (EPA-QAD)

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)

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)

Finding:
An assessment conclusion that identifies a condition having a significant effect on an item or activity. As assessment finding is normally a deficiency and is normally accompanied by specific examples of the observed condition. (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)

Inspection:
An activity such as measuring, examining, testing, or gauging one or more characteristics of an entity and comparing the results with specified requirements in order to establish whether conformance is achieved for each characteristic. (ANSI/ASQC E4-1994)

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)

Instrument Response:
Instrument response is normally expressed as either peak area or peak height however it may also reflect a numerical representation of some type of count on a detector (e.g. Photomultiplier tube, or Diode array detector) and is used in this document to represent all types.

Laboratory:
A defined facility performing environmental analyses in a controlled and scientific manner. (NELAC)

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.

Manager (however named):
The individual designed as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual. (NELAC)

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)

National Environmental Laboratory Accreditation Program (NELAP):
The overall National Environmental Laboratory Accreditation Program of which NELAC is a part. (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)

NELAC Standards:
The plan of procedures for consistently evaluating and documenting the ability of laboratories performing environmental measurements to meet nationally defined standards established by the National Environmental Laboratory Accreditation Conference. (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 Method:
A method of known and documented accuracy and precision issued by an organization recognized as competent to do so. (NELAC)

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)

Requirement:
Denotes a mandatory specification; often designated by the term “shall”. (NELAC)

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)

Supervisor (however named):
The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties, and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses. (NELAC)

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)

Technical Director:
Individuals(s) who has overall responsibility for the technical operation of the environmental testing laboratory. (NELAC)

Test:
A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process, or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate. (ISO/IEC Guide 2-12.1, amended)

Test Method:
An adoption of a scientific technique for a specific measurement problem, as documented in a laboratory SOP. (NELAC)

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.

United States Environmental Protection Agency (EPA):
The Federal governmental agency with responsibility for protecting public health and safeguarding and improving the natural environment (i.e., the air, water, and land) upon which human life depends. (US-EPA)

Validation:
The process of substantiating specified performance criteria. (EPA-QAD)

Verification:
Confirmation by examination and provision of evidence that specified requirements have been met. (NELAC)

NOTE: In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.

The result of verification leads to a decision either to restore in service, to perform adjustment, to repair, to downgrade, or to declare obsolete. In all cases, it is required that a written trace of the verification performed shall be kept on the measuring instrument's individual record.

Work Cell:
A well-defined group of analysts that together perform the method analysis. The members of the group and their specific functions within the work cell must be fully documented. (NELAC)

Acronyms:

BS – Blank Spike
BSD – Blank Spike Duplicate
CAR – Corrective Action Report
CCV – Continuing Calibration Verification
CF – Calibration Factor
CFR – Code of Federal Regulations
COC – Chain of Custody
CRS – Change Request Form
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
ICP - Inductively Coupled Plasma Atomic Emission Spectroscopy
ICV – Initial Calibration Verification
IDL – Instrument Detection Limit
IH – Industrial Hygiene
IS – Internal Standard
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
PT – Performance Testing
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
TAT – Turn-Around-Time
VOA – Volatiles
VOC – Volatile Organic Compound

Appendix 6.

Laboratory Certifications, Accreditations, Validations

TestAmerica Irvine 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:

State	Agency	Program	License Number
CA	DHS-ELAP	HW	1197
CA	DHS-ELAP	WW, HW	17941[1]
CA	DHS-ELAP	WW, HW	25362
CA	DHS-NELAP	DW, WW, HW	01108CA
AZ	DHS	DW, WW, HW	AZ0671
NV	DEP	DW, WW, RCRA	CA72
UT	DHS-ELCP	DW, WW,HW	DEL9492611022
WA	DOE	WW, HW	C2025
NM	DWB	DW	--
CNMI	DEQ	DW	--
GUAM	EPA	DW	--
HI	DOH	DW	--
--	ACIL	Seal Of Excellence	300
--	USDA	Foreign Soil	S-669307

[1] for Moblile lab (EPA # CA01103)

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 following offices: QA, marketing, and project management.

Claims of Accreditation Status

TestAmerica Irvine has agreed to make only valid claims as to its accreditation/certification status by any authority by ensuring that the expiration dates are not exceeded and the method-specific scope or parameter lists are supportable, as required by each. Any false claims would be reported to that authority. The agreement covers the use of the authority's name, such as "Authority-Accredited," logo, or certificate number. The only valid proof of accreditation/certification is the current certificate and scope of the authority. It is the responsibility of the laboratory to make these documents available to all staff, and it is the staff's duty to reference only the current documents.

A report with scope and non-scope analytes may only be presented on the same report if the non-accredited results are clearly and unambiguously identified. No report with non-scope analytes may be associated with the logo, "Authority accredited" phrase, or the certificate number. Only the analytes specified by a unique method are valid within the scope. There shall be no intentional misleading of the users of the laboratory's services in this regard.

No opinions and/or interpretations based on results outside the laboratory's scope may be presented on a document referenced by "Authority-accredited, the logo, or the certificate number. If these are made, they must be written in a separate letter which is not endorsed by the authority.

The "Authority-accredited" logo may only be affixed to equipment calibrated by a laboratory that is accredited by the authority. If calibration labels contain the logo, they must also show the calibration laboratory's name or its certificate number, the instrument's unique identification, the date of the last calibration, and a cross-reference to the last calibration certificate.

Should the company decide to use the "Authority-accredited" logo in marketing activities, no misrepresentation may occur. Only reference to the accredited scope at a specific laboratory site is allowed. If any "Authority-accredited" language is used in proposals or quotations, any non-scope analytes must be clearly denoted as not accredited by that authority. The same is true for any use of laboratory letterhead with the "Authority-accredited" wording or logo. The logo may not be affixed to any material, item, product, part, or packaging, thereby implying accreditation status to that piece. In literature, any use of the logo must be positioned adjacent to the accredited laboratory's name and clearly state that the presence of the logo does not imply certification/approval of the products tested. At no time may the logo appear to suggest that a person is accredited. Misrepresentation of accreditation status is never allowed and must be reported if it occurs. If in doubt, the idea of the logo's use may be presented to the authority for approval.

If accreditation is terminated or suspended, the laboratory will immediately cease to use the "Authority-accredited" wording, the logo, or the certificate number reference in any way and inform clients impacted by the change.

Appendix 7. Data Qualifiers

Qualifier	Text	Usage Comments
-	Negative Ion Balance	
+	Positive Ion Balance	
<	Result is less than the indicated value.	Used only for Flashpoint
>	Result is greater than the indicated value.	Used only for Flashpoint
A-01	[Custom Value]	Type the qualifier in full sentences without abbreviations or uncommon acronyms. DO NOT USE ALL CAPs. AZ requires narrative.
A1	Too numerous to count.	Microbiology only (Put 'TNTC' in CSTM qualifier)
A10	Results based upon colony counts outside the acceptable range.	
A12	Atypical growth	
A13	Atypical growth appears to have a toxic effect on surrounding growth, thus affecting the plate count.	
A2	Sample incubation period exceeded method requirement.	Microbiology only **(NDs ONLY)**
A3	Sample incubation period was shorter than method requirement.	Microbiology only
A4	Target organism detected in associated method blank.	Microbiology only **(NDs ONLY)**
A5	Incubator/water bath temperature was outside method requirementents.	Microbiology only
A6	Target organism not detected in associated positive control.	Microbiology only
A7	Micro sample received without adequate headspace.	Microbiology only (Coliforms)
A8	Result is greater than or equal to the indicated value.	Microbiology only. Won't really be used, 'CSTM' qualifier is used instead.
A9	Bacterial results confirmed	
B	Analyte was detected in the associated Method Blank.	Requires internal CAR. Flag method blank and all associated samples with positive hits. **Do not flag blank for J-flag hits unless regulatory limit has been exceeded..**
B-1	Analyte was detected in the associated method blank. Analyte concentration in the sample is greater than 10x the concentration found in the method blank.	20x for organics; Requires internal CAR.
B2	Non-target analyte detected in method blank and sample, producing interference.	Requires internal CAR.
B3	Target analyte detected in calibration blank at or above the method reporting limit.	Requires internal CAR.
B4	Target analyte detected in blank at/above method acceptance criteria.	AZ - Metals and IC only. Requires internal CAR
B5	Target analyte detected in method blank at or above the method reporting limit, but below the trigger level or MCL.	

Qualifier	Text	Usage Comments
B6	Target analyte detected in calibration blank at or above the method reporting limit, but below the trigger level or MCL.	
BQC	Reported for batch QC purposes only. See re-analysis (RE) for final result.	AZ requires narrative.
BQC1	Reported for batch QC purposes only. See original analysis for final result.	AZ requires narrative.
C	Calibration Verification recovery was above the method control limit for this analyte. Analyte not detected, data not impacted.	Flag all affected sample results. Corrective action, such as re-calibration, is required. **Not to be used on a continuous basis.**
C-1	Calibration Verification recovery was above the method control limit for this analyte, however the average % difference for all analytes met method criteria. See Calibration Summary form. [Custom Value]	Used for NDs unless reanalysis confirms sample causing interference. **8000B series methods only**. Flag all affected sample results.
C-2	Calibration Verification recovery was below the method control limit for this analyte, however the average % difference for all analytes met method criteria. See Calibration Summary form. [Custom Value]	Used for NDs unless reanalysis confirms sample causing interference. **8000B series methods only**. Flag all affected sample results.
C4	Calibration Verification recovery was below the method control limit for this analyte.	Corrective Action, such as re-calibration, is required. Not to be used on a continuous basis. **Requires internal CAR.**
C5	Calibration Verification recovery was below the method control limit for this analyte. An additional check standard was analyzed at the reporting limit to ensure instrument sensitivity at the reporting limit. Samples ND.	Corrective Action, such as re-calibration, is required. Not to be used on a continuous basis. CAR not required for 8000 methods if average %R meets criteria. AZ requires narrative.
C6	CCV recovery was below method acceptance limits. The sample could not be reanalyzed due to insufficient sample.	CAR required.
C-7	Calibration Verification recovery was below the method control limit due to matrix interference carried over from analytical samples. The matrix interference was confirmed by reanalysis with the same result.	Re-extraction and/or re-analysis required for all bracketed samples. **Needs internal CAR.**
C8	Calibration Verification recovery was above the method control limit for this analyte. A high bias may be indicated.	Requires internal CAR.
CBP	Calibration verification recovery for this analyte is outside of limits as stated in BP-GCLN Technical Requirements however the calibration verification meets the requirements as stated in the analytical method.	BP work only.
CE	Sample not homogenous.	
CF1	Confirmatory analysis not performed as required by the method.	Always use with N1
CF2	Confirmatory analysis was past holding time.	
CF3	Confirmatory analysis was past holding time. Original result not confirmed.	

Qualifier	Text	Usage Comments
CF5	The sample was originally analyzed with a positive result, however the reanalysis did not confirm the presence of the analyte.	Use for BP Ethanol Reporting
CIG	The % RSD for this compound was above 20%. The average % RSD for all compounds in the calibration met the 20% criteria specified in EPA method 8000B. See the attached Initial Calibration Criteria form.	For GC or HPLC 8000B series only. **Used for NDs only.**
CIN	The % RSD for this compound was above 15%. The average % RSD for all compounds in the calibration met the 15% criteria specified in EPA methods 8260B/8270C. See the attached Initial Calibration Criteria form.	For GCMS 8000B series only. **Used for NDs only.**
cl	Compound reported based on total Chlordane result being less than the reporting limit.	Special qualifier for client specific requirements. Do not use for Arizona clients.
CN1	The cyanide value was greater after chlorination than before chlorination due to the sample matrix. An additional Weak Acid Dissociable Cyanide analysis was performed.	AZ requires narrative.
CN2	The cyanide value was greater after chlorination than before chlorination due to the sample matrix.	AZ requires narrative.
CN3	Reactive sulfide results reported from total determination method.	
CN4	Amenable cyanide results reported from total determination method.	
CR	The carbon range of the fuel found in the sample = [Custom Value]	When requested, enter Carbon range of fuel at the prompt.
CSTM	[Cutom Value]	Use when results need to be reported as '<' or '>' or negative values. Enter exactly as it should appear on the report (e.g "> 50" or "-3.2", or "DNQ")
DNQ	Detected but not quantified.	For Boeing Project to use in conjunction with J flag. PM to add to report.
DR	Sample dried prior to screening.	
E	Concentration exceeds the calibration range and therefore result is semi-quantitative.	Use when re-analysis is for multiple dilutions.
E1	Concentration estimated. Analyte exceeded calibration range. Reanalysis not possible due to insufficient sample.	
E3	Concentration estimated. Analyte exceeded calibration range. Reanalysis not performed due to holding time requirements.	
E8	Analyte reported to the MDL per project specification. Target analyte was not detected in the sample	
FT	This analysis was performed in the field by the sampler whose name appears on the attached Chain of Custody form.	

Qualifier	Text	Usage Comments
H	Sample analysis performed past method-specified holding time.	Requires client notification prior to release of data. **Requires internal CAR.**
H-1	Sample analysis performed past the method-specified holding time per client's approval.	**MUST HAVE DOCUMENTED CLIENT APPROVAL. Requires internal CAR**
H2	Initial analysis within holding time. Reanalysis for the required dilution was past holding time.	Requires client notification prior to release of data.
H3	Sample was received and analyzed past holding time.	Requires client notification prior to release of data.
H4	Sample was extracted past holding time, but analyzed within analysis holding time.	Requires client notification prior to release of data. **Requires internal CAR.**
H5	The sample was prepared outside of the required 8 hour holding time, however it was stored at >0° and <4°C and prepared within the method allowed 24 hour holding time.	For HPC only
H6	The sample was received at the laboratory either past, or with insufficient time remaining on, the required 8 hour holding time. However, it was stored at >0° and <4°C and prepared within the method allowed 24 hour hold time.	For HPC only
H8	The sample was extracted past the holding time.	
H9	Sample analysis performed past the EPA recommended holding time.	
H10	The holding time calculation is based on a sampling time of 00:00 on the sampling date noted on the Chain of Custody. No sampling time was provided to the laboratory.	For clients that won't give a sampling time
HFT	The holding time for this test is immediate. It was analyzed in the laboratory as soon as possible after receipt.	
HS	HS = Sample container contained headspace.	
HTI	The holding time for this test is immediate. The laboratory measurement, therefore, cannot be used for compliance purposes.	Arizona clients only (at this time). Use for pH, Temperature, Residual Chlorine, Dissolved Oxygen and Free Carbon Dioxide. AZ requires narrative.
I	Internal Standard recovery was outside of method limits. Matrix interference was confirmed.	
I2	Internal Standard recovery was outside of method limits.	Requires internal CAR
ID	Due to the low levels of analyte found in the sample, the analyte was qualitatively identified based on the compound's retention time and the presence of a single mass ion.	For GCMS when 2 mass ions cannot be detected. (e.g. low level TBA) AZ requires narrative.
ID2	Secondary ion abundance outside of method requirements. Identification based on analytical judgment	
J	Estimated value. Analyte detected at a level less than the Reporting Limit (RL) and greater than or equal to the Method Detection Limit (MDL). The user of this data should be aware that this data is	When, on a project specific basis, reporting results down to the MDL is required.

Qualifier	Text	Usage Comments
	of limited reliability.	
K	The sample dilutions set-up for the BOD analysis did not meet the oxygen depletion criteria of at least 2 mg/l. Therefore the reported result is an estimated value only.	
K-1	The sample dilutions set up for the BOD analysis failed to meet the criteria of a residual dissolved oxygen of at least 1 mg/l. Therefore the reported result is an estimated value only.	
K-2	The seed depletion was outside the method acceptance limits. Therefore, the reported result is an estimated value only.	
K-3	The dilution water D.O. depletion was > 0.2 mg/L.	
K-4	The seed depletion was not within method recommended limits. The LCS, which is a means of checking dilution water quality and seed effectiveness, was within acceptance limits. The acceptable LCS demonstrates that the data is valid.	
L	Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was above the acceptance limits. Analyte not detected, data not impacted.	Flag all affected sample results. **Requires internal CAR.**
L1	Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was above acceptance limits.	When there are positive hits. R**equires internal CAR. Add N-1 or N-2 if for any additional clarification.**
L2	Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was below acceptance limits.	Use only if samples cannot be reanalyzed. **Requires internal CAR. Add N-1 or N-2 if for any additional clarification.**
L4	Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was below the acceptance limits. A low bias to sample results is indicated.	Generally for BOD only. However it could be used for BP-Amoco if technical requirements are met and local clients are o.k. with it.
L6	Per the EPA methods, benzidine is known to be subject to oxidative losses during solvent concentration.	To be used for high or low recoveries.
M1	The MS and/or MSD were above the acceptance limits due to sample matrix interference. See Blank Spike (LCS).	Flag source sample AND MS and/or MSD only.
M2	The MS and/or MSD were below the acceptance limits due to sample matrix interference. See Blank Spike (LCS).	Flag source sample AND MS and/or MSD only.
M-3	Results exceeded the linear range in the MS/MSD and therefore are not available for reporting. The batch was accepted based on acceptable recovery in the Blank Spike (LCS).	Analyte Qualifier in the LCS. AZ requires narrative.

Qualifier	Text	Usage Comments
M4	The sample required a dilution due to matrix interference. Because of this dilution, the matrix spike concentrations in the sample were reduced to a level where the recovery calculation does not provide useful information. See Blank Spike (LCS).	**Must be diluted below Reporting Limit.**
M5	Due to CCV failure, the MS/MSD results were not available for reporting. The batch was accepted based on acceptable recovery in the Blank Spike (LCS).	Generally a sample qualifier though it could be used as an analyte qualifier if some analytes are to be reported. AZ requires narrative.
M6	Matrix Spike recovery was outside the method control limits.	Do Not Use Anymore
M7	The MS and/or MSD were above the acceptance limits. See Blank Spike (LCS).	Internal CAR required. **Add N-2 if Client CAR is needed.**
M8	The MS and/or MSD were below the acceptance limits. See Blank Spike (LCS).	Internal CAR required. **Add N-2 if Client CAR is needed.**
M9	Matrix Spike recovery was high. Data Reported per ADEQ policy 0154.000	AZ Only. Use only if BS/BSD have acceptable **Recovery AND RPD.**
M10	Matrix Spike recovery was low. Data Reported per ADEQ policy 0154.000	AZ Only. Use only if BS/BSD have acceptable **Recovery AND RPD.**
M13	The sample spiked had a pH of less than 2. 2-Chloroethylvinylether degrades under acidic conditions.	
MCP	No results were reported for the MS and/or MSD due to a clogged autosampler port. Batch was accepted based on Blank Spike (LCS) recoveries.	Requires internal CAR. AZ requires narrative.
MEN	Unspiked sample results were determined from the sample portion received in an Encore sampler. The sample portions used for the MS/MSD were taken from an additional sample sleeve due to an insufficient number of Encore samplers supplied.	When insufficient Encores are available for MS/MSD. AZ requires narrative.
MHA	Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).	Sample results > 4x spike level. Use whether or not the QC passes.
MNR	No results were reported for the MS/MSD. The sample used for the MS/MSD required dilution due to the sample matrix. Because of this, the spike compounds were diluted below the detection limit.	Use as sample qualifier on the LCS. AZ requires narrative.
MNR1	There was no MS/MSD analyzed with this batch due to insufficient sample volume. See Blank Spike/Blank Spike Duplicate.	Use when there is not enough sample available to analyze MS/MSD. Use as a sample qualifier on the LCS. **LCSD must be analyzed too.**
MNR2	Insufficient sample received to meet method QC requirements. See case narrative.	**FOR AZ DRINKING WATERS ONLY.**
MNR3	Insufficient sample received to meet method QC requirements.	
N1	See case narrative.	

Qualifier	Text	Usage Comments
N2	See corrective action report.	
Neg	The reported result is a negative value.	For Redox Potential only.
NFP	Non-fuel pattern present.	
P	The sample, as received, was not preserved in accordance to the referenced analytical method.	except for metals
P1	Sample received and analyzed without chemical preservation.	
P2	Sample received without chemical preservation, but preserved by the laboratory.	
P3	Sample was received above recommended temperature	
P4	Sample received in inappropriate sample container.	
P5	Insufficient sample received to meet method QC requirements.	
P6	Sample received unpreserved, however the sample was analyzed within 7 days per EPA recommendation.	For EPA 624
P7	Sample filtered in lab.	
P8	Sample unable to be adjusted to correct pH due to matrix.	
P9	This analyte has been shown to degrade upon preservation with HCl and cannot accurately be quantitated.	
P10	Sample received with chemical preservation; pH measured in lab >2	
P12	Sample received with chemical preservation; pH measured in lab >2	
pH	pH = [Custom value]	AZ requires narrative.
P-HS	Sample container contained headspace.	
QB	Quantitated against a Bunker C Oil standard.	Use as "Analyte Qualifier"
QC4	Quantitation begun immediately before the retention time of tert-Butanol (TBA).	Only for TPH when C4 carbon range is requested. **Use as Analyte qualifier.**
QCM	Quantitation begun immediately following the methanol peak.	Only for TPH when C4 carbon range is requested. **Use as Analyte qualifier.**
QD	Quantitated against a diesel fuel standard.	Use as "Sample Qualifier"
QG	Carbon range C6-C12 quantitated against a gasoline standard.	Use as "Analyte Qualifier" To be used with the analyte "Volatile Fuel Hydrocarbons".
QG1	Quantitated against a gasoline standard.	Use as "Analyte Qualifier" for any carbon range other than C6-C12
QJ	Quantitated against a jet fuel standard.	Use as "Sample Qualifier"
QM	Quantitated against a motor oil standard.	Use as "Sample Qualifier"
QMS	Quantitated against a mineral spirits standard.	Use as "Analyte Qualifier"
QP	Hydrocarbon result partly due to individual peak(s) in quantitation range.	Use when individual non-HC peaks are present.

Qualifier	Text	Usage Comments
qr	Qualitative result based on chromatographic comparison with a known standard.	
QS	Quantitated against a Stoddard solvent standard.	Use as "Sample Qualifier"
QT	Quantitated against a therminol standard.	Use as "Sample Qualifier"
QU	Unquantitated hydrocarbons present in the sample outside of the reported carbon range.	Use for EFH when there are HCs above the quantitation range.
QV	The molecular weight of 100 was used to convert Volatile Fuel Hydrocarbons from mg/m3 to ppm by volume (ppmv).	
R	The RPD exceeded the method control limit due to sample matrix effects. The individual analyte QA/QC recoveries, however, were within acceptance limits.	Apply to MSD only
R-1	The RPD between the primary and confirmatory analysis exceeded 40%. Per method 8000B, the higher value was reported.	
R-2	The RPD exceeded the acceptance limit.	Narrative required for AZ. (narrative likely for all). **Add N-2 if Client CAR is needed.**
R-3	The RPD exceeded the acceptance limit due to sample matrix effects.	
R-4	Due to the low levels of analyte in the sample, the duplicate RPD calculation does not provide useful information.	Duplicates Only. NOT for MS/MSD.
R-6	The RPD calculation does not provide useful information due to varying sample weights when Encore samplers are used.	Encore Samples only.
R-7	LFB/LFBD RPD exceeded the method control limit. Recovery met acceptance criteria.	Apply to LCSD only.
R-9	Sample RPD exceeded the laboratory control limit.	For Sample Duplicates
R-10	The RPD between the primary and confirmatory analysis exceeded 40%. Per method 8000B, the lower value was reported due to apparent chromatographic problems.	
R-11	RPD exceeded the laboratory control limit. See case narrative.	When there are no "Method" Limits.
R-12	The RPD between the primary and confirmatory analysis exceeded 40%. Per method 8000C, the lower value was reported.	For labs referenceing 8000C-series methods.
RL1	Reporting limit raised due to sample matrix effects.	
RL2	Reporting limit raised due to high concentrations of hydrocarbons.	
RL3	Reporting limit raised due to high concentrations of non-target analytes.	
RL4	Reporting limit raised due to insufficient sample volume.	
RL5	Reporting raised due to high single peak analyte.	For TPH (DRO or GRO) only.

Qualifier	Text	Usage Comments
RL6	Reporting limit raised due to high toxaphene concentrations.	
RL7	Sample required dilution due to high concentration of target analyte.	
S	Analyzed by standard addition.	Will probably only be used for metals in rare instances.
S10	Insufficient sample available for reanalysis.	
SB	Sustained burning when exposed to open flame.	For Ignitability only. For all positive hits.
SC	Analytical results not reliable due to potential sample container contamination.	For low level Volatiles when contamination is the likely cause of the result.
SF	Reactive sulfide results reported from total determination method.	
T1	Method promulgated by EPA, but not by ADHS at this time	AZDHS only
T2	Cited ADHS licensed method does not contain this analyte as part of method compound list.	AZDHS only
T3	Method not promulgated by EPA or ADHS.	AZDHS only
T4	The cited licensed method does not contain this analyte as part of the method compound list.	**Not for AZ work**
T5	Less than the prescribed sample amount was available to perform the leachate extraction. The volume of extraction fluid was adjusted proportionately based on the method prescribed ratio of extraction fluid to sample weight.	**Internal CAR not required if documented in extraction log.**
T6	The temperature during the 18 hour TCLP extraction exceeded the 21-25 degrees C range stated in EPA Method 1311. The temperature range during the extraction was [Custom Value] degrees C.	**Enter the temperature range during the extraction when prompted (e.g. 20-27)**
T7	Tentatively identified compound. Concentration is estimated based on the closest internal standard.	
TMP	Temperature taken in the field at the time of sampling.	Only when lab is reporting temperature into an ELMNT analysis code.
TRM	Per client request, the sample was digested according to section 4.1.4 of "Methods for the Chemical Analysis of Water and Wastes 1983". The sample was subsequently prepared and analyzed by EPA Method 245.1.	Boeing Total Recoverable Mercury ONLY.
TRM	Per client request, the sample was digested according to section 4.1.4 of "Methods for the Chemical Analysis of Water and Wastes 1983". The sample was subsequently prepared and analyzed by EPA Method 245.1.	
TVO	Based on the sum of the concentrations of the compounds in the EPA 8010/8020 list.	Client Specific for special Air test code.
X	Exceeds regulatory limit.	PM to apply as an "Analyte" Qualifier.
X1	Exceeds specified permit limit.	PM to apply as an "Analyte" Qualifier.

Qualifier	Text	Usage Comments
Z	Due to sample matrix effects, the surrogate recovery was below the acceptance limits.	Re-extraction and/or re-analysis required unless chromatographic interference is clearly evident
Z1	Surrogate recovery was above acceptance limits.	AZ requires narrative. Requires internal CAR.
Z2	Surrogate recovery was above the acceptance limits. Data not impacted.	Only use if sample results are ND. Requires internal CAR
Z3	The sample required a dilution due to the nature of the sample matrix. Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information.	**Only if diuted below calibration range for surrogate.** Surrogates in MB and LCS must pass to use this qualifier.
Z5	Due to sample matrix effects, the surrogate recovery was outside acceptance limits. Secondary surrogate recovery was within the acceptance limits.	For PCBs only. AZ requires narrative.
Z6	Surrogate recovery was below acceptance limits.	When reanalysis not performed. Rerquires internal CAR.
Z7	Surrogate recovery was high. Data reported per ADEQ policy 0154.000.	For AZDHS only. Surrogate passes in LCS but not in sample.
Z8	Surrogate recovery was low. Data reported per ADEQ policy 0154.000.	For AZDHS only. Surrogate passes in LCS but not in sample.
Z9	Unable to calculate surrogate recovery due to matrix interference.	Chromatographic interference must be clearly evident.
ZX	Due to sample matrix effects, the surrogate recovery was outside acceptance limits.	Use for High bias. Re-extraction and/or re-analysis required **(Narrate for AZ)**

QUALITY ASSURANCE PROGRAM PLAN

Prepared by:

AQUATIC TESTING LABORATORIES
4350 Transport St., Unit 107
Ventura, CA 93003
(805) 650-0546

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Approval:

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Joseph A. LeMay
Laboratory Director

Table of Contents

1. INTRODUCTION

Aquatic Testing Laboratories (ATL) is dedicated to providing quality aquatic toxicity testing to its clients. This document describes ATL's Quality Assurance policies and procedures as they relate to biological monitoring for environmental pollutants.

Purpose of Document

This Quality Assurance Program Plan (QAPP) is intended to ensure that precision, accuracy, completeness, comparability, and representativeness of data are known and documented.

The QAPP presents an overview of the essential elements of ATL's QA program. This plan has been modeled along EPA guidelines as outlined in "Interim Guideline and Specifications for Preparing Quality Assurance Program Plans," QAMS-004/80, December 29,1980; "Interim Guideline and Specifications for Preparing Quality Assurance Project Plans," QAMS-005/80, February 1983; "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms," EPA/600/4-89/001; and "Manual for the Evaluation of Laboratories Performing Aquatic Toxicity Tests," EPA/600/4-90/031. All of these documents have been issued by the Office of Monitoring Systems and Quality Assurance, Office of Research and Development, U.S. Environmental Protection Agency (U.S. EPA). Primary guidance was obtained from "Enseco Incorporate Quality Assurance Program Plan for Environmental Biology," Revision 3.1, July, 1988, written by Enseco Inc. with additional guidance provided from the Environmental Laboratory Accreditation Program, (State of California Department of Health Services and Department of Fish and Game).

QA Objectives

This QA Program Plan is designed to control and monitor the quality of data generated at ATL. The described QA program is geared toward generating data that comply with federal regulatory requirements specified under the National Pollutant Discharge Elimination System (NPDES) as well as the State of California Department of Health Services Environmental Laboratory Accreditation Program (DOHS ELAP) and other state equivalents. Although the QC requirements of these various programs are not completely consistent, each of the programs base data quality judgements on two types of information:

* Data that indicate the overall qualifications of the laboratory to perform environmental analyses;

* Data that measure the laboratory's daily performance using a specific method.

The operational elements that are involved in making each of these assessments are described in TABLE 1 along with the pertinent section number from this document in which each is discussed.

TABLE 1
DATA QUALITY ASSESSMENT

Evaluation Criteria	Operational Elements	Section of QA Plan
LABORATORY QUALIFICATIONS	Facilities/Equipment/Staff	SOQ*
	Written SOP's for all laboratory procedures	15
	Sample custody	5
	Calibration procedures	6
	Testing procedures	7
	Data validation	8
	Documented QA program	1-15
	Laboratory certifications	10
LABORATORY PERFORMANCE	Calibration data	6
	Check samples	10
	Reference toxicant data	9
	Control charts	9

* SOQ (Statement Of Qualifications) described in a separate document.

2. DEFINITIONS

Definition of Terms

Protocol: the actual plan for scientific testing. A protocol may refer to several SOP's to complete the plan.

Quality Assurance (QA): the total integrated program for assuring the reliability of data generated in the laboratory.

Quality Assurance Program Plan (QAPP): an assemblage of management policies, objectives, principles, and general procedures outlining the techniques by which the laboratory produces data of known and accepted quality.

Quality Assurance Project Plan (QAPjP): an assemblage of detailed SOP's describing how the laboratory will generate data that meet the data quality objective of a specific project.

Quality Control (QC): the routine application of specific, well documented procedures to ensure the generation of data of known and accepted quality, thus fulfilling the objectives of the QA program.

Quality Control Manual: an assemblage of detailed SOP's describing the laboratory implementation of the QAPP.

Standard Operating Procedure (SOP): a detailed, written description of a procedure designed to systematize and standardize the performance of the procedure.

3. ORGANIZATION, RESPONSIBILITIES AND AUTHORITIES

Executing an effective QA program demands the commitment and attention of both management and staff. The QA effort at ATL is managed by the Laboratory Director who serves as the QA Officer and as such, has the responsibility of overseeing and regulating all laboratory functions. The QA program operates independently of all areas, generating analytical data to ensure complete objectivity in the evaluation of laboratory operations.

QA Officer Responsibilities

The QA officer is responsible for:

* Developing and implementing a QA program that ensures that all data generated are scientifically sound, legally defensible, and of known precision and accuracy;

* Monitoring the QA Plan to ensure compliance with QA objectives;

* Ensuring that all employees are complying with the QA Plan;

* Developing and implementing new QA procedures to improve data quality;

* Conducting in-house audits and inspections of all laboratories on a regular basis and applying corrective actions as needed to ensure compliance with the QA Plan;

* Maintaining copies of all SOP'S;

* Assist in the writing of SOP's;

* Distributing current SOP's to the laboratory staff;

* Monitoring laboratory performance in the areas of holding times, turn-around times, and meeting contractual obligations;

* Performing statistical analyses of QC data and establishing data bases that accurately reflect the performance of the laboratory;

* Maintaining reference toxicant control charts on all testing done at ATL;

* Maintain records and archives of all QA/QC data, PE results, audit comments, and client inquiries concerning data quality;

* Conducting seminars on QA issues for both clients and laboratory staff; and

* Promoting sound QA practices within the environmental regulatory and analytical communities.

QA Officer Authority

The QA officer has the final authority on all issues dealing with data quality and has the authority to require that procedures be amended or discontinued, or analyses suspended or repeated. He also has the authority to suspend or terminate employees on the grounds of dishonesty, incompetence, or repeated non-compliance with QA procedures.

Laboratory Personnel Responsibilities

All laboratory personnel involved in the generation and reporting of data have a responsibility to understand and follow the ATL QA Plan. Laboratory personnel are responsible for:

* Have a working knowledge of the ATL QA Plan;

* Ensuring that all work is generated in compliance with the QA Plan;

* Performing all work according to written SOP's;

* Ensuring that all documentation related to their work is complete and accurate; and

* Providing management with immediate notification of quality problems.

Laboratory Personnel Authority

Laboratory personnel have the authority to accept or reject data based on compliance with well-defined QC acceptance criteria. The acceptance of data that fall outside QC criteria must be approved by laboratory management. The authority of the laboratory personnel flows from the Laboratory Director.

4. SAMPLING PROCEDURES

The generation of quality data begins with the collection of the effluent, water or sediment sample. Therefore the integrity of the sample collection process is of concern to the laboratory. Samples must be collected in such a way that no foreign material is introduced into the sample and no material of interest escapes from the sample prior to analysis. To ensure sample integrity, the following must be considered:

* Samples must be collected in appropriate containers. In general, glass containers are used for soils and solids, while plastic "cubitainers" are used for effluents and surface waters;

* The sample containers must be properly cleaned to ensure that the sample is not contaminated during the collection process;

* Appropriate volumes of sample must be collected to ensure that the required testing may completed and QC samples may be analyzed;

* Samples must be cooled to the appropriate holding temperature (4°C) prior to shipping;

* Samples must be properly shipped to the laboratory, in the appropriate time frame, to ensure that holding times can be met.

ATL can assist in the sample collection process by providing consultation and assistance to clients designing sampling programs and also by making available to the client a set of appropriate sample containers that are properly cleaned for use in sample collection.

The maximum holding times recommended by ATL, appropriate containers, and minimum sample volumes required for routine testing are given in Appendix I. These holding times are in general agreement with EPA and the State of California recommended holding times, as stated in the National Pollutant Discharge Elimination System (NPDES) and the California Environmental Laboratory Accreditation Program (ELAP) programs. Other holding times can be honored if special arrangements are made with the laboratory.

5. SAMPLE CUSTODY

Upon receipt by ATL, samples proceed through an orderly processing sequence specifically designed to ensure continuous integrity of both the sample and its documentation.

All samples are received by ATL's sample control personnel and are carefully checked for label identification, and completed, accurate chain-of-custody records. Photographs may be used to document the condition of samples. Each sample is then assigned an unique laboratory identification number. The date received, the condition upon receipt, the temperature upon receipt, the new laboratory identification number, as well as the client and the client's sample identification are recorded in the sample control log book. A sample file is then generated in which all documentation, including testing results, are kept. The sample itself is labeled with the laboratory identification number and stored in a secured refrigerated storage facility with temperature maintained at 4°C until analysis. The total residual chlorine (TRC) of effluent samples is measured and recorded. Any unused sample is returned to refrigerated storage with little headspace as possible, until all analyses are complete. Samples are then either returned to the client, properly disposed of, or at the request of the client, stored for an extended length of time.

6. CALIBRATION PROCEDURES AND FREQUENCY

Standard/Reagent Preparation

A critical element in the generation of quality data is the purity/quality and traceability of the standard solutions and reagents used in the analytical and/or biological operations. ATL continually monitors the quality of reagents and standard solutions through a series of well-documented procedures.

To ensure the highest purity possible, all primary reference standards and standard solutions are obtained from the EPA laboratory in Cincinnati, Ohio, or other reliable commercial sources. All standards and standard solutions are recorded into a log book that identifies the supplier, lot number, purity/concentration, receipt/preparation date, preparer's name, method of preparation, expiration date, and all other pertinent information.

Care is exercised in the proper storage and handling of standard solutions, and all containers are labeled as to compound, concentration, solvent, expiration date, and preparation data (initials of preparer/date of preparation).

Instrument Calibration and Tuning

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity. Instruments used for routine measurements of chemical and physical parameters such as pH, DO, temperature, conductivity, salinity, alkalinity, and hardness, must be calibrated and standardized according to the instrument manufacturer's procedures prior to any uninterrupted use. The light meter is certified calibrated biannually per manufacturer's recommendation. Analytical balances are calibrated annually by a certified technician and verified monthly by laboratory personnel.

Dissolved oxygen probes are calibrated daily by use of the moist air technique, however, comparison to the Winkler titrimetric method may be performed as needed.

Wet chemical methods used to measure hardness and alkalinity must be standardized according to EPA Methods 130.2 and 310.1.

7. TESTING PROCEDURES

Test Organisms

The fish and invertebrates used in toxicity testing should appear healthy, behave normally, feed well, and have low mortality in cultures, holding tanks, and test controls. Test organisms should be disease-free and should be positively identified to species.

The sensitivity (quality) of test organisms obtained from an outside of the laboratory source is to be tested by conducting a reference toxicant test on organisms from each batch received by the laboratory. The sensitivity of test organisms obtained from an in-lab breeding culture is to be tested by conducting a reference toxicant test on the cultured organisms on a monthly basis. Reference toxicant tests may be performed concurrently with an effluent toxicity test.

Facilities, Equipment, and Test Chambers

Laboratory and bioassay temperature control equipment must be adequate to maintain recommended test water temperatures. Surfaces that come in contact with the sample, such as test chambers, must be made of recommended materials. See individual testing SOP's and protocols for recommended materials and testing regimes.

Dilution Water

The dilution water used in toxicity tests will depend on the objectives of the study and client requirements. Hazardous waste testing utilize synthetic, soft (hardness: 40-48 mg/l $CaCO_3$) water. EPA NPDES toxicity test utilizes synthetic, moderately hard water or 20% diluted mineral water (DMW). Some tests will required the use of client-supplied dilution water.

The dilution water used for internal quality assurance tests with organisms, food, and reference toxicants should be water routinely used with success in the laboratory.

Testing Conditions

Water temperature must be maintained within the limits specified for each test. Dissolved oxygen (DO) concentration and pH in fish and invertebrate test chambers should be checked daily throughout the test period, as described in the test SOP.

Food Quality

The quality of the food for fish and invertebrates is an important factor in toxicity tests. Suitable fish food flakes, brine shrimp cysts, and other foods must be obtained as described in the test SOP's and protocols. The suitability of each new supply of food should be determined in a side-by-side test, using two treatments with four replicates per treatment. In this test, the response of control test organisms fed with the new food is compared with the response of organisms fed a reference food or a previously used, satisfactory food.

Test Methods

Most tests performed by ATL are driven by regulatory concerns. Therefore, methods used at ATL predominately originate from regulatory agencies. Generally the methods used are those specified by the U.S. EPA and other federal agencies, state agencies, and professional organizations, as provided in the following references:

* California Department of Health Services. 1988. Static Acute Bioassay Procedures for Hazardous Waste Samples. Prepared by J.M. Polisini and R.G. Miller. California Department of Fish and Game Water Pollution Control Laboratory.

* California State Water Resources Control Board (CSWRCB). 1996. Procedures Manual for Conducting Toxicity Tests Developed by the Marine Bioassay Project. CSWRCB, Sacramento, CA. 96-1WQ

* U.S.EPA. 1985. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. EPA/600/4-85/013.

* U.S.EPA. 1988. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms. EPA/600/4-87/028.

* U.S.EPA. 1989. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. EPA/600/4-89/001.

* U.S.EPA. 1993. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. 4th ed. EPA/600/4-90/27F.

* U.S.EPA. 1994. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. 3rd ed.EPA600-4-91-002.

* U.S.EPA. 1994. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms. 2nd ed. EPA-600-4-91-003.

* U.S.EPA. 1995. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms. EPA/600/R-95R/136.

* U.S.EPA. 2002. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. 5th ed. EPA-821-R-02-012.

* U.S.EPA. 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. 4th ed. EPA-821-R-02-013.

* U.S.EPA. 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms. 3rd ed. EPA-821-R-02-014.

The choice of method is dependent on the objectives of the study in terms of qualitative certainty, quantitative sensitivity, precision and accuracy, and the type of matrix to be analyzed. Each method used routinely is documented in the form of an SOP. The SOP contains detailed instructions concerning both the use and the expected performance of the method. Any deviations from the published methodology are documented and explained in the SOP. A complete description of the contents of laboratory SOP's is given in Section 15.

Before any methods are routinely used to generate analytical and/or biological data, the method is validated. Validation criteria consists of:

* Method selection by a senior staff member;

* Documentation of the method in a SOP. This includes a summary of the method, detailed description of the procedure, calculations, reporting formats, safety concerns, and special remarks;

* Testing of the method to verify detection limits and linear range and establish precision and accuracy criteria; and

* Establishment of data acceptance criteria that must be approved by a senior staff member and the QA Officer.

8. DATA REDUCTION, VALIDATION, AND REPORTING

All data generated by ATL are extensively checked for accuracy and completeness. The data validation process consists of data generation, reduction, and two levels of review, as described below.

The analyst who generates the data has the prime responsibility for the correctness and completeness of the data. All data are generated and reduced following methods specified in laboratory SOP's. Each analyst reviews the quality of his work based on an established set of guidelines. The analyst reviews the data package to ensure that:

* The protocol has been followed exactly; if not, any deviations are properly noted;
* Sample preparation information is correct and complete;
* Analyst information is correct and complete;
* The appropriate SOP's have been followed;
* Analytical/biological results are correct and complete;
* QC (reference toxicant) results are within established control limits;
* Special sample preparation and analytical requirements have been met; and
* Documentation is complete.

The data reduction and validation steps are documented, signed and dated by the analyst. This initial review step, performed by the analyst, is designated as Level 1 review. The analyst then passes the data package to the QA Officer, who performs a Level 2 review.

Level 2 review is conducted to an established set of guidelines and is structured to ensure that:

* Calibration data are scientifically sound, appropriate to the method, and completely documented;
* QC samples (reference toxicants) are within established guidelines;
* Qualitative identification of sample components is correct;

* Quantitative results are correct;

* Documentation is complete and accurate;

* The data are ready for incorporation into the final report; and

* The data package is complete and ready for data archive.

Level 2 review is structured so that all calibration and QC data are reviewed and all of the analytical and biological results are checked back to the bench sheet. The review is complete when the data package has been reviewed in its entirety.

An important element of Level 2 review is the documentation of any errors that have been identified and corrected during the review process. Errors that are found are documented and transmitted to the appropriate supervisor. The cause of the errors is then addressed with additional training or clarification of procedures to ensure that quality data will be generated at the bench.

Data Reduction

Many toxicity tests require the calculation of an LC50, EC50, NOEC, LOEC, or percent survival calculations. ATL primarily utilizes the computer statistical program TOXCALC to calculate these values. Other statistical packages may be utilized to evaluate the data when appropriate. Proper statistical procedures, such as examining homogeneity of variance prior to ANOVA analyses, or data transformations when required, are conducted according to the method being tested. Proper statistical analyses are outlined in each test method SOP.

Data that do not appear to be in conformance with the substantial majority are often referred to as "outliers", and may be due to random variation, clerical errors, or experimental errors. Statistical outlier detection procedures are screening procedures that indicate whether a value is extreme enough to be considered not due just to random variation and thereby excluded from statistical analysis of the remaining testing data. When outliers are not known to be erroneous values, data analyses are performed with and without the questionable values in order to assess their importance.

Data Reporting

A final report will be generated after successful completion of Level 1 and 2 reviews. The report will include, but not be limited to, the following items:

* Summary, which includes: client name, client sample description, title and description of test, laboratory identification number, test dates, a description of the test organism, water, a definition of the effect criteria, and calculated endpoints.

* Material and Methods, which include: protocol, test dates, laboratory personnel, raw data and/or bench sheets, a description of the test methods and any deviation from the protocol, identification and source of test organisms, description of holding conditions, description and chemical/physical characterization of diluent water, description of analytical methods, counting procedures and statistical techniques.

* Results, which include: all observations, and endpoint determinations.

* References.

* Appendices, where appropriate:

    A. Raw data, including all biological observations and analytical results.

    B. Certification of good laboratory practices signed by all personnel involved in the study and the QA Officer. The certification will include the location and the period for data archiving.

* Client Services: Special services including data interpretation, special consultation, and raw data packages, when requested are included in the final report.

9. INTERNAL QC CHECKS

The QA/QC program monitors data quality with internal QC checks which are used to determine if all laboratory operations are "in control," (i.e., operating within acceptable QC guidelines), during data generation.

Responsibility for internal QC checks rests with the QA Officer and with the individual analyst. These QC checks include instrument calibration checks, chemical monitoring of dilution waters, specific test validity requirements, and a reference toxicant monitoring program which includes the generation of test control charts.

Instrument QC Checks

All analytical instruments will be calibrated prior to use as set forth in ATL SOP's. Whenever calibration cannot be achieved or measurement of a calibration standard is not within specified limits, the instrument will be considered malfunctioning and will be reported to the Laboratory Director. Any malfunctioning instrument will not be used until appropriate maintenance or repairs are performed and documented.

Chemical Monitoring Of Dilution Waters

In order to establish and continuously monitor the acceptability of the dilution waters utilized in toxicity tests, the dilution waters will be monitored continuously, for deionized water, or at least twice per year for field collected seawater. Dilution waters are to be analyzed to the parameters listed in the appropriate SOP. Results of such analyses are to be maintained in appropriate dilution log books.

Test Validity Requirements

Due to the wide range of test guidelines utilized in toxicity testing, the requirements to determine the validity of any test conducted will be stated in the appropriate SOP. Generally, all acute toxicity tests will be required to meet the following criteria for acceptability:

* No more than a total of 10 percent of the control organisms may appear to be diseased, stressed, or die in a test.

* Appropriate testing conditions, (i.e., temperature, light/dark cycles), are maintained during the course of testing.

Reference Toxicant Monitoring Program

The QA Officer will obtain reference toxicants from the EPA Environmental Monitoring and Support Laboratory in Cincinnati, Ohio, (Telephone No.: (513) 569-7325), or from another reputable commercial supplier. Generally, sodium dodecylsulfate (SDS) will be the reference toxicant of choice, however, in some instances or for certain species other reference toxicants may be utilized.

Reference toxicant tests will be performed on each new batch of test organisms received at the laboratory or on a monthly basis for organisms cultured in-house. Appropriate reference toxicant testing will be conducted concurrently with sample testing when required by test methodology or by the client.

Control Charts

Control charts are to be established and continuously maintained for each organism and test conducted at ATL. Control charts should monitor appropriate test endpoints such as LC50 and NOEC values obtained from the reference toxicant testing program. The control chart is used to evaluate the cumulative trend of the statistics from a series of tests. For point estimation techniques, the mean and upper and lower control limits (+/- 2 times the mean toxicity value standard deviation) are re-calculated with each successive point, until the statistics stabilize. Outliers, which are values which fall outside the upper and lower control limits, and trends of increasing or decreasing sensitivity are readily identified. Note: at the 0.05 probability level, one in 20 tests would be expected to fall outside of the control limits by chance alone. For hypothesis testing results, the same concentrations of reference toxicants are used for each toxicity test. The NOEC from each successive test is entered on the control chart, and the values should fall within one concentration interval above or below the central tendency.

Control charts are to be established based on five successfully completed reference toxicant tests with control limits recalculated with each successive valid reference toxicant test data endpoint. Control charts are used to monitor test organism sensitivity for both commercially obtained and in-house cultured test organisms. If a control chart data point falls outside the established control limits, corrective action must be taken to determine the

cause of the discrepancy.

Laboratory Performance QC Program

Laboratory Performance QC is provided as a standard part of every analysis. The main elements of Laboratory Performance QC are:

* Organism survival and reproduction;

* The analysis of reference toxicants

* The generation of daily calibration data.

Satisfactory laboratory performance is demonstrated by performing at least one acceptable reference toxicant test per month for each of the toxicity test methods commonly used in the laboratory. Reference toxicant tests are to be conducted concurrently with less frequently performed tests. If the toxicity value from a given test with the reference toxicant does not fall in the expected range for the test organisms when using the standard dilution water, the sensitivity of the organisms and the overall credibility of the test system are suspect. In this case, the test procedure should be examined for defects and should be repeated with a different batch of test organisms.

Please refer to section 6 of this manual for a discussion of calibration procedures.

10. PERFORMANCE AND SYSTEM AUDITS

ATL participates in a variety of federal and state certification programs, (i.e., EPA's DMR study and California's ELAP program), that subject the laboratory to stringent system and performance audits on a regular basis. A system audit is a review of laboratory operations conducted to verify that the laboratory has the necessary facilities, equipment, staff and procedures in place to generate acceptable data. A performance audit verifies the ability of the laboratory to correctly identify toxicity in blind check samples submitted by the auditing agency. The purpose of these audits is to identify those laboratories that are capable of generating scientifically sound data. A list of current ATL certifications is available upon request.

In addition to external audits conducted by certifying agencies or by clients, the QA Officer periodically conducts system and performance audits of the laboratory to verify that only quality, scientifically sound, data are being generated.

11. PREVENTIVE MAINTENANCE

To minimize downtime and interruption of analytical and/or biological work, preventive maintenance is routinely performed. Designated laboratory personnel are trained in routine maintenance procedures for all major equipment. When repairs are necessary, they are performed by either trained staff or trained service engineers employed by the manufacturer or qualified service company personnel.

Detailed SOP's are on file that describe preventive maintenance procedures. The laboratory also maintains a detailed logbook documenting the preventive maintenance and repairs performed on each analytical instrument or piece of equipment.

12. SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA QUALITY

The effectiveness of a QA program is measured by the quality of data generated by the laboratory. Data quality is judged in terms of its precision, accuracy, representativeness, completeness and comparability. These terms are described as follows:

Precision

Precision is the degree to which the measurement is reproducible. Precision can be assessed by replicate measurements of reference toxicants or environmental samples. The standard deviation of replicate measurements of a single sample is commonly used in estimating precision. The sample coefficient of variation or CV, (also known as the relative standard deviation), expresses the standard deviation as a percentage of the mean, where CV = 100(std. dev./mean).

In the case of duplicates, the relative percent difference (RPD) between two samples may be used to estimate precision. $RPD = [|X_1 - X_2| / ((X_1 + X_2)/2)]*100$

The ability of the laboratory personnel to obtain consistent, precise results must be demonstrated with reference toxicants before they attempt to measure effluent toxicity. The single laboratory precision of each type of test to be used in a laboratory should be determined by performing at least five or more toxicity tests with a reference toxicant. In cases where the test data are used to obtain point estimates, such as LCs, ECs, or ICs, precision can be described by the mean, standard deviation, and relative standard deviation (percent coefficient of variation, or CV) of the calculated endpoints from the replicated tests. However, in cases where the results are reported in terms of the NOEC and LOEC, precision can only be described by listing the NOEC-LOEC interval for each test. In this case, it is not possible to express precision in terms of a commonly used statistic. For instance, when all tests of the same toxicant yield the same NOEC-LOEC interval, maximum precision has been attained. However, the "true" no effect concentration could fall anywhere within the interval, NOEC +/- (NOEC-LOEC).

The dilution factor selected for a test determines the width of the NOEC-LOEC interval and the inherent maximum precision of the test. As the absolute value of the dilution factor decreases, the width of the NOEC-LOEC interval increases, and the inherent maximum precision of the test decreases. Other factors which can affect test precision include test organism age, condition, and sensitivity, and temperature control and feeding.

Replication and Test Sensitivity

The sensitivity of the tests will depend in part on the number of replicates, the probability level selected, and the type of statistical analysis. The minimum recommended number of replicates varies with the test and statistical method used. If the variability remains constant, the sensitivity of the test will increase as the number of replicates is increased. See individual test SOP's and protocols for additional information on replication.

Accuracy

Accuracy is a determination of how close the measurement is to the true value. Accuracy can be assessed by comparing testing data to standard reference materials of a known toxicity or value.

Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Analytical and/or biological data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix.

Completeness

Completeness is a measurement of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions. To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the data base is sufficient.

Comparability

Comparability expresses the confidence with which one data set can be compared to another data set measuring the same property. Comparability is ensured through the use of established and approved analytical/biological methods, consistency in the basis of analysis (wet weight, volume, etc.), and consistency in reporting units (ppm, ppb, etc.).

13. CORRECTIVE ACTION

When errors, deficiencies, or out-of-control situations exist, the QA program provides systematic procedures, called "corrective actions," to resolve problems and restore proper functioning to the analytical and/or biological system.

Laboratory personnel are alerted that corrective actions may be necessary if:

* QC data are outside the warning or acceptable limits for precision and accuracy;

* Deficiencies are detected during QA internal or external audits or from the results of performance check samples.

* Inquiries concerning data quality are received from clients.

Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation procedure for possible errors, checks the instrument calibration, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, director or QA Officer for further investigation. Once resolved, full documentation of the corrective action procedure is filed with the QA Officer and recorded in the corrective action log book.

14. QUALITY ASSURANCE REPORTS

The reporting system is a valuable tool for measuring the overall effectiveness of the QA program. It serves as an instrument for evaluating the program design, identifying problems and trends, and planning for future needs. The QA Officer periodically prepares QA reports which include:

* The results of system audits including corrective actions taken;
* Performance evaluation scores and commentaries;
* Results of site visits and audits by regulatory agencies and clients;
* Performance on major contracts;
* Problems encountered and corrective actions taken;
* Holding time violations; and
* Comments and recommendations.

QA Reports are submitted to the Laboratory Director for review and action if necessary.

15. LABORATORY DOCUMENTATION

Complete and accurate documentation of analytical, biological and procedural information is an important part of the QA program. Bound notebooks should be used to maintain detailed records of the test organisms such as species, source, age, date of receipt, and other pertinent information relating to their history and health, and information on the calibration of equipment and instruments, test conditions employed, and test results. Annotations should be made on a real-time basis to prevent loss of information. The following describes different types of documentation used at ATL.

Standard Operating Procedures (SOP's)

Details of analytical, biological and QC protocols are contained in SOP's. SOP's are documents that contain detailed information on the requirements for the correct performance of a laboratory procedure. ATL has five categories of laboratory SOP's:

* Performance of an Analytical Testing Method
* Performance of a Biological Testing Method
* Preparation of Standards and Reagents
* Equipment Operation, Calibration, and Maintenance; and
* General Laboratory Procedures.

Formats for these SOP's are shown in Appendix II.

All SOP's are approved by the QA Officer before being implemented. The distribution of current SOP's and archiving of outdated ones is controlled by the QA Officer who also serves as the Document Custodian.

Laboratory Bench Sheets

Laboratory bench sheets are used to document information from routine laboratory operations, including sample preparation and analysis. Bench sheets are used to ensure that the information is recorded in a complete and organized manner and that the analysis can be reconstructed, if necessary.

Laboratory Notebooks

Laboratory notebooks are used to document information that cannot easily be recorded on benchsheets such as methods development information. Each data entry in a laboratory notebook in initialed and dated by the analyst as the data is being entered.

Control Charts

Control charts are used to visually track precision and accuracy data. These control charts are used to identify trends in the analyses which may indicate a problem with the analytical procedure. When an adverse trend or data point is detected corrective action is performed.

Project Files

The project file consists of a project summary and raw data records. The project summary records includes correspondence from the client, (letters, phone logs, contracts, project plans), copies of preliminary and final reports, chain of custody records, air bills, photographs of samples, QA review checklists when applicable, and the summary file inventory check list. Raw data records include original sample raw data, QC data, benchsheets, and instrument logbook pages pertinent to the project. Contracts, project plans, calibration data and QC data may be stored separately from the project record. All project records must contain cross-references to this information. When a project is complete, all records are passed to the Document Custodian who inventories the file, checks for completeness, and puts the file into document archive.

APPENDIX I

SAMPLE HOLDING TIMES AND COLLECTION INFORMATION

Sample Holding Times And Collection Information

TEST	Container	Volume	Holding Time
Hazardous Waste Tests			
CCR Title 22 (Calif. DOHS 1988)	glass	Screen: 25 gm	NA*
		Definitive: 55 gm	"
NPDES Acute Tests			
Fathead Minnow, *Menidia*, Topsmelt, Mysid	plastic/cubitainer	% Survival: 1 gallon	36 Hours
		Full (LC50): 2.5 gallons	"
Rainbow Trout, Sticklebacks	plastic/cubitainer	% Survival: 5 gallons	36 Hours
		Full (LC50): 10 gallons	"
Ceriodaphnia, *Daphnia*	plastic/cubitainer	% Survival: 1 liter	36 Hours
		Full (LC50): 1 liter	"
NPDES Chronic Tests			
Fathead Minnow	plastic/cubitainer	2.5 liters/day	36 Hours
Ceriodaphnia	" "	1 liter/day	"
Selenastrum	" "	1 liter	"
3 Species Freshwater Chronics	" "	2.5 gal./2 days	"
Red Abalone Larvae	plastic/cubitainer	1 liter	36 Hours
Giant Kelp	" "	1 liter	"
Topsmelt	" "	1 gal./day	"
Menidia	" "	1 gal./day	"
3 Species Marine Chronics	" "	2.5 gal./2 days	"

* No holding time specified in protocol.

Note: Static-renewal tests may require more than one sample. Chronic static-renewal tests may require multiple day sampling, ie. collecting samples on a Monday, Wednesday and Friday.

APPENDIX II

FORMATS FOR STANDARD OPERATING PROCEDURES (SOP's)

FORMAT FOR SOP - LABORATORY ANALYTICAL METHOD

Title (includes method number)

1.0 Scope and Application

- 1.1 Analytes
- 1.2 Detection limit (instrument and method)
- 1.3 Applicable matrices
- 1.4 Dynamic range
- 1.5 Approximate analytical time

2.0 Method Summary

Generic description of method and chemistry behind it.

3.0 Comments

- 3.1 Interferences
- 3.2 Helpful hints

4.0 Safety Issues

5.0 Sample Collection, Preservation, Containers, and Holding Times

6.0 Apparatus

7.0 Reagents and Standards

8.0 Procedure (detailed step-by-step)

- 8.1 Sample preparation
- 8.2 Calibration
- 8.3 Analysis

9.0 QA/QC Requirements

9.1 QC samples
9.2 Acceptance criteria (precision and accuracy)
9.3 Corrective action required (reference current QC manual)

10.0 Calculations

11.0 Reporting

11.1 Reporting units
11.2 Reporting limits
11.3 Significant figures

12.0 References

12.1 Method source
12.2 Deviations from source method and rationale

13.0 Appendices (optional)

Additional information may be placed in appendices. This may include supporting data (e.g. method validation information), tables, flow charts, etc.

FORMAT FOR SOP - LABORATORY BIOLOGICAL METHOD

Title (includes method number, if applicable)

1.0 Scope and Application

1.1 Organism(s)
1.1.1 Source
1.1.2 How identified
1.1.3 Authority

1.2 Response

1.3 Analysis

1.4 Approximate analytical time

2.0 Method Summary

Generic description of method and chemistry behind it.

3.0 Comments

3.1 Definitions
3.2 Helpful hints
3.3 Comments

4.0 Safety Issues

5.0 Sample Collection, Preservation, Containers, and Holding Times

5.1 Toxicant
5.2 Preservation
5.3 Containers
5.4 Holding Time

6.0 Equipment

7.0 Reagents and Standards

- 7.1 Reagents
- 7.2 Standards

8.0 Procedure (detailed step-by-step)

- 8.1 Sample preparation
- 8.2 Organism preparation
- 8.3 Equipment and calibration of equipment
- 8.4 Analysis
- 8.5 Monitoring parameters
- 8.6 Organism disposal
- 8.7 Data analysis
  - 8.7.1 Statistics required
  - 8.7.2 Technique
  - 8.7.3 Reasoning and interpretation
- 8.9 Other

9.0 Record Keeping

- 9.1 Lab notebooks
- 9.2 Benchsheets
- 9.3 Other

10.0 Reporting

- 10.1 Reporting units
- 10.2 Reporting limits
- 10.3 Significance of values
- 10.4 Other

11.0 QA/QC Requirements

- 11.1 QC controls
- 11.2 Reference Toxicant
- 11.3 QC Acceptance criteria
  - 11.3.1 Precision and accuracy
  - 11.3.2 Water Quality parameters
  - 11.3.3 Other

11.4 Inspections
11.5 Audits
11.6 Special considerations (client requests)
11.7 Corrective action required (reference current QC manual)
11.8 Other

12.0 References

12.1 Method source
12.2 Deviations from source method and rationale

13.0 Responsibilities

14.0 Appendices (optional)

Additional information may be placed in appendices. This may include supporting data (e.g. method validation information), tables, flow charts, etc.

FORMAT FOR SOP - LABORATORY PROCEDURE

Title (includes method number)

1.0 Purpose

2.0 Policies

3.0 Safety Issues

4.0 Procedure (detailed step-by-step)

5.0 Responsibilities

6.0 Comments

7.0 Definitions

8.0 References

FORMAT FOR SOP - LABORATORY STANDARDS AND REAGENTS

Title

1.0 Reagent/standard name

2.0 Type

3.0 Constituents/concentration

4.0 Solvent

5.0 Safety Issues

6.0 Shelf life and storage

- 6.1 Neat material
- 6.2 Prepared solution
- 6.3 Other

7.0 Procedure (detailed step-by-step)

- 7.1 Preparation for use
- 7.2 Documentation
  - 7.2.1 Purchase date
  - 7.2.2 Source
  - 7.2.3 Purity
  - 7.2.4 Date opened
  - 7.2.5 Labelling
  - 7.2.6 Other
- 7.3 Verification
- 7.4 Usage

8.0 Responsibilities

9.0 Comments

10.0 Definitions

11.0 References

Quality Assurance Program Manual

Prepared by:
Richmond, CA Laboratory
Quality Assurance Department

☐ Controlled Copy No. _____ ☐ Uncontrolled Issue Date _____

Issued to:

Eberline Services, Inc.
Richmond, CA Laboratory
2030 Wright Avenue
Richmond, CA 94804
Tel (510) 235-2633
Fax (510) 235-0438
NELAP Cert No.
01120CA (California)

Rodney Melgard
Mr. Rodney Melgard
Laboratory Manager 7/27/07

Marvin E. Clague
Mr. Marvin E. Clague
Technical Director 7/27/07

Katsumi Yamamoto
Mr. Katsumi Yamamoto
Q.A. Manager 07/27/07

AUTHORIZATION AND APPROVAL (A&A) STATEMENT

This Eberline Services, Inc., Richmond, CA Laboratory, Quality Assurance Program Manual, with all revisions, is authorized and approved in its entirety by:

Katsumi Yamamoto 07/27/07

Katsumi Yamamoto
Q.A. Manager
Eberline Services, Inc.
Richmond, CA Laboratory
2030 Wright Avenue
Richmond, CA 94804

Date

And Directed by:

Rodney Melgard 07/27/07

Rodney Melgard
Laboratory Manager
Eberline Services, Inc.
Richmond, CA Laboratory
2030 Wright Avenue
Richmond, CA 94804

Date

QUALITY ASSURANCE MISSION STATEMENT

Our mission is to ensure that all of the Eberline Services, Inc., Richmond, CA Laboratory's systems, services, processes, and deliverables are of a quality that meets or exceeds client requirements; and to foster a Richmond Laboratory culture in which there is a commitment to a rising standard of quality. This culture demands that the quality of those systems, services, processes, and deliverables and the methods used to achieve that quality be continuously improved.

FOREWORD

Quality Assurance, essentially, is a spirit that pervades all aspects of an organization. It is the quality attitude developed by a quality culture in an organization. It is the spirit in which the procedure, policy, or activity is written, implemented, and performed. This spirit produces empowerment and motivation in all employees to achieve the highest level of quality. This esprit de corps must start with the President of Eberline Services, Inc. and extend to all employees. The result of this attitude is **"Quality Assurance."**

This philosophy is realized and implemented through the policy guidelines presented in this Richmond Laboratory Quality Assurance Program Manual, and is based on premises that:

- People are our greatest asset and are ultimately responsible for the quality of the items and services we provide. Therefore, our most important objective is to treat each person with the greatest possible respect and consideration.
- Employees are inherently proud and want to produce top quality and on time services and deliverables. In order to do this they must be made aware of the quality requirements that are expected, and they must be provided appropriate facilities, equipment, and proper training.
- A culture of quality embodied within the entire Richmond Laboratory organization is the most effective way to provide support for the employee's commitment to quality.
- Management support is paramount, and organizational responsibilities must ensure integration of quality requirements in day to day operations.
- All systems, services, processes, and deliverables can be planned, performed, assessed, and improved.
- Improvements allow operations to become more efficient and result in contractual requirements performed "on time" and done "right the first time."
- Quality improvements also lead to reduced costs and allow the ultimate objective of providing the highest quality items and services at the lowest costs to be a viable goal.
- Quality is also a perception of our clients. Our actions in quality assurance must assure our clients that the Richmond, CA Laboratory organization provides the quality for systems, services, processes, and deliverables that will meet or exceed their requirements and expectations.

Rodney Melgard
Laboratory Manager
Eberline Services, Inc.
Richmond, CA Laboratory
2030 Wright Avenue
Richmond, CA 94804
(510) 235-2633

STATEMENT OF COMPLIANCE

This Quality Assurance Program Manual addresses the basic requirements of NQA-1 and requirements outlined in several regulatory manuals, standards, and regulations. Matrix comparison to some of these documents is included on pages 9 through 15. Additional regulatory requirements are listed in Section 1.0. This manual is organized as follows:

REVISION/REVIEW RECORD

Page No.	Rev. No.	Rev. date	Review Date	Reviewed by:
Entire Manual	Original	04-14-95	04-14-95	L. A. Johnson
Entire Manual	01	11-15-95	11-15-95	L. A. Johnson
Entire Manual	02	11-05-96	11-05-96	L. A. Johnson
Entire Manual	03	11-19-97	11-19-97	L. A. Johnson
Entire Manual	04	12-11-98	12-11-98	L. A. Johnson
Entire Manual	05	05-21-99	05-21-99	L. A. Johnson
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Entire Manual	07	11-10-00	11-10-00	L. A. Johnson
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Entire Manual	11	09-25-03	09-25-03	L. A. Johnson
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Entire Manual	13	05-06-05	05-06-05	L. A. Johnson
Entire Manual	14	05-12-06	05-12-06	L. A. Johnson
Entire Manual	15	07-31-07	07-11-07	K. Yamamoto

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MATRIX COMPARISON

NQA-1, 1994 Cross Reference to - Richmond, CA Laboratory Q.A. Program Manual

NQA-1-1994 -Quality Assurance Requirements for Nuclear Facility Applications (Basic Requirements)		Richmond, CA laboratory Quality Assurance Program Manual	
BASIC RQMT	TITLE	QAM SECT	TITLE
1.	Organization	2.0	Organization and Responsibility
2.	Quality Assurance Program	3.0 4.0	Quality Assurance Objectives Personnel Indoctrination and Training
3.	Design Control	N/A	Does not apply
4.	Procurement Document Control	6.0	Procurement Document Control
5.	Instructions, Procedures, and Drawings	5.0	Instructions and Procedures
6.	Document Control	13.0	Document Control
7.	Control of Purchased Items and Services	7.0	Material Receipt and Control
8.	Identification and Control of Items	8.0	Material Storage and Control
9.	Control of Process	9.0	Control of Process
10.	Inspection	14.0	Internal Quality Control
11.	Test Control	14.0	Internal Quality Control
12.	Control of Measurement and Test Equipment	11.0	Control of Measurement and Test Equipment
13.	Handling, Storage, and Shipping	8.0	Material Storage and Control
14.	Inspection, Test, and Operating Status	14.0	Internal Quality Control
15.	Control of Nonconforming Items	8.0	Material Storage and Control
16.	Corrective Actions	17.0	Corrective Actions
17.	Quality Assurance Records	16.0	Quality Assurance and Inspection Records
18.	Audits	15.0	Audits
	N/A	N/A	Title Page
	N/A	N/A	Authorization and Approval Statement
	N/A	1.0	Introduction and Description
	N/A	10.0	Preventive Maintenance
	N/A	12.0	Data Reduction, Verification, and Reporting
	N/A	18.0	Quality Assurance Reports to Management

MATRIX COMPARISON

10 CFR Part 50, Appendix B Cross Reference to Richmond, CA Laboratory Q.A. Program Manual

NRC 10 CFR Part 50 Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."		**Richmond, CA Laboratory Quality Assurance Program Manual**	
Criterion No.	TITLE	QAM SECT	TITLE
I	Organization	2.0	Organization and Responsibility
II	Quality Assurance Program	3.0	Quality Assurance Objectives
III	Design Control	N/A	Does not apply
IV	Procurement Document Control	6.0	Procurement Document Control
V	Instructions Procedures, and Drawings	5.0	Instructions and Procedures
VI	Document Control	13.0	Document Control
VII	Control of Purchased Material, Equipment, and Deliverables	7.0	Material Receipt and Control
VIII	Identification and Control of Materials, Parts, and Components	8.0	Material Storage and Control
IX	Control of Special Process	9.0	Control of Process
X	Inspections	14.0	Internal Quality Control
XI	Test Control	14.0	Internal Quality Control
XII	Control of Measuring and Test Equipment	11.0	Control of Measurement and Test Equipment
XIII	Handling, Storage, and Shipping	8.0	Material Storage and Control
XIV	Inspection, Tests, and Operating Status	14,0	Internal Quality Control
XV	Nonconforming Materials, Parts or Components	7.0	Material Receipt and Control
XVI	Corrective Actions	17.0	Corrective Actions
XVII	Quality Assurance Records	16.0	Quality Assurance Inspection Records
XVIII	Audits	15.0	Audits
		N/A	Title Page
		1.0	Introduction and Description
		10.0	Preventative Maintenance
		12.0	Data Reduction, Verification, and Reporting
		18.0	Quality Assurance Reports to Management

MATRIX COMPARISON

DOE Quality Systems for Analytical Services *and DOD Quality Systems for Environmental Laboratories*
Cross Reference to Richmond, CA Laboratory Q.A. Program Manual

DOE QSAS		Richmond, CA Laboratory Quality Assurance Program Manual	
4.2.3 RQMT	TITLE	QAM SECT	TITLE
	Title Page		Title Page
(a)	Policy statement, objectives, commitment by top management	1.0 3.0	Introduction and Description Quality Assurance Objectives
(b)	Organization and Management structure, Org Charts	2.0	Organization and Responsibility
(c)	Relationship between management, technical operations, support services and the quality system	2.0	Organization and Responsibility
(d)	Document control and records retention	16.0	Quality Assurance & Inspection Records
(e)	Job Descriptions	4.0	Personnel Indoctrination and Training
(f)	Approval signatories, signed concurrences	A&A	Authorization and Approval Statement
(g)	Traceability of measurements	14.0	Internal Quality Control
(h)	List of test methods	9.0	Control of Process
(i)	Review for facility and resource availability	9.0	Control of Process
(j)	Calibration or verification test procedures	5.0	Instructions and Procedures
(k)	Procedures for handling submitted samples	9.0	Control of Process
(l)	Major equipment and measurement standards	9.0 11.0	Control of Process Control of Measurement & Test Equipment
(m)	Calibration, verification, & maintenance	11.0	Control of Measurement & Test Equipment
(n)	Interlaboratory comparison, proficiency testing, reference material, internal Q.C.	14.0	Internal Quality Control
(o)	Corrective actions	17.0	Corrective Actions
(p)	Departures from policy/procedures	5.0	Instructions and Procedures
(q)	Complaints	1.0	Introduction and Description
(r)	Confidentiality and Proprietary rights	1.0	Introduction and Description
(s)	Audits and Data reviews	12.0 15.0	Data Reduction, Verification, and Reporting Audits
(t)	Personnel experience and training	4.0	Personnel Indoctrination and Training
(u)	Analytical results reporting	12.0	Data Reduction, Verification, and Reporting
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Hanford Analytical Services Quality Assurance Requirements Documents
Cross Reference to - Richmond, CA Laboratory Q.A. Program Manual

HASQARD Volume 1		Richmond, CA Laboratory Quality Assurance Program Manual	
RQMT	TITLE	QAM SECT	TITLE
2.0	Organization and Responsibility	1.0 2.0 3.0	Introduction and Description Organization and Responsibility Quality Assurance Objectives
3.0	Personnel Qualification and Training	4.0	Personnel Indoctrination and Training
4.0	Procedures	5.0 9,0	Instructions and Procedures Control of Process
5.0	Corrective Actions and Quality Improvement	14.0 17.0	Internal Quality Control Corrective Actions
6.0	Documents and Quality Records	5.0 9.0 13.0 16.0	Instructions and Procedures Control of Process Document Control Quality Assurance and Inspection Records
7.0	Software Systems Quality Assurance	12.0	Data Reduction, Verification, and Reporting
8.0	Procurement Controls	6.0 7.0 8.0	Procurement Document Control Material Receipt and Control Material Storage and Control
9.0	Equipment Preventative Maintenance	10.0	Preventive Maintenance
10.0	Assessments	2.0 15.0	Organization and Responsibilities Audits
11.0	Quality Assurance Reporting	18.0	Quality Assurance Reports to Management
		N/A	Title Page
		N/A	Authorization and Approval Statement
		N/A	Table of Contents
		11.0	Control of Measurement & Test Equipment

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NELAC Chapter 5 Cross Reference to - Richmond, CA Laboratory Q.A. Program Manual

NELAC Chapter 5 "Quality Systems"		Richmond, CA Laboratory Quality Assurance Program Manual	
5.5.2 RQMT	TITLE	QAM SECT	TITLE
	Title Page		Title Page
(a)	Policy statement, objectives, commitment by top management	1.0 3.0	Introduction and Description Quality Assurance Objectives
(b)	Organization and Management structure, Org Charts	2.0	Organization and Responsibility
(c)	Relationship between management, technical operations, support services and the quality system	2.0	Organization and Responsibility
(d)	Document control and records retention	16.0	Quality Assurance & Inspection Records
(e)	Job Descriptions	4.0	Personnel Indoctrination and Training
(f)	Approval signatories, signed concurrences	A&A	Authorization and Approval Statement
(g)	Traceability of measurements	14.0	Internal Quality Control
(h)	List of test methods	9.0	Control of Process
(i)	Review for facility and resource availability	9.0	Control of Process
(j)	Calibration or verification test procedures	5.0	Instructions and Procedures
(k)	Procedures for handling submitted samples	9.0	Control of Process
(l)	Major equipment and measurement standards	9.0 11.0	Control of Process Control of Measurement & Test Equipment
(m)	Calibration, verification, & maintenance	11.0	Control of Measurement & Test Equipment
(n)	Interlaboratory comparison, proficiency testing, reference material, internal Q.C.	14.0	Internal Quality Control
(o)	Corrective actions	17.0	Corrective Actions
(p)	Departures from policy/procedures	5.0	Instructions and Procedures
(q)	Complaints	1.0	Introduction and Description
(r)	Confidentiality and Proprietary rights	1.0	Introduction and Description
(s)	Audits and Data reviews	12.0 15.0	Data Reduction, Verification, and Reporting Audits
(t)	Personnel experience and training	4.0	Personnel Indoctrination and Training
(u)	Ethical and legal responsibilities	1.0	Introduction and Description
(v)	Analytical results reporting	12.0	Data Reduction, Verification, and Reporting
(w)	Table of Contents	TOC	Table of Contents

MATRIX COMPARISON

10 CFR Part 830.122 Cross Reference to Richmond, CA Laboratory Q.A. Program Manual

10CFR 830.122 "Quality Assurance Criteria"			Richmond, CA Laboratory Quality Assurance Program Manual
Criterion No.	TITLE	QAM SECT	TITLE
830.122 (a)	Management/Program	1.0 2.0	Introduction Organization and Responsibility
(b)	Management/Personnel Training and Qualification	4.0	Personnel Indoctrination and Training
(c)	Management/Quality Improvement	3.0 14.0 17.0	Quality Assurance Objectives Internal Quality Control Corrective Actions
(d)	Management/Documents and Records	5.0 9.0 12.0 13.0 16.0 18.0	Instructions and Procedures Control of Process Data Reduction, Verification, and Reporting Document Control Quality Assurance Records Quality Assurance Reports to Management
(e)	Performance/Work Process	7.0 8.0 10.0 14.0	Material Receipt and Control Material Storage and Control Preventive Maintenance Internal Quality Control
(f)	Performance/Design	N/A	Does not apply
(g)	Performance/Procurement	6.0	Procurement Document Control
(h)	Performance/Inspection and Acceptance Testing	11.0 14.0 15.0	Control of Measurement and Test Equipment Internal Quality Control Audits
(i)	Assessment/Management Assessment	2.0	Organization and Responsibility
(j)	Assessment/Independent Assessment	2.0 15.0	Organization and Responsibility Audits
N/A		N/A	Title Page
N/A		N/A	Authorization and Approval Statement

MATRIX COMPARISON

EPA SW-846 Cross Reference to - Richmond, CA Laboratory Q.A. Program Manual

EPA SW-846 (Essential Elements)		Richmond, CA laboratory Quality Assurance Program Manual	
BASIC RQMT	TITLE	QAM SECT	TITLE
1.	Title Page	N/A	Title Page
2.	Table of Contents	N/A	Table of Contents
3.	Project Description	1.0	Introduction and Description
4.	Project Organization and Responsibility	2.0	Organization and Responsibility
5.	Q.A. Objectives	3.0	Quality Assurance Objectives
6.	Sampling Procedures	N/A	Does not apply to laboratory
7.	Sample Custody	9.0	Control of Process
8.	Calibration Procedures and Frequency	11.0	Control of Measurement and Test Equipment
9.	Analytical Procedures	5.0 9.0	Instructions and Procedures Control of Process
10.	Data Reduction, Validation, and Reporting	12.0	Data Reduction, Verification, and Reporting
11.	Internal Quality Control Checks	14.0	Internal Quality Control
12.	Performance and System Audits	15.0	Audits
13.	Preventive Maintenance	10.0	Preventive Maintenance
14.	Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completion	14.0	Internal Quality Control
15.	Corrective Action	17.0	Corrective Actions
16.	Quality Assurance Reports to Management	18.0	Quality Assurance Reports to Management
N/A		N/A	Authorization and Approval Statement
N/A		4.0	Personnel Indoctrination and Training
N/A		6.0	Procurement Document Control
N/A		7.0	Material Receipt and Control
N/A		8.0	Material Storage and Control
N/A		13.0	Document Control
N/A		16.0	Quality Assurance and Inspection Records

SECTION 1.0
INTRODUCTION AND DESCRIPTION

1.1 PREFACE

The management of Eberline Services, Inc., Richmond, CA Laboratory is committed to a rigorous Quality Assurance (Q.A.) Program. While this commitment is necessary for the normal conduct of business, our basic policies dictate the highest standards of ethics and integrity in the conduct of our affairs. This philosophy and the specific procedures to attain policy objectives form the framework of our Q.A. Program. "We will provide only those services that are within our qualifications and with confidence that our Q.A. Program and all related operating procedures dictate reliable performance of those services."

1.2 PURPOSE

This manual outlines management's Q.A. policy and establishes a requirement that procedures be promulgated and implemented to accomplish all of the quality assurance elements necessary to fulfill our responsibility to meet or exceed client or regulatory specifications. It also provides a means for creating mutual understanding, regarding our Q.A. program and reliability techniques, with our subcontractors, suppliers, and clients.

1.3 SCOPE

This Quality Assurance Program Manual provides guidance to meet operational Q.A. requirements.

In addition to the documents identified in the Matrix Comparison Section, this Manual complies with applicable requirements of the following regulations:

1.3.1 NRC 10 CFR Part 21, "Reporting of Defects and Non-compliance."
1.3.2 ANSI/ANS-10.3-1995, "Documentation of Computer Software.
1.3.3 NRC Regulatory Guide 4.15, Rev. 1, "Quality Assurance for Radiological Monitoring Programs - Effluent Streams and the Environment."
1.3.4 U.S. EPA QA/R2, "EPA Requirements for Quality Assurance Program Plans."
1.3.5 HPS N13.30 - 1996, "Performance Criteria for Radiobioassay."
1.3.6 EPA 2185, "Good Automated Laboratory Practices" (GALP)
1.3.7 DOE STD- 1112-98, "DOE Laboratory Accreditation Program for Radiobioassay"

1.4 INTRODUCTION

Quality assurance, as outlined herein, is a tool that allows management to utilize the expertise and experience of all personnel on the job. It requires each worker to be aware of his/her work environment and to continually evaluate methods and processes to ensure that the best and correct operation is being performed. It requests each employee to identify and suggest any improvement to the processes while performing an operation. Improvements or changes will be coordinated with management who will validate improvement and disseminate the information to all affected personnel. Management will also, if required, change procedures and provide additional training. This program also requires that all personnel be qualified, and trained on a continuing basis to maintain that qualification and be assimilated into the Richmond Laboratory quality culture.

Management provides facilities, resources, tools, equipment, scheduling, and training to ensure personnel can perform their duties effectively. Deputies for key managerial personnel have been identified to ensure continuity of process.

Management will also ensure that assessments are performed annually to evaluate management and processes with feed back for review with a goal of improving all areas of operations.

Laboratory personnel are required to train to the Quality Assurance Program and to implement the policies and procedures in their work. It is only by having a quality assurance culture, with all personnel involved, that a system, service, or product can be provided with full assurance that the best possible work, the best possible product, or the best possible service has been provided.

In order to ensure that this manual is an effective management tool, subjects that are not normally considered quality assurance, i.e. safety, security, etc., may be addressed.

The following titled designations of positions are used within the Richmond, CA Laboratory:

- **Laboratory Manager:** Refers to the General Manager of the Richmond, CA Laboratory.
- **Technical Director:** Refers to the individuals who provide technical direction or advice for laboratory operations and/or special programs, *research* projects, or activities.
- **Operations Manager:** Refers to the individual within a laboratory who is responsible for the technical operations.
- **Program Manager:** Refers to an individual in the laboratory who is responsible for client service activities and is the single point of contact with a client for the laboratory.

- **Supervisor:** Refers to individuals within the laboratory who are responsible for the operational functions of a group of personnel.

- **Q.A. Manager:** Refers to the individual who is responsible for the laboratory's Q.A. Program.

- **Q.C. Coordinator:** Refers to the individual who is responsible for the laboratory's Quality Control (Q.C.) Program.

- ***Facilities Support Superintendent:*** *Refers to the individual who is responsible for managing and operating the facilities including building and systems maintenance, repair, and security.*

- ***Purchasing Agent:*** *Refers to the individual who is responsible for the procurement of material, components, supplies, reagents, equipment, and services.*

- ***Environmental Compliance Officer:*** *Refers to the individual who is responsible for ensuring hazardous wastes are processed as required by local, state, and federal regulations.*

- ***Laboratory Health & Safety Officer:*** *Refers to the individual who is responsible for the implementation of the Safety Program.*

- ***Radiation Safety Officer:*** *Refers to the individual who is responsible for the implementation of the Radiation Safety Program.*

- ***Document Control Custodian:*** *Refers to the individual who is responsible for the control of technical and project specific documents, procedures, and manuals.*

- ***Information Technology Specialist:*** *Refers to the individual who is responsible for the administration and control of all data management systems at Eberline Services, Richmond.*

See Appendix B for the names of individuals assigned to the positions described above.

1.5 DESCRIPTION

This document outlines the organization of the Q.A. function, describes and depicts the lines of authority, and lists the duties and responsibilities within the organization. It provides direction for the preparation of procedures manuals which provide the detailed methods of processes and analyses that accomplish the goal of quality data in terms of precision, accuracy and reproducibility.

1.6 CONFIDENTIAL AND PROPRIETARY INFORMATION

Richmond laboratory employees are exposed to confidential and/or proprietary information pertaining to the company and its clients. Information concerning the report of analysis, radiation dosimetry records, audit reports, calibration reports, and other documents relating to a project are considered confidential. This information is to be released only to the client or to the client's authorized representative. Each employee will sign an agreement with the Eberline Services, Inc. organization concerning the security of proprietary and confidential information. A copy of the agreement will be retained in the employee's personnel file.

1.7 *CUSTOMER* COMPLAINTS

All customer complaints will be addressed by the Technical Director, Program Manager, or staff member with the most expertise in the area of complaint. If the complaint is not valid, every attempt will be made to satisfy the client. If the complaint is determined to be valid, the cause of the complaint will be identified and corrected as soon as feasible. Verification that the cause for a valid complaint has been corrected is the responsibility of the individual addressing the complaint. Details of all *customer* complaints will be recorded and maintained in the customer's project file.

1.8 DATA INTEFGRITY, ETHICAL AND LEGAL RESPONSIBILITIES

Quality Assurance Procedure (QAP)-06 has been promulgated for the education and training of personnel in the areas of Data Integrity, ethical and legal responsibilities including the potential punishment and penalties for improper, unethical, or illegal actions. QAP-15 provides the methodology for periodic monitoring and recording of data integrity, and ethical observations.

1.9 ACCREDITATIONS

The laboratory has been granted certification by different agencies, organizations, and states. The laboratory maintains proficiency as required by the certifying agency. The Quality Assurance Manager maintains credentials and lists of certifying agencies. List will include the following:

1.9.1 U. S. Department of Energy Consolidated Audit Program (DOECAP)

The Richmond laboratory has been audited by the U.S. Department of Energy, Consolidated Audit Program to provide across the board certification for all DOE operations.

1.9.2 National Environmental Laboratory Accreditation Conference (NELAC)

The laboratory has been granted NELAP accreditation by the State of California.

1.9.3 Nuclear Utilities Procurement Issues Committee (NUPIC)

The Richmond laboratory participates in this program by the Nuclear Utilities to perform 10 CFR Part 61 required analysis.

1.9.4 State

The laboratory is accredited under NELAC by the state of California and other states through NELAP reciprocity.

SECTION 2.0
ORGANIZATION AND RESPONSIBILITY

2.1 ORGANIZATIONAL STRUCTURE

The Laboratory Manager has overall responsibility for this Quality Assurance Program (hereafter referred to as the Program). In this capacity, he has delegated the responsibility for formulation, implementation, and execution of the Program to the laboratory Q.A. Manager.

Current organization charts, identifying key individuals and the structure of the laboratory, are included in the "Statement of Qualifications." Additional organizational structure, functional responsibilities, levels of authority, and lines of communication for management, direction, and execution of the Program are documented below.

2.2 RESPONSIBILITY

Management at all levels will periodically assess the integrated quality assurance program and its performance. Problems that hinder the organization from achieving its objectives will be identified and corrected.

2.2.1 The Q.A. Manager is responsible for the establishment and execution of the Q.A. Program as outlined herein and for defining and measuring the overall Program effectiveness.

2.2.2 The Q.A. Manager has direct access to the Laboratory Manager for matters pertaining to quality assurance that cannot be resolved.

2.2.3 The Q.A. Manager operates independently from line management and will report to the Laboratory Manager, providing the required authority and organizational freedom to ensure that appropriate action can be taken in implementing an effective Program. The Q.A. Manager has independence from cost, scheduling, and production considerations, and has the authority to control processing, delivery, installation, or use until proper disposition of a non-conformance, deficiency, or condition adverse to quality that has been identified.

2.2.4 The Q.A. Manager is responsible to review the Q.A. Program on a continuing basis and recommend revisions to the Program as necessary to ensure compliance with the latest revisions of applicable standards. A formal review of the Program will be performed annually.

2.2.5 Quality related activities may be assigned to designated qualified personnel. Responsibility for quality control functions resides with the Q.A. Manager.

2.2.6 The Q.A. Manager and designated personnel are authorized to sign client related Certificates of Conformance and/or Compliance.

2.2.7 The *Document Control Custodian* will maintain a log of names, with signature and initials, for all individuals who are responsible for signing or initialing any laboratory record.

2.2.8 The responsibility for compliance to the general workmanship and standard practices is vested in the first line level of supervision. Supervisors will provide training and ensure employee compliance.

2.2.9 All employees are responsible for supporting the Program in principle and in detail and shall retain responsibility for the quality of their work.

2.2.10 The Q.A. Manager will annually provide a summary of quality assurance activities to the Laboratory Manager for review of the Program, to evaluate its adequacy and assure its effective implementation.

2.3 ASSESSMENT

2.3.1 The Laboratory Manager *shall periodically and at least annually* conduct a *review of the laboratory's quality system and environmental testing activities to ensure their continuing suitability and effectiveness, and to introduce necessary changes or improvements. The review shall take account of:*

- *the suitability of policies and procedures,*
- *reports from managerial and supervisory personnel,*
- *the outcome of recent internal audits,*
- *corrective and preventive actions,*
- *assessments by external bodies,*
- *the results of inter-laboratory comparisons or proficiency tests,*
- *changes in the volume and type of the work,*
- *client feedback,*
- *complaints; and*
- *other relevant factors, such as quality control activities, resources, and staff training.*

2.3.2 Findings from management reviews and the actions that arise from them shall be recorded. The management shall ensure that those actions are carried out within an appropriate and agreed timescale.

2.4 DOCUMENTATION

Results of the Laboratory Manager's management assessment and recommendations will be documented annually. Decisions and related actions resulting from the recommendations will be properly followed up and evaluated for their effectiveness.

2.5 ORGANIZATION CHARTS

2.5.1 The Analytical Services Group corporate organization is illustrated in Figure 1. *See Appendix A for the names of individuals holding titles to the positions.*

2.5.2 The Richmond laboratory organization is illustrated in Figure 2. *See Appendix B for the names of individuals assigned to the positions.*

Figure 1
Analytical Services Group
CORPORATE ORGANIZATION

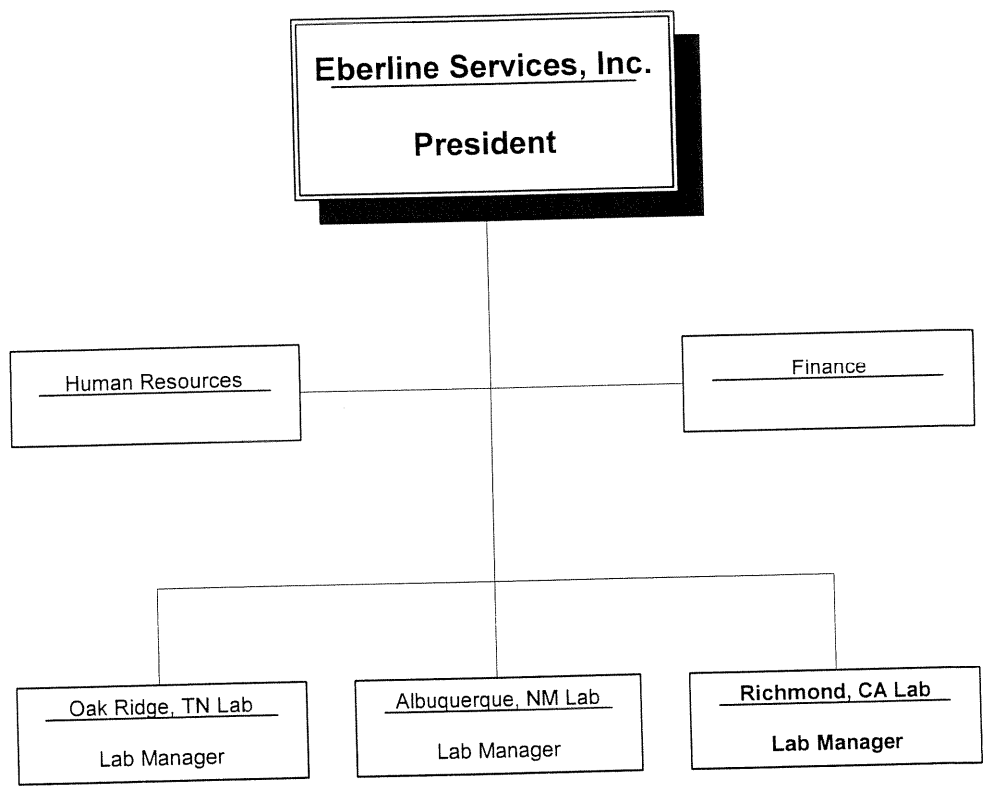
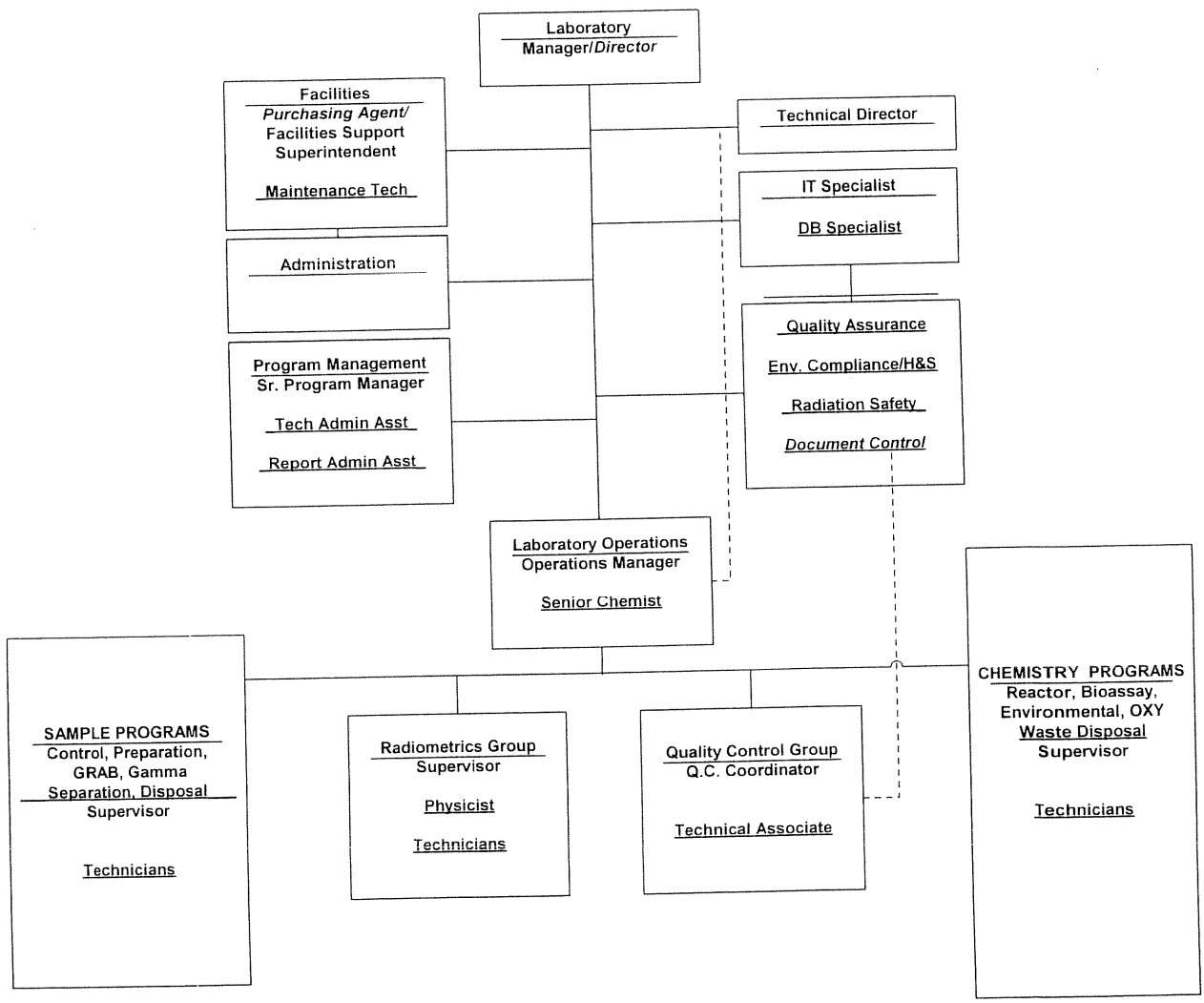


Figure 2

Richmond, CA Laboratory

ORGANIZATION



SECTION 3.0
QUALITY ASSURANCE OBJECTIVES

3.1 OBJECTIVES

The Richmond, CA laboratory Q.A. Program is organized to meet the following objectives:

3.1.1 To ensure performance of those actions that provide confidence that quality is achieved.

3.1.2 To provide an effective control for the verification of characteristics of all systems, services, and processes that produce data of the required quality.

3.1.3 To ensure that systems, services, processes, and deliverables meet the rigid quality and reliability standards of the Richmond laboratory. Also, to ensure that individual client criteria pursuant to these standards are met.

3.1.4 To provide a continuing monitoring service for review of operating procedures, and for overall effectiveness and evaluation of the Q.A. Program. Also, to provide observations and recommendations for improvement in all areas of laboratory operations where quality may be affected.

3.1.5 To ensure the documents program provides valid records of the control measures applied to all factors bearing on the final results of investigations.

3.1.6 To ensure the assessment of results provides feedback to improve the process.

3.1.7 To foster a culture in which there is a commitment to achieve a rising standard of quality, which demands that the quality for systems, services, processes, and deliverables, and the methods utilized to achieve that quality, be continuously monitored and improved.

3.2 QUALITY IMPROVEMENT

Operational processes will be reviewed continually by management and employees to detect and prevent problems and to ensure quality improvement. Any item or process that does not meet established requirements will be identified, controlled, and corrected. The cause of problems will be identified with corrections made to prevent recurrence. Item reliability, process implementation, and quality-related information will be reviewed and the data analyzed to identify items and processes needing improvement.

3.3 RESPONSIBILITIES

Employees are an integral part of the organization and are responsible to be aware of their work environment, to review operational processes and materials utilized, to identify any problems, and to make suggestions and recommendations for improvement. Employees are empowered, through their supervisor, to make and/or recommend corrections to improve operations and to prevent recurrence of the problems. Employees are also empowered, through their supervisor, to stop work where detrimental ethical, contractual, quality, safety, or health conditions exist. Management will immediately be made aware of any situations requiring work stoppage.

Management is responsible to be actively involved in the quality improvement process to ensure proper focus is maintained and for resolution of difficult issues. Management will maintain a "no fault" attitude to encourage employees to identify problems that compromise safety and reliability. Management will consider all recommendations for quality improvement and will recognize employee contributions.

3.4 CORRECTIONS

Items and processes that do not meet established requirements must be identified, documented, analyzed, and corrected. Corrective actions will be implemented and followed up to ensure effectiveness.

SECTION 4.0
PERSONNEL INDOCTRINATION AND TRAINING

4.1 QUALIFIED PERSONNEL

4.1.1 Personnel within the Richmond laboratory who perform activities that will affect quality will have indoctrination, training, and job evaluation conducted on an individual basis to ensure that suitable proficiency is achieved and maintained. A job description, identifying position qualification and duty requirements, will be provided the individual and also included in each individual's training records.

4.1.2 All personnel will have training outlining their data integrity, ethical, and legal responsibilities, including the potential disciplinary actions and penalties for improper, unethical, or illegal actions.

4.1.3 Personnel performing technical functions or processes will have known and documented related work experience and education *concomitant with technical complexity of duties.*

4.2 RESPONSIBILITY

4.2.1 Supervisors are responsible for initial evaluation of capabilities and qualifications of assigned personnel and will assign those personnel to perform functions based on the individual's qualifications and abilities.

4.2.2 Supervisors and managers are responsible for an annual review of assigned personnel for evidence of unethical, improper, or illegal activities. Documentation of the review will be retained in the individual's training files.

4.2.3 Appropriate training is the responsibility of the supervisors with support from management. Training will address specific needs and will vary according to each job's requirements and previous experience of the employee, and will ensure:

4.2.3.1 Understanding of the fundamentals of the work and its context.

4.2.3.2 Understanding of the processes and tools being used, the extent and sources of variability in those processes and tools, and the degree to which control over the variability is maintained.

4.2.3.3 Emphasis on correct performance of the work, understanding why quality requirements exist, and potential consequences of improper work.

4.2.3.4 Emphasis on "doing it right the first time."

4.2.4 New employees will receive detailed information concerning safety practices, security policies, and general corporate policies. A current copy of the Chemical Hygiene Plan will be made available to employees who will familiarize themselves with this document.

4.2.5 Milestone achievements or unique training will be noted by the supervisors via entry in the training records. Available certificates of training, education, or awards will also be maintained with the individual's training records.

4.2.6 Supervisors will monitor individual work habits to ensure proficiency is maintained, to note progressive improvement, and to identify any needed supportive training. Additional training requirements will be developed by the individual's supervisor.

4.2.7 When applicable, employees will be informed of the requirements of 10 CFR Part 21 "Reporting of Defects and Non-Compliance," and will familiarize themselves with this regulation. Familiarization will be made a matter of record.

4.2.8 Requirements for personnel training and the details for composition and maintenance of training records are outlined in the Richmond Laboratory Quality Assurance Procedure, QAP-02 "Personnel Indoctrination and Training."

SECTION 5.0
INSTRUCTIONS AND PROCEDURES

5.1 POLICY

The policy at the Richmond laboratory is to use written and approved procedures for routine activities and for analytical and operational processes that ensure data is produced that meets the minimum method QA/QC requirements. Applicable procedures are available to operating personnel. A current copy of the appropriate procedure will be maintained in each chemistry laboratory/operating department. Departures from routine procedures due to non-standard situations or specific requests by clients, will be approved by management and will be fully documented.

5.2 TECHNICAL PROCEDURES

Technical procedures are descriptions of particular protocols for testing or operations. Technical procedures will be developed when there is no published reference procedure for a test or process, and the Operations Manager, Technical Director, or Q.A. Manager deem it necessary.

5.2.1 Qualification requirements for personnel performing operations and criteria used to determine the proficiency of the operator will be defined.

5.2.2 Each technical procedure will include a list of Personal Protective Equipment (PPE) required for the operation being performed. Training for the identification, operation, use, limitations, and disposal of the PPE will be conducted.

5.2.3 Each technical procedure will identify any chemicals/reagents required for completion of the process. Material Safety Data Sheets (MSDSs) for those chemicals/reagents will be readily available, and training applicable to the MSDSs will be conducted.

5.2.4 Each technical procedure will identify the hazardous wastes generated as a result of the process. Training will be conducted to the procedures used for processing wastes generated within the applicable chemistry laboratory.

5.3 PROCEDURE MANUALS

Procedure manuals consist of the individual technical procedures for a laboratory area or for an operation combined into one document. The procedures within the manual define all parameters of the operations being performed to include required accuracy and completeness of specific measurement parameters involved. Procedures will be incorporated into procedure manuals. Signature on the Authorization and Approval page applies to all procedures in the manual.

5.4 FORMAT AND DISTRIBUTION

5.4.1 Procedures will comply to the format prescribed in the laboratory document control procedure and will be approved by the Technical Director, the Senior Chemist, or the responsible supervisor, the relevant manager and the Q.A. Manager.

5.4.2 Distribution of procedure manuals will be in accordance with the laboratory's document control procedure. The original copy of each department's procedure manual will be retained by the *Document Control Custodian.*

5.5 REVIEW

Procedures and manuals will be reviewed for *accuracy and adequacy at least annually or whenever procedural method changes occur*, and updated *as appropriate*.

5.6 REVISION

5.6.1 The appropriate supervisor, or designated representative, is responsible for revisions or changes to the applicable procedure manuals.

5.6.2 Revisions are reviewed and approved by the organization(s) and personnel responsible for the original document. When possible, revisions or changes will be accomplished on a page replacement basis.

5.6.3 A procedure or manual that has been revised will be issued as soon as possible.

5.6.4 The Q.A. Manager will be advised of any changes in procedures required to satisfy specifications of the client.

5.6.5 The *Document Control Custodian* will be responsible for retention of the original copy of each superseded procedure, marked "Revised" or "Obsolete." The original copy of each superseded or obsolete technical procedure will be designated for lifetime retention.

SECTION 6.0
PROCUREMENT DOCUMENT CONTROL

6.1 PURCHASING

Procurement of material, components, supplies, reagents, equipment, and services necessary to carry on operations at the Richmond, CA laboratory is initiated by purchase requisition and controlled by the use of an authorized purchase order number. To the extent necessary, purchase orders will require suppliers to have a Q.A. program consistent with the requirements of this document.

6.2 PURCHASE REQUISITION REVIEW

Purchase requisitions or change orders are reviewed by purchasing department personnel to ensure conformance to the procurement requirements. As applicable, quality related requisitions are reviewed by Q.A. personnel prior to being processed. Change orders undergo the same review process.

6.3 CERTIFICATION/CERTIFICATE OF CONFORMANCE

All materials and processes requiring certification and certificates of conformance are identified on the face of the purchase order or by attachment thereto. Adequate information is provided to ensure supplier compliance to the required specifications. The Q.A. Manager is responsible for the retention, filing, and recall of material certification or certificates of conformance.

6.4 SUBCONTRACTS

Subcontractor laboratories must have an established and documented laboratory quality system that complies with the NELAC Quality Systems requirements, the DoD QSM requirements, or the DOE QSAS requirements, if applicable. The subcontractor laboratories must be certified by NELAP and be approved by the specific DoD Component laboratory approval process or be approved by the DOE Procurement Representative, as applicable. Subcontractor laboratories must demonstrate the ability to generate acceptable results from the analysis of proficiency testing samples. Subcontractor laboratories must receive project-specific approval from the DoD or the DOE client, if applicable, before any samples are analyzed.

6.5 VENDORS

6.5.1 For procurement of quality-related items or services the Q.A. Manager is responsible for vendor evaluation and approval. Vendor evaluation and qualification will be through accreditation as a secondary standard calibration laboratory (NVLAP - NIST); an audit by Richmond laboratory personnel or an acceptable audit agency; or facility inspection, test reports, or receipt inspections, when the quality of the materials can be verified by these methods; or by a history of material or services

provided. Documentary evidence that products and services conform to procurement requirements will be provided and retained. A list of Richmond laboratory approved vendors will be provided the Albuquerque Procurement Office.

6.5.2 The effectiveness of the control of quality by contractors and subcontractors will be assessed at intervals consistent with the importance, complexity, and quantity of the product or services.

6.5.3 The purchasing department is responsible for maintaining a record of quality related materials received from vendors including any reports for non-conforming material.

6.6 QUALITY RELATED SERVICES

Q.A. personnel will review the purchase requisitions for quality related services. Those services that are determined to be quality related will include, as applicable, the following statement, or similar wording, in the body of the purchase order or by attachment: "The pieces of equipment and/or services to be furnished under this purchase order are subject to the applicable requirements of NQA-1-1994 or ANSI/NCSL-Z540-1-1994."

6.7 *NUCLEAR SAFETY RELATED SERVICES*

Not applicable to the services provided to clients by Eberline Services.

SECTION 7.0
MATERIAL RECEIPT AND CONTROL

7.1 POLICY

Only material with acceptable quality characteristics will be allowed into the laboratory.

7.2 RESPONSIBILITY

Receipt and initial verification of all materials and equipment received by the Richmond laboratory, either purchased or contract (client) supplied, is the responsibility of the Facilities Support Superintendent or designated individual. Technical verification for materials and equipment will be by the requisitioner or Q.A. personnel, whichever is applicable. Quality related purchase order items will be receipt inspected by Q.A. personnel *or the requisitioner.*

7.3 MATERIAL CONTROL

Purchased material is controlled by the Facilities Support Superintendent or designated individual.

7.3.1 The Facilities Support Superintendent, or designated individual, is responsible for the expedient and correct routing of all initially accepted received materials to general laboratory material storage, or to the requisitioner.

7.3.2 Purchasing department personnel are responsible for maintaining a record of materials received from vendors, including Rejected Material Report (RMR), or equivalent form, for any non-conforming material.

7.4 NON-CONFORMING MATERIAL

When received material, affecting quality, has been determined to be non-conforming, the requisitioner or the Q.A. Manager will *work with the Purchasing Agent* for proper *disposition.*

SECTION 8.0
MATERIAL STORAGE AND CONTROL

8.1 POLICY

All materials and supplies in storage will have the necessary protection to preclude deterioration, corrosion, or damage during storage life and will carry identification sufficiently clear to ensure that only those materials specified by process instructions will be withdrawn from material storage and issued for processing.

8.2 RESPONSIBILITY

Only authorized personnel will have access to, and the responsibility for, control and issue of materials or supplies. Materials and supplies will be stored to allow for ready identification. Care will be taken to preclude mixing of rejected material and supplies with those that are qualified for issue.

SECTION 9.0
CONTROL OF PROCESS

9.1 STANDARD PRACTICES

Standard practices applicable to services provided by the Richmond laboratory are contained in documented procedures and this Q.A. Program Manual. Every effort is made to fulfill the requirements of the following laws, rules, guidance(s), and directives as may be applicable to the operational practices within the laboratory.

9.1.1 Federal and State rules and regulations.

9.1.2 Consensus standards related to the services performed (e.g., American National Standards Institute).

9.1.3 Regulatory Guides published by the Nuclear Regulatory Commission, Department of Energy, or the Environmental Protection Agency.

9.1.4 Specific contractual agreements with clients.

9.1.5 Where conflict occurs among the above four items, or other appropriate authority, the client will be notified and requested to specify the policy to be followed.

9.2 DOCUMENTED PROCEDURES

Routine technical procedures are documented. The laboratory has developed, promulgated, and implemented procedures for the operations performed in the laboratory. Each procedure includes quality control features unique to that process. Additionally, the following general procedures have been developed:

9.2.1 Quality Assurance Procedures

9.2.2 Radiation Safety Manual and Procedures

9.2.3 Health & Safety Manual and Procedures

9.2.4 Chemical Hygiene Plan

9.2.5 Environmental Compliance Procedures

9.2.6 Client Services Procedures

9.2.7 Sample Control Procedures

9.2.8 Calculations Procedures

9.2.9 Facility Maintenance Procedures

9.3 RESPONSIBILITY

The Operations Manager, or designated representative, determines which instructions or procedures require quantitative or qualitative acceptance criteria and specifies the appropriate criteria on special contracts or projects.

9.4 WORK POLICY

All work to be performed by the Richmond Laboratory on client samples is authorized by the client and controlled through a Laboratory Information Management System (LIMS) work order process, or other document deemed necessary by the Program Manager, which incorporates the client's requirements. Field sampling operations are not performed by laboratory personnel.

9.4.1 The work order specifies those analyses necessary to assure compliance with contractual obligations.

9.4.2 The Program Manager, or designated individual, is responsible for notifying the Q.A. Manager and performing laboratory departments, through the appropriate supervisor, of all contract requirements including reporting format and quality control criteria. This may be done by reference to other documents (e.g., Purchase Order, statement of work, technical specifications, etc.) that delineates the contract requirements.

9.4.3 The Program Manager, Operations Manager, or designee, will ensure planning, scheduling, and resources are considered when contracting for or accepting work.

9.4.4 When subcontracting analytical services, the Program Manager, or designated individual, will assure that *the requirements for subcontractor laboratories, as specified in Section 6.4 of this manual, are met and* that:

- The client is notified in writing of the intention to subcontract any portion of the testing to another party.

SECTION 10.0
PREVENTIVE MAINTENANCE

10.1 POLICY

Preventive maintenance is performed as required on instrumentation and equipment to prevent down time and to ensure reliable performance. The laboratory maintains instrument redundancy which precludes the requirement for a repair and maintenance capability for instrumentation. Maintenance and/or repair of equipment is performed by the equipment manufacturer or authorized representative under contract or purchase order.

10.2 MAINTENANCE

Preventive maintenance procedures will be developed for use where instructions are not provided in the manufacturer supplied operator's manual. As applicable, each department will maintain a major equipment and measurement standards list. A record of instrument maintenance, calibration, and repair, if applicable, will also be maintained. The supervisors and operating personnel are responsible for complying with the department maintenance schedule.

10.3 SPARE PARTS

Supervisors will ensure that an adequate inventory of spare parts and consumables is requisitioned and maintained for instrumentation in their area in order to prevent down time or compromised operating conditions.

10.4 FACILITIES MAINTENANCE

Procedures have been developed for management, operation, and maintenance of the facility to include systems maintenance and repair and building security.

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SECTION 11.0
CONTROL OF MEASUREMENT AND TEST EQUIPMENT

11.1 MEASUREMENT AND TEST EQUIPMENT CALIBRATION POLICY

This section establishes the controls and calibration requirements for all analytical and nuclear measurement equipment. An equipment list will be maintained indicating calibration status.

11.1.1 All equipment, whose operation and function directly affect the quality of service, will be inspected/calibrated at established intervals. As applicable, equipment will be suitably identified to reflect calibration status. If an instrument is determined to be out-of-tolerance, it will be segregated, or otherwise clearly identified as inoperable. Records of each calibration will be kept in appropriate logbooks or files. Instruments whose calibrations are performed during method operations are calibrated and controlled in accordance with the method requirements. Run logs will be maintained for this category of instrumentation.

11.1.2 The equipment used to determine the quality characteristics and accuracy of instruments will be checked and verified either internally (dependent upon capability), or by qualified calibration services.

11.1.3 Frequency of inspection/calibration will be based on use of the equipment or instrument, environmental conditions in which it is used, its inherent stability, manufacturer's recommendation, and the wear or deterioration resulting from its use.

11.1.4 Certified standards are used for all primary calibrations. National Institute of Standards and Technology (NIST) or NIST traceable, Environmental Protection Agency (EPA), New Brunswick Laboratory (NBL), or Department of Energy (DOE) standards are used, when available, for the primary calibrations or verification of primary calibrations.

11.1.5 All preparations of standard solutions are recorded in a standards preparation logbook or file. Identities of standards are such that a secondary standard or dilution can be traced, through subsequent actions, back to the initial certification.

11.1.6 Quality control check standards are used to record instrument sensitivity and linearity and to verify proper response. Methods and calibration entries are dated, initialed, and documented by the analyst.

11.1.7 Measuring and test equipment are tagged as to calibration or operating status for periodic processes performed on a scheduled interval of greater than one month. For processes performed more frequently, separate documentation will be available for verification of operational status. Instruments that are too small to be tagged or are subject to a wide variety of calibrations shall have separate documentation of status available.

11.2 RESPONSIBILITY

Testing and/or calibration of equipment and instruments will be performed under the direction of the supervisor, the department manager, or the operations manager and performed under suitable environmental conditions.

11.3 PROCEDURES

Tests and calibrations will be performed in accordance with written procedures which contain provisions for ensuring that all prerequisites for the given test have been met, including appropriate equipment to be used.

11.4 CERTIFICATION AND CERTIFICATES OF CALIBRATION

11.4.1 To the extent possible, calibration will be traceable to NIST. Records of traceability will be maintained along with records of routine calibrations of each instrument or measurement system. Where no NIST traceability exists, the basis used for calibration will be documented.

11.4.2 Equipment records will be maintained to indicate past and current status, and to provide reproducibility and traceability of results.

11.5 RADIOACTIVE SOURCE CALIBRATION

Radioactive sources used as calibration standards will be periodically calibrated and controlled. Current calibration certificates will be kept on file.

11.6 CALIBRATION RECORDS

Supervisors will ensure that calibration data for instruments and radioactive sources is recorded in the instrument logbook, on data work sheets, on computer files and/or control charts. Supervisors will also ensure that field/portable survey instruments are identified with the individual calibration labels. When required, new calibration charts will be prepared when there is measurable change in calibration effect on instruments that have been calibrated. If an instrument is determined to be out of tolerance, it will be segregated or otherwise clearly tagged as inoperable and not used until repaired.

11.7 REPORTS GENERATED FROM USE OF A DEFICIENT INSTRUMENT

If a major deficiency in an instrument or device is detected during periodic calibration procedures, the technician will immediately notify his/her supervisor who will notify the Operations Manager, and the Q.A. Manager. A conference will immediately be scheduled to investigate and decide corrective actions to be taken for past data and reports resulting from the use of the deficient instrument or device. A record of corrective actions will be maintained.

11.8 PERFORMANCE CHECKS OF RADIATION SCREENING INSTRUMENTS

Performance checks will be made to ensure the continuing capability of radiation screening instruments. Procedures will include efficiency checks and background determinations. The procedure and frequency of each check is optimized for each detector system to provide assurance of the detector's performance. Documentation of the checks and the results are kept for all operations.

SECTION 12.0

DATA REDUCTION, VERIFICATION, AND REPORTING

12.1 USE OF COMPUTER HARDWARE AND SOFTWARE

Computer programs used in the production or support of client data are either purchased, or developed using approved development methodology. Such programs are independently validated, verified, and documented. Changes are controlled to assess the potential impact of the change on the performance of the program.

12.2 DATA REDUCTION AND VERIFICATION

12.2.1 Results of analyses are generated by computer and are reviewed initially by the Radiometrics staff. The Program Manager, Operations Manager, or designated individual, performs the final review and approves the data.

12.2.2 Calculation methods, transcriptions, and data flow, plus times and locations of the various tiers of review are detailed in the specific procedure manual.

12.3 REPORTING

The Program Manager or designated individual is responsible for providing the client with the required analytical results. Reports to clients will be reviewed for accuracy and completeness and, where required, analytical methods and minimum/method detection limits (MDL) will be reported. Laboratory reports of analyses will be signed by an authorized individual who, along with the person who signed the data sheets, can attest to the fact that the data was generated in accordance with established procedures.

SECTION 13.0
DOCUMENT CONTROL

13.1 POLICY

The primary formal communication methods within the Richmond laboratory departments are documents that inform or direct activities affecting purchasing, sample analyses and reporting, instrument calibration and/or testing, proper handling of wastes, and Health and Safety. These documents are controlled by the Q.A. Program Manual, Operating Procedure Manuals, other documented procedures, or by interoffice memoranda. Drawings and specifications are not controlled as separate documents but are included in controlled procedures where applicable.

13.2 RESPONSIBILITY

13.2.1 The Document Control Custodian is primarily responsible for maintaining files of all controlled documents and will:

13.2.1.1 Ensure all holders of controlled documents receive copies of revisions to the documents.

13.2.1.2 Maintain files of controlled document distribution indicating document title, number, revision number, assigned date, and the name of the individual to whom the document is assigned.

13.2.1.3 Forward revisions of controlled documents to assigned individuals. An acknowledgment form will accompany each document revision for verification of receipt and to provide disposition instructions for the superseded pages.

13.2.2 Uncontrolled copies of controlled documents will be distributed only if marked "Uncontrolled."

13.2.3 Superseded and/or obsolete documents are isolated from use or destroyed.

13.2.4 Supervisors are responsible for revisions or changes to operating procedures for their area of responsibility.

13.2.5 The Q.A. Manager will be advised of any changes in procedures required to satisfy specifications of the client.

13.2.6 Clients will be queried for disposition instructions for their related documentation if the laboratory transfers ownership, is decommissioned, or goes out of business.

SECTION 14.0

INTERNAL QUALITY CONTROL

14.1 LABORATORY ANALYTICAL SERVICES

Precautions are taken in the chemistry laboratories to avoid cross-contamination of samples and to ensure the reporting of accurate results. Quality control samples are analyzed along with routine samples to indicate when results may be in error due to improper operation or calibration of equipment, inadequate training of personnel, a deficiency in the procedure, or cross-contamination from other samples. The Q.C. Coordinator will have oversight of PE analysis.

14.1.1 Laboratory Precision - Laboratory management personnel are responsible to ensure that analytical results are reproduced internally within acceptable limits.

14.1.2 Precision and Accuracy - Replicate standards and/or samples are used to estimate the precision of each analytical test procedure for a known matrix. Data control limits are established to satisfy the requirements of specific measurement projects based on prior knowledge of the measurement system and method validation studies. Certified standards and/or spiked samples are used to estimate chemical recovery and accuracy for these procedures for known matrices.

14.1.3 Calibration and Performance Checks of Nuclear Measurement Systems - Reference standards are used for calibrating nuclear measurement systems. In addition to calibration of all instrumentation, routine monitoring is performed to ensure the continuing integrity of the instrument performance. The monitoring parameters performed include efficiency checks, background determinations, and energy calibrations. The procedure and frequency of each check is optimized for each detector system to provide assurance of the detector's performance. Documentation of the checks and the results are kept for all systems. The supervisor is responsible for these calibration and performance checks.

14.1.4 Duplicate Analysis - Duplicate aliquots of randomly selected samples will be processed on a routine basis. The analyst will always process samples in accordance with approved operating procedures. The evaluation of the duplicate analysis will be based on examination of the difference between the duplicates. A statistical analysis of the data may be performed when a cursory evaluation indicates problems with the results. If the two results agree with the three standard deviation limits, more detailed evaluation will generally not be necessary. Results of duplicate analyses will be included in the monthly Q.C./Q.A. report.

14.1.5 Detection and Elimination of Bias - Where possible, calibration will be with standards that are traceable to NIST. However, traceability to NIST is not always possible and reliance on other suppliers may be necessary (e.g., International Atomic Energy Agency, U.S. Department of Energy, U.S. Environmental Protection Agency, or commercial suppliers such as Analytics, Amersham Biosciences, AEA Technology, etc.). Standards in the appropriate geometry or form will be used to determine efficiency of instruments on a periodic basis. In the calibration process, the ideal standard will be a known quantity of the radionuclide to be measured, prepared in exactly the same geometry as the samples and counted under the same conditions. In this way, factors such as self-absorption, back-scattering, sample geometry, and detector efficiency will be accounted for empirically.

14.1.5.1 Spiked Samples - A known quantity of calibrated radioactive standard solution will be added to an aliquot of the sample or to a "blank" sample for replicate analysis. When the entire analytical system is operating properly, the laboratory record will demonstrate the accuracy and precision of the data. Divergent data from the spiked sample will point out problem areas. If the data is consistently higher or lower than the known value, bias in the analytical procedure is indicated. This may require a search for personnel errors, re-standardization of carriers or tracers, and/or recalibration of counting equipment.

14.1.6 Background Determination - The type of equipment and environmental factors contribute to variation in the counting rate of instrument background. The background of each system instrument will be determined and recorded with sufficient frequency to provide a firm statistical basis for that measurement and also to ensure response to potential instrument problems or other artifacts such as controlled contamination.

14.1.6.1 These background determinations will include use of the items that most closely duplicate the analytical configuration in type, geometry, and with any associated fixtures. In some cases, true blanks are not available, but the closest practicable analog is used.

14.1.6.2 Some systems are sufficiently stable to require no change in backgrounds used for data reduction (e.g., uranium daughter gamma-rays found in gamma spectra due to adjacent building materials and earth). In this case, backgrounds will be compared to historical data to insure sufficient stability. Other systems experience enough variability to require computed backgrounds based upon running averages.

14.1.6.3 Background data will be recorded in the logbook or computer file for that specific instrument along with calibration data and instrument maintenance records.

14.1.7 Blanks - Blank samples are routinely analyzed to verify control of contamination and process. Results of processed blanks will be included in the monthly Q.C./Q.A. report.

14.1.8 Collaborative Testing - The Richmond Laboratory participates in collaborative testing or interlaboratory comparison programs. Natural or synthetic samples prepared to contain known concentrations of certain radionuclides are sent to participating laboratories by an independent referee group such as the Radiological and Environmental Sciences Laboratory, DOE, Idaho Falls, Idaho (MAPEP) and by a NELAC approved provider or by client(s).

These programs enable Richmond Laboratory personnel to document the precision and accuracy of radioactivity measurements, identify instrumental and procedural problems, and compare performance with other laboratories.

14.2 QUALITY CONTROL AND DATA REPORTS

14.2.1 Quality Control Reports

Quality control results will be summarized monthly with distribution to management and others upon request.

14.2.2 Data Reports

Routine performance requires documentation of all pertinent information with the basic documents dated and initialed or signed. Required documentation will be the initial work order, Chain-of-Custody (CoC), or document, that records all pertinent information such as the identity of the sample and analyses to be performed. Technical analysis notes, logbooks, and work sheets, utilized during the analytical procedure are other major documents that include all raw data and other information used in performing the analysis. The report of analysis will be the final report of the data to the client and is issued in accordance with the laboratory's procedure for review and processing.

14.3 DATA VERIFICATION

Routine performance requires inclusion of all pertinent information with basic documents dated and initialed or signed. The work order has recorded such information as the identity of the samples and analyses to be performed. All raw data and other information used in performing the analyses is documented.

14.3.1 Electronic Deliverables Verification - Program managers, or designated individuals, are responsible for ensuring that electronic deliverables are complete and accurate.

14.4 SAMPLE CUSTODY

Samples are assigned a unique laboratory identification number, marked on a label which is applied directly to the container and which identifies the work order set number and the laboratory sample number. Sample control personnel are designated sample custodians for strict (legally defensible) CoC samples. Locked buildings, rooms, refrigerators, freezers, and cabinets are available for storage of CoC samples. Sample custody forms or technician analysis notes are used for tracking all samples through the analytical process. Details for radiological survey of samples, sample security, sample disposal, etc. are outlined in approved Sample Control Procedures. Sample chemistry and nuclear counting requirements are assigned by the program manager, or designated individuals, after consultation with the operations manager, if necessary.

SECTION 15.0
AUDITS

15.1 POLICY

The Richmond laboratory has established a comprehensive system of planned and documented audits to verify compliance with all aspects of the Q.A. Program. An audit is defined as a documented activity performed in accordance with written procedures or checklists to verify, by examination and evaluation of objective evidence, that applicable elements of the Q.A. Program have been developed and effectively implemented in accordance with specific requirements. Audits will be performed by persons not having direct responsibility for the areas being audited.

15.1.1 Client Access to the Richmond Laboratory Facilities and Personnel - The client is frequently responsible for auditing the Richmond Laboratory's performance relative to contractual requirements. The exact nature of this responsibility is relative to the nature of the regulatory or licensing requirements, the significance of the services, and the technical expertise available or inherent within the client's organization. The need for, and frequency of, client audits is dependent upon the above factors. A client may authorize an independent agency to perform an audit on his behalf. When possible, the facilities, equipment, and records (proprietary information excluded) of the Richmond laboratory will be made available for client inspection along with the necessary personnel to permit verification of quality characteristics.

15.1.1.1 The Q.A. Manager will coordinate and participate in audits conducted by the client or the client's representative.

15.1.2 Internal Audits - The Q.A. Manager will schedule and ensure audits the laboratory operations are conducted to verify compliance with established procedures and requirements set forth in the Q.A. Program Manual. Use of a check list will insure items in compliance are noted as well as any requirements for improvement.

15.1.3 External Audits - External audits of organizations providing services to the Richmond laboratory are scheduled at a frequency commensurate with the status and importance of the activity.

15.2 RESPONSIBILITY

Audits will be directed by the Q.A. Manager with assistance from designated personnel or the Operations Manager.

15.2.1 The Q.A. Manager will be responsible for an independent quality assurance audit of each department.

15.2.2 The Q.A. Manager will be responsible for assuring that audits are performed by knowledgeable professionals.

15.2.3 An independent qualified auditor will audit areas of responsibility assigned to the Q.A. Manager.

15.2.4 The individual assigned the responsibility of conducting an audit will be certified to ASME NQA-1 requirements.

15.3 DOCUMENTATION

Audit results will be documented by the Q.A. Manager.

15.3.1 The Laboratory Manager and the responsible Manager or Supervisor will be provided a copy of the audit report.

15.3.2 Recipients will review the audit report to determine responsibility and any corrective actions required.

15.4 DEFICIENT AREAS

15.4.1 The responsible Manager will ensure correction of the identified deficiencies.

15.4.2 The Q.A. Manager will verify that action is taken to correct any deficiency and will take follow-up action to ensure that corrections have been completed.

15.4.3 The Q.A. Manager will ensure close out, with documentation, of the audit after corrective actions have been completed.

15.4.4 For uncorrected or unresolved deficiencies and after due diligence, the Q.A. Manager will petition the Laboratory Manager to impose his authority for resolution of the deficiencies.

15.5 FREQUENCY OF AUDITS

The Q.A. Manager will ensure internal audits are conducted on an annual basis. Additional selective audits will be conducted when one or more of the following conditions exists:

15.5.1 When significant changes are made in functional areas of the Q.A. Program, including significant reorganization or procedure revisions.

15.5.2 When assessment of the Program's effectiveness is considered necessary.

SECTION 16.0
QUALITY ASSURANCE AND INSPECTION RECORDS

16.1 POLICY

Records that provide objective evidence of the quality of work and of associated activities conducted in all phases of project work are generated and maintained. These records include controlled logbooks, customer instructions, sample analyses data sheets, the results of reviews, inspections, tests, audits, corrective actions, reports, and training records. Also included are related data such as personnel qualifications, procedures, and equipment records.

16.2 RESPONSIBILITY

Responsibility for initiation, completeness, and reliability of Q.A. records is vested in the appropriate supervisor with periodic verification checks by the Q.A. Manager. All Richmond laboratory personnel performing processes or services for which controlling documentation is an associated part of the work being performed will assist in the efforts.

16.3 RECORDS

16.3.1 Inspection and test records will, as a minimum, identify the inspector or data recorder, the type of observation, the results, the action taken in connection with any deficiencies noted, and the date of the inspection or test.

16.3.2 All required records will be legible and of a quality that can be copied. Records shall be completed using reproducible ink. Errors or incorrect entries, will be lined through with a single line, dated, and initialed by the recorder.

16.3.3 Correspondence from clients may be made available for inspection at the discretion of client representatives and authorization from the originating organization.

16.3.4 Q.A. records will be identified and controlled by customer number and/or client identification as applicable.

16.4 STORAGE OF RECORDS

Quality assurance records will be firmly attached in binders, or placed in folders or envelopes, and, if applicable, cross referenced by client identification and stored in a secure area.

16.4.1 Q.A. records will be properly stored and may be made available to the client upon request.

16.4.2 Records will be maintained in a secured and protective storage area.

16.4.3 Records will be identified so as to be retrievable at a later date.

16.4.4 CoC records are included with the sample set records.

16.4.5 Specific arrangements will be made by the client for longer retention or duplication of records.

16.4.6 The Q.A. Manager will be responsible for governing access to, and control of these records.

16.4.7 Analytical reports and source calibration data will be retained for a minimum of five years after results are reported to the client.

16.4.8 Procurement records will be retained for a minimum of five years or as required by the contract.

SECTION 17.0
CORRECTIVE ACTION

17.1 POLICY

The Richmond laboratory policy is to ensure continuous acceptable quality levels for services provided. Conditions adverse to quality will be identified and corrected as soon as practical.

17.2 CORRECTIONS

17.2.1 CORRECTIVE ACTION REQUEST (CAR)

In the case of a significant condition adverse to quality, the cause of the condition shall be determined and corrective action taken to preclude recurrence. The identification, cause, and corrective action shall be documented and reported to appropriate levels of management. Follow-up action shall be taken to verify implementation of this corrective action. The Corrective Action Request (CAR) Form shall be used to document this condition. Typically the Q.A. Manager/Q.C. Coordinator will initiate investigation and corrective action by issuing a Corrective Action Request (CAR) in any of the following situations:

17.2.1.1 When an audit reveals circumstances that will adversely affect quality (Audit Finding) as determined by the Q.A. Manager.

17.2.1.2 When any results of an inter-comparison study are out of control, or for non-participation.

17.2.1.3 When procedural or technical problems arise and the Q.A. Manager or Q.C. Coordinator determine that they will significantly affect quality.

17.2.2 NON-CONFORMANCE REPORT (NCR)

A non-conformance is a deficiency in a characteristic, procedure, or documentation that renders the quality of an item unacceptable, however, is not considered to be a significant condition that would require an investigation by use of a CAR. In the laboratory non-conformances can include physical defects, incorrect or inadequate documentation, and deviations from an established protocol, plan, or documented technical requirement. This condition is documented using a Non-Conformance Report (NCR) Form.

17.3 RESPONSIBILITY

All laboratory personnel are responsible to communicate any evidence of unacceptable quality performance to their supervisor, the responsible manager, and/or the Q.A. Manager.

17.3.1 The responsible manager will ensure investigation of a condition adverse to quality, determine assignable cause, and provide recommendation(s) for corrective action.

17.3.2 The responsible manager will ensure action is initiated to correct the assignable cause of the adverse condition and to determine and initiate the specific corrective action(s) necessary to preclude recurrence.

17.3.3 The Q.A. Manager/Q.C. Coordinator will review CARs, NCRs, and routine Q.C. reports for evidence of unacceptable quality.

17.3.4 Copies of the completed CARs and NCRs will be kept on file by the Q.A. staff.

17.4 CLIENT NOTIFICATION

The client will be notified when any Corrective Action is initiated due to evidence of unacceptable quality that is related to their contract. The client will be kept abreast of progress in correcting the adverse condition and will be provided a copy of the signed CAR and all related closure documentation when the CAR is closed.

17.5 RESUMPTION OF WORK

In the event that non-conforming work is identified, the Operations Manager will confer with the Technical Director, the Program Manager, and the applicable supervisor to evaluate the significance of the non-conformance, the corrective action(s) to be taken, and client notification requirements prior to authorizing resumption of that portion of the work process.

SECTION 18.0
QUALITY ASSURANCE REPORTS TO MANAGEMENT

18.1 POLICY

The policy at the Richmond laboratory is to keep management apprised of all quality assurance problems, actions taken to correct them, and any actions taken to prevent recurrence.

18.2 QUALITY ASSURANCE REPORTS

18.2.1 The Q.A. Manager will provide the Laboratory Manager with a monthly report detailing the quality related activities and performance summaries for the laboratory.

18.2.2 Special reports to management *will* be provided whenever results of inter-comparison studies or tests are received and whenever CARs are initiated.

18.2.3 The Q.A. Manager will also report all general or system audit results, problems, corrective actions, and replies.

Eberline Services' Corporate Positions

Position	***Employee***
President	*Dr. Wm. Shelton Clark*
Human Resources Manager	*Lori Jordan*
Finance Manager	*Carl Lloyd*
Laboratory Manager, Oak Ridge, TN Lab	*Mike McDougall*
Laboratory Manager, Albuquerque, NM Lab	*Karen Schoendaller*
Laboratory Manager, Richmond, CA Lab	*Rodney Melgard*

Richmond, CA Laboratory Positions

Position	***Employee***
Laboratory Director	*Rodney Melgard*
Laboratory Manager	*Rodney Melgard*
Facilities Support Superintendent	*Roger J. Mitchell*
Technical Director	*Marvin E. Clague*
Operations Manager	*Michael W. Thorn*
Program Manager	*Melissa C. Mannion*
Supervisor, Sample Programs	*Alex B. Kelenson*
Supervisor, Chemistry Programs	*Teresita S. Cruz*
Quality Assurance Manager	*Katsumi Yamamoto*
Quality Control Coordinator	*Katsumi Yamamoto*
Environmental Compliance Officer	*Fredelino F. Sarao*
Health and Safety Officer	*Fredelino F. Sarao*
Radiation Safety Officer	*Melissa C. Mannion*
Document Control Custodian	*Janine R. Gutierrez*
Information Technology Specialist	*Roc L. Smith*
Purchasing Agent	*Roger J. Mitchell*

TRUESDAIL LABORATORIES, INC.
INDEPENDENT TESTING, FORENSIC SCIENCE, AND ENVIRONMENTAL ANALYSES

Established 1931

14201 FRANKLIN AVENUE
TUSTIN, CALIFORNIA 92780-7008
(714) 730-6239 · FAX (714) 730-6462
www.truesdail.com

QUALITY ASSURANCE AND QUALITY CONTROL MANUAL FOR ENVIRONMENTAL SAMPLE ANALYSIS

STANDARD OPERATING PRACTICE

REVISION 14, JUNE 2007

Dr. John C. Hill
President

Dr. Norman E. Hester
Technical Director

Dr. Pat Iyer, Manager
Quality Assurance/Quality Control

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ANNUAL REVIEW OF Q.A./Q.C. MANUAL

Date	Reviewer	Revisions Made Yes	No
4/96	Dr. Norman Hester	☒	☐
3/97	Dr. Norman Hester	☐	☒
3/98	Dr. Norman Hester	☐	☒
5/99	Dr. Norman Hester	☒	☐
4/00	Dr. Norman Hester	☒	☐
10/01	Dr. Norman Hester	☒	☐
3/02	Dr. Norman Hester	☒	☐
2/03	Dr. Pat Iyer	☒	☐
4/04	Dr. Pat Iyer	☐	☒
7/05	Dr. Pat Iyer	☒	☐
9/06	Dr. Pat Iyer	☒	☐
6/07	Dr. Norman Hester	☒	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
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TABLE OF CONTENTS

SECTION 1 – INTRODUCTION

Truesdail Laboratories Inc., has made an ongoing commitment to quality. Throughout our 70 year history, we have always provided the best analytical services. The purpose of this Manual is to describe our Quality Assurance System, specifically as it applies to environmental analyses. It is derived from a combination of a quality assurance project plan originally developed for the U.S. Army Corps of Engineers under regulation ER 1110-1-263, and QAMS-005/80 from the Office of Monitoring Systems and Quality Assurance of the U.S. Environmental Protection Agency and from our general Quality Assurance Manual, which was developed in accordance with ASPR 7-103.SQ and applicable portions of MIL-I-45208A.

Truesdail Laboratories' goal is to maintain both the functions of Quality Assurance and Quality Control in accordance with ISO-17025 and other criteria as set forth by client contracts and/or purchase orders.

The function of Quality Assurance is to provide an operating system under which Truesdail Laboratories can perform services and attest to the reliability of these services. This includes making precision measurements in analyzing, inspecting and testing solutions, materials, products, systems, and/or performing research.

The function of Quality Control is to control the quality of our services so that they meet the needs of all users. This includes methods, samples, control charts and evaluation of data so that the analyst and management can feel confident in their data.

The Quality Assurance and Quality Control Managers of the Laboratory shall establish and maintain the quality systems and all related forms and procedures.

It is the responsibility of the department heads to monitor their department to insure compliance with the instructions and procedures outlined by this manual and the Quality Department, and to insure that all equipment calibration is current.

Management will meet with its Quality Assurance staff and department heads on a regular basis to determine if the policies are implemented, evaluate problems, and make plans for the future as new testing and/or Quality Assurance and Control requirements become known. Findings from management reviews and actions that arise from them shall be recorded. Management shall ensure that the actions are carried out.

It is the responsibility of the Technical Director to oversee the Laboratories and mediate disputes between quality and performance of services.

This manual shall be reviewed annually by the Technical Director or his designee.

SECTION 2 – ORGANIZATION, STRUCTURE AND PERSONNEL

2.1 DESCRIPTION OF THE CORPORATION

Truesdail Laboratories, Inc. was founded in 1931 by Dr. Roger W. Truesdail as an independent consulting, testing, and research organization. Its activities in the fields of Chemistry, Microbiology, Engineering and Forensic Science are designed to benefit its clients by satisfying the clients' needs for professional technical talent and specialized laboratory facilities on an "on call" basis.

The Laboratories and offices occupy 40,000 square feet of floor space. The organization is staffed by chemists, microbiologists, engineers, metallurgists, and support personnel who are thoroughly experienced in the application of their special disciplines to the consulting, testing, and research requirements of our clients.

Professional engineer registration is for California. Memberships are maintained in professional, scientific, and technical societies and organizations including American Society for Testing and Materials (ASTM), and the American Chemical Society (ACS). A science reference library is maintained to provide readily available technical information. This includes books, scientific and technical periodicals, and in-house files of technical data developed in the course of thousands of unique investigations.

An accumulation of approvals from clients and regulatory agencies and a superior evaluation of performance standards have made Truesdail one of the nation's most competent and diversified laboratories.

Truesdail Laboratories, Inc. began as a one-man operation offering consultation, analysis and testing in the field of nutrition and food chemistry. There are now more than 80 employees engaged in a broad scope of activities.

2.2 LOCATION

Truesdail Laboratories, Inc.
14201 Franklin Avenue
Tustin, California 92780

(714) 730-6239, Fax (714) 730-6462, Web site: www.truesdail.com

Facility ~ 40,000 sq.ft.

2.3 PRIME FUNCTIONS

The Facility provides the space and laboratories for the professional staff members to conduct the analyses, tests, examinations and consultations in their fields of competence.

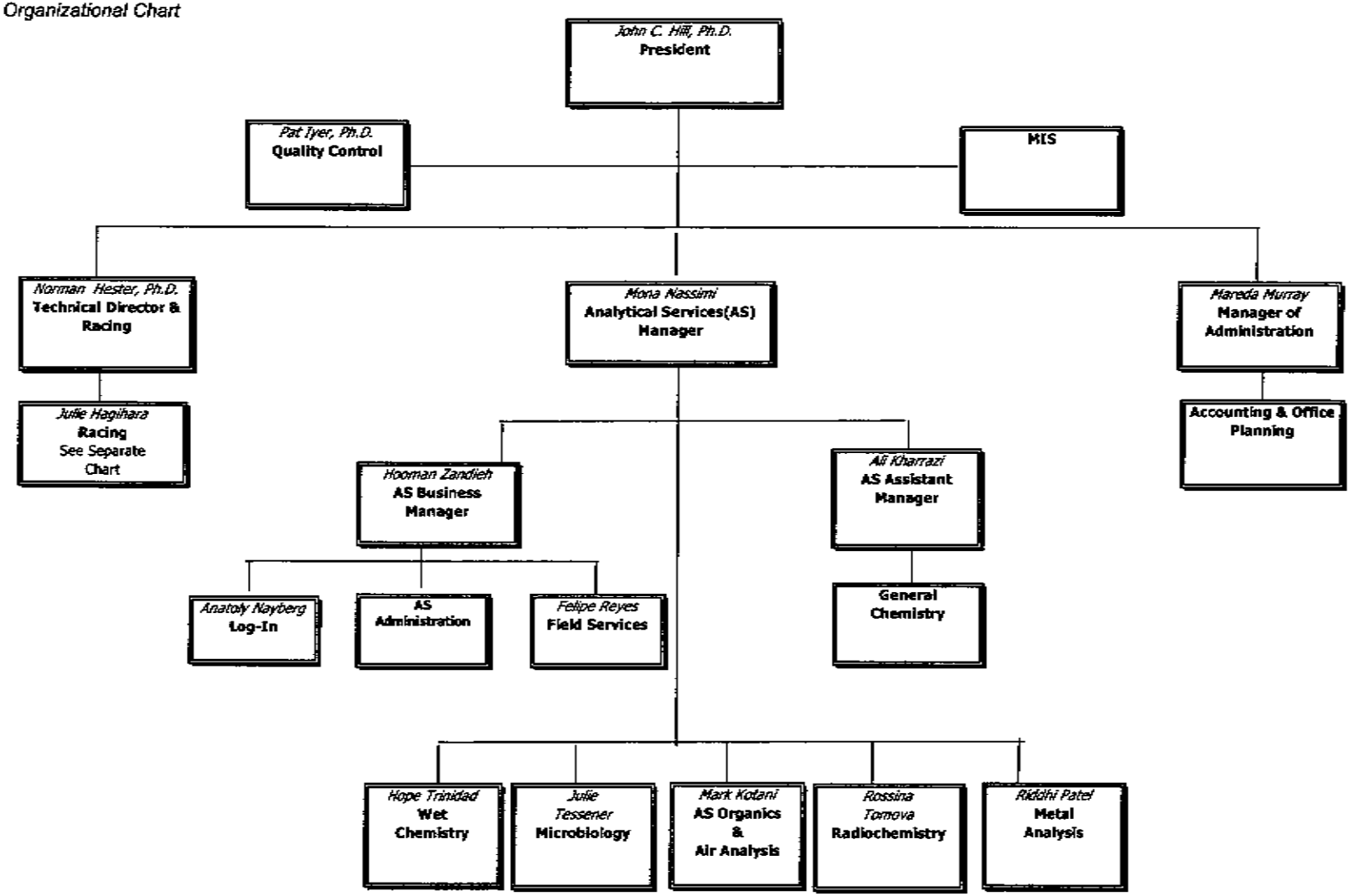
2.4 GEOGRAPHICAL AREA SERVED

Truesdail staff members have been engaged in field assignments throughout the U.S.A. and foreign countries as far away as Japan and Italy. However, the major portion of our work is in the Southern California area.

2.5 DEPARTMENTS AND LABORATORIES

- Administration Group
  - Human Resources Department
  - Accounting Department
  - Word Processing Department
  - Purchasing Department
  - Marketing Department
- Quality Department
  - Quality Assurance
  - Quality Control
- Safety Department
- Analytical Services
  - Water and Waste
  - Instrumental Methods
    - GC/HPLC Laboratory
    - GC/MS Laboratory
    - Extraction Laboratory
  - General Chemistry
  - Microbiology
  - Air Analysis
  - Field Services
  - Mechanical Testing Department
- Racing Chemistry
  - Chromatography Laboratory
  - Immunoassay Laboratory
  - GC/MS Laboratory
- Forensics Department
- Facilities Department

Organizational Chart



2.7 FUNCTIONS OF THE DEPARTMENTS AND LABORATORIES

2.7.1 Human Resources Department

Personnel consultation, and orientation.

2.7.2 Accounting Department

Financial statements, analysis, budgeting, and taxes.

2.7.3 Word Processing

Report processing, proposals, and standard operating procedures.

2.7.4 Purchasing Department

Coordinates ordering and buying lab supplies.

2.7.5 Marketing Department

Customer service and promotional material design.

2.7.6 Forensics

Accident reconstruction, failure analysis, product evaluation, industrial hygiene, mechanical, electrical, metallurgical, and safety investigations.

2.7.7 Safety Department

Safety manual, safety audits, safety meetings, material safety data sheets (MSDS), coordination and disposal of laboratory hazardous waste.

2.7.8 Quality Department

2.7.8.1 Quality Assurance

Preparation and maintenance of quality assurance manual; host for auditors and surveys; quality audits; quality training; review of safety related orders; monitors equipment calibrations.

2.7.8.2 Quality Control

Quality Control maintains contacts with regulatory agencies regarding new methods including EPA, DOHS and NIST, new approvals and renewals of certification processes which involve performance evaluation samples and on site visits. Stays abreast of new method developments and obtains copies of new methods. Quality Control provides Q.C. samples for on-going and normal routine Q.C. within the lab, and buys outside standards "check samples". Quality Control provides blind analytical check samples within the lab if there is a problem with a particular method or process. Monitors training of new analysts and cross training for existing analysts. Provides Q.C. documentation to clients upon request including annual and quarterly Q.C. reports with results of current Q.C. samples, Q.C. charts, written report, and cover letters. Quality Control is responsible for temperature charts and checking that thermometers are calibrated. Coordinates and controls a Q.C. data base, and provides statistical analysis when required. Quality Control performs special assignments such as analysis of complicated data and preparation of proposals.

2.7.9 Racing Chemistry Department

Routine Drug Testing for Equine, canine and human samples. Drug screening for stimulants, depressants, and medications. Special and legal samples.

2.7.10 Water and Waste Laboratory

Analysis and certification of drinking water. Analysis of industrial and municipal effluents for organic and inorganic pollutants. Analysis of soils and solid wastes for hazards. Project Management. Sample Control.

2.7.11 Field Services Department

Pickup and delivery services. Sample collection, flow studies, industrial waste monitoring, NPDES monitoring. Building inspections (ACM). Flow Meter Calibration.

2.7.12 Microbiology Laboratory

Bacteriological examinations, fungus contamination studies, fungus and bacteria resistance. Product efficacy testing. Asbestos determinations. Particle counts. Food contamination studies. Microscopic evaluations.

2.7.13 Instrumental Methods Department

Organic chemical analysis with modern instrumentation. Gas Chromatography, Gas Chromatography/Mass Spectrometry, High Pressure Liquid Chromatography, and UV Spectrometry.

2.7.14 Air Analysis Laboratory

Source testing and process flows of stacks on boilers, dryers and reactors. Efficiency tests on scrubbers, incinerators, precipitators and absorbers.

2.7.15 General Chemistry Laboratory

Routine wet chemistry. Environmental exposure testing. Microanalytical chemistry. Penetrant qualifications. Lubricating oil and fuel analysis. Physical properties. Fourier transform infra-red (FTIR) spectrometry. Special investigations.

2.7.16 Mechanical Testing Department

Physical and chemical properties analysis for metals, wood, rubber, plastics and composites. Product safety and qualification testing for furniture, chairs, service equipment, ladders and other assemblies. Microphotography. Laboratory facilities for consultants and legal investigations.

2.7.17 Facilities Department

Maintenance and repair of building and equipment. Trouble-shoots instruments that are malfunctioning and coordinates service contracts.

2.8 PERSONNEL

The following personnel are directly involved in the process of ensuring the collection of valid data for environmental reports. The "List of Personnel" is maintained in Appendix A. This is non-mandatory information which will be updated upon review.

2.8.1 General Management

President – responsible for company direction, policies, and management protocols.

Controller – responsible for all accounting functions and office procedures. Reports to the President.

Technical Director – oversees all technical and laboratory activities. Reports to the President.

Manager of Analytical Services – responsible for direction of Environmental Services Group which includes the Water and Waste, Instrumental Methods, General Chemistry, Microbiology, Air Analysis, and Field Services Department. Reports to the President.

Chief Racing Chemist – responsible for direction of the Racing Chemistry Department which includes the Racing Laboratory. Reports to the Technical Director.

Chief Microbiologist – responsible for direction of the Microbiology Laboratory. Reports to the Manager of Analytical Services.

Department Manager – responsible for all personnel assigned to his/her department. Reports to the Manager of Analytical Services, except for department manager for racing chemistry, who reports to the Technical Director.

Project Manager – responsible for all jobs accepted or assigned to their area of expertise.

2.8.2 General Personnel

Registered Professional Engineer - Staff engineer responsible for conducting engineering and legal investigations involving special talents. Reports to the Technical Director.

Quality Assurance/Quality Control – Reviews quality related documents requiring the President's signature. Responsible for developing implementing and monitoring quality assurance and control activities, and ensuring conformance with department managers. Reports to the President.

Hazardous Waste Manager – Responsible for guidance in the labeling, storage, disposal, associated paperwork, regulations and permits regarding hazardous waste generated by the laboratories. Reports to the Technical Director and/or the President.

Assistant Manager – Responsible for the operation of his/her respective department and the responsibilities of the Department Manager/Supervisor in his/her absence. Reports to their Department Manager.

Senior Chemist, and Group Leader – responsible for leading and managing other less experienced persons in the best method to use on each assignment.

Test Engineer - responsible for conducting tests as assigned. Reports to the department Manager/Supervisor and/or Assistant Manager.

Chemist – responsible for conducting chemical analysis and tests as assigned. Reports to the department Manager/Supervisor and/or Assistant Manager.

Technician – responsible for applying his special skills to assist those responsible for the assignment. Reports to the department Manager/Supervisor and/or Assistant Manager.

2.9 JOB TRAINING PROGRAMS

Technical employee training is covered by SOP 5.11, rev. 10/98.

2.9.1 New Employee Training

2.9.1.1 Program Administration

New employee training programs are administered by the immediate supervisor of the activity in which the new employee is assigned.

2.9.1.2 Methods of Determining Job Competence

Supervisors will observe and check the work product for errors. Also "special" samples may be assigned to the new employee to check agreement of his data to a known value.

2.9.2 Job Training for Full-time Employees

2.9.2.1 Special Courses and Training Sessions

These will be utilized as required.

2.9.2.2 Quality System

All personnel connected with testing and calibration activities shall familiarize themselves with the quality documentation and implement the policies and procedures in their work.

2.9.2.3 Documentation

It is the responsibility of each employee to document his/her training in new methods and in using new equipment. This is to be done by taking notes and organizing them into a notebook, using a job training notebook, or maintaining them in his/her laboratory data record. The Department Manager shall maintain a file documenting analyst training and proficiency.

2.9.3 Quality Training Program

The Quality Department will meet with the department managers. They will review any quality issues, requirements or problems which the department managers are responsible for, and determine the need for additional training of personnel. They will review how the quality system is working and determine if changes are needed. The Quality Assurance Manager shall keep a log of these meetings and note any discussion pertaining to quality assurance.

2.9.4 Certification Program Training

Individual records of all employees specified in product certification must also be kept. This includes records for managers, and directors involved with the certification program.

2.10 PERSONNEL QUALIFICATION

2.10.1 General Management

Each member of the technical management team shall have a minimum of a bachelors degree in science or engineering with applicable professional license or certificates in one or more fields which he directs. He must demonstrate capability in applicable field. Each is a full time employee of the Laboratory.

2.10.2 Technical Director

The Technical Director shall have as a minimum a Ph.D. degree in the physical sciences with applicable professional license or certificates in one or more fields which he directs and five years or more experience in one or more fields which he directs. Must demonstrate capability in applicable field. Must be a full time employee. Affiliations with technical and professional societies pertinent to field shall be maintained.

2.10.3 Department Manager or Supervisor

A Department Manager or Supervisor shall have a bachelors degree or higher in the physical sciences or biological science, three years or more experience relevant to the technology supervised. They are fulltime employees with affiliations with technical and professional societies pertinent to field.

2.10.4 Scientific Staff

The staff member shall have a bachelors degree or higher pertinent to his field of work. Should be working towards or have achieved any applicable license or certificate. As a minimum, he should have on-the-job training by supervisor or predecessor and demonstrate capability in applicable fields.

2.10.5 Technicians

The Technician shall be qualified by education and/or experience to perform inspections, testing or analysis. Should be high school graduate with some college training. Should strive for any applicable certificates in their field. Should have sufficient on-the-job training and/or trade school. The Technician must demonstrate competence in assigned work.

SECTION 3 – ENVIRONMENTAL QUALITY ASSURANCE PROGRAM

3.1 QUALITY ASSURANCE OBJECTIVES

The laboratory shall determine, where feasible, the accuracy and precision of all analyses performed.

Reporting Limits

Linear calibration ranges (or working calibration ranges) and method detection limits (MDLs) shall be established and statistically verified for each method as a part of the method validation process at least annually and whenever there is a change in methodology or instrumentation, linear calibration ranges and MDLs shall be reestablished and verified. For methods with stated MDLs, demonstration of ability to achieve such MDL is required.

A minimum of three calibration standards which bracket sample concentration and a blank should be used to construct a calibration curve.

Methods for analytical testing shall demonstrate a quantitation limit equal to or less than 20% of the lowest relevant action level or regulatory limit of interest.

3.1.1 Precision and Accuracy

The Quality Assurance objectives for precision, accuracy, and completeness are based on results from the analysis of quality control samples whose values are known. We use standard statistical methods (see Section 3.4) to describe the performance of each measurement system (in terms of accuracy and precision), and the result of each subsequent quality control sample can be used to determine whether the system is performing as it should. Examples of accuracy and precision information are given in Appendix E.

3.1.2 Completeness

Completeness is the percentage of measurements made which are determined to be valid measurements. We use completeness as a measure of how effective our quality assurance program has been, and our goal is to keep completeness as high as possible. Although it makes a nice goal, we do not always expect to achieve 100% completeness. Because all of our control limits are defined statistically, we know that some quality control sample results will be out of control. Some methods will fail to reach 100% completeness for procedural as well as statistical reasons. For methods which are automated, sample analysis proceeds unattended, and control limits are often assessed after field samples have been analyzed. Some wet chemistry methods do not permit analysts to stop after analysis of quality control samples before analyzing field samples, and these methods will also fall below 100% completeness from time to time.

3.1.3 Internal Quality Control Checks

The total proportion of samples analyzed to meet the requirements of internal quality assurance will be 10%. A blank, a spiked blank, and a duplicate spiked blank should be analyzed with each batch of 20 samples or less, or each matrix, or as needed to meet contractual requirements.

Quality assurance requirements sometimes state that field samples must be analyzed in duplicate. Prior to analysis, however, there is no guarantee that any given sample will contain a detectable amount of any parameter of interest. If a clean sample is chosen for duplicate analysis, we cannot monitor the precision of the method. It is more efficient for statistical purposes to spike laboratory blanks in duplicate, so that both the accuracy and precision of the method can be monitored while field samples are being analyzed.

Matrix effects on the method are monitored in different ways. For some methods, a portion of a field sample is spiked with a known amount of a parameter of interest, and the "recovery" of this spiked material is monitored, by comparison with the unspiked portion of the sample. For other methods, "surrogate" parameters may be added directly to all field samples. Surrogate parameters are chemically similar to environmental pollutants, but are not expected to be found in field samples. Again, the recovery of known amounts of surrogate parameters reflects matrix effects.

As part of the quality assurance program for each matrix for which it is accredited, the laboratory shall adhere to all stated QA/QC requirements as published in the method being used.

AIHA specific QA/QC requirements state accuracy and precision at a frequency at 5% per batch of samples. Wipe sampling should be conducted at least quarterly to determine surface levels of lead in the laboratory. Consult the method being used for specific QA/QC acceptance limit.

3.1.4 External Quality Control Checks

We participate in several programs which submit blind samples on a periodic schedule. Our performance in analyzing these samples is compared to other laboratories and to established true values for the parameters in the samples. A listing of various external programs is given in Section 8.

3.2 DEFINITION OF INTERNAL QUALITY CONTROL COMPONENTS

Definitions of the elements of the internal quality control system are given below. Note that some of the elements below are general in nature, while some are mainly applicable to organic or inorganic analysis.

3.2.1 System Blank

The system is run without a sample in the same manner as if a sample were present. It is used to verify that the background due to column or other equipment contamination is below detection limits.

3.2.2 Method/Reagent Blank

A sample of reagent water which is processed exactly as if it were an environmental sample. It is used to monitor the background due to reagents and labware used.

3.2.3 Calibration Blank

A volume of deionized distilled water acidified with HNO_3 and HCl and analyzed directly.

3.2.4 Calibration Standard

A sample prepared using a concentrated standard (certified as traceable to NBS and EPA standards by the manufacturer) which is carefully diluted as directed by the calibration section of the Standard Operating Procedures. These standards are used to quantitate the compound in environmental samples.

3.2.5 Instrument Check Standard

A multi-element standard of known concentrations prepared by the analyst to match the midpoint of the calibration standard series and used to monitor the performance of the instrument on a daily basis.

3.2.6 Quality Control Check Standards

Quality control check standards must be obtained from (1) a second source which is different from the source of the calibration standard or (2) the same source but with a different lot number compared to the lot number of the calibration standard. Results of analysis are compared with calibration standard results. If the relative percent difference is 25% or greater then the instrument must be recalibrated.

3.2.7 Spiked Duplicate

These are prepared by addition to two aliquots of media material (i.e. soil or water), known amounts of the compounds being assayed from a laboratory reagent stock, and analyzing these duplicate samples. The results from analysis of the untreated environmental sample and the spiked environmental sample are used to calculate percent recovery of the spike:

$$P = 100 (A-B)/T$$

Where:

P = percent recovery
A = measured value of the analyte concentration in the spiked sample
B = measured value of the analyte concentration in the untreated environmental sample
T = known amount of compound added expressed as final concentration in the sample

This assumes the volume of the spiked aliquot was not significantly increased during the spiking process. This is assured by using concentrated solutions of spiking compounds. Tolerance limits for acceptable percent recovery are described in Section 3.4.

The results from the analysis of the duplicated spiked aliquots are used to monitor the precision of the measurement system. Precision data are assessed using the equations in Section 3.4.1.

3.2.8 Interference Check Sample

A sample containing both parameters of interest and interfering compounds at known concentrations is used to verify background and inter-element correction factors.

3.2.9 Internal Standards

These are prepared by addition of a known amount of a compound (not expected to be present in the environmental sample) from a laboratory reagent stock. The internal standard is added just prior to analysis of the sample. The internal standard is used to monitor the operation and sensitivity of the analytical system and the effectiveness of the purge and trap apparatus.

3.2.10 Surrogate Compound

A surrogate compound is chemically similar to the analytes. Surrogates are prepared by addition of a known amount of a compound (not expected to be present in the environmental sample) from a laboratory reagent stock. The surrogate compound is added just prior to analysis of the sample (usually mixed with the internal standard). The surrogate compound is used to assess the accuracy and precision of the method. Typically the acceptable surrogate recovery range is 20%.

3.2.11 Control Chart

The basis for objective consideration of analysis results for a control sample is the control chart. Construction of such a chart assumes that the laboratory data approximate a normal distribution. A useful way to plot such data is to let the vertical scale (ordinate) represent the units of analytical results, and to enter the results along the horizontal axis (abscissa) in the order in which they were obtained. The mean and the limits of dispersion, expressed in terms of the standard deviation, are then calculated and plotted. (See Section 3.2.7 and 3.4 for detailed calculations.)

The upper and lower control limits (UCL, LCL) are set at +3 and -3 standard deviations from the mean, respectively, and the upper and lower warning limits (UWL, LWL) at +2 and -2 standard deviations. Results which fall outside the control limits signal an analysis which is out of control and indicate that analytical results for unknown samples obtained in the same run are suspect. See Section 7.2 for out of control procedures. While results which fall outside the warning limits do not require strong action, a response may be necessary when results exceed these limits on a regular basis.

An example of standard control charts along with the data used to generate them are given in Appendix E.

3.3 QUALITY PLANNING

Special Operational Procedures

Customer contracts or purchase orders, drawings and specifications are reviewed to identify and make timely provisions for special or unusual requirements.

3.4 PRECISION AND ACCURACY PROCEDURES

This section describes procedures used to assess precision, accuracy, and completeness of the measurement systems both by the means required by EPA Methods, and by the statistical methods used by Truesdail Laboratories as part of internal quality control procedures.

3.4.1 Precision

Precision will be determined using data from the analysis of spiked laboratory duplicates of media materials. EPA Methods base precision control limits on the standard deviation of spike recovery data, as described in Section 3.2.7. The limits for precision are taken from the relevant EPA method. Results which fall outside these limits are considered out of control and require appropriate action to be taken as described in Section 7. In addition, Truesdail Laboratories uses the results of duplicate analyses to monitor precision.

The Relative Percent Difference (RPD) between the analyses of the duplicate samples is calculated as follows:

$$RPD = \frac{(s-d)}{(s+d)/2} \times 100$$

where s = the first sample value

and d = the duplicate value

Duplicate analyses which return values above five times the method detection limit and an RPD greater than 20% are considered to be insufficiently precise and out of control procedures are initiated as described in Section 7. RPD values are plotted as RPD versus sample number.

3.4.2 Accuracy

For EPA Organic Methods, spike recovery data are used to determine the accuracy of the measurement system. After data for five spiked environmental samples are collected, average percent recovery, P, is calculated, along with the standard deviation, SD. P is compared with the established limits for accuracy, and SD is compared with the limits for precision. In addition, a control chart is maintained for spike recovery results. Limits are set for a range from P + 3SD to P – 3SD. Results which are outside these limits are out of control. See Section 7 for the appropriate action to be taken. For EPA Metals methods accuracy will be monitored using data from analysis of instrument check standards and a standard control chart as described in Section 3.2.11. A minimum of 20 determinations are needed for construction of the control chart. The mean is calculated and plotted on the graph. Standard deviation is calculated as follows:

$$SD = \sqrt{\frac{n\sum x^2 - (\sum x)^2}{n(n-1)}}$$

Warning limits are set at X + 2 SD and X - 2 SD. Control limits are set at X + 3 SD and X - 3 SD, and all four limits are plotted on the chart. Results of analysis of instrument check standards are plotted in sequence along the horizontal axis.

Failure of the results of analysis of the instrument check standards to be within + 25% of true value or within established control limits, indicates that referral should be made to the out of control actions listed in Section 7.

For calibration blank data a similar chart is constructed with the exception that control limits are placed at X + 2 SD. If the result of analysis of the calibration blank falls outside the control limits, the analysis is repeated twice and the average of all three determinations is plotted. If this result is still outside the control limits, the analysis is out of control; see Section 7 for out of control procedures.

3.5 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The quality assurance manager reports to upper management which include assessments of data accuracy, precision, and completeness derived from summaries of standard control charts. Corrective actions and maintenance reports are also to be reported. These reports help management focus attention on areas which are not performing up to expectations. Results of external quality control checks and internal audits will be included as they become available.

SECTION 4 – OPERATIONAL PROCEDURES

4.1 INITIAL JOB ORDER PROCEDURE

Job orders are initiated on the basis of:

Written requests received with samples (typically on a chain of custody form) by mail, e-mail, facsimile, or purchase order.

Purchase orders (P.O.) are preferable when accepting a job. The P.O.s, or a release to a blanket P.O., shall be kept with the Laboratory Record as outlined below. When an order is received without a P.O. number on it, the words "Verbal" are recorded in the slot for a P.O. number. Occasionally a client's P.O. is received after the samples arrive and the report and invoice are prepared. Late P.O.s are to be filed with the respective invoice and report paperwork.

Oral requests received either by telephone or personal contact.

Signed contracts with a schedule of tests to be performed.

Once a contract is signed, the original is kept in the "contracts" drawers in the accounting office and copies are distributed to the responsible departments.

Upon receipt at Truesdail of a sample, the job order is assigned a sequential number, labeled, and entered into Truesdail's computer system. (The sequential numbers are audited weekly to ensure all jobs are processed.) Sample testing associated with contracts can also be tracked by contract identification – the client's or Truesdail's – in the computer system under the "job" segment of Truesdail's accounting system.

From the data entered into the computer system, a green Laboratory Record is generated and any necessary yellow copies for intracompany testing. This Laboratory Record, with the respective paperwork including any P.O., and the sample are turned over to the project manager assigned to the job. The analysis of the sample is then scheduled on a "do" list.

4.2 SAMPLING PROCEDURES

Obtaining representative samples and maintaining their integrity are critical parts of any testing program. Analytical methods have been standardized, but the results of analysis are only as good as the sampling methods.

If requested by the client, Truesdail can provide trained staff to collect samples or the client can be advised of the best way to collect, contain and deliver the samples. When samples are collected on-site by our staff, the method used will be in accordance with the pertinent regulations or standards and will be so described in the workbook and report. This specifically includes (but is not limited to) the collection of water and sewage, stack emissions, ambient air, and working atmosphere (industrial hygiene) samples.

When a client chooses to collect their own samples, our staff can brief clients and provide written directions on proper methods of sample selection or collection. The majority of the samples analyzed are submitted by the client. We have no control over their quality and no knowledge of whether they are truly representative of the material in question.

Truesdail Laboratories can also provide clients with the appropriate sample containers. A Sampling Guide Form lists the container types, sizes, preservatives, container closures and maximum holding times for analytical parameters. The form is made available to clients to assist with their sampling programs. A copy of the Sampling Guide form is included in Appendix B.

4.2.1 Sample Custody

Truesdail Laboratories recommends that all environmental samples submitted for analysis be accompanied by a chain-of-custody form. The chain-of-custody form is used to document the name of the person collecting the samples, the date and time of collection for each sample, and a description of each sample and the analyses it requires. We will use chain-of-custody forms provided by our clients, or we can provide our own form. When samples are delivered to Truesdail Laboratories, the log-in clerk signs the chain-of-custody form, including the date and time, establishing the change in custody of the samples. A copy of Truesdail's chain-of-custody form is given in Appendix B.

Upon arrival at Truesdail Laboratories, the condition of the samples is noted, and they are logged into a standard log book. The client is immediately notified if any problems are found with the samples at log-in. A laboratory identification number is assigned, sample information is entered into our log-in database system, and aliquots of the sample are dispersed for analysis. Samples sent from one laboratory to another within Truesdail Laboratories are accompanied by a two part intra-company analytical request form, which functions as an intra-company chain-of-custody form. One copy is retained by the originating lab, one travels with the sample or aliquot, and becomes part of the file used to compile the report when analyses are completed. The Laboratory Supervisor assigns the job to a qualified technical staff member who will be responsible for performing the work through his/her own individual efforts and with the assistance of other staff members when necessary. The assigned technical staff member will collect and assemble all laboratory work sheets with data and calculations.

4.2.2 Sample Storage

Environmental sample storage is available at room temperature, at refrigerator temperature (4°C)), and frozen (-20°C). Samples are assigned to an appropriate storage area, depending on the nature of the analysis required. Each storage location has a unique identifying number, which is recorded on the Laboratory Record for that sample when the sample is stored. Refrigerators and freezers used for sample storage are used exclusively for sample storage. Standards are stored in separate refrigerators and freezers to avoid potential contamination of samples.

4.2.3 Sample Disposal

Samples and extracts are retained for three months after analysis and then disposed of appropriately. The results of analysis are used as a guide to determine whether the sample should be considered normal or hazardous waste. Longer periods of sample and extract storage can be arranged and, if requested, the client can be notified prior to disposal.

4.3 PROCEDURES, STANDARDS AND REGULATIONS PROCUREMENT

It is the responsibility of the Laboratory Managers/Supervisors to obtain and maintain the current edition of all official regulations, standard procedures and other documents and publications pertinent to their departments. This is accomplished by referring to the current index of a standard such as ASTM, or by placing a call to a document house, agency or the client to determine the latest revision date. The documents will be kept in the location designated by the department heads. Standards used in laboratory and field testing include:

- American Chemical Society (ACS)
- American Public Health Association (APHA)
- American Society for Testing and Materials (ASTM)
- Association of Official Analytical Chemists (AOAC)
- Bay Area Pollution Control District (BAPCD)
- California Department of Health Services (DOHS)
- Department of Defense (DOD)
- Environmental Protection Agency (EPA)
- Los Angeles County Sanitation District (LACSD)
- National Institute of Occupational Safety and Health (NIOSH)
- National Institute of Standards and Technology (NIST)
- Occupational Safety and Health Agency (OSHA)
- South Coast Air Quality Management District (SCAQMD)
- Truesdail Laboratories Inc. Standard Operating Procedure – Manual for Environmental Analysis
- United States Pharmacopoeia (USP)

4.4 CALIBRATION PROCEDURES AND FREQUENCY

When possible, all calibration standards are purchased from reliable vendors who can demonstrate traceability to NIST or EPA Standards. In cases where commercial standards of this quality are not available, we make our own standards using the highest grade reagents. Our analytical balances are calibrated against NIST traceable standards annually by an outside firm. We also have available NIST Class S weights for internal audits of the balances and for analyst use if a problem is encountered.

4.4.1 Environmental Analytical Instruments

Instruments are calibrated according to our Standard Operating Procedure (SOP) for the relevant method. Our SOPs for environmental methods are based on, and compliant with, EPA methods. Typically, after the instrument is demonstrated to be within specifications, a multi-point calibration curve is made and verified. Daily check standards, run prior to any sample analysis each day, are used to ensure the current calibration curve is still valid. When the results for the daily check standard show that the calibration curve is no longer valid, the corrective actions described in Section 7 will be applied. Some methods (especially those used in the EPA's Contract Laboratory Program) require a new calibration curve on a regular schedule, regardless of whether or not the existing curve is still valid.

4.4.2 Calibration of Supporting Equipment

4.4.2.1 Calibration

Measuring and test equipment which requires periodic calibration shall be described in accordance with ANSI/NCSL Z540-1, and ISO 10012-1. Measurement standards shall be maintained under the control of each department supervisor.

- All equipment which is calibrated is given a unique number and location.
- All equipment which is calibrated has an interval date and source of calibration on its calibration record.
- Each type of equipment (thermometer, micrometer, balance or gauge) is calibrated according to its own specification. These specifications state the required environmental test conditions for calibration, use and storage.
- Where required for coordination with use, the calibrated equipment (thermometer, gauge, or balance) shall be tagged giving the date calibrated and date due.

The Quality Assurance Director has ultimate responsibility for all phases of the quality assurance program, equipment calibration and documentation.

The Department Supervisors are responsible for assuring that the calibrations are performed properly and on time. All documentation, procedures, calibration data records and reference standards are kept by the Department Head.

The Quality Assurance Manager shall have access to these records and shall make them available to Client and Government representatives.

4.4.2.2 Adequacy of Standards

Inspection gauges and test equipment used in testing and analysis shall have the capabilities for accuracy, stability, range, and resolution required for the intended use. Calibration shall be performed by comparison with higher level accuracy standards.

4.4.2.3 Environmental Control

Measuring and test equipment shall be calibrated and utilized in an environment controlled to the extent necessary to assure continued measurement of required accuracy to maintain precision measurement under standard conditions. Environmental factors which may affect accuracy of measuring and test equipment include temperature, humidity, vibration, storage and cleanliness. Housekeeping and cleanliness are part of "Good Laboratory Practices" and shall be adhered to.

Thermometers

Thermometers shall be calibrated either by single point calibration at the temperature for which they monitor in service or multipoint calibration through their range or the range of intended use. Bulb thermometers shall be used and stored in a vertical position whenever possible to prevent liquid separation.

Micrometers

Micrometers shall be calibrated at the ambient air conditioned environment of the laboratory and used in the same manner. They shall be kept clean.

Balances

Balances shall be calibrated at the ambient air conditioned environment of the laboratory and used in the same manner. They shall be kept clean. Second floor analytical balances experience effects of vibration and floor movement. They shall be operated with this in mind and checked for proper zeroing with each use.

Gauges

Gauges shall be calibrated either by single point calibration at the humidity, pressure or flow which they monitor in service or multipoint calibration through their range or the range of intended use. They shall be calibrated at ambient temperature of the laboratory and used at these conditions unless otherwise required, in which case, they shall be calibrated at the temperature(s) of the intended use and so noted on the calibration records. In the event of use of environmental condition compensation corrections, the correction factors shall be developed over the range of use and kept with the record. All gauges shall be kept clean to the extent possible with their use.

4.4.2.4 Calibration Intervals

Measuring equipment and standards will be calibrated at periodic intervals established on the basis of stability, purpose, and degree of usage. Intervals shall be shortened as required to assure continued accuracy as determined by results of the previous calibrations, and a mandatory recall system shall be maintained to insure continued accuracy. The Microbiology Laboratory thermometers shall be calibrated at no less than once every six months. Maximum recommended intervals are as follows:

Laboratory Thermometers..... 1 year
Secondary Standard Thermometers..... 1 year
Microbiology Thermometers..... 6 months
Micrometers..... 1 year
Gage Blocks..... 2 years
Balances..... 1 year
Weight Sets..... 2 years
Pressure Gauges..... 1 year
Pressure Gauge Calibrators..... 2 years
Humidity Gauges..... 1 year
Flow Gauges..... 1 year
Volume Gauges..... 1 year
Water Meters..... 1 year

The quality assurance manager may extend a calibration interval of an out of calibration instrument to allow for use until a calibration may be performed.

Recall System

A recall system shall be in effect for all measuring and test equipment (thermometers, micrometers, balances and gauges) to assure timely calibrations, thereby precluding use of an instrument beyond its calibration due date. The recall system may include provisions for the temporary extension of the calibration due date for limited periods of time under certain specific conditions such as the completion of a test in progress. The system shall be monitored by the quality department who informs the affected departments of the equipment coming due. It is recommended that these notices be distributed one month, one week and one day prior to the date due as needed. Inspections shall be performed by the quality department to insure compliance. Any equipment found past due will be impounded or appropriately tagged. Substitute equipment should be available where needed. Equipment which is currently performing a test shall not be impounded without replacement. Either or both of the following systems are acceptable:

- 4 X 6 Card File Recall System – Cards are maintained in chronological order by due date. Each card is headed by the item description and serial number. It then lists the location, date calibrated and date due.

- Computer Recall System – A system which performs as above.
- Any system approved by the Quality Assurance Manager.

4.4.2.5 Calibration Procedures

Calibration procedures of inspection gages and instruments by company personnel will be accomplished per MIL-STD-120 (or GGG-C-105B). Calibration of thermometers will be accomplished per ASTM E 77. Other calibrations will be performed in accordance with S.O.P's for each instrument.

Each class of calibrated equipment shall have a copy of the calibration method in the vicinity of the calibration records and available for utilization.

Calibration procedures shall specify the accuracy of the instruments being calibrated and the measurement standard to be used or the required accuracy of the standard. The procedure shall require that calibration be performed by comparison with higher accuracy level standards.

These procedures shall identify and prevent the use of any unsatisfactory equipment.

4.4.2.6 Out of Tolerance Evaluators

Data

Out of tolerance data shall be used to determine adjustments to calibration intervals, to determine the adequacy of measuring and test equipment, and to determine the adequacy of calibration and measuring and test procedures. Measuring and test equipment which does not perform satisfactorily shall be identified and its use prevented.

Significance

Equipment shall be considered significantly out of tolerance when it does not perform to the level it is calibrated and not necessarily to the level to which it was originally manufactured. For example, a de-rated set of Class S weights may be used as a set of Class P weights. Equipment so used shall be clearly identified to any changes in the original precision. Equipment determined to be inaccurate and not suitable for a down-grade in precision may not be reclassified and its use shall be prevented.

Reporting Channels

Reporting channels for out of tolerance data vary significantly due to the diversity of possible out of tolerance data. However, the department supervisor shall be notified. The supervisor then directs the action which often involves the department or group manager, the quality department and the maintenance/facilities department.

Notice of Out of Calibration Conditions

In the event that an inspection gage or instrument is found to be out of calibration when recalibrated, the department supervisor shall be notified and a record of the condition shall be made in the calibration file for the device. The supervisor then directs the action which often involves the department or group manager, the quality department and the maintenance/facilities department. The impact of accuracy of results on products tested or examined by equipment found to be out of tolerance during calibration will be determined. Appropriate corrective action will be taken to correct possible reporting errors. The calibration interval of the measuring or test equipment shall be adjusted to prevent recurrence.

4.4.2.7 Calibration Status

Calibration status of measuring equipment and standards will be indicated by labels to assure adherence to calibration schedules. The label will indicate date of last calibration, date when next calibration is due, and by whom calibrated. Any measuring or test equipment which does not perform satisfactorily shall be identified as such and preferably removed to prevent its use. Items not calibrated to their full capacity or which require functional check only shall be labeled to indicate condition. Although usually removed to prevent use, measuring and test equipment available for use which is not calibrated shall be tagged "NOT CALIBRATED, FOR REFERENCE USE ONLY". Red stickers are available from the Quality Assurance Manager for this purpose.

4.4.2.8 Storage and Handling

All inspection gages and test equipment shall be handled, stored and transported in a manner which shall not adversely affect the calibration or condition of the equipment. Items shall be packaged properly when required, and shall be stored under adequate storage conditions. Improper storage, handling or transportation of measuring and test equipment shall be reported to the department manager and as appropriate, to the quality department. Some storage recommendations are as follows:

Item	Storage Conditions
Thermometers, bulb	Vertically, protected from shock
Micrometers/Calipers	In original cases away from corrosives, oiled lightly as appropriate, protected from vibration and shock
Balances	Cleaned of any daily spillage, left in "rest" or off position, analytical – protected from vibration
Gauges	Individually on appropriate shelves or boxes, kept clean of excessive dust

4.5 ANALYTICAL AND TEST PROCEDURES

All analyses, tests, and measurements preferably are to be in accordance with a standard method from Truesdail's Standard Operating Procedures Manuals or some standard publication and shall be so stated on the Laboratory Record. Detailed analytical procedures are found in Truesdail's Standard Operating Procedure Manual. This document is available in the Laboratory as a separate document. The methods described follow EPA standard procedures or other appropriate methods ("Standard Methods", or ASTM).

Frequently the client will specify a particular procedure to be used. The client's instructions will be authorized by the supervisor only. Many assignments or samples are received for which there is no standard method for analysis or testing. In such cases, procedures will be devised based on technical experience and judgment and approved by the supervisor. The procedure used must be described in the laboratory workbook or report in sufficient detail to enable repetition of the work by someone else at a later date. All in-house procedures shall indicate the revision number, date and preparer.

Any changes in procedures specified by a client shall be authorized by the client and preferably this notification will be in writing by the customer.

4.6 DATA ACQUISITION AND RECORDING

Two part laboratory workbooks are assigned to individuals and/or work stations. They are the preferred recording medium for all handwritten original (primary) data. Laboratory work sheets shall be signed, dated, and indicate the method used in analysis. To the extent practical, data shall be collected and processed utilizing automated and computer assisted systems. Hard copy of printed data and/or electronic media such as floppy discs or tapes shall be likewise labeled with the name of the analyst, date, methods of analysis, etc.

Any changes made to original data shall be single line crossed out and initialed by the person making the change. If the date of change is other than that indicated on the laboratory work sheet, then the initialed change shall also be dated. Original data shall be written in non-erasable ink. "White Out" shall never be used over original data. Where applicable, test data shall be rounded off per ASTM recommended Practice E29. Results of tests shall not include significant figures in excess of those substantiated by the precision of the instruments and methods used. For most analysis, no more than three significant figures are reported.

4.6.1 Certification of Reports

Purchase orders which stipulate that a Certificate of Conformance (C of C) is required with shipment of items on the purchase order is a request to certify the work was done as requested and not necessarily a statement of whether or not the items passed or failed a requested procedure. It is recommended that the QA Department review all reports requiring a C of C. This requirement is met by adding the following statement, or suitable facsimile, below the conclusion and above the signature:

Certification: The above testing was performed in accordance with the above purchase order, the above referenced methods and the Quality Assurance Manual, rev. O, 3/31/03.

Caution must be used to be certain that the client has approved the version of the QA manual that the report is being certified to. If they have issued their purchase order on an old revision, then the C of C is written to that revision.

4.7 DATA REDUCTION AND VALIDATION

4.7.1 Data reduction for EPA gas chromatograph methods

Data collection and reduction is automated using Maxima software from Dynamic Solutions. Standard output from the Maxima software is passed to a custom spreadsheet application where QC data are checked, and final reports are generated. If QC data show an out of control situation, appropriate corrective action is taken as indicated in Section 7. When the QC data show that the system is in control, but above the warning limits, results are flagged for special review.

4.7.2 Data reduction for metals

For each ICP, data are collected and reduced using software provided by the manufacturer. These software packages report analytical results to the analyst in concentration units. QC results are reported like field sample results, and must be compared to the control charts by the analyst.

For AA data, a custom spreadsheet application is used to reduce data output from the instrument.

4.7.3 Data reduction for EPA GC/MS methods

GC/MS data collection and reduction is fully automated for all methods using Hewlett-Packard's Aquarius software system running on HP 1000 mini-computers. Final reports to the analysts are in EPA report format.

4.7.4 Data reduction for wet chemistry methods

Wet chemistry methods are not typically performed using computer-aided instruments. Analysts record raw data in lab notebooks, then enter these raw numbers into custom spreadsheet applications for final data reduction. QC data are handled in the same way as field samples. Reports in standard format are used for final report preparation.

4.7.5 Data Validation

Data validation begins with review of QC sample results by the analyst. For manually operated instruments QC sample results can be checked against control charts, to avoid collecting invalid data. Most environmental methods are automated, so validation does not begin until after field samples have been analyzed. Data collected while a system was in control but out of warning limits are marked for special attention during higher level reviews. Samples analyzed while the system was out of control follow the corrective actions in Section 7.

4.7.6 Outliers

QC charts are regularly updated to reflect results of QC sample analyses. However, points which are determined to be "outliers" will not be included in the population used to update control and warning limits. This is the first stage at which points will be screened for suitability. These results will still be taken as indications that a warning or control limit has been exceeded.

4.8 REPORTING PROCEDURE

Final reports are prepared using report forms generated by the computer-aided instruments, or the custom spreadsheet used to reduce raw data. During report preparation, QC sample results are again reviewed to verify that the system was in control when field samples were analyzed. Final reports are reviewed by a manager, and QC results are included in this process as well. At any stage, if a question arises about the validity of sample data, corrective action is taken.

The assigned technical staff member will prepare and submit a report along with all test data to the laboratory supervisor. The report should describe the scope of the problem, proper method numbers, other designation or procedures, summarize the results and present a conclusion or recommendation if required.

All test reports shall refer to the unique Laboratory Number assigned to the sample. In the event that a report is revised in any way and the client has received a report by any means, the preferred distinction is with revision letters, i.e. A, B, C, etc. The typed report is proofread by the supervisor. The handwritten or draft copy of the report should be discarded after proofreading to minimize file congestion.

The supervisor will evaluate the report, check data, and approve the accounting and invoice data.

The Laboratory Record and report are sent to billing for invoicing, packaging, and mailing.

4.8.1 Billing and Mailing of Invoice and Report

The papers are divided into two packets

1. The first packet is clipped together and forwarded to billing.
   - Green laboratory record
   - All original pages of the report
   - Duplicate pages of the report if client requested
   - All client paperwork that is to be returned, such as P.O. acknowledgments or client copies
2. The second packet is stapled together and retained in the department
   - A copy of the laboratory record
   - All client's paperwork
   - All Truesdail paperwork including copies of the final report
   - All original data

The invoice is processed in billing and a package prepared for mailing to the client which includes an original with copies, plus packet No. 1.

Billing retains and files a copy of the invoice with the Laboratory Record and sends a copy of the invoice to the department.

The department attaches their copy of the invoice to packet No. 2 and files by client.

4.8.2 Record Retention

Laboratory worksheets with calculations and data, file copies and other records generated for a job assignment will be maintained in a secure location for ten years. This material is the property of the Laboratory and its clients and must be maintained intact for future reference. All such documentation shall be available for customer review upon request. After the ten-year retention period, the material will be discarded. Should a special request be made for extended retention, these records shall be kept in a separate file noting a discard date.

4.8.3 Confidentiality

Material generated as a result of work performed in the Laboratories and the fact a particular analysis has been performed for a client are confidential information between the client and the Laboratory. There will be no release of information to any individual other than the client without the client's permission. The only exception to this is in response to subpoena, in which case the client will be notified of such.

4.9 Outside Review

Truesdail Laboratories will allow clients and /or their representatives reasonable access to relevant areas of the laboratory for the witnessing of tests and/or calibrations performed for the client.

SECTION 5 – INTERNAL QUALITY ASSURANCE AUDITS

5.1 GENERAL AUDITS

The Quality Department will audit the Laboratories annually.

The findings of each audit will be forwarded to the responsible department manager indicating corrective actions to be taken and a follow-up date. These findings shall be in the form of an internal memo. The Quality Assurance Manager will submit a signed and dated report to the upper management of the company. Any deficiencies noted will be resolved in a timely manner.

The audit will be performed to the check list of Appendix B so as to assure the following:

- Service performed was strictly in conformance with the details of a purchase order or that any deviation was covered by a change to the purchase order.
- All changes or corrections on the laboratory data sheets are initialed and dated by the person making the corrections.
- Controlled in-house methods and procedures have a signature and a date as to when issued to assure the latest revision is being used.

A copy of the results of each audit go to the department supervisor. A complete set is submitted to the Technical Director.

The Quality Department will audit the Purchasing Department annually to assure that technical and quality requirements are included in the purchase of services or products which are required to meet client specifications.

5.2 SYSTEMS AND PERFORMANCE AUDITS

5.2.1 Systems Audit

The measurement system for analysis of each parameter consists of four basic components: personnel, reagents and instrumentation, methods of analysis, and the quality assurance program. Standards for evaluation of each of these components are described or referenced below.

Requirements for personnel training and experience are contained in Section 2.

All reagents used are of the highest quality and meet or exceed the requirements listed in the EPA standard procedures used.

The instruments used are substantially in compliance with requirements of EPA standard methods. In all cases where instrument specifications deviate from requirements, the modification was made to improve performance. Documentation which demonstrates that these modified instruments do perform as well as or better than required by EPA standard methods has been demonstrated.

This quality assurance program has been prepared following "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans" publication number QAMS-005/80 of the Office of Monitoring Systems and Quality Assurance, Office of Research and Development, U.S. Environmental Protection Agency, and U.S. Army Corps of Engineers regulation ER 1110-1-263.

5.2.2 Performance Audits

Summaries are made from quality control data for each parameter measured, and reviewed to determine that accuracy and precision remain within the allowed limits. If drift in the mean or excessive scattering of quality control analysis values outside warning limits is detected, action will be taken to bring the measurement system into better control. The quality control standards used in this process originate from the Environmental Monitoring and Support Laboratory of the U.S. Environmental Protection Agency in Cincinnati, Ohio, if available. This constitutes an external check on Truesdail Laboratories' performance. In addition, external samples are analyzed on a semi-annual or annual basis as part of overall Laboratory auditing procedures. Examples of the EPA Cincinnati reports, as well as other outside audit reports, are given in Appendix E.

SECTION 6 – FACILITIES AND EQUIPMENT

6.1 FACILITIES

Truesdail Laboratories offers both engineering and chemical analytical services. The main facility in Tustin, California contains 40,000 square feet. This includes the Racing Chemistry Laboratories, Mechanical Testing on the first floor, and Air Analysis, Water and Waste, Instrumental Methods, Microbiology, and General Chemistry, on the second floor. Floor plans of the Laboratory and a list of the major pieces of equipment in laboratories which have most of their work in the environmental area are given in Appendix C.

The space available at Truesdail Laboratories is composed of operational areas, office services, sample preparation, wet chemistry rooms, and instrumentation facilities. All rooms which encompass the Chemistry Laboratories are equipped with adequate lighting, counter space, exits, and any other structural requirements as outlined by state and local building regulations. Each laboratory is equipped with a water sprinkler system, portable fire extinguishers, emergency eyewash and emergency shower systems.

6.2 PREVENTATIVE MAINTENANCE

Preventative maintenance is intended to keep an instrument operating within specifications. In some cases there are components which are expected to become dirty with use, such as the source in a GC/MS, which is therefore scheduled for cleaning at regular intervals. In other cases, there are components which are gradually destroyed or consumed during use, such as the septum on a gas chromatograph. These components are scheduled for regular replacement, and spare parts are always kept on hand. Specific preventative maintenance is part of the Standard Operating Procedure for each method.

Each instrument has a maintenance logbook which is used for documenting all maintenance of that instrument.

6.3 VOLUMETRIC GLASSWARE, ANALYTICAL BALANCES AND THERMOMETERS

6.3.1 Volumetric Glassware

In order to maintain reliable results, standard solutions are prepared in class "A" volumetric flasks. Class "A" volumetric pipets are also used for sample and standard aliquots where applicable (see chart below). Serological pipets are employed for the dispensing of reagents where extreme accuracy is not required. For all titrimetric procedures class "A" microburets are used. All syringes are calibrated and certified by the distributor (Hamilton, Supelco), and inspected prior to each use by the analyst.

Tolerances for volumetric glassware:

Type	Capacity, ml	Limit of Error, ml
Volumetric flasks	25	0.03
	50	0.05
	100	0.08
	250	0.11
	500	0.15
	1000	0.30
	2000	0.50
Volumetric pipets	1	0.003
	2	0.006
	5	0.01
	10	0.02
	25	0.025
	50	0.05
Buret	5	0.01
	10	0.02
	25	0.025

6.3.2 Analytical Balances

The analytical balances are some of the most important equipment items in an analytical laboratory, because the accuracy of all weight-prepared standards will be affected by the accuracy of the balance. Balances are fragile instruments, subject to shock, vibration, temperature and humidity changes, mishandling, corrosion, and spilled material. A balance must be well protected and cared for if the laboratory is to produce reliable data.

Analytical balances are mounted on shock isolated tables away from traffic, temperature and humidity changes, vibration, shock, drafts, and air contaminants.

Analytical balances receive maintenance and are calibrated annually by an outside calibration service, using N.I.S.T. traceable weights. Calibration includes cleaning and inspection of the balance's internal mechanism.

Calibration, in addition to the annually scheduled calibrations, will be performed at the discretion of the laboratory staff if daily operating checks are not satisfactory or if damage is suspected.

6.3.3 Thermometers

Thermometers are used throughout the lab to monitor ovens, water baths, refrigerators, and to provide standard conditions for analyses. Truesdail Laboratories maintains a number of N.I.S.T. traceable thermometers covering a variety of temperature ranges. The "primary" references are maintained in a secured area and are not available for routine use. All thermometers employed routinely are cross-checked against those reference thermometers on an annual basis. Microbiology Laboratory thermometers (±0.2°C), however, are cross-checked against reference thermometers every six months. Correction factors are noted and each thermometer is tagged noting the next due date for calibration. A copy of our standard form for checking thermometers is found in Appendix B, page B7.

6.4 REAGENTS, SOLVENTS AND GASES

The proper selection, preparation, and storage of chemical compounds is essential to the production of reliable analytical data. The composition of these compounds is a focal point of continuous scrutiny by the analyst. For this purpose, a "method blank" (a blank sample composed of those compounds incorporated into the analysis) is run concurrently with each analysis performed. Errors associated with the use of reagents, solvents and/or gases are minimized by the use of "method blanks", monitored inventory control, and use of proper techniques in the handling and storage of materials.

At any point that a "method blank" fails to perform according to the parameters of the method, an inquiry as to the source of the interference is conducted. Outlined below are the three areas of prominent concern.

6.4.1 Reagents

The purity of the reagents employed in any analysis has a direct effect on the accuracy of the results obtained. Therefore, the registered purity as published by the producer is noted along with other pertinent information (such as lot no., date received, quantity, etc.) to ensure the materials meet the requirements of the purchase orders. The analyst will use reagents of sufficient purity as recommended by the method and/or SOP employed in the analysis.

The labeling of all reagents employed includes compound or mixture name, lot no., date made, or date received, and quantity. Most suppliers also print a list of impurities and all chemicals are now accompanied with hazard information. The hazard information (material safety data sheets) is essential in the safe handling of reagents and is contained in the safety information file. The file is placed in a common area to allow all personnel access to the safety information of the chemicals used in the laboratory.

The preparation of standards and solutions is conducted in accordance with the method employed and all procedures and practices such as standardization, weight tolerances, or physical conditions are followed.

Commercially prepared calibration and stock standards are purchased for all analyses requiring such. Organic standards are purchased from commercial suppliers such as Ultra Scientific, Supelco and Chem Service. Fisher Scientific, Baker, MCB, etc., are the suppliers for inorganic and some metals standards (ACS grade). Calibration standards for metals are purchased from Banco, Fisher and other supply houses. Pesticide grade organic solvents are purchased from Burdick and Jackson and J.J. Baker. All other reagents are supplied as ACS grade by Fisher, Baker, MCB, Mallenkrodt, etc.

All reagents are stored in proper containers recommended by the procedure. Generally, dry chemical reagents are stored in a separate storage area at the rear of the building, in alphabetical order, for easy access. For those reagents with special handling or storage requirements, specific information is outlined in the manual under laboratory safety.

6.4.2 Solvents

The solvents employed at Truesdail Laboratories are certified by the producer as to the grade of solvent, (such as technical, pesticide spectral, etc.). The physical nature of solvents warrant special care in the handling and mixing of solutions. These guidelines are outlined in greater detail in the Laboratory Safety Manual.

Solvents are stored in a special vented, fire-resistant storage room. Small quantities employed in daily use are stored in special storage cabinets under the fume hoods. At no time will a solvent be subjected to an environment not conducive to safety or control.

6.4.3 Gases

A complete list of delivery invoices and contracts with the distributor are logged in the gas logbook. The handling of gas containers, installation of gas lines, or the day to day use in analyses is always conducted under the immediate control of the analyst. All gas lines are regulated with proper equipment and techniques in gas detection. Further information on these techniques are outlined in the Laboratory Safety Manual. All gases are stored in tanks certified by the producer as conforming to state and/or federal regulations. These tanks are stored in the loading dock area of the building for safe and easy access. Any tank brought into the laboratory for routine use is safely secured; i.e., chained or strapped down.

6.5 WATER, AIR, VACUUM, ELECTRICAL SERVICE & VENTILATION

6.5.1 Water

Each room is supplied with one or more sinks with hot and cold running water and deionized water as needed. Spaced periodically throughout the facility are floor drains to accommodate any water overflow. The following types of water are currently in use at Truesdail Labs:

- **Deionized Water**

  The deionized water is supplied by a service exchange deionization system composed of two packed bed ion exchange resin tanks and an activated carbon tank, followed by a particulate filter. This system was installed and is serviced by Pacific Industrial Water. The quality of the water produced by the system meets the specifications listed below. Resistivity is continuously monitored and a light changes color if resistivity is out of specification.

  Particulates $\leq$0.1 mg/l

  Electrical resistivity $\geq 10^6$ ohms/cm @ 25°C

  The resin tanks are changed if the indicator lights show a problem.

- **Sterile Water**

  Sterile water is produced by autoclaving deionized water at 121°C at 15 psi for 15 minutes. Once a month, Truesdail performs a total plate count on the water employed for bacterial analyses. If it is found to be contaminated by any colony forming units, samples are retested after sterility has been reestablished.

- **Reagent Water and Hydrocarbon Free Water** (ASTM - DH93, Type 1)

  Ultra-high purity water is produced in the laboratory from our standard D.I. water by passing it through a Barnstead "Nanopure" water purification system. The system employs ion exchange resin beds and an activated carbon bed to purify the water. After the resin and charcoal beds, a 0.2 filter removes particulates.

  Particulate <0.2

  Electrical resistivity $\geq 18 \times 10^6$ ohms/cm @ 25°C

  The reagent water is further purified for analyses of volatile (purgeable) organics by sparging with ultra-high purity nitrogen or helium. Bottles of water used for preparation of blanks, calibration solutions, and travel blanks are set up next to the analyses with a continuous purge.

6.5.2 Air

Compressed air available to the laboratory is supplied by an industrial compressor distributed by Ingersol-Rand, Rotary Screw Operations, Davidson, North Carolina. This compressor has a capacity of 125 CFM and a rated operating pressure of 150 PSIG. The compressor contains an oil and water trap, and is supplied with a blow down valve located outside of the laboratory building. This system is serviced by the facilities department as required.

6.5.3 Vacuum

Vacuum is provided by an A-B Industries air cooled, oil sealed, rotary vane pump directly coupled to operate by motor speed. The pumps are serviced and maintained by the facilities department at Truesdail Labs.

6.5.4 Electrical Service

Independent circuits for 110 volt lines are conveniently located throughout the laboratory to provide a safely grounded supply of power. Most hot plates, autoclaves and ovens are supplied with 220 volt lines with independent breakers. Power to sensitive instrumentation with microprocessers, computer systems, etc., are equipped with voltage surge protection and/or regulation as required to insure maximum up-time.

6.5.5 Ventilation

Fume hoods are provided in those rooms where extractions, digestions and distillations are conducted. These hoods have a volume of approximately 16 cubic feet to 30 cubic feet and are supplied with a cupsink, water and gas lines (some with D.I. water). Hood face velocities are checked with calibrated flow meters and with smoke tests to insure proper flows.

6.6 LABORATORY CONTAINERS

In all cases, polyethylene or borosilicate (Pyrex, Kimax) containers are used for storage of standards and reagents, including tinted glass for photosensitive reagents. Most metal stock solutions are stored in polyethylene bottles located in the spectroscopy laboratory, except for those elemental solutions known to react with polyethylene (such as antimony). Disposable glassware is used for instruments that employ autosamplers. Disposable glassware is rinsed prior to use with 10 percent nitric acid for metals analysis, or with reagent water for ion chromatography. Standard solutions of alkalies (silica, boron, and the alkali metals) are stored in polyethylene bottles.

6.7 CLEANING

All general glassware is cleaned by washing in detergents (Alconox, Liquinox, and Alcojet) followed by rinsing with tap water and then again with deionized water. After rinsing, the clean glassware is inverted on an open air drying rack. This method supplies clean glassware for most procedures employed; however, further steps are taken for specific analyses. These steps are outlined below according to procedure.

- Glassware used in trace metal analysis is washed with non-ionic detergent, rinsed three times with 10% nitric acid, rinsed three times with deionized water and air dried.
- Glassware used in anion analysis of ammonia, phosphate, nitrate and fluoride are cleaned by continuous rinsing with deionized water for a period of approximately one minute.
- Glassware for use in organic sampling and analyses is rinsed with reagent organic free water prior to being employed. Glassware used in sampling extractions, for standards and in analyses is fired in a ceramics kiln to oxidize any residual organics. After firing, it is stored wrapped in aluminum foil.
- Cells are cleaned with periodic soaking in non-ionic detergent followed by rinsing with deionized water and allowed to air dry. Glassware for critical low level determinations can also be rinsed with reagent/hydrocarbon free water.
- Glass bottles used for sample collection are cleaned with non-ionic detergent, tap water, and deionized water. Glassware used for sampling low level volatile organics determinations (such as drinking water) is treated as an expendable. Precleaned glassware that has been Q.C. inspected is purchased from major vendors (I-Chem, Eagle-Picher), used once and discarded.

SECTION 7 – CORRECTIVE ACTION

7.1 NONCONFORMING INCOMING CHEMICALS AND SUPPLIES

In the event items are received defective, not as ordered or otherwise unacceptable, the responsible party shall notify the purchasing department as needed and the vendor to arrange for return. Such items shall be segregated from acceptable chemicals and supplies either by tag or physical placement to preclude their use.

7.2 OUT OF CONTROL PROCEDURES

Methods for establishing and updating limits for data acceptability are described in Appendix E. Standard control charts for each method contain the information necessary for determining when a process is out of control.

When a result for a quality control sample indicates that a measurement system is out of control, the series of actions described in Table 1 will be initiated. The tests are performed in order, until the cause of the out-of-control situation is found, then the remedial action listed for that cause will be taken. A corrective action form is filled out describing the initial indication of the out-of-control situation, the cause that was discovered, and the actions taken to return to control.

All corrective action forms must be filled out and signed by the analyst who took the corrective action. They must be reviewed and initialed by the applicable department manager. All procedures can be reviewed and initialed by the Technical Director. An example of a corrective action form is given in Appendix B.

Table 1: Out of Control Procedures

Suspected Cause	Test	Remedial Action
Mathematical Error (Bookkeeping – right values for parameters)	Check Calculations	Correct error and continue analysis
Quality Control Check (or instrument check) Sample deviates from expected concentration	Prepare fresh Quality Control check sample and analyze	Proceed with analysis
Instrument Calibration	Make new calibration standards, recalibrate reanalyze quality control check sample	Reevaluate all environmental samples just preceding bad Q.C. result. If new result deviated by more than 25% and client specifications require tight precision, then reanalyze all samples since last valid Q.C. result.
Instrument Maintenance Required	Perform instrument maintenance as required in SOP manual. Perform sensitivity checks and recalibrate	Reanalyze all samples since last valid Q.C. result

7.3 CORRECTING TEST REPORTS

If a customer should request a corrected test report, this request shall be evaluated at Truesdail by the person who signed and submitted the test report to the customer. If corrective action is deemed necessary by Truesdail Laboratories, a "CORRECTED REPORT" will be issued. A "CORRECTED REPORT" should be clearly labeled in order to distinguish it from the original report. A "CORRECTED REPORT" shall have the same laboratory number previously stated in "Reporting Procedure".

7.4 NOTICE OF OUT OF CALIBRATION CONDITIONS

In the event that an inspection gage or instrument is found to be out of calibration when recalibrated, the department supervisor shall be notified and a record of the condition shall be made in the calibration file for the device. The supervisor then directs the action which often involves the department or group manager, the quality department and the maintenance/facilities department. The impact of accuracy of results on products tested or examined by equipment found to be out of tolerance during calibration will be determined. Appropriate corrective action will be taken to correct possible reporting errors. The calibration interval of the measuring or test equipment shall be adjusted to prevent recurrence.

7.5 NOTIFICATION TO CLIENTS

Clients shall be notified of any out of calibration conditions, which affect results submitted to them. Clients will also be notified of any deviation from requirements listed in purchase orders or contracts.

SECTION 8 – EXTERNAL QUALITY ASSURANCE ACTIVITIES FOR ENVIRONMENTAL SAMPLES

Truesdail Laboratories participates in a number of external programs which provide our independent assessment of the laboratories capabilities. Appendix E gives some examples of reports which we routinely receive from the various auditing programs.

Water and Waste Analysis: We participated in the WS and WP audit programs from EPA Cincinnati. We also participated in the radiation audit program from EPA Las Vegas. For bulk asbestos determinations, we participated in the AIHA PAT program.

Industrial Hygiene: Truesdail Laboratories participates in the Proficiency Analytical Testing Program (PAT) sponsored by the National Institute for Occupational Safety and Health (NIOSH).

Air Analysis: The Environmental Protection Agency sponsors an Air Pollution audit program through its facility in Research Triangle Park, N.C. Also related to air pollution audits are results for fuel analyses.

Since 2000, we have participated in commercial P.E. programs for drinking water, waste water, solid waste. Microbiological P.E. have been from commercial sources starting in 2000. Examples of our results follow in Appendix E.

QUALITY ASSURANCE/PERFORMANCE EVALUATION RESULTS

Listed below is a summary of our EPA Performance Evaluation results through 1998.

EPA WS - Drinking Water Proficiency Testing

Date	Round	# of Parameters Reported	Grade
9/98	041	100	90%
3/98	040	100	98%
10/97	039	89	99%
4/97	038	89	97%
10/96	037	67	97%
11/95	036	99	88%
4/95	035	101	84%
10/94	034	92	95%
2/94	033	82	92%
8/93	032	77	87%
2/93	**031**	**66**	**100%**
8/92	030	70	83%

EPA WP - Wastewater Proficiency Testing

Date	Round	# of Parameters Reported	Grade
03/00	040	75	96%
6/98	039	75	96%
12/97	038	75	99%
5/97	037	75	97%
12/96	036	75	99%
5/96	**035**	**62**	**100%**
10/95	034	145	98%
3/95	033	146	95%
8/94	032	150	97%
12/93	031	143	96%
6/93	030	138	90%
12/92	029	138	99%
6/92	028	141	94%

SECTION 9 – PURCHASING AND RECEIVING

9.1 MATERIAL AND EQUIPMENT PROCUREMENT

9.1.1 Purchase Requests

Routine replacement of chemicals, glassware, small hardware, etc. are initiated by any staff member by notifying the purchasing agent. Requests for new equipment or apparatus procurement involving $250 or less, capital expenditure will be made to a supervisor or department head for approval. Major (over $500) new equipment requests will be made in writing on the capital expenditure requisition form by department heads and submitted to the President for approval.

9.1.2 Purchase Orders

Purchases of chemicals and supplies shall be made by purchase order. The majority of purchase orders are made verbally but assigned a sequential number. A record of the order is maintained by the purchasing department. The record contains the purchase order number, date of order, supplier and items covered. The purchase order shall indicate the responsible recipient of the order. All chemicals or substances requiring certification will be procured per the specification required for the material and the purchase order will reflect these requirements. This is usually the catalog number of the chemical procured for which quality requirements are then traceable through the chemical catalog. Chemicals will be procured with reference to their standards. Purchase of outside services shall be made by written purchase order. Technical and quality requirements shall be stated as required. In no event shall nuclear safety related work be subcontracted without authorization of the Quality Assurance Manager. Any shipping of test samples shall be done in a manner that prevents contamination, damage, or loss and minimizes deterioration.

9.1.3 Repair and Replacement of Apparatus

The need of repair or adjustment of an apparatus will be reported at once to a supervisor or department head who will decide (after consultation with others) whether the equipment can be repaired either in-house or outside the facility, or should be replaced.

9.1.4 Quality Assurance Personnel

QA personnel are not involved in the procurement of ordinary laboratory chemicals, supplies, or apparatus.

9.2 APPROVED VENDORS

9.2.1 Selection of suppliers

Supplier selection will be based on historical performance and/or on-site surveys. Subcontractor approval for safety related testing services is covered in our Standard Operating Procedures Manual.

For subcontracted testing, Truesdail will review our clients requirements from either a purchase order or contract to make sure that the requirements are passed down to subcontractors and that the subcontractors have the capabilities to perform the work. Truesdail will be responsible for subcontracted work and the results from subcontractors will be reviewed to ensure adherence. Approval of laboratories by DOHS ELAP or NELAC programs may be substituted for on-site audits of subcontractors. Clients will be made aware of subcontracted work and their approval will be obtained as required.

9.2.2 Calibration Services

Quality Assurance personnel shall verify by survey the certification systems of outside calibration services that are used. This includes manufacturers who calibrate their own manufactured equipment. The outside calibration vendors shall be audited every two years. These audits may be extended by the quality assurance manager to permit convenient scheduling. Exceptions to this requirement are recognized government agencies serving as a branch of the National Institute of Standards and Technology (NIST).

9.2.3 Quality Assurance Personnel

QA personnel shall maintain a list and/or file of qualified vendors.

9.3 RECEIVING INSPECTION

Receiving of Chemicals and Supplies

Incoming items are logged in the receiving record for purposes of record of receipt and destination only. Receiving assures that material received corresponds with that ordered and that necessary labeling or certifications are included on all shipments. They are routed to the appropriate department or laboratory where they are inspected for content and condition. Shippers of items received in damaged condition shall be notified by telephone followed by a written confirmation. General use chemicals are inspected and preferably, dated prior to stocking (see Section 11 on Age Control). Packing slips are forwarded to Accounts Payable. Invoices correlated with the packing slips are approved by the person who requested the supply and then forwarded to Accounts Payable. The record of these inspections is manifested by the approval of invoices and is maintained in the "Accounts Payable" files.

SECTION 10 – DOCUMENT CONTROL

10.1 IN-HOUSE CONTROLLED DOCUMENTS

All controlled in-house procedures shall be dated and signed and reflect latest revision.

A list of all in-house controlled documents shall be maintained by the Quality Assurance Manager and/or the Technical Director.

Uncontrolled in-house procedures shall be noted as such.

It shall be the responsibility of each department manager to prepare, review, approve and issue documents and changes thereto relative to their department.

10.2 QUALITY RELATED DOCUMENTS

All quality related documents shall be reviewed for adequacy, approved for release by authorized personnel and properly distributed. Changes to documents shall receive the same degree of review and approval as original documents.

10.2.1 Quality Assurance Manuals

- Maintenance and distribution of the Quality Assurance Manual shall be the responsibility of the Quality Assurance Manager.
- Maintenance and distribution of the Environmental Quality Assurance Manual shall be the responsibility of the Technical Director.
- The distributions shall be controlled by distribution logs which include manual number, company name, address, date sent, date acknowledgment received and revision sent.
- When the quality assurance manual is revised, it shall be reviewed by the Technical Director and Quality Assurance Manager. It shall be approved by the Quality Assurance / Quality Control Manager, Technical Director and the President.
- Once the manual is approved, it shall be released and sent to controlled copy holders within 30 days.
- A letter of acknowledgment shall include instructions to dispose of superseded, obsolete or voided sections of the Quality Assurance Manual.

10.3 JOB RELATED DOCUMENT CONTROL

This subject is covered in Section 2.9.2.

SECTION 11 – AGE CONTROL

11.1 INCOMING CHEMICALS AND SUPPLIES

Procured items subject to age deterioration shall be dated upon receipt and the expiration date shall be indicated. It is preferred that all chemicals not rapidly consumed in the course of testing be dated upon stocking and dated when opened.

11.2 MEASUREMENT STANDARDS

Standard materials subject to age deterioration or otherwise dated as expired, shall not be used as primary standards after their expiration date. Such materials may be used as check standards providing that additional primary standards are used as appropriate.

11.3 TEST SAMPLES

Test samples shall be kept for three months and then disposed either by returning to the client or in accordance with state and local requirements.

Samples of a useful nature may be used as appropriate in the laboratory. Samples such as consumer items may be removed from company premises by employees with written permission from the department supervisor.

SECTION 12 – HOUSEKEEPING, SAFETY AND ENVIRONMENTAL CONTROL

12.1 Truesdail Laboratories shall maintain all work areas relating to the function of any testing area, handling area, or other related areas in a clean and orderly fashion so as not to impair the process of obtaining reliable data or to interfere with the control and identification of materials being processed.

All areas of operation shall be kept safe for workers.

Many chemicals in the laboratory are inherently unsafe. They cannot be made safe. Use and handling shall be performed in accordance with Truesdail Laboratories Safety Manual Rev. 2 or current.

The laboratory is temperature controlled within a normal range of 70-74°F during normal working hours. Timer switches are located adjacent to thermostats for operation at night or on weekends. Twenty-four hour environmental control is available as needed for special sample and/or apparatus conditioning.

12.2 The Laboratory Managers are responsible for the overall cleanliness of the facility. They are also responsible for the monitoring and control of environmental conditions relative to test requirements.

12.3 The chemists and technicians operating in each area are responsible for maintaining clean and safe work conditions in their work area.

12.4 The Technical Director shall make periodic inspections and direct the staff as needed. No record of these inspections is required.

SECTION 13 – LABORATORY CERTIFICATIONS FOR ENVIRONMENTAL TESTING

Sample Certificates and letters from various certifying organizations are given in Appendix F.

We are currently certified or accredited by the following organizations:

- California Department of Health Services for analyses of Drinking Water, Wastewater, and Hazardous Waste.
- American Industrial Hygiene Association for industrial hygiene testing.
- California Air Resources Board for air pollution source testing.
- South Coast Air Quality Management District for air pollution source testing.
- U.S. Navy NEESA program.
- L.A. County Sanitation District.
- International Association of Plumbing and Mechanical Officials (IAPMO) for faucet testing.
- AHERA Inspector certification.

APPENDIX A – LIST OF PERSONNEL

A.1 PRINCIPAL OFFICERS

President and Member of the Board	John C. Hill, Ph.D.
Chairman of the Board	James A. Charley, Ph.D.
Secretary and Treasurer	Linda C. Hill
Member of the Board	William J. Charley

A.2 PRINCIPAL MANAGERS

President	John C. Hill, Ph.D.
Technical Director	Norman E. Hester, Ph.D.
Controller	Mareda Murray
Manager of Analytical Services	Mona Nassimi

A.3 ANALYTICAL SERVICES GROUP

Manager — Mona Nassimi, M.S.

A.3.1 Group Managers

Instrumental Methods	Harvey Abernatha
General Chemistry	Ali Kharrazi, M.S.
Microbiology	Julie Tessener
Air Analysis	Mark Kotani
Field Services	Felipe Reyes
Radiochemistry	Rossina Tomova, M.S.
Metals	Riddhi Patel
Wet Chemistry	Hope Trinidad

A.4 RACING CHEMISTRY

Manager	Chris Nattrass, B.S.
Chief Pharmaceutical Chemist	Robert E. Vessiny, B.S.
Assistant Manager	Julie Hagihara, B.A.

A.5 MECHANICAL TESTING

Manager	Pat Iyer, Ph.D., P.E.

A.6 FORENSICS DEPARTMENT

Engineer	Gordon Banerian, Ph.D., P.E.

A.7 QUALITY DEPARTMENT

Quality Assurance and Control	Pat Iyer, Ph.D., P.E.

A.8 SAFETY DEPARTMENT

Safety Officer	Mareda Murray, B.A.

A.9 FACILITIES DEPARTMENT

Manager	Harvey Abernatha, B.A.

APPENDIX B – SAMPLE FORMS

INTERNAL QUALITY ASSURANCE AUDIT

Date: _____

Audit Performed By: _____

Laboratory Audited: _____

Meeting opened, purpose of audit explained. Participants: _____

GENERAL PROCEDURES:

1. Is there a current copy of the Quality Assurance Manual (QAM) available in accordance with QAM Section 6.2.1? Is it read by all employees of the department? YES NO

2. Is there a list of calibrated equipment, current and complete, in accordance with QAM Sections 5.1 & 5.5? Are there instruments calibrated by external agencies and their certificates traceable to NIST? YES NO

3. Are calibration decals affixed in accordance with QAM Sections 5.1.1 & 5.10? Are calibrations of instruments or referenced standards traceable to NIST? YES NO

4. Is any equipment being used for which calibration is past due in violation of QAM Section 5.4, Recall System and 5.10? YES NO

5. Is there a file of controlled in-house methods and procedures (Standard Operating Procedures) in accordance with QAM Sections 4.3, 4.4 & 6.1? Are they dated, signed and do they show the latest revision number? Is there a file of EPA methods on which SOP's are based? YES NO

6. Are samples being properly logged and labeled in accordance with QAM Section 3.3.2.2? Are samples transported / handled / stored properly prior to distribution to analysts? Are incoming chemicals inspected and dated prior to stocking and when opened as per QAM 3.3.1 and 10.1? YES NO

7. All raw data lab books documented according to requirements? YES NO
(analyst signed (initialed) lab record, SOP dated & signed & rev. #, procedure for analysis listed on lab record, record includes: method #, date received, & initialed, sample analysis data, control data, quality control data)

8. Accuracy and precision data available and verified? YES NO

9. Are analysts training records up-to-date? YES NO
Do they follow various safety measures diligently?

10. Are analyst's IDP records up-to-date? Do they take part in routine P.E. sample testing internal and external? YES NO

11. Sample "Green Sheet" documentation complete? YES NO

12. QC Standards, Blanks, MS/MSD run? YES NO

13. Instrument calibrations documented & logbooks (internal chain of custody, standard and check standard preparation, reagent preparation) verified? YES NO

14. Current instrument logs & maintenance logs up to date? YES NO

15. Are current methods approved and MDLs determined? YES NO

16. Are MDL records up-to-date? YES NO

17. Chain of custody forms used? YES NO

    A. Items logged in.

    B. POS SPECIFY PROCEDURE TO BE USED

    C. Condition of samples noted and if damaged client notified?

18. Are the sources of analytical reference standards available, records of preparation dates kept, and traceable to NIST standard? YES NO

19. Is storage and work space adequate for equipment and chemicals?

    A. Housekeeping acceptable? YES NO
    B. Chemical Expiration Dates? YES NO

20. Are analytes measured at levels within the required calibration range? (is the lowest point on the calibration curve equal to the PQL?) YES NO

21. Does lab monitor instrument performance characteristics (BEC for ICP, Tuning check for ICPMS, Instrument check samples for radiochemistry, Linear dynamic range, and routine instrument calibration)? YES NO

22. Are temperature records up-to-date (ovens, incubators, refrigerators, and autoclave)? Are temperatures monitored in weekend also? YES NO

23. Do lab workbooks include descriptions of standard preparation steps, name of analyst, date, reagents used, dilution information, source of the standard material, and standard certification records? YES NO

24. Is corrective action documented where method performance is outside acceptable range? YES NO

25. Are QC standards used past the expiration date? YES NO

26. Are standard calibration materials from a different source than the QC standards? YES NO

27. Do measures exist to prevent contamination? (For example, pesticide analysis contamination, hexane contamination, air-handling system contamination, trip blank preparation.) YES NO

28. Are check standards analyzed at the correct frequency? Are all quality control measures implemented as per SOP and EPA method and documented? YES NO

29. Is corrective action documented where check standards do not meet method criteria?
YES NO

30. Are % recovery and RPD met for all analytes measured and if not is corrective action documented?
YES NO

31. Are all calculations cross-checked by a second analyst and evaluated by a Project Manager?
YES NO

32. Are ASTM type 1 or 2 weights available for daily calibration? YES NO

SPECIFIC AUDIT of a random job: Laboratory No.: _____

33. Is service performed strictly in conformance with a purchase order and are any deviations covered by a change order in accordance with QAM Section 4.1.1? YES NO

34. Are changes and corrections on laboratory data sheets single line crossed out, initialed, and dated by persons making corrections in accordance with QAM Section 4.6? YES NO

35. Are prescribed procedures readily available and are they being utilized? Is the method indicated on the laboratory data record in accordance with QAM Sections 4.4 & 4.6?
YES NO

36. Does lab report document: methods, sample receipt date, preparation (extraction or digestion) date, analysis date, QA/QC results? Is documentation available for sample analysis data, control data, quality control data, standard and check standard preparation, reagent preparation, corrective action, if any? Is documentation available regarding internal and external chain of custody, sample integrity form?
YES NO

37. Are lab records and documentation stored for 10 years? YES NO

ANALYST AUDIT Analyst Name: _____

38. Does the analyst have documented training and IDP records for the method they are performing?
YES NO

39. Does the analyst know where the specific SOP is located? Do they have access to the specific SOP?
YES NO

40. Does the analyst know the appropriate procedure to correct data in the lab notebook?
YES NO

Meeting closed, deficiencies and suggestions for improvement discussed with: _____

TRUESDAIL LABORATORIES, INC.

QUALITY ASSURANCE – CORRECTIVE ACTION REQUEST (CAR)

Page of

1. Number: _____
   Revision: _____
2. Date: _____

3. Item / System Description	
4. Client:	5. Lab Record No./P.O. No.:
6. Description of Condition:	
7. Condition Noted In:	8. Initiator: _____ Date:
9. *The above condition requires your prompt attention for corrective action.*	Reply Requested From: _____ Reply Due Date: _____

10. Action Taken to Resolve Problem:			
11. Cause of Condition		12. Corrective Action to Prevent Recurrence	
13. Effective Date:	14. Signature	Title:	Date:

15. Corrective Action Acceptable _____Yes _____No (See # 17)	Quality Assurance Signature	Date:
16. Corrective Action Implementation Verified: _____Yes _____ No (See # 17)	Quality Assurance Signature	Date:
17. Remarks / References:		
18. *QA Final Review (CAR Closed):*	Quality Assurance Signature	Date:
19. Distribution: President, Technical Director, Chief Chemist, QA/QC Logbook		

CONTROLLED STAMP REQUEST

STAMP REQUESTED FOR:

Employee Name	Department	Type of Stamp Requested
_____	_____	_____

Please issue the stamp(s) to the employee listed above. The purpose of the stamp, how to use it, and the responsibility for its use to indicate the acceptable product quality have been explained to the employee by me.

REASON FOR REQUEST: NEW _____ REPLACEMENT: LOST_____ WORN _____

Date Requested: _____

Supervisor Signature: _____

Q.C. Manager or Designate Signature: _____

STAMP ISSUED BY:

New Stamp Impression(s) _____

Issued By: _____ Date: _____

CONTROLLED STAMP AGREEMENT

I acknowledge receipt of the stamp(s) assigned to me and the impression of the stamp(s) as shown above.

The use of the stamp(s) has been explained to me by my supervisor as stated above.

I will use my stamp(s) ONLY when I have personally inspected the work accomplished and have satisfied myself to the best of my ability that the work is complete and meets the standards required by Truesdail policies.

I will exercise the necessary precaution to prevent loss or damage of the stamp(s) and will immediately report to my supervisor should either occur.

I will not load my stamp(s) to, or borrow a stamp(s) from, any other employee.

I have read and understand the above agreement. I understand that failure to comply with this agreement could result in the forfeit of the stamp(s) assigned to me and could result in disciplinary action, up to and including discharge.

Employee: _____

Typed Name: _____

NOTE: A copy of this agreement will be filed in your personnel folder.

CALIBRATION HISTORY RECORD TRUESDAIL LABORATORIES, INC.

Description ____________________ S/N ______________ Range ____________________

Accuracy ______________ Manufacturer __________________ Location ____________________

Calibration Environment ____________________________________ Procedure ________________

Date Cal.	Ref. Std. Used	Ref. Std.	Test Reading/Corr.	Cal. by	Date Due

LABORATORY RECORD "GREEN SHEET"

Truesdail Laboratories, Inc.
14201 Franklin Avenue
Tustin, CA 92780
(714) 730-6239
Fax (714) 730-6462

Invoice # 00101111

Bill to:

ABC Manufacturing
Attn: John Smith
123 Main Street
Anytown, CA 910000

Ship To:

ABC Manufacturing
Attn: John Smith
123 Main Street
Anytown, CA 910000

PROJECT MANAGER	YOUR NO.	SHIP VIA	COL	PPD	SHIP DATE	TERMS	DATE	PG.
Patty Jones	8543		X			C.O.D.	3/13/03	1

QTY.	ITEM NO.	DESCRIPTION	PRICE		DISC %	EXTENDED PRICE
	Received	3/13/03				
	Matrix	WW/4				
	Date	Collection: 3/9/03				
-	Sample I.D.	24568				
2	21-coli (PA)	Coliform Bacteria Test – P/A	$52.00			$104.00
3	41-Bod	Biochemical Oxygen Demand	$35.00			$105.00
1	51-Fld Mat	Field Meterial	$25.00			$25.00
1	51-Fld Ser	Field Service	$75.00			$75.00
				SALE AMOUNT		$309.00
				FREIGHT		$0.00
				SALES TAX		$0.00
				TOTAL AMOUNT		$309.00
				PAID TODAY		$0.00
				BALANCE DUE		$309.00

LABORATORY WORKBOOK RECORD

LABORATORY No. _____ DATE RECEIVED_____

CLIENT: _____ DATE REPORTED_____

METHODS USED_____

DATA & CALCULATIONS:_____

SUMMARY OF RESULTS:

DATE				Total Time
HRS.				Hrs.
Signed:				

CHECKLIST – CALIBRATION SERVICES

Vendor Name: _____

Address: _____

City/State/Zip Code: _____

Vendor contact and members of the audit team:

ITEM **ANSI/NCSL**

1.0	Z540-1	RESPONSIBILITIES AND EVALUATION	COMPLIES	
1.1	5	Is the Quality Control manual current and approved by management?	YES	NO
1.2	5	Is the quality program, including procedures, processes and products available for review?	YES	NO

ITEM **ANSI/NCSL**

2.0	Z540-1	MEASURING AND TEST EQUIPMENT (M&TE)	COMPLIES	
2.0	17,18	Is there a written description of the calibration system covering the M&TE and measurement standards?	YES	NO
2.1	9	Are measurement standards traceable to NIST (National Institute of Standards and Technology)?	YES	NO
2.2	18.2	Do the measurement standards have the accuracy, stability, range, and resolution required for the intended use?	YES	NO
2.3	18.4	Are the measurement systems calibrated at periodic intervals and is there a effective recall system for the mandatory recall of M&TE and measurement systems?	YES	NO
2.4	18.9	Do calibration records include: (a) individual record of calibration (b) description/identification of item (c) calibration interval (d) calibration rate (e) identification of calibration source (f) calibration used (g) calibration results (h) calibration action taken?	YES	NO
2.5	18.10	Are M&TE labeled and identified with calibration date?	YES	NO

Comments _____

Audit Completed By:
Name: _____ Signature: _____
Title: _____ Date: _____

TRUESDAIL LABORATORIES, INC.
14201 FRANKLIN AVENUE · TUSTIN, CA 92780-7009
(714) 730-6239 FAX (714) 730-6462
www.truesdail.com

CHAIN OF CUSTODY RECORD

☐ TURNAROUND TIME ______________

DATE ______________ PAGE ______ OF ______

METHODS

COMPANY ______________

PROJECT NAME ______________

PHONE ______________ FAX ______________

ADDRESS ______________

____

P.O. NUMBER ______________

SAMPLERS (SIGNATURE) ______________

SAMPLE I.D.	DATE	TIME	DESCRIPTION															NUMBER OF CONTAINERS	COMMENTS

CHAIN OF CUSTODY SIGNATURE RECORD

Signature (Relinquished)	Printed Name	Company/ Agency	Date/ Time
Signature (Received)	Printed Name	Company/ Agency	Date/ Time
Signature (Relinquished)	Printed Name	Company/ Agency	Date/ Time
Signature (Received)	Printed Name	Company/ Agency	Date/ Time
Signature (Relinquished)	Printed Name	Company/ Agency	Date/ Time
Signature (Received)	Printed Name	Company/ Agency	Date/ Time
Signature (Relinquished)	Printed Name	Company/ Agency	Date/ Time
Signature (Received)	Printed Name	Company/ Agency	Date/ Time

TOTAL NUMBER OF CONTAINERS

SAMPLE CONDITIONS

RECEIVED COOL ☐ WARM ☐ ________ °F

CUSTODY SEALED YES ☐ NO ☐

SPECIAL REQUIREMENTS:

SAMPLING GUIDE

Parameter	Method*	Suggested Container	Volume**	Holding Preservative	Time
Inorganic and Wet Chemistry					
Acidity (as $CaCO_3$)	305.1	P,G	100	4°C	14 days
Alkalinity (as $CaCO_3$)	305.1, SM2320B	P,G	100	4°C	14 days
Ammonia	350.1, 350.2, 350.3	P,G	500	4°C, H_2SO_4 to pH<2	28 days
Biochemical Oxygen Demand (BOD)	405.1	P,G	1000	4°C	48 hours
Boron – Direct	212.3	P,G	200	HNO_3 to pH,2	28 days
Bromide	320.1	P,G	200	None	28 days
Chemical Oxygen Demand (COD)	410.1, 410.2, HACH 8000	P,G	100	4°C, H_2SO_4 to pH<2	28 days
Chloride	325.2, 325.3, 9252	P,G	200	None	28 days
Chlorine, residual	330.4	P,G	200	None	Immediate
Chromium – Hexavalent	218.4	P,G	250	4°C	24 hours
Coliform, Total	SM9221B, 9222B	P,G (sterile)	100	4°C	6 hours
Coliform, Fecal	SM9221C, 9222D	P,G (sterile)	100	4°C	6 hours
Color	110.2, 110.3	P,G	100	4°C	48 hours
Cyanide	335.2, 335.3, 9010	P,G	1000	4°C, ascorbic acid, NaOH to pH >12	14 days
Flashpoint	1010	P,G	100	None	Not specified
Fluoride	340.1, 340.2	P	500	None	28 days
Hardness (Total)	130.2	P,G	100	4°C, HNO_3 or H_2SO_4 to pH<2	6 months
Iodide	345.1	P,G	200	4°C	24 hours
Metals	6010, 200, 7000 series	P,G	500	HNO_3 to pH<2	6 months
Mercury	245.1, 7471	P,G	500	HNO_3 to pH<2	28 days
Nitrate	352.1, 353.1, 353.2	P,G	100	4°C	48 hours
Nitrite	354.1	P,G	100	4°C	48 hours
Nitrate-Nitrite	353.1, 353.2	P,G	200	4°C, H_2SO_4 to pH<2	28 days
Nitrogen – Total (Kjeldahl)	351.2, 351.3	P,G	500	4°C, H_2SO_4 to pH<2	28 days
Odor	140.1	G	200	4°C	24 hours
Oil & Grease	413.1, 413.2	G	1000	4°C, H_2SO_4 or HCl to pH<2	28 days
Organic Lead	DHS (LUFT)	G-A	1000	4°C	14 days
pH	150.1	P,G	100	None	Immediate
Phenols	420.1, 420.2	G-A	1000	4°C, H_2SO_4 to pH<2	28 days
Phosphates – Ortho	365.1, 365.2	P,G	200	4°C, filter on site	48 hours

SAMPLING GUIDE (CONT.)

Parameter	Method*	Suggested Container	Volume**	Holding Preservative	Time
Phosphorus, Total (as P)	365.1, 365.2	P,G	200	4°C, H_2SO_4 to pH<2	28 days
Radiochemistry (Alpha, beta & radionuclides)	900 & 9000 series	P,G	2000	HNO_3 to pH <2	1 year
Silica	370.1, 200.7	P	100	4°C	28 days
Solids – Dissolved – TDS	160.1	P,G	100	4°C	7 days
Solids – Suspended – TSS	160.2	P,G	100	4°C	7 days
Solids – Total – TS	160.3	P,G	100	4°C	7 days
Solids – Volatile – TVS	160.4	P,G	100	4°C	7 days
Specific Conductance – EC	120.1	P,G	100	4°C	28 days
Sulfate	375.3, 375.4	P,G	200	4°C	28 days
Sulfide	376.1, 376.2	P,G	500	4°C, Zn acetate, NaOH to pH >7	7 days
Sulfite	377.1	P,G	200	None required	Immediate
Surfactants (MBAS)	425.1	P,G	250	4°C	48 hours
Total Organic Carbon (TOC) in water	415.2	G	100	4°C, H_2SO_4 or HCl to pH<2	28 days
Total Organic Halogen (TOX)	9020	G-TLC-A	500	4°C, H_2SO_4 to pH<2	7 days
Turbidity	180.1	P,G	100	4°C	48 hours
Organic Analyses					
Base/Neutrals/Acid	525, 625, 8250, 8270, CLP	G-TLC-A	1000	4°C	7/40 days (5/35 days for CLP)
EDB and DBCP	504	VOA-G-A	3x40 vials	4°C	7 days/14 soil
Chlorinated pesticides & PCBs	508, 608, 8080	G-TLC-A	1000	4°C	7/40 days
Chlorinated Herbicides	515.1, 615, 8150	G-TLC-A	1000	4°C	7/40 days
Diesel (EFH)	8015m	G-A	1000	4°C	7 days/14 soil
Gasoline (VFH)	8015m, 8020	VOA-G	2x40 vials	4°C	7 days/14 soil
Organophosphorus Pesticides	507, 614, 8140	G-TLC-A	1000	4°C	7/40 days
Phenolics	604	G-TLC-A	1000	4°C	7 days
Purgeable Halocarbons	601, 8010	VOA-G	2x40 vials	4°C	14 days
Purgeable Aromatics	602, 8020	VOA-G	2x40 vials	4°C	7 days/14 soil
Volatile Organics in water	502.2, 524.1, 524.2	VOA-G	2x40 vials	4°C	14 days

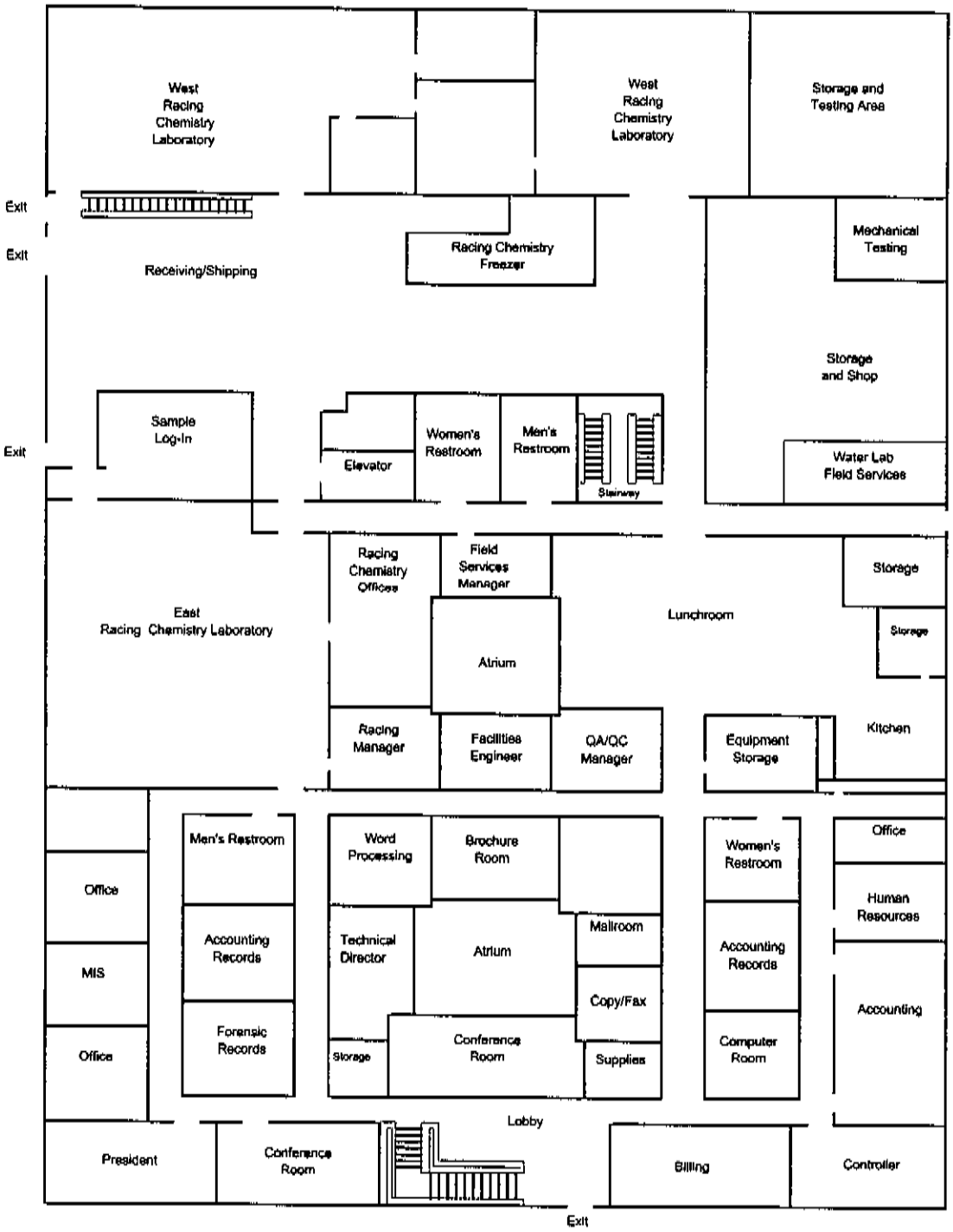
Soil samples are typically collected in brass or steel tubes and wide mouth jars (500ml) with Teflon-lined caps and preserved at 4°C.

G = Glass
P = Polyethylene
G-A = Amber Glass
VOA = Glass vial with Teflon-lined septum
G-TLC-A = Amber Glass with Teflon-lined cap

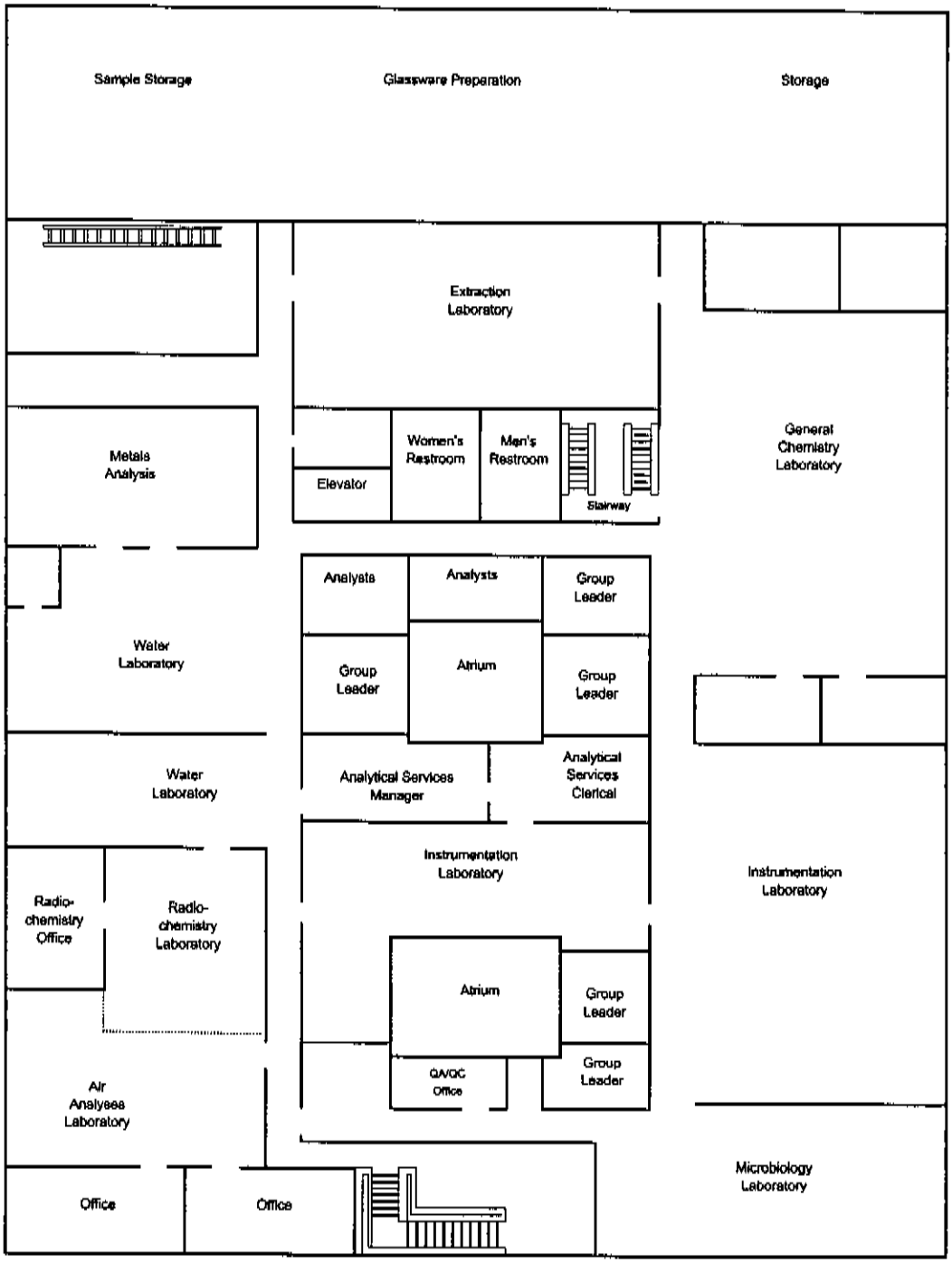
* The methods listed are EPA references, except for SM which references *Standard Methods for the Examination of Water and Wastes*, 19th. Edition. We also reference 40CFR, Part 136.

** More than one analysis can be performed on the same sample which would reduce the volume required. Additional volume would be required for matrix spikes and duplicates.

Floor Plan, First Floor



Floor Plan, Second Floor



WATER AND WASTE LABORATORY EQUIPMENT

Truesdail's Water and Waste Laboratory occupies about 5,000 square feet of space. This laboratory is responsible for determinations of inorganic chemicals, metals, and radioactivity. Purchase dates are in parentheses. All equipment is maintained and fully functional. A list of major equipment in this department follows:

Analytical Equipment — Purchase Date

Spectro CIR-OS M160 Axial ICP-OES (2003)
- Software Controlled "Intelligent" Auto Sampler
- Two Seconds Data Acquisition Time across 160nm to 800nm Spectrum
- Axial Plasma for Maximum Sensitivity and Substantially Lower MDL's than Standard ICP
- Full PC based Data System with remote access capability for 24hr operations

Spectromass 2000 ICP-MS (1999)
- Intelligient Auto Sampler
- Windows 98 Workstation with Integrated QC Software Package
- Full Spectrum of Elemental Analysis
- 3% TDS Analysis Capability

Buck Scientific Cold Vapor Generator (1998)
- Ultra Trace Level Gold Amalgam Concentrator

Perkin Elmer ICP 5500 Plasma Emission Spectrometer (1985)
- P.E. Data Work Station 3600
- A.A. Optics
- Auto Sampler

ARL Simultaneous ICP 3560 (1989)
- Windows 98 Work Station
- CETAC Auto Sampler
- Vacuum Upgrade
- 24 elements

ARL Model 902 Atomic Absorption Spectrometer (1990)
- HG900 Hydride Generator
- GF2000 Graphite Furnace
- Auto Sampler
- AST Data Work Station

ARL Model 902 Atomic Absorption Spectrometer (1990)
- HG 900 Hydride Generator
- Flame Unit - Acetylene and Nitrous Oxide
- Auto samplers
- AST Data Work Station

WATER AND WASTE EQUIPMENT (CONT.) PURCHASE DATE

Perkin Elmer 5100 Atomic Absorption Spectrometer (1995)
- Graphite Furnace
- Zeeman background correction
- Auto sampler
- IBM (clone) Data Work Station

Dionex ICS-2500 Ion Chromatograph (2003)
- Auto Sampler
- Windows PC Data System

Dionex ICS-2000 Ion Chromatograph (2003)
- Auto Sampler
- Windows PC Data System

Dionex 4000 Ion Chromatograph with advanced chromatography modules for anions and cations (1989)
- Auto Sampler
- Windows PC Data System (1998)

Dorhmann/Envirotech Model 80 TOC Analyzer (1990)

Dorhmann/Envirotech Model 50A TOC Analyzer (1987)
- D54 Ultra Low Organics Module

Dorhmann/Envirotech Model MC-3 TOX Analyzer (1991)

CEM Model MSD-2000 Microwave Digestion System (1992)

Technicon II Auto Sampler

Ludlum 2000-Alpha Scintillation Counter (1996)

Random Model SC-5 - Alpha Scintillation Counter (1995)

Tennelec LB-5100 Series III-Automatic Low Background Alpha/Beta Counting System (1990)

Protean Ulta Low Level Alpha/Beta Counter (1996)

Beckman LS-100C Liquid Scintillation Counter (1984)

Turner Fluorometer Model 110

Abott Auto-Logic III Gamma Counter Model 7402-06

Precision Scientific BOD Incubator (1986)

HACH 2100AN Turbidimeter (1998)

Fischer & Porter Amperometric Titrator (1993)

Labline Circulating Water Bath

PS Model 104 Convection Oven

Bausch and Lomb Spectronic 20 (3)

Water and Waste Laboratory (Cont.)

Spectronic Instruments Model 20 Genesis	(1998)
Bausch and Lomb Spectronic 21	(1987)
Orion Digital pH Meter Model 501	(1984)
Orion Model SA720 pH Meter	(1989)

Field Sampling Equipment

3 - ISCO 1870 Flowmeters
1 - ISCO 1700 Flowmeter
1 - Manning UF 1100 Flowmeter
6 - ISCO 1680 Samplers
3 - ISCO 1391 Samplers
3 - ISCO 2910 Samplers
1 - ISCO 3710 Sampler
1 - ISCO 2900 Sampler
4 - Plastifab Portable Flumes, 2 ea. 6", 10" and 12"
4 - ISCO Flow Programs
1 - VWR pH Meter
7 - 12V Lead/Acid Batteries
4 - ISCO Battery Chargers (Trickle Chargers)
2 - Battery Chargers (Fast Chargers)
1 - Airflow 2351 (Vertical Fan and Hose)
1 - Rope and Harness
1 - Manhole Cover Lifter
1 - Large Rubber Boots
5 - Assorted Marker Cones
1 - Hand Truck
1 - Yellow Poncho
2 - MSA Canister Type Respirations
1 - Full Body Harness
1 - Portable Tripod with winch
1 - Recording pH Meter
3 - Calibrated Water Meters
2 - Portable Gas Analyzers
3 - Teflon & Stainless Steel Bailers
1 - Portable D.O. Meter
- Coliwasa Samplers
- Drum Thiefs

2 - 3" Soil Augers (20 feet)
1 - Soil Core Sampler (25 feet)

Microbiology Laboratory Equipment

Truesdail's Microbiology Department examines water, waste, and other environmental samples (including foods) for microbiological contaminations. The staff in the microbiology department is also responsible for determination of asbestos in environmental samples. Where available, purchase dates are given in parentheses. All equipment is maintained and fully functional. A list of equipment in this department follows:

Asbestos Testing	**Purchase Date**
2 - Low Power Microscopes	
• A.O., 30X	
• Bausch & Lomb, 15-90X	
2 - Polarized Light	(1988)
• Olympus DOS	
• Megi ML RM (with phase contrast)	
1 - Toyodo Phase Contrast Microscope	
1 - Airfiltronix Model 4500 Work Station Hood with HEPA filter	

Microbiology

1 - Castle Thermatic Model 60 Autoclave (1987)

4 - Precision Scientific Incubators (R.T. temp to 60°C)

2 - Fungus Chambers (Truesdail designed)

- 4' x 2' x 3'
- 1-1/2' x 2' x 3'

1 - A.O. Darkfield Quebec Colony Counter, Model 3330

2 - Water Baths

- Labline (R.T. Temp to 120°C)
- Precision Scientific (R.T. Temp 20° to 100°C)

Instrumental Laboratory Equipment

The Instrumental Analysis Laboratory occupies three rooms, totaling about 4,000 square feet. One room houses GCs, HPLC, and data systems. A second room houses our GC/MS units and their data systems. A third room is the solvent extraction and sample preparation area. The Instrumental Laboratory provides the bulk of organic pollutant analyses. Where available, purchase dates are given in parentheses. All equipment is maintained and fully functional. A list of major equipment in this department follows:

	Purchase Date
Varian Saturn 2100 GC/MS with NIST Mass Spectral Library	(2002)
• Saturn PC based Data System with environmental quantitation software	
• Varian CP-8400 Auto Sampler	
Varian Saturn 2200 GC/MS	(2002)
• Saturn PC based Data System with environmental quantitation software	
• Varian CP-8400 Auto Sampler	
3 - Hewlett Packard 5970 B GC/MS	(1985 & 1989)
• ProLab Data System with NIST Mass Spectral Library	(1999)
• Techmar LSC II Purge and Trap Device	
1 – Hewlett Packard 5972 GC/MS	(1996)
• ProLab Data System with NIST Mass Spectral Library	(1999)
• PTA 30 W/S Auto Sampler	
• O.I. Model 4460A Sample Concentrator	
1 - Hewlett Packard 5995C GC/MS	(1986)
• ProLab GC/MS Data System with NIST Mass Spectral Library	(1999)
• Tekmar LSC II Purge and Trap Device	
• O.I. Model 4460 sample concentration	
2 - Hewlett Packard 5971 GC/MS	(1991)
• ProLab GC/MS Data System with NIST Mass Spectral Library	(1999)
1 - Technicon Fast LC HPLC UV Detector	(1988)
1 - Shimadzu SCL-6A HPLC	(1985)
• Shimadzu SPD-6AV UV-VIS Detector	
• Kratos Model 150 Fluorescent Detector	
1 - Hewlett-Packard 5730 GC Dual FID, Dual TC Detectors	(1981)
1 - Hewlett-Packard 402 GC Dual FID Detectors and Tracor-Hall Detector	

Instrumental Laboratory Equipment (Cont.)

Purchase Date

1 - Hewlett-Packard 5750 GC Dual FID, Dual TC & Electron Capture Detector (1984)

1 - Hewlett-Packard 5700 GC Dual FID Detectors

1 - Carle 221 GC FID Detector

1 - Carle 400 GC, FID Detector

1 - Perkin-Elmer Model 154B GC NDIR Detector (1990)

4 - Tracor 540 GC, PID and Hall Detectors (1984, 1985, 1988, 1990)

- Techmar LSC II Purge and Trap Device (3)
- O.I. 4460 Sample Concentrator
- PTA 30 Auto Sampler

1 - Tracor 540 GC, FID and N/P Detectors (1986)

- Precision Sampling Auto Sampler

1 - Tracor 540 GC, PID and FID Detectors (1984)

- Precision Sampling Auto Sampler
- Techmar ISC II Purge and Trap

4 - Tracor 540 GC, Dual ECD's (1987, 1987, 1991, 1992)

- Precision Sampling Auto Sampler

1 - Tracor 540 GC, FPD and TCD Detectors (1988)

1 - Shimadzu 9A GC, Dual FID (1986)

- Tekmar LSC II Purge and Trap Device
- Tekmar ALS Auto Sampler

12 - Shimadzu CR3A Electronic GC Integrator/Recorder
1 - Hewlett-Packard 3390 Electronic Integrator/Recorder
1 - Spectra Physics 41A Electronic Integrator/Recorder

1 - Perkin Elmer 257 Infra Red Analyzer (1985)

1 - Analect Instruments FX6160 FTIR Spectrophotometer (1985)

1 - Beckman D.U. 50 U.V. - Visible Spectrophotometer (1986)

- IBM XT Data System

8 - Dynamic Solutions Chromatography Work Stations (1987-1991)

- NEC at Computer, 1.2 MB Disc, 20 MB Disc
- 8-Detector Data Acquisition Board
- NEC Printer

1 - Head Systems - Ultrasonics Sonicator with 1/2" horn, 1/2" standard microtip, 3/4" distrupter horn

1 – SRI 8610 GC, FID, and TCD Detectors

Air Analysis Laboratory Equipment

The Air Analysis Laboratory occupies about 2700 square feet. This department is responsible for emissions testing, SCAQMD source testing, air contaminant analyses, CARB emissions determinations, air quality compliance testing, and emissions testing research and development.

The following major equipment items are available:

Source Testing Equipment

3 – EPA 5 Sampling Trains, Nutech

6 – Gast Vacuum Pumps

5 – Sprague Dry Test Meters

10 – Sets of Greenburg–Smith Impingers (4 ea.)

14 – Magnehelic Differential Pressure Gages–Various

8 – Assorted Pitot Tubes

40 – Calibrated NOx Flasks (EPA 7 equiv.)

40 – S.S. Traps with 7–liter Aluminum Cylinders (SCAWMD 25.1)

Analytical

3 - ORSAT Analyzer Absorption Spectrometer

1 - Turner Spectrophotometer

2 - Carle GC/FID with Methanizer - EPA 25

2 - Beckman I.R. Analyzers - EPA 25 (equiv.)

1 - Sartorius Torsion Balance - 0.1 mg.

1 - Right-A-Weigh Balance - 0.1 mg.

1 - Trap Condensate Recovery System - EPA 25 (equiv.)

3 - Computing Integrators for FID, IR, TCD, FPD.

- NBS Traceable Cal Gases for GCs

- Complete Chemical Lab, Hood, Benches, etc.

1 - Tracor 540 GC with TCD and FPD detectors - Fixed gases and sulfur

APPENDIX D – EXAMPLES OF EXTERNAL AUDIT REPORTS

PRODUCT CERTIFICATION

AUDIT FORM

Company_____ **Date**_____

Location(s)_____

_____

Audit participants_____

_____

Description of product_____

ModelNumber(s)_____

_____

Brand Name(s)_____

_____

1.0 Organization and Management

1.1 Organization Chart with clearly defined management structure?

1.2 Name and title of individual(s) responsible for the product line to be certified?

1.3 Is the quality assurance organization clearly defined?

1.4 Does QA/QC report directly to senior management?

1.5 Name of QA/QC person(s) responsible for the product to be certified?

2.0 Quality Assurance/Control Plan

2.1 Is there in place a written QA/QC manual that covers the operations producing the product to be certified?

2.2 Does the QA/QC Manual Cover:

A reference to the QA/QC standards being used such as ISO or ANSI etc.

Goals of program

Organization/ structure/personnel

Purchasing and subcontracting

Equipment and calibration

Document control

Internal audits

Corrective actions

Personnel qualifications

Employee training

Operational Procedures

2.3 Is the QA/QC manual regularly updated and is it maintained with a document control system?

3.0 Standard Operating Procedures / Manufacturing Specifications

3.1 Are there written, standard operating and manufacturing procedures?

3.2 Are written procedures maintained under strict document control, with changes and modifications dated and signed?

3.4 Are the standard procedures readily available to the workers producing the product?

3.4 What internal audits are performed to insure workers are following procedures?

4.0 Subcontractor requirements for Quality Assurance/ Material Specifications

4.1 How are specifications and quality assurance requirements passed through to subcontractors and suppliers?

4.2 Are on-site inspections and/or audits done on suppliers or subcontractors?

4.3 Are any of the subcontractors and suppliers approved by other certifying agencies?

5.0 Documentation of in-house QA/QC (records review)

5.1 What documentation is available for routine in-house testing and inspections?

5.2 How long are records kept?

5.3 Is there a standard corrective action protocol?

6.0 Audit trail of parts: purchasing specifications, invoices, shipping and receiving documentation

6.1 Do purchasing orders and subcontracts clearly specify the items or materials to be purchased with drawings, descriptions, QC requirements etc.

6.2 Do invoices agree with descriptions of purchased parts or materials?

6.3 Do shipping and receiving documents clearly identify parts and materials, and how are records kept?

6.4 Are "First Article" inspections done on received goods and what records are kept?

7.0 Results of any prior audits by other certifying organizations

7.1 Has this product ever been certified by any other organization?

7.2 Has any of the components in this product been certified?

7.3 Have any similar models of this product been certified?

8.0 Results of prior sample testing, in house and external

8.1 What tests and analyses relevant to certification parameters are routinely ran?

8.2 Are any tests routinely ran outside the company?

8.3 Are results available from any previous certification effort?

9.0 Review of product/packaging markings

9.1 Do products and/or packaging clearly display the certification mark?

9.2 What other documents carry the certification mark (brochures, fliers, ads, posters etc.)

10.0 Records of complaints received about certified products

10.1 Are records of complaints about a product kept?

10.2 Are records of corrective actions maintained?

11.0 Samples to be tested

11.1 Can samples be taken at random from the warehouse or production line?

11.2 Can the auditor leave with samples to be tested or must they be shipped?

12.0 Other Comments

Auditor(s) Signature_____**Date**_____

_____**Date**_____

VENDOR QUALITY SYSTEM ON-SITE AUDIT

Vendor Name: _____

Address: _____

City/State/Zip Code: _____

Vendor contact and members of audit team:

ITEM 1.0	ANSI/NCSL Z 540-1	RESPONSIBILITIES AND EVALUATION	COMPLIES	
1.1	3.1	Is the Quality Control manual current and approved by management?	YES	NO
1.2	3.2	Is the quality program, including procedures, processes and products available for review?	YES	NO

ITEM 2.0	MIL-I-45208A	MEASURING AND TEST EQUIPMENT (M&TE)	COMPLIES	
2.0	5.1	Is there a written description of the calibration system covering the M&TE and measurement standards?	YES	NO
2.1	5.2	Are measurement standards traceable to NIST (National Institute of Standards and Technology)?	YES	NO
2.2	5.3	Do the measurement standards have the accuracy, stability, range, and resolution required for the intended use?	YES	NO
2.3	5.4	Are the measurement systems calibrated at periodic intervals and is there a effective recall system for the mandatory recall of M&TE and measurement systems?	YES	NO
2.4	5.9	Do calibration records include: (a) individual record of calibration (b) description/ identification of item (c) calibration interval (d) calibration date (e) identification of calibration source (f) calibration used (g) calibration results (h) calibration actions taken?	YES	NO
2.5	5.10	Are M&TE labeled and identified with calibration date?	YES	NO

Comments _____

Audit Completed By:

Name: _____ Signature: _____

Title: _____ Date: _____

A. PERFORMANCE EVALUATION SAMPLE RESULTS

Truesdail participated in several QA/QC programs sponsored by EPA until they were ultimately cancelled. We have included a summary of our EPA WST WP results through termination of the program. In 1998, Radiochemistry results are given for the last EPA performance evaluation. Results for Microbiology performance evaluations are included through termination by the State in 2000. Most of our pollution performance evaluation results are prior to 1994 when EPA ended the air pollution performance evaluation program.

Recent performance evaluation results for water, wastewater, and solid waste have been included for samples from commercial sources.

Dataset
Dataset 1

Accreditors

Evaluations of this dataset will be sent to the accreditor(s) listed below using your laboratory's labcode listed above each accrediting agency. If any of the information listed below is incorrect, please contact RTC immediately.

Accrediting Labcode ELAP 1237
California Dept. of Health Services
Environmental Lab Accred. Program Branch
104 Fred Choske
850 Marina Bay Parkway
Bldg. P, 1st Floor, MS 7103
Richmond CA 94804
UNITED STATES

Analyte Group N/A

Analysis
EPA 300.0
Ion Chromatography Electroconductivity

Method Number 10053006
Technology Code IC-COND

	Result Units	Accept / Warn	Z	Evaluation
Chloride [1, 4] 1575 / PEI-011 - Lot 011942	62.6 mg/L	54.6 to 72.8 57.6 to 69.7	-0.36	Acceptable
Sulfate [1, 2, 4] 2000 / PEI-011 - Lot 011942	38.4 mg/L	33.6 to 44.3	-0.21	Acceptable

Base/Neutrals

Base/Neutrals

Analysis
EPA 525.2
Other

Method Number 10089608
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Naphthalene [1, 4, 5] 5005 / PEO-006-2 - Lot 011972	34.9 µg/L	25.3 to 59.1	-0.86	Acceptable
Acenaphthene [1, 4, 5] 5500 / PEO-006-2 - Lot 011972	2.46 µg/L	0.810 to 2.43	2.07	Not Acceptable
Acenaphthylene [1, 4, 5] 5505 / PEO-006-2 - Lot 011972	5.67 µg/L	3.23 to 9.69	-0.49	Acceptable
Anthracene [1, 4, 5] 5555 / PEO-006-2 - Lot 011972	6.38 µg/L	4.30 to 12.9	-1.04	Acceptable
Benzo(a)anthracene [1, 4, 5] 5575 / PEO-006-2 - Lot 011972	7.76 µg/L	4.43 to 13.3	-0.50	Acceptable
Benzo(a)pyrene [1, 3, 4] 5580 / PEO-006-1 - Lot 011968	1.61 µg/L	0.530 to 1.66	1.81	Acceptable
Benzo(b)fluoranthene [1, 4, 5] 5585 / PEO-006-2 - Lot 011972	6.55 µg/L	3.52 to 10.5	-0.27	Acceptable
Benzo(g,h,i)perylene [1, 4, 5] 5590 / PEO-006-2 - Lot 011972	8.23 µg/L	4.43 to 13.3	-0.28	Acceptable
Benzo(k)fluoranthene [1, 4, 5] 5600 / PEO-006-2 - Lot 011972	4.76 µg/L	2.42 to 7.26	-0.07	Acceptable
Butyl benzyl phthalate [1, 4] 5670 / PEO-006-2 - Lot 011972	30.3 µg/L	11.4 to 45.4	0.22	Acceptable
Chrysene [1, 4, 5] 5855 / PEO-006-2 - Lot 011972	2.07 µg/L	1.04 to 3.12	-0.02	Acceptable
Dibenz(a,h) anthracene [1, 4, 5] 5895 / PEO-006-2 - Lot 011972	8.35 µg/L	4.51 to 13.5	-0.29	Acceptable
Di-n-butyl phthalate [1, 4, 5] 5925 / PEO-006-2 - Lot 011972	16.3 µg/L	5.56 to 22.2	0.58	Acceptable
Di(2-ethylhexyl)adipate [1, 3, 4] 6062 / PEO-006-1 - Lot 011968	10.1 µg/L	3.40 to 17.6	-0.12	Acceptable
Di(2-ethylhexyl)phthalate [1, 3, 4] 6065 / PEO-006-1 - Lot 011968	22.8 µg/L	10.4 to 38.5	-0.23	Acceptable
Diethyl phthalate [1, 4, 5] 6070 / PEO-006-2 - Lot 011972	20.0 µg/L	6.60 to 26.4	0.71	Acceptable

Base/Neutrals (continued)

Base/Neutrals

Analysis
EPA 525.2
Other

(continued)
Method Number 10089608
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Dimethyl phthalate 1, 4, 5 6135 / PEO-006-2 - Lot 011972	18.3 µg/L	8.48 to 33.9	-0.46	Acceptable
Di-n-octyl phthalate 1, 4, 5 6200 / PEO-006-2 - Lot 011972	33.8 µg/L	15.4 to 61.8	-0.41	Acceptable
Fluoranthene 1, 4, 5 6285 / PEO-006-2 - Lot 011972	8.03 µg/L	3.93 to 11.8	0.08	Acceptable
Fluorene 1, 4, 5 6270 / PEO-006-2 - Lot 011972	6.26 µg/L	3.29 to 9.87	-0.19	Acceptable
Indeno(1,2,3-cd) pyrene 1, 4, 5 6315 / PEO-006-2 - Lot 011972	7.77 µg/L	4.11 to 12.3	-0.21	Acceptable
1-Methylnaphthalene 4 6380 / PEO-006-2 - Lot 011972	24.2 µg/L	12.7 to 50.7	-0.79	Acceptable
2-Methylnaphthalene 4 6385 / PEO-006-2 - Lot 011972	19.4 µg/L	9.08 to 36.3	-0.48	Acceptable
Phenanthrene 1, 4, 5 6615 / PEO-006-2 - Lot 011972	3.90 µg/L	2.14 to 6.42	-0.36	Acceptable
Pyrene 1, 4, 5 6665 / PEO-006-2 - Lot 011972	8.06 µg/L	4.09 to 12.3	-0.05	Acceptable

Group Analysis Summary
Acceptable 24 / 25
Score 96.0% - (Acceptable)

Herbicides

Herbicides

Analysis
EPA 515.4
Other

Method Number 10088503
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
4-Nitrophenol 4 8500 / PEO-005-4 - Lot 011974	13.8 µg/L	21.3 to 63.8	-2.70	Not Acceptable
Pentachlorophenol 1, 3, 4 8605 / PEO-005-4 - Lot 011974	60.4 µg/L	35.0 to 105	-0.55	Acceptable
Acifluorfen 1, 3, 4 8505 / PEO-005-4 - Lot 011974	26.2 µg/L	7.32 to 38.3	0.44	Acceptable
Bentazon 1, 4, 5 8530 / PEO-005-4 - Lot 011974	62.2 µg/L	36.3 to 127	-0.86	Acceptable
Chloramben 1, 4, 5 8540 / PEO-005-4 - Lot 011974	25.4 µg/L	18.2 to 54.6	-1.21	Acceptable
2,4-D 1, 3, 4 8545 / PEO-005-4 - Lot 011974	23.5 µg/L	31.4 to 94.1	-2.50	Not Acceptable
Dacthal (DCPA) 1, 4, 5 8550 / PEO-005-4 - Lot 011974	11.4 µg/L	0.00 to 75.9	-1.26	Acceptable
Dalapon 1, 3, 4 8555 / PEO-005-4 - Lot 011974	24.1 µg/L	0.00 to 102	-0.81	Acceptable
2,4-DB 1, 4 8560 / PEO-005-4 - Lot 011974	102 µg/L	41.0 to 113	1.38	Acceptable
Dicamba 1, 3, 4 8595 / PEO-005-4 - Lot 011974	23.0 µg/L	8.18 to 41.5	-0.22	Acceptable
3,5-Dichlorobenzoic acid 1, 4, 5 8600 / PEO-005-4 - Lot 011974	43.5 µg/L	23.4 to 70.1	-0.27	Acceptable
Dichloroprop 1, 4, 5 8605 / PEO-005-4 - Lot 011974	58.4 µg/L	47.5 to 97.7	-1.13	Acceptable
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP) 1, 3, 4 8620 / PEO-005-4 - Lot 011974	31.4 µg/L	7.48 to 50.7	0.21	Acceptable
Picloram 1, 3, 4 8645 / PEO-005-4 - Lot 011974	18.3 µg/L	5.46 to 34.3	-0.22	Acceptable

Herbicides (continued)

Herbicides

Analysis
EPA 515.4
Other

(continued)
Method Number 10088503
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Silvex (2,4,5-TP) [1, 3, 4] 8650 / PEO-005-4 - Lot 011974	82.1 µg/L	46.5 to 140	-0.47	Acceptable
2,4,5-T [1, 4] 8655 / PEO-005-4 - Lot 011974	51.4 µg/L	17.6 to 58.8	1.28	Acceptable

Group Analysis Summary
Acceptable 14 / 16
Score 87.5% - (Acceptable)

Inorganic Disinfection By-Products

Analysis
EPA 300.0
Ion Chromatography Electroconductivity

Method Number 10053006
Technology Code IC-COND

	Result Units	Accept / Warn	Z	Evaluation
Bromide [1, 3, 4] 1540 / PEI-017-1 - Lot 011884	299 µg/L	290 to 480	-2.03	Acceptable

Minerals

Analysis
EPA 354.1
Other

Method Number 10068403
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Nitrite as N [1, 3, 4] 1840 / PEI-011 - Lot 011942	1.34 mg/L	0.911 to 1.36	1.82	Acceptable

Analysis
EPA 300.0
Ion Chromatography Electroconductivity

Method Number 10053006
Technology Code IC-COND

	Result Units	Accept / Warn	Z	Evaluation
Fluoride [1, 3, 4] 1730 / PEI-011 - Lot 011942	3.52 mg/L	2.86 to 4.09	0.13	Acceptable
Nitrate as N [1, 3, 4] 1810 / PEI-011 - Lot 011942	4.00 mg/L	3.29 to 4.56	0.24	Acceptable

Analysis
EPA 365.2
Other

Method Number 10070209
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Orthophosphate as P [1, 3, 4] 1870 / PEI-011 - Lot 011942	2.52 mg/L	2.09 to 2.71	0.76	Acceptable

Miscellaneous Analytes

Analysis
EPA 415.2
Other

Method Number 10078601
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Dissolved organic carbon (DOC) [4] 1710 / PEI-225 - Lot 011890	4.08 mg/L	3.43 to 4.80	-0.10	Acceptable
Total organic carbon (TOC) [1, 3, 4] 2040 / PEI-013 - Lot 011911	3.56 mg/L	2.98 to 4.21	-0.10	Acceptable

Analysis
EPA 150.1
Other

Method Number 10008205
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Corrosivity (pH) [4] 1825 / PEI-010-12 - Lot 011945/9	8.23 Units	7.60 to 8.40	1.15	Acceptable

Miscellaneous Analytes (continued)

(continued)

Analysis
EPA 150.1
Other
Method Number 10008205
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
pH [1, 3, 4] 1900 / PEI-010-3 - Lot 011891	5.47 Units	5.27 to 5.67	0.00	Acceptable

Analysis
EPA 180.1
Other
Method Number 10011402
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Turbidity [1, 3, 4] 2055 / PEI-014 - Lot 011883	1.29 NTU	1.06 to 1.69	-0.52	Acceptable

Analysis
EPA 310.1
Other
Method Number 10054601
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Alkalinity as CaCO3 [1, 3, 4] 1505 / PEI-010-12 - Lot 011945/9	51.0 mg/L	45.1 to 53.3	0.89	Acceptable

Analysis
EPA 330.1
Other
Method Number 10057804
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Total chlorine 1585 / PEI-224 - Lot 011880	0.70 mg/L	0.508 to 0.712	1.76	Acceptable
Total residual chlorine [1, 4] 1940 / PEI-012 - Lot 011880	0.67 mg/L	0.523 to 0.732	0.82	Acceptable
Residual free chlorine [1, 3, 4] 1945 / PEI-012 - Lot 011880	0.60 mg/L	0.450 to 0.737	0.06	Acceptable

Analysis
EPA 335.2
Other
Method Number 10060205
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Cyanide [1, 3, 4] 1635 / PEI-015 - Lot 011881	0.37 mg/L	0.277 to 0.461	0.02	Acceptable

Analysis
EPA 370.1
Other
Method Number 10071804
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Silica as SiO2 [1, 4, 5] 1990 / PEI-227 - Lot 011904	8.50 mg/L	7.26 to 9.74	0.05	Acceptable

Analysis
EPA 425.1
Other
Method Number 10080407
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Surfactants - MBAS [1, 4, 5] 2025 / PEI-203 - Lot 011889	0.63 mg/L	0.539 to 0.792	-0.56	Acceptable

Analysis
EPA 300.0
Ion Chromatography Electroconductivity
Method Number 10053006
Technology Code IC-COND

	Result Units	Accept / Warn	Z	Evaluation
Sulfate [1, 3, 4] 2000 / PEI-013 - Lot 011911	382 mg/L	325 to 407	0.79	Acceptable

Analysis
EPA 120.1
Other
Method Number 10006209
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Specific conductance, Conductivity (25°C) [1, 4] 1610 / PEI-010-12 - Lot 011945/9	782 µmhos/cm	714 to 872	-0.28	Acceptable

Miscellaneous Analytes (continued)

Analysis
EPA 130.2
Other

Method Number 10007008
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Hardness, total as CaCO3 [1, 4] 1755 / PEI-010-12 - Lot 011945/9	258 mg/L	234 to 286	-0.25	Acceptable

Analysis
EPA 7196A
Other

Method Number 10162400
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Chromium VI, Cr(VI) [1, 4, 5] 1045 / PEI-229 - Lot 011887	20.4 µg/L	16.9 to 20.7	1.65	Acceptable

Analysis
EPA 160.1
Other

Method Number 10009004
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Residue-filterable (TDS) [1, 3, 4] 1955 / PEI-010-12 - Lot 011945/9	457 mg/L	219 to 743 306 to 656	-0.27	Acceptable

Analysis
SM 18/19/20th ED 5910
OTHER

Method Number 9944778
Technology Code OTHER

	Result Units	Accept / Warn	Z	Evaluation
UV 254 [1, 4, 5] 2060 / PEI-225 - Lot 011890	0.055 cm-1	0.0460 to 0.0976	-1.23	Acceptable

Organic Disinfection By-Products

Analysis
EPA 552.2
Other

Method Number 10095600
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Bromoacetic acid [1, 3, 4] 9312 / PEO-098 - Lot 011973	32.4 µg/L	18.0 to 42.0	0.40	Acceptable
Bromochloroacetic acid [1, 3, 4] 9315 / PEO-098 - Lot 011973	27.5 µg/L	12.5 to 29.3	1.58	Acceptable
Chloroacetic acid [1, 3, 4] 9336 / PEO-098 - Lot 011973	32.0 µg/L	18.9 to 44.1	0.08	Acceptable
Dibromoacetic acid [1, 3, 4] 9357 / PEO-098 - Lot 011973	42.6 µg/L	18.8 to 44.0	1.78	Acceptable
Dichloroacetic acid [1, 3, 4] 9360 / PEO-098 - Lot 011973	42.9 µg/L	22.0 to 51.4	0.84	Acceptable
Total haloacetic acids 9414 / PEO-098 - Lot 011973	214 µg/L	101 to 235	1.37	Acceptable
Trichloroacetic acid [1, 3, 4] 9642 / PEO-098 - Lot 011973	37.1 µg/L	15.9 to 37.1	2.00	Acceptable

Oxygenates - Gasoline Additives

Analysis
EPA 8015B
Other

Method Number 10173601
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
n-Butyl alcohol [4] 4425 / PEO-230 - Lot 012055	19.2 mg/L	10.8 to 24.6	0.45	Acceptable
Ethanol [4] 4750 / PEO-230 - Lot 012055	7.24 mg/L	3.20 to 7.49	1.77	Acceptable
Methanol [4] 4930 / PEO-230 - Lot 012055	153 mg/L	72.0 to 168	1.38	Acceptable

Analysis
EPA 524.2
Other

Method Number 10088605
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation

Oxygenates - Gasoline Additives (continued)

Analysis
EPA 524.2
Other

(continued)
Method Number 10088605
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
T-amylmethylether (TAME) [1, 4, 5] 4370 / PEO-075 - Lot 012002	46.9 µg/L	25.6 to 59.8		Acceptable
tert-Butyl alcohol [1, 4, 5] 4420 / PEO-075 - Lot 012002	53.4 µg/L	26.7 to 62.3	1.00	Acceptable
Carbon disulfide [4] 4450 / PEO-075 - Lot 012002	11.7 µg/L	9.96 to 23.2		Acceptable
Ethyl-t-butylether (ETBE) [1, 4, 5] 4770 / PEO-075 - Lot 012002	43.5 µg/L	24.1 to 56.3	0.41	Acceptable
Methyl tert-butyl ether (MTBE) [4] 5000 / PEO-075 - Lot 012002	28.0 µg/L	17.7 to 41.3	-0.25	Acceptable
n-Propylbenzene [4] 5090 / PEO-075 - Lot 012002	5.29 µg/L	3.48 to 8.12	-0.44	Acceptable
Trichlorofluoromethane [4] 5175 / PEO-075 - Lot 012002	22.2 µg/L	15.1 to 35.3		Acceptable
1,2,3-Trichloropropane [1, 4, 5] 5180 / PEO-075 - Lot 012002	1.25 µg/L	0.888 to 2.07		Acceptable
Trichlorotrifluoroethane (Freon 113) [1, 4, 5] 5185 / PEO-075 - Lot 012002	37.3 µg/L	21.4 to 50.0	0.22	Acceptable
Di-isopropylether (DIPE) [1, 4, 5] 9375 / PEO-075 - Lot 012002	13.2 µg/L	2.62 to 23.6	0.02	Acceptable

Group Analysis Summary
Acceptable 10 / 10
Score 100.0% - **(Acceptable)**

PCBs in Water

Analysis
EPA 508
Other

Method Number 10085402
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
PCB Aroclor Identification [1] 8872 / PEO-003 - Lot 002197	1242	1242 to 1240 1240 to 1240		Acceptable
Aroclor-1016 (PCB-1016) [1, 4] 8880 / PEO-003 - Lot 002197	<0.1 µg/L	0.00 to 0.30 0.00 to 5.04		Acceptable
Aroclor-1221 (PCB-1221) [1, 4] 8885 / PEO-003 - Lot 002197	<0.1 µg/L	0.0 to 0.0 0.0 to 0.0		Acceptable
Aroclor-1232 (PCB-1232) [1, 4] 8890 / PEO-003 - Lot 002197	<0.1 µg/L	0.0 to 0.0 0.0 to 0.0		Acceptable
Aroclor-1242 (PCB-1242) [1, 4] 8895 / PEO-003 - Lot 002197	1.07 µg/L	0.00 to 3.75 0.00 to 3.00	-0.57	Acceptable
Aroclor-1248 (PCB-1248) [1, 4] 8900 / PEO-003 - Lot 002197	<0.1 µg/L	0.0 to 0.0		Acceptable
Aroclor-1254 (PCB-1254) [1, 4] 8905 / PEO-003 - Lot 002197	<0.1 µg/L	0.0 to 0.0 0.0 to 0.0		Acceptable
Aroclor-1260 (PCB-1260) [1, 4] 8910 / PEO-003 - Lot 002197	<0.1 µg/L	0.0 to 0.0 0.0 to 0.0		Acceptable

Pesticides

Pesticides

Analysis
EPA 508
Other

Method Number 10085004
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Hexachlorobenzene [1, 3, 4] 6275 / PEO-005-2 - Lot 011967	3.11 µg/L	1.36 to 3.75	0.92	Acceptable
Hexachlorocyclopentadiene [1, 3, 4] 6285 / PEO-005-2 - Lot 011967	20.6 µg/L	4.08 to 30.4	0.51	Acceptable

Pesticides (continued)

Pesticides

Analysis
EPA 508
Other

(continued)
Method Number 10085004
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Aldrin [1, 3, 4] 7025 / PEO-005-1 - Lot 011958	1.43 µg/L	0.634 to 1.89	0.54	Acceptable
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane) [1, 3, 4] 7120 / PEO-005-1 - Lot 011958	0.267 µg/L	0.259 to 0.681	-1.92	Acceptable
Chlordane (total) [1, 3, 4] 7250 / PEO-005-5 - Lot 011963	5.24 µg/L	3.38 to 8.90	-0.65	Acceptable
Dieldrin [1, 3, 4] 7470 / PEO-005-1 - Lot 011958	3.04 µg/L	1.69 to 3.51	0.97	Acceptable
Endrin [1, 3, 4] 7540 / PEO-005-1 - Lot 011958	0.449 µg/L	0.285 to 0.817	-0.77	Acceptable
Heptachlor [1, 3, 4] 7685 / PEO-005-1 - Lot 011958	4.18 µg/L	2.17 to 5.71	0.27	Acceptable
Heptachlor epoxide [1, 3, 4] 7690 / PEO-005-2 - Lot 011967	0.467 µg/L	0.360 to 1.00	-1.44	Acceptable
Methoxychlor [1, 3, 4] 7810 / PEO-005-2 - Lot 011967	63.0 µg/L	32.9 to 86.7	0.24	Acceptable
Propachlor (Ramrod) [1, 3, 4] 8045 / PEO-005-2 - Lot 011967	2.09 µg/L	1.43 to 3.42	-0.67	Acceptable
Toxaphene (Chlorinated camphene) [1, 3, 4] 8250 / PEO-005-6 - Lot 011966	11.1 µg/L	5.27 to 16.5	-0.12	Acceptable
Trifluralin (Treflan) [1, 3, 4] 8295 / PEO-005-2 - Lot 011967	2.97 µg/L	1.62 to 4.01	0.26	Acceptable

Group Analysis Summary
Acceptable 13 / 13
Score 100.0% - **(Acceptable)**

Analysis
EPA 525.2
Other

Method Number 10089608
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Alachlor [1, 3, 4] 7005 / PEO-005-3 - Lot 011960	4.69 µg/L	2.50 to 6.58	0.15	Acceptable
Atrazine [1, 3, 4] 7065 / PEO-005-3 - Lot 011960	5.10 µg/L	3.00 to 7.92	-0.29	Acceptable
Bromacil [1, 4, 5] 7130 / PEO-005-3 - Lot 011960	5.42 µg/L	4.43 to 11.7	-1.45	Acceptable
Butachlor [1, 4] 7160 / PEO-005-3 - Lot 011960	53.5 µg/L	26.2 to 62.8	0.98	Acceptable
Metolachlor [1, 4] 7835 / PEO-005-3 - Lot 011960	14.0 µg/L	7.84 to 18.1	0.38	Acceptable
Metribuzin [1, 4] 7845 / PEO-005-3 - Lot 011960	7.89 µg/L	6.12 to 40.0	-1.79	Acceptable
Molinate [1, 4, 5] 7875 / PEO-005-3 - Lot 011960	36.5 µg/L	19.6 to 51.6	0.11	Acceptable
Simazine [1, 3, 4] 8125 / PEO-005-3 - Lot 011960	19.4 µg/L	7.83 to 49.5	-0.89	Acceptable

Regulated VOCs

Analysis
EPA 524.2
Other

Method Number 10088605
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Benzene [1, 3, 4] 4375 / PEO-007-2 - Lot 011998	11.9 µg/L	9.68 to 14.5	-0.23	Acceptable
Carbon tetrachloride [1, 3, 4] 4455 / PEO-007-1 - Lot 011997	8.72 µg/L	5.39 to 12.8	-0.15	Acceptable
Chlorobenzene [1, 3, 4] 4475 / PEO-007-1 - Lot 011997	6.14 µg/L	4.02 to 9.38	-1.32	Acceptable

Regulated VOCs (continued)

Analysis
EPA 524.2
Other

(continued)
Method Number 10088605
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
1,2-Dichlorobenzene 1, 3, 4 4610 / PEO-007-2 - Lot 011998	8.74 µg/L	5.89 to 13.7	-1.07	Acceptable
1,4-Dichlorobenzene 1, 3, 4 4620 / PEO-007-2 - Lot 011998	13.8 µg/L	12.8 to 19.2	-1.27	Acceptable
1,2-Dichloroethane 1, 3, 4 4635 / PEO-007-1 - Lot 011997	14.3 µg/L	13.2 to 19.8	-1.21	Acceptable
1,1-Dichloroethylene 1, 3, 4 4640 / PEO-007-1 - Lot 011997	8.10 µg/L	5.26 to 12.3	-0.72	Acceptable
cis-1,2-Dichloroethylene 1, 3, 4 4645 / PEO-007-1 - Lot 011997	12.5 µg/L	12.0 to 18.0	-2.10	Acceptable
1,2-Dichloropropane 1, 3, 4 4655 / PEO-007-1 - Lot 011997	14.8 µg/L	12.2 to 18.4	-0.43	Acceptable
trans-1,2-Dichloroethylene 1, 3, 4 4700 / PEO-007-1 - Lot 011997	14.1 µg/L	12.1 to 18.1	-0.84	Acceptable
Ethylbenzene 1, 3, 4 4765 / PEO-007-2 - Lot 011998	5.05 µg/L	3.23 to 7.53	-0.61	Acceptable
Methylene chloride (Dichloromethane) 1, 3, 4 4975 / PEO-007-1 - Lot 011997	6.89 µg/L	4.64 to 10.8	-0.81	Acceptable
Styrene 1, 3, 4 5100 / PEO-007-1 - Lot 011997	5.48 µg/L	3.47 to 8.09	-0.36	Acceptable
Tetrachloroethylene (Perchloroethylene) 1, 3, 4 5115 / PEO-007-1 - Lot 011997	12.6 µg/L	10.9 to 16.3	-0.78	Acceptable
Toluene 1, 3, 4 5140 / PEO-007-2 - Lot 011998	3.16 µg/L	1.97 to 4.59	-0.39	Acceptable
1,2,4-Trichlorobenzene 1, 3, 4 5155 / PEO-007-1 - Lot 011997	11.1 µg/L	13.9 to 20.9	-2.24	Not Acceptable
1,1,1-Trichloroethane 1, 3, 4 5160 / PEO-007-1 - Lot 011997	15.7 µg/L	13.6 to 20.4	-0.92	Acceptable
1,1,2-Trichloroethane 1, 3, 4 5165 / PEO-007-1 - Lot 011997	14.2 µg/L	12.4 to 18.6	-0.89	Acceptable
Trichloroethene (Trichloroethylene) 1, 3, 4 5170 / PEO-007-1 - Lot 011997	16.4 µg/L	14.6 to 22.0	-1.71	Acceptable
Vinyl chloride 1, 3, 4 5235 / PEO-007-1 - Lot 011997	1.09 µg/L	0.846 to 1.97	-1.28	Acceptable
Xylene, total 1, 3, 4 5260 / PEO-007-2 - Lot 011998	23.6 µg/L	20.6 to 30.8	-0.87	Acceptable

Group Analysis Summary
Acceptable 20 / 21
Score 95.2% - (Acceptable)

Analysis
EPA 504.1
Other

Method Number 10082607
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
1,2-Dibromo-3-chloropropane (DBCP) 1, 3, 4 4570 / PEO-007-4 - Lot 012001	0.47 µg/L	0.306 to 0.714	-0.39	Acceptable
1,2-Dibromoethane (EDB, Ethylene dibromide) 1, 3, 4 4585 / PEO-007-4 - Lot 012001	0.87 µg/L	0.936 to 2.18	-2.21	Not Acceptable

Trihalomethanes

Analysis
EPA 502.2
Other

Method Number 10082005
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Bromodichloromethane 1, 3, 4 4395 / PEO-002 - Lot 011957	52.1 µg/L	28.8 to 67.2	0.43	Acceptable
Bromoform 1, 3, 4 4400 / PEO-002 - Lot 011957	12.7 µg/L	7.26 to 16.9	0.25	Acceptable

Trihalomethanes (continued)

Analysis
EPA 502.2
Other

(continued)
Method Number 10082005
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Chloroform 1, 3, 4 4505 / PEO-002 - Lot 011957	22.5 µg/L	17.8 to 26.8	0.14	Acceptable
Dibromochloromethane 1, 3, 4 4575 / PEO-002 - Lot 011957	15.9 µg/L	8.46 to 19.7	0.64	Acceptable
Total trihalomethanes 1, 3, 4 5205 / PEO-002 - Lot 011957	103 µg/L	57.8 to 135	0.34	Acceptable

Group Analysis Summary
Acceptable 5 / 5
Score 100.0% - **(Acceptable)**

Analysis
EPA 524.2
Other

Method Number 10088605
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Bromodichloromethane 1, 3, 4 4395 / PEO-007-3A - Lot 011999	<0.5 µg/L	0.0 to 0.0		Acceptable
Bromoform 1, 3, 4 4400 / PEO-007-3A - Lot 011999	<0.5 µg/L	0.0 to 0.0		Acceptable
Chloroform 1, 3, 4 4505 / PEO-007-3A - Lot 011999	<0.5 µg/L	0.0 to 0.0		Acceptable
Dibromochloromethane 1, 3, 4 4575 / PEO-007-3A - Lot 011999	<0.5 µg/L	0.0 to 0.0		Acceptable

Group Analysis Summary
Acceptable 4 / 4
Score 100.0% - **(Acceptable)**

Unregulated VOCs

Analysis
EPA 524.2
Other

Method Number 10088605
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Bromobenzene 1, 3, 4 4385 / PEO-007-3B - Lot 012000	29.1 µg/L	26.1 to 39.1	-0.99	Acceptable
Bromochloromethane 1, 3, 4 4390 / PEO-007-3B - Lot 012000	11.4 µg/L	7.32 to 17.1	-0.98	Acceptable
n-Butylbenzene 1, 3, 4 4435 / PEO-007-3B - Lot 012000	33.4 µg/L	32.8 to 49.2	-1.57	Acceptable
sec-Butylbenzene 1, 3, 4 4440 / PEO-007-3B - Lot 012000	18.1 µg/L	16.0 to 24.0	-0.61	Acceptable
tert-Butylbenzene 1, 3, 4 4445 / PEO-007-3B - Lot 012000	39.3 µg/L	36.6 to 55.0	-0.93	Acceptable
Chloroethane 1, 3, 4 4485 / PEO-007-3A - Lot 011999	57.6 µg/L	24.6 to 57.4	2.02	Not Acceptable
2-Chlorotoluene 1, 3, 4 4535 / PEO-007-3B - Lot 012000	15.6 µg/L	8.94 to 20.9	0.29	Acceptable
4-Chlorotoluene 1, 3, 4 4540 / PEO-007-3B - Lot 012000	39.9 µg/L	36.7 to 55.1	-1.43	Acceptable
Dibromomethane 1, 3, 4 4595 / PEO-007-3B - Lot 012000	31.2 µg/L	28.4 to 42.6	-1.46	Acceptable
1,3-Dichlorobenzene 1, 3, 4 4615 / PEO-007-2 - Lot 011998	7.57 µg/L	5.33 to 12.4	-1.14	Acceptable
1,3-Dichlorobenzene 1, 3, 4 4615 / PEO-007-3A - Lot 011999	22.1 µg/L	19.8 to 29.6	-0.78	Acceptable
Dichlorodifluoromethane 1, 3, 4 4625 / PEO-007-3A - Lot 011999	<0.5 µg/L	0.0 to 0.0		Acceptable
1,1-Dichloroethane 1, 3, 4 4630 / PEO-007-3A - Lot 011999	24.7 µg/L	21.2 to 31.8	-0.78	Acceptable

Unregulated VOCs (continued)

Analysis
EPA 524.2
Other

(continued)
Method Number 10088605
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
1,3-Dichloropropane [1, 3, 4] 4680 / PEO-007-3B - Lot 012000	22.3 µg/L	19.7 to 28.5	-0.98	Acceptable
2,2-Dichloropropane [1, 3, 4] 4685 / PEO-007-3B - Lot 012000	16.0 µg/L	8.94 to 20.9	0.40	Acceptable
1,1-Dichloropropene [1, 3, 4] 4670 / PEO-007-3B - Lot 012000	8.88 µg/L	5.80 to 13.5	-1.42	Acceptable
cis-1,3-Dichloropropene [1, 3, 4] 4680 / PEO-007-3A - Lot 011999	43.9 µg/L	37.5 to 56.3	-0.76	Acceptable
trans-1,3-Dichloropropene [1, 3, 4] 4685 / PEO-007-3A - Lot 011999	6.30 µg/L	4.12 to 9.62	-0.59	Acceptable
Hexachlorobutadiene [1, 3, 4] 4835 / PEO-007-3B - Lot 012000	10.1 µg/L	6.60 to 15.4	-0.62	Acceptable
Isopropylbenzene [1, 3, 4] 4900 / PEO-007-3B - Lot 012000	33.6 µg/L	29.2 to 43.8	-0.80	Acceptable
4-Isopropyltoluene [1, 3, 4] 4901 / PEO-007-3B - Lot 012000	9.59 µg/L	6.36 to 14.8	-1.06	Acceptable
Methyl bromide (Bromomethane) [1, 3, 4] 4950 / PEO-007-3A - Lot 011999	22.2 µg/L	18.3 to 37.9	-1.49	Acceptable
Methyl chloride (Chloromethane) [1, 3, 4] 4960 / PEO-007-3A - Lot 011999	27.5 µg/L	19.7 to 45.9	-1.20	Acceptable
Methyl tert-butyl ether (MTBE) [1, 4] 5000 / PEO-007-2 - Lot 011998	41.6 µg/L	26.1 to 60.9	-0.79	Acceptable
Naphthalene [1, 4] 5005 / PEO-007-2 - Lot 011998	9.61 µg/L	7.74 to 18.1	-1.16	Acceptable
n-Propylbenzene [1, 3, 4] 5090 / PEO-007-3B - Lot 012000	11.1 µg/L	7.38 to 17.2	-0.72	Acceptable
1,1,1,2-Tetrachloroethane [1, 3, 4] 5105 / PEO-007-3B - Lot 012000	18.1 µg/L	16.7 to 25.1	-1.73	Acceptable
1,1,2,2-Tetrachloroethane [1, 3, 4] 5110 / PEO-007-3A - Lot 011999	6.06 µg/L	4.57 to 10.7	-1.65	Acceptable
1,2,3-Trichlorobenzene [1, 3, 4] 5150 / PEO-007-3B - Lot 012000	28.5 µg/L	31.9 to 47.9	-2.13	Not Acceptable
Trichlorofluoromethane [1, 3, 4] 5175 / PEO-007-3A - Lot 011999	22.8 µg/L	17.3 to 40.5	-2.27	Acceptable
1,2,3-Trichloropropane [1, 3, 4] 5180 / PEO-007-3B - Lot 012000	10.8 µg/L	4.16 to 9.70	4.79	Not Acceptable
1,2,4-Trimethylbenzene [1, 4] 5210 / PEO-007-2 - Lot 011998	12.0 µg/L	8.40 to 19.6	-1.42	Acceptable
1,2,4-Trimethylbenzene [1, 3, 4] 5210 / PEO-007-3B - Lot 012000	11.5 µg/L	7.08 to 16.5	-0.23	Acceptable
1,3,5-Trimethylbenzene [1, 4] 5215 / PEO-007-2 - Lot 011998	16.0 µg/L	14.9 to 22.3	-1.24	Acceptable
1,3,5-Trimethylbenzene [1, 3, 4] 5215 / PEO-007-3B - Lot 012000	41.2 µg/L	34.1 to 51.1	-0.39	Acceptable
m+p-Xylene [4] 5240 / PEO-007-2 - Lot 011998	13.9 µg/L	12.9 to 19.3	-1.37	Acceptable
o-Xylene [4] 5250 / PEO-007-2 - Lot 011998	9.70 µg/L	5.81 to 13.6	0.02	Acceptable

Group Analysis Summary
Acceptable 34 / 37
Score 91.9% - (Acceptable)

Analysis
EPA 504.1
Other

Method Number 10082607
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
1,2,3-Trichloropropane [1, 3, 4] 5180 / PEO-007-4 - Lot 012001	8.48 µg/L	6.12 to 14.3	-2.10	Acceptable

End of Dataset 1

Dataset
Dataset 2

Accreditors

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California Dept. of Health Services
Environmental Lab Accred. Program Branch
104 Fred Choske
850 Marina Bay Parkway
Bldg. P, 1st Floor, MS 7103
Richmond CA 94804
UNITED STATES

Miscellaneous Analytes

Analysis
EPA 7199
Ion Chromatography Electroconductivity

Method Number 10163005
Technology Code IC-COND

	Result Units	Accept / Warn	Z	Evaluation
Chromium VI, Cr(VI) [1, 4, 5] 1045 / PEI-229 - Lot 011887	19.8 µg/L	18.9 to 20.7	1.03	Acceptable

Regulated VOCs

Analysis
EPA 524.2 SIM
Other

Method Number 99913421
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
1,2-Dibromo-3-chloropropane (DBCP) [1, 3, 4] 4570 / PEO-007-4 - Lot 012001	0.58 µg/L	0.306 to 0.714	0.69	Acceptable
1,2-Dibromoethane (EDB, Ethylene dibromide) [1, 3, 4] 4585 / PEO-007-4 - Lot 012001	1.46 µg/L	0.936 to 2.18	-0.32	Acceptable

Unregulated VOCs

Analysis
EPA 524.2 SIM
Other

Method Number 99913421
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
1,2,3-Trichloropropane [1, 3, 4] 5180 / PEO-007-4 - Lot 012001	10.2 µg/L	6.12 to 14.3	0.00	Acceptable

End of Dataset 2

Dataset
Dataset 3

Accreditors

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104 Fred Choske
850 Marina Bay Parkway
Bldg. P, 1st Floor, MS 7103
Richmond CA 94804
UNITED STATES

Miscellaneous Analytes

Analysis
EPA 200.7
Other

Method Number 10013408
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Sodium, Na [1, 3, 4] 1155 / PEI-010-12 - Lot 011945/9	21.0 mg/L	19.6 to 24.3	-0.79	Acceptable

Trace Metals

Analysis
EPA 6010B
Other

Method Number 10155609
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Aluminum, Al [1, 4] 1000 / PEI-016-1 - Lot 011914	348 µg/L	302 to 419	-0.44	Acceptable
Antimony, Sb [1, 3, 4] 1005 / PEI-016-2 - Lot 011915	29.6 µg/L	22.4 to 41.6	-0.61	Acceptable
Arsenic, As [1, 3, 4] 1010 / PEI-016-1 - Lot 011914	14.8 µg/L	9.03 to 16.8	1.26	Acceptable
Barium, Ba [1, 3, 4] 1015 / PEI-016-2 - Lot 011915	739 µg/L	657 to 889	-0.85	Acceptable
Beryllium, Be [1, 3, 4] 1020 / PEI-016-1 - Lot 011914	2.70 µg/L	2.55 to 3.45	-1.33	Acceptable
Boron, B [1, 3, 4] 1025 / PEI-016-2 - Lot 011915	889 µg/L	852 to 1070	-1.32	Acceptable
Cadmium, Cd [1, 3, 4] 1030 / PEI-016-1 - Lot 011914	10.7 µg/L	10.2 to 15.4	-2.58	Acceptable
Chromium, Cr (total) [1, 3, 4] 1040 / PEI-016-1 - Lot 011914	45.9 µg/L	49.8 to 67.4	-5.38	Not Acceptable
Copper, Cu [1, 3, 4] 1055 / PEI-016-1 - Lot 011914	513 µg/L	513 to 627	-2.83	Acceptable
Iron, Fe [1, 4] 1070 / PEI-016-1 - Lot 011914	485 µg/L	422 to 538	0.17	Acceptable
Lead, Pb [1, 3, 4] 1075 / PEI-016-1 - Lot 011914	12.5 µg/L	9.17 to 17.0	-0.44	Acceptable
Magnesium, Mg [1, 4] 1085 / PEI-016-2 - Lot 011915	4850 µg/L	4410 to 5610	-0.53	Acceptable
Manganese, Mn [1, 3, 4] 1090 / PEI-016-1 - Lot 011914	102 µg/L	99.1 to 123	-1.51	Acceptable
Molybdenum, Mo [1, 3, 4] 1100 / PEI-016-2 - Lot 011915	39.6 µg/L	32.7 to 43.5	0.56	Acceptable
Nickel, Ni [1, 3, 4] 1105 / PEI-016-1 - Lot 011914	298 µg/L	258 to 348	-0.44	Acceptable
Selenium, Se [1, 3, 4] 1140 / PEI-016-1 - Lot 011914	38.2 µg/L	30.5 to 45.7	0.02	Acceptable
Silver, Ag [1, 4] 1150 / PEI-016-2 - Lot 011915	246 µg/L	234 to 298	-1.25	Acceptable

Trace Metals (continued)

Analysis
EPA 6010B
Other

(continued)
Method Number 10155609
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Thallium, Tl [1, 3, 4] 1165 / PEI-016-2 - Lot 011915	5.69 µg/L	3.89 to 7.23	0.16	Acceptable
Vanadium, V [1, 4] 1185 / PEI-016-2 - Lot 011915	776 µg/L	729 to 891	-0.96	Acceptable
Zinc, Zn [1, 3, 4] 1190 / PEI-016-1 - Lot 011914	662 µg/L	614 to 750	-0.59	Acceptable

Analysis
EPA 200.7
Other

Method Number 10013408
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Calcium, Ca [1, 4] 1035 / PEI-010-12 - Lot 011945/9	78.4 mg/L	70.0 to 86.7	0.01	Acceptable
Magnesium, Mg [1, 4] 1085 / PEI-010-12 - Lot 011945/9	15.4 mg/L	13.6 to 17.0	0.12	Acceptable
Potassium, K [1, 4] 1125 / PEI-010-12 - Lot 011945/9	28.1 mg/L	26.4 to 34.7	-1.18	Acceptable

End of Dataset 3

Dataset
Dataset 4

Accreditors

Evaluations of this dataset will be sent to the accreditor(s) listed below using your laboratory's labcode listed above each accrediting agency. If any of the information listed below is incorrect, please contact RTC immediately.

Accrediting Labcode **ELAP 1237**
California Dept. of Health Services
Environmental Lab Accred. Program Branch
104 Fred Choske
850 Marina Bay Parkway
Bldg. P, 1st Floor, MS 7103
Richmond CA 94804
UNITED STATES

Trace Metals

Analysis
EPA 200.8
Other

Method Number 10014401
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Aluminum, Al [1, 4] 1000 / PEI-016-1 - Lot 011914	338 µg/L	302 to 419	-0.78	Acceptable
Antimony, Sb [1, 3, 4] 1005 / PEI-016-2 - Lot 011915	29.6 µg/L	22.4 to 41.6	-0.61	Acceptable
Arsenic, As [1, 3, 4] 1010 / PEI-016-1 - Lot 011914	14.0 µg/L	9.03 to 16.8	0.73	Acceptable
Barium, Ba [1, 3, 4] 1015 / PEI-016-2 - Lot 011915	772 µg/L	657 to 889	-0.03	Acceptable
Beryllium, Be [1, 3, 4] 1020 / PEI-016-1 - Lot 011914	2.99 µg/L	2.55 to 3.45	-0.04	Acceptable
Cadmium, Cd [1, 3, 4] 1030 / PEI-016-1 - Lot 011914	12.3 µg/L	10.2 to 15.4	-0.62	Acceptable
Chromium, Cr (total) [1, 3, 4] 1040 / PEI-016-1 - Lot 011914	60.7 µg/L	49.8 to 67.4	0.89	Acceptable
Copper, Cu [1, 3, 4] 1055 / PEI-016-1 - Lot 011914	503 µg/L	513 to 627	-3.32	Not Acceptable
Iron, Fe [1, 4] 1070 / PEI-016-1 - Lot 011914	483 µg/L	422 to 538	0.10	Acceptable
Lead, Pb [1, 3, 4] 1075 / PEI-016-1 - Lot 011914	14.6 µg/L	9.17 to 17.0	1.10	Acceptable
Manganese, Mn [1, 3, 4] 1090 / PEI-016-1 - Lot 011914	106 µg/L	99.1 to 123	-0.84	Acceptable
Molybdenum, Mo [1, 3, 4] 1100 / PEI-016-2 - Lot 011915	39.2 µg/L	32.7 to 43.5	0.41	Acceptable
Nickel, Ni [1, 3, 4] 1105 / PEI-016-1 - Lot 011914	313 µg/L	268 to 348	0.88	Acceptable
Selenium, Se [1, 3, 4] 1140 / PEI-016-1 - Lot 011914	38.1 µg/L	30.5 to 45.7	0.00	Acceptable
Silver, Ag [1, 4] 1150 / PEI-016-2 - Lot 011915	250 µg/L	234 to 298	-1.00	Acceptable
Thallium, Tl [1, 3, 4] 1165 / PEI-016-2 - Lot 011915	5.69 µg/L	3.89 to 7.23	0.16	Acceptable
Vanadium, V [1, 4] 1185 / PEI-016-2 - Lot 011915	783 µg/L	729 to 891	-0.76	Acceptable
Zinc, Zn [1, 3, 4] 1190 / PEI-016-1 - Lot 011914	706 µg/L	614 to 750	0.71	Acceptable

End of Dataset 4

Dataset
Dataset 5

Accreditors
Evaluations of this dataset will be sent to the accreditor(s) listed below using your laboratory's labcode listed above each accrediting agency. If any of the information listed below is incorrect, please contact RTC immediately.

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California Dept. of Health Services
Environmental Lab Accred. Program Branch
104 Fred Choske
850 Marina Bay Parkway
Bldg. P, 1st Floor, MS 7103
Richmond CA 94804
UNITED STATES

Trace Metals

Analysis
EPA 6020A
Other

Method Number 10156408
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
Aluminum, Al [1, 4] 1000 / PEI-016-1 - Lot 011914	339 µg/L	302 to 419	-0.75	Acceptable
Antimony, Sb [1, 3, 4] 1005 / PEI-016-2 - Lot 011915	27.5 µg/L	22.4 to 41.6	-1.14	Acceptable
Arsenic, As [1, 3, 4] 1010 / PEI-016-1 - Lot 011914	14.1 µg/L	9.03 to 16.8	0.80	Acceptable
Barium, Ba [1, 3, 4] 1015 / PEI-016-2 - Lot 011915	772 µg/L	657 to 889	-0.03	Acceptable
Beryllium, Be [1, 3, 4] 1020 / PEI-016-1 - Lot 011914	2.61 µg/L	2.55 to 3.45	-1.73	Acceptable
Cadmium, Cd [1, 3, 4] 1030 / PEI-016-1 - Lot 011914	12.7 µg/L	10.2 to 15.4	-0.12	Acceptable
Chromium, Cr (total) [1, 3, 4] 1040 / PEI-016-1 - Lot 011914	60.1 µg/L	49.8 to 67.4	0.63	Acceptable
Copper, Cu [1, 3, 4] 1055 / PEI-016-1 - Lot 011914	503 µg/L	513 to 627	-3.32	Not Acceptable
Iron, Fe [1, 4] 1070 / PEI-016-1 - Lot 011914	486 µg/L	422 to 538	0.20	Acceptable
Lead, Pb [1, 3, 4] 1075 / PEI-016-1 - Lot 011914	14.3 µg/L	9.17 to 17.0	0.88	Acceptable
Manganese, Mn [1, 3, 4] 1090 / PEI-016-1 - Lot 011914	110 µg/L	99.1 to 123	-0.17	Acceptable
Molybdenum, Mo [1, 3, 4] 1100 / PEI-016-2 - Lot 011915	39.2 µg/L	32.7 to 43.5	0.41	Acceptable
Nickel, Ni [1, 3, 4] 1105 / PEI-016-1 - Lot 011914	305 µg/L	258 to 348	0.18	Acceptable
Selenium, Se [1, 3, 4] 1140 / PEI-016-1 - Lot 011914	37.7 µg/L	30.5 to 45.7	-0.09	Acceptable
Silver, Ag [1, 4] 1150 / PEI-016-2 - Lot 011915	248 µg/L	234 to 298	-1.13	Acceptable
Thallium, Tl [1, 3, 4] 1165 / PEI-016-2 - Lot 011915	5.69 µg/L	3.89 to 7.23	0.16	Acceptable
Vanadium, V [1, 4] 1185 / PEI-016-2 - Lot 011915	765 µg/L	729 to 891	-1.27	Acceptable
Zinc, Zn [1, 3, 4] 1190 / PEI-016-1 - Lot 011914	717 µg/L	614 to 750	1.04	Acceptable

End of Dataset 5

Dataset
Dataset 1

Accreditors
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Richmond CA 94804
UNITED STATES

Base/Neutrals
Base/Neutrals

Analysis
EPA 525.2
Gas Chromatography - Mass Spectrometry

Method Number 10089608
Technology Code GC-MS

	Result Units	Accept / Warn	Z	Evaluation
Acenaphthene [1, 4, 5] 5,500 / O-006-2 - Lot 011504	9.82 µg/L	4.89 to 14.7	0.01	Acceptable

Herbicides
Herbicides

Analysis
EPA 515.4
Other

Method Number 10088503
Technology Code NA

	Result Units	Accept / Warn	Z	Evaluation
4-Nitrophenol [4] 6,500 / O-005-4 - Lot 011507	32.0 µg/L	1.65 to 58.9	1.07	Acceptable

Analysis
EPA 515.4
OTHER

Method Number 10088503
Technology Code OTHER

	Result Units	Accept / Warn	Z	Evaluation
2,4-D [1, 3, 4] 8,545 / O-005-4 - Lot 011507	146 µg/L	13.1 to 191	0.99	Acceptable

Regulated VOCs

Analysis
EPA 524.2
Gas Chromatography - Mass Spectrometry

Method Number 10088605
Technology Code GC-MS

	Result Units	Accept / Warn	Z	Evaluation
1,2,4-Trichlorobenzene [1, 3, 4] 5,155 / O-007-1 - Lot 011490	6.63 µg/L	5.84 to 13.6	-2.91	Acceptable

Analysis
EPA 504.1
Gas Chromatography - Electron Capture Detection

Method Number 10082607
Technology Code GC-ECD

	Result Units	Accept / Warn	Z	Evaluation
1,2-Dibromoethane (EDB, Ethylene dibromide) [1, 3, 4] 4,585 / O-007-4 - Lot 011484	0.342 µg/L	0.218 to 0.504	-0.25	Acceptable

Trace Metals

Trace Metals (continued)

Analysis
EPA 200.8
Mass Spectrometry - Inductively Coupled Plasma

Method Number 10014401
Technology Code ICP-MS

	Result Units	Accept / Warn	Z	Evaluation
Copper, Cu [1, 3, 4] 1,055 / I-018-1 - Lot 011677	1570 µg/L	1280 to 1570	1.78	Acceptable

Unregulated VOCs

Analysis
EPA 524.2
Gas Chromatography - Mass Spectrometry

Method Number 10088605
Technology Code GC-MS

	Result Units	Accept / Warn	Z	Evaluation
Chloroethane [1, 3, 4] 4,485 / O-007-3A - Lot 011496	20.3 µg/L	12.0 to 28.0	0.07	Acceptable
1,2,3-Trichlorobenzene [1, 3, 4] 5,150 / O-007-3B - Lot 011518	21.9 µg/L	17.7 to 26.5	-0.06	Acceptable
1,2,3-Trichloropropane [1, 3, 4] 5,180 / O-007-3B - Lot 011518	8.83 µg/L	6.96 to 16.2	-2.50	Acceptable

End of Dataset 1

Dataset
Dataset 2

Accreditors

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850 Marina Bay Parkway
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Richmond CA 94804
UNITED STATES

Trace Metals

Analysis
EPA 6020B
Mass Spectrometry - Inductively Coupled Plasma

Method Number 9912457
Technology Code ICP-MS

	Result Units	Accept / Warn	Z	Evaluation
Copper, Cu [1, 3, 4] 1,065 / I-016-1 - Lot 011677	1570 µg/L	1280 to 1570	1.78	**Acceptable**

End of Dataset 2

Dataset
Dataset 3

Accreditors

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UNITED STATES

Trace Metals

Analysis
EPA 6010B
Atomic Emission - Inductvely Coupled Plasma Spectrometry

Method Number 10155609
Technology Code ICP-AES

	Result Units	Accept / Warn	Z	Evaluation
Chromium, Cr (total) [1, 3, 4] 1,040 / 1-016-1 - Lot 011677	81.3 µg/L	68.6 to 90.0	0.44	Acceptable

End of Dataset 3

Performance Evaluation Report
RTC Laboratory Proficiency Testing Program
2006 Water Supply (WS) Summary

2931 Soldier Springs Rd. - Laramie WY 82070 - (307) 742-5452

Participating Laboratory:

Truesdail Laboratories, Inc.
Attention: **Pat Iyer**
14201 Franklin Ave.
Tustin, CA 92780
EPA Lab Code: **CA00062**

If you have any questions about your report, please contact Chris Rucinski at (307) 742-5452 or e-mail: reports@rt-corp.com.

Base/Neutrals

EPA 525.2
Gas Chromatography - Mass Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Naphthalene *5005 PEO-006-2 WS06-2*	30.2 µg/L	23.1	13.9 to 32.3	1.5368	3/3	Acceptable
Acenaphthene *5500 PEO-006-2 WS06-2*	11.1 µg/L	8.81	4.41 to 13.2	1.0397	2/3	Acceptable
Acenaphthylene *5505 PEO-006-2 WS06-2*	8.39 µg/L	8.27	4.14 to 12.4	0.0580	1/4	Acceptable
Anthracene *5555 PEO-006-2 WS06-2*	4.21 µg/L	5.33	2.66 to 7.99	-0.8405	2/4	Acceptable
Benzo(a)anthracene *5575 PEO-006-2 WS06-2*	4.55 µg/L	4.55	2.28 to 6.83	0.0000	1/4	Acceptable
Benzo(a)pyrene *5580 PEO-006-1 WS06-2*	0.91 µg/L	0.840	0.439 to 0.961	1.6067	6/6	Acceptable
Benzo(b)fluoranthene *5585 PEO-006-2 WS06-2*	1.96 µg/L	2.10	1.05 to 3.15	-0.2667	1/4	Acceptable
Benzo(g,h,i)perylene *5590 PEO-006-2 WS06-2*	2.19 µg/L	1.70	0.850 to 2.55	1.1529	4/4	Acceptable
Benzo(k)fluoranthene *5600 PEO-006-2 WS06-2*	7.31 µg/L	9.31	4.66 to 14.0	-0.8593	3/4	Acceptable
Butyl benzyl phthalate *5670 PEO-006-2 WS06-2*	44.5 µg/L	40.4	16.2 to 64.6	0.3383	2/4	Acceptable
Chrysene *5685 PEO-006-2 WS06-2*	4.72 µg/L	5.46	2.73 to 8.19	-0.5421	2/4	Acceptable
Dibenz(a,h) anthracene *5695 PEO-006-2 WS06-2*	4.95 µg/L	5.02	2.51 to 7.53	-0.0558	1/4	Acceptable
Di-n-butyl phthalate *5925 PEO-006-2 WS06-2*	57.4 µg/L	45.2	18.1 to 72.3	0.8997	2/4	Acceptable
Di(2-ethylhexyl)adipate *6062 PEO-006-1 WS06-2*	16.6 µg/L	17.6	6.12 to 25.9	0.1244	1/6	Acceptable
Di(2-ethylhexyl)phthalate *6065 PEO-006-1 WS06-2*	9.52 µg/L	9.62	3.48 to 14.7	0.1597	1/6	Acceptable
Dimethyl phthalate *6135 PEO-006-2 WS06-2*	76.1 µg/L	49.1	19.6 to 78.6	1.8330	4/4	Acceptable
Di-n-octyl phthalate *6200 PEO-006-2 WS06-2*	35.8 µg/L	38.6	15.4 to 61.8	-0.2418	1/2	Acceptable
Fluoranthene *6265 PEO-006-2 WS06-2*	1.36 µg/L	1.19	0.595 to 1.79	0.5714	1/3	Acceptable
Fluorene *6270 PEO-006-2 WS06-2*	5.88 µg/L	4.39	2.19 to 6.59	1.3576	3/4	Acceptable

EPA 525.2
Gas Chromatography - Mass Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Indeno(1,2,3-cd) pyrene *6315 PEO-006-2 WS06-2*	4.55 µg/L	4.30	2.15 to 6.45	0.2326	1/4	Acceptable
1-Methylnaphthalene *6380 PEO-006-2 WS06-2*	12.7 µg/L	9.32	3.73 to 14.9	1.2069	2/2	Acceptable
2-Methylnaphthalene *6385 PEO-006-2 WS06-2*	42.0 µg/L	29.4	11.8 to 47.0	1.4286	2/2	Acceptable
Phenanthrene *6615 PEO-006-2 WS06-2*	8.93 µg/L	9.39	4.70 to 14.1	-0.1960	2/4	Acceptable
Pyrene *6665 PEO-006-2 WS06-2*	7.13 µg/L	7.36	3.68 to 11.0	-0.1250	1/4	Acceptable

Herbicides

EPA 515.4
Gas Chromatography - Electron Capture Detection

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
4-Nitrophenol *6500 PEO-005-4 WS06-2*	15.1 µg/L	12.7	6.35 to 19.0	0.7559	1/2	Acceptable
4-Nitrophenol *6500 PEO-005-4 WS06-2-118*	12.1 µg/L	12.2	2.41 to 16.9	1.0179	4/5	Acceptable
Pentachlorophenol *6605 PEO-005-4 WS06-2*	51.8 µg/L	34.6	17.3 to 51.9	1.9884	6/7	Acceptable
Pentachlorophenol *6605 PEO-005-4 WS06-2-118*	27.3 µg/L	45.1	22.5 to 67.6	-1.5787	7/7	Acceptable
Acifluorfen *8505 PEO-005-4 WS06-2*	33.4 µg/L	37.8	16.0 to 51.3	-0.0275	1/3	Acceptable
Acifluorfen *8505 PEO-005-4 WS06-2-118*	33.9 µg/L	42.0	19.0 to 55.8	-0.3770	1/5	Acceptable
Bentazon *8530 PEO-005-4 WS06-2*	95.9 µg/L	85.6	34.2 to 120	0.8621	3/3	Acceptable
Bentazon *8530 PEO-005-4 WS06-2-118*	35.9 µg/L	37.4	13.4 to 54.0	0.2183	1/6	Acceptable
Chloramben *8540 PEO-005-4 WS06-2*	69.8 µg/L	84.4	42.2 to 127	-0.6919	1/2	Acceptable
Chloramben *8540 PEO-005-4 WS06-2-118*	33.7 µg/L	30.2	15.1 to 45.3	0.4636	4/4	Acceptable
2,4-D *8545 PEO-005-4 WS06-2-118*	8.94 µg/L	14.5	7.25 to 21.8	-1.5338	8/8	Acceptable
Dacthal (DCPA) *8550 PEO-005-4 WS06-2*	54.7 µg/L	60.6	0.00 to 104	0.1567	1/3	Acceptable
Dacthal (DCPA) *8550 PEO-005-4 WS06-2-118*	9.82 µg/L	23.4	0.00 to 38.4	-0.7692	5/5	Acceptable
Dalapon *8555 PEO-005-4 WS06-2*	55.4 µg/L	80.6	0.00 to 111	0.1513	2/5	Acceptable
Dalapon *8555 PEO-005-4 WS06-2-118*	95.8 µg/L	116	0.00 to 158	0.5446	5/7	Acceptable
2,4-DB *8560 PEO-005-4 WS06-2-118*	85.1 µg/L	75.0	33.5 to 93.9	1.4198	5/7	Acceptable
Dicamba *8595 PEO-005-4 WS06-2*	29.9 µg/L	32.0	8.61 to 44.9	0.3384	3/5	Acceptable
Dicamba *8595 PEO-005-4 WS06-2-118*	55.0 µg/L	76.8	20.2 to 106	-0.3820	4/7	Acceptable
3,5-Dichlorobenzoic acid *8600 PEO-005-4 WS06-2*	20.1 µg/L	20.8	10.4 to 31.2	-0.1346	1/2	Acceptable
3,5-Dichlorobenzoic acid *8600 PEO-005-4 WS06-2-118*	39.3 µg/L	44.1	22.0 to 66.1	-0.4354	3/5	Acceptable
Dichloroprop *8605 PEO-005-4 WS06-2-118*	15.4 µg/L	15.0	7.79 to 17.8	1.0543	4/7	Acceptable
Dichloroprop *8605 PEO-005-4 WS06-2*	24.5 µg/L	33.0	18.6 to 39.5	-0.8659	3/3	Acceptable
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP) *8620 PEO-005-4 WS06-2*	37.4 µg/L	36.1	7.53 to 51.0	0.7493	4/5	Acceptable
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP) *8620 PEO-005-4 WS06-2-118*	39.0 µg/L	44.2	9.56 to 62.6	0.2195	1/7	Acceptable
Picloram *8645 PEO-005-4 WS06-2*	18.6 µg/L	18.1	3.99 to 25.8	0.6820	4/5	Acceptable
Picloram *8645 PEO-005-4 WS06-2-118*	50.4 µg/L	55.9	13.1 to 78.6	0.2787	3/6	Acceptable
Silvex (2,4,5-TP) *8650 PEO-005-4 WS06-2*	110 µg/L	115	57.5 to 173	-0.1739	1/5	Acceptable
Silvex (2,4,5-TP) *8650 PEO-005-4 WS06-2-118*	103 µg/L	124	62.0 to 186	-0.6774	6/7	Acceptable
2,4,5-T *8655 PEO-005-4 WS06-2*	40.9 µg/L	53.1	20.9 to 69.6	-0.3571	2/3	Acceptable
2,4,5-T *8655 PEO-005-4 WS06-2-118*	26.2 µg/L	23.6	9.29 to 32.2	0.9563	5/7	Acceptable

Inorganic Disinfection By-Products

EPA 300.0
Ion Chromatography Electroconductivity

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Bromide *1540 PEI-017-1 WS06-2-118*	122 µg/L	140	104 to 175	-0.9809	8/9	Acceptable

Minerals

EPA 300.0
Ion Chromatography Electroconductivity

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Chloride *1575 PEI-010-12 WS06-2*	99.1 mg/L	97.1	88.6 to 106	0.4424	11/24	Acceptable
Fluoride *1730 PEI-011 WS06-2*	2.07 mg/L	2.08	1.53 to 2.62	-0.0239	1/30	Acceptable
Nitrate as N *1810 PEI-011 WS06-2*	7.48 mg/L	7.45	6.70 to 8.19	0.0805	4/40	Acceptable

EPA 354.1
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Nitrite as N *1840 PEI-011 WS06-2*	0.87 mg/L	0.900	0.765 to 1.03	-0.5248	14/38	Acceptable

EPA 365.2
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Orthophosphate as P *1870 PEI-011 WS06-2*	2.24 mg/L	2.15	1.88 to 2.45	0.5547	9/26	Acceptable

Miscellaneous Analytes

EPA 120.1
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Specific conductance, Conductivity (25°C) *1810 PEI-010-12 WS06-2*	507 µmhos/cm	528	475 to 581	-0.7955	19/25	Acceptable

EPA 130.2
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Hardness, total as CaCO3 *1755 PEI-010-12 WS06-2*	138 mg/L	136	120 to 153	0.2954	6/19	Acceptable

EPA 150.1
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Corrosivity (pH) *1825 PEI-010-12 WS06-2*	7.89 Units	7.70	7.30 to 8.10	0.9500	8/12	Acceptable
pH *1900 PEI-010-3 WS06-2*	7.58 Units	7.60	7.40 to 7.80	-0.2000	9/21	Acceptable

EPA 160.1
Gravimetry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Residue-filterable (TDS) *1955 PEI-010-12 WS06-2*	315 mg/L	320	154 to 493	-0.1477	5/26	Acceptable

EPA 180.1
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Turbidity *2055 PEI-014 WS06-2*	2.83 NTU	3.10	2.63 to 3.83	-1.4870	26/31	Acceptable

EPA 200.7
Atomic Emission - Inductvely Coupled Plasma Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Potassium, K *1125 PEI-011 WS06-2*	20.92 mg/L	24.4	20.9 to 27.9	-2.0155	15/16	Acceptable
Sodium, Na *1155 PEI-010-12 WS06-2*	22.6 mg/L	22.6	20.0 to 24.9	0.1302	4/27	Acceptable

EPA 300.0
Ion Chromatography Electroconductivity

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Sulfate *2000 PEI-013 WS06-2*	161 mg/L	165	146 to 184	-0.4022	10/18	Acceptable

EPA 310.1
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Alkalinity as CaCO3 *1505 PEI-010-12 WS06-2*	34.0 mg/L	34.8	29.8 to 36.8	0.4028	6/28	Acceptable

EPA 314
Ion Chromatography Electroconductivity

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Perchlorate *1895 PEI-226 WS06-2*	9.30 µg/L	8.52	7.35 to 9.69	1.3295	2/2	Acceptable

EPA 330.1
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Total chlorine *1585 PEI-224 WS06-2*	0.70 mg/L	0.750	0.624 to 0.867	-0.7443	2/5	Acceptable
Residual free chlorine *1945 PEI-012 WS06-2*	0.66 mg/L	0.690	0.534 to 0.847	-0.3890	6/18	Acceptable
Residual free chlorine *1945 PEI-012 WS06-2*	0.66 mg/L	0.690	0.534 to 0.847	-0.3890	6/18	Acceptable

EPA 335.2
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Cyanide *1635 PEI-015 WS06-2-118*	0.41 mg/L	0.431	0.323 to 0.539	-0.3849	9/20	Acceptable

EPA 370.1
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Silica as SiO2 *1990 PEI-227 WS06-2*	30.2 mg/L	29.5	25.1 to 33.9	0.4184	3/6	Acceptable

EPA 415.2
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Total organic carbon (TOC) *2040 PEI-013 WS06-2*	3.11 mg/L	3.43	2.80 to 4.04	-1.1183	8/14	Acceptable

EPA 425.1
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Surfactants - MBAS *2025 PEI-203 WS06-2*	0.27 mg/L	0.165	0.0589 to 0.412	0.5911	3/6	Acceptable

EPA 6010B
Atomic Emission - Inductvely Coupled Plasma Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Potassium, K *1125 PEI-011 WS06-2*	22.73 mg/L	24.4	20.9 to 27.9	-0.9672	8/16	Acceptable
Sodium, Na *1155 PEI-010-12 WS06-2*	21.25 mg/L	22.6	20.0 to 24.9	-0.9618	21/27	Acceptable

EPA 7196A
Colorimetric

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Chromium VI, Cr(VI) *1045 PEI-229 WS06-2*	29.8 µg/L	29.1	26.1 to 32.0	0.4901	1/3	Acceptable

EPA 7199
Ion Chromatography Electroconductivity

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Chromium VI, Cr(VI) *1045 PEI-229 WS06-2*	27.8 µg/L	29.1	26.1 to 32.0	-0.8677	2/3	Acceptable

SM 18/19/20thED 5910 B
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
UV 254 *2060 PEI-225 WS06-2*	0.046 cm-1	0.0502	0.0313 to 0.0705	-0.4996	2/3	Acceptable

Organic Disinfection By-Products

EPA 552.2
Gas Chromatography - Electron Capture Detection

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Bromoacetic acid *9312 PEO-098 WS06-2*	59.7 µg/L	49.8	26.9 to 62.7	1.6629	8/9	Acceptable
Bromochloroacetic acid *9315 PEO-098 WS06-2*	49.4 µg/L	41.9	25.1 to 58.7	0.8950	6/7	Acceptable
Chloroacetic acid *9336 PEO-098 WS06-2*	39.0 µg/L	35.8	21.5 to 50.1	0.4469	4/8	Acceptable
Dibromoacetic acid *9357 PEO-098 WS06-2*	54.1 µg/L	47.9	28.7 to 67.1	0.6472	5/9	Acceptable
Dichloroacetic acid *9360 PEO-098 WS06-2*	36.7 µg/L	31.7	19.0 to 44.4	0.7886	4/9	Acceptable
Total haloacetic acids *9414 PEO-098 WS06-2*	301 µg/L	243	146 to 340	1.1934	6/8	Acceptable
Trichloroacetic acid *9642 PEO-098 WS06-2*	62.5 µg/L	51.2	30.7 to 71.7	1.1035	7/9	Acceptable

Oxygenates - Gasoline Additives

EPA 524.2
Gas Chromatography - Mass Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
T-amylmethylether (TAME) *4370 PEO-075 WS06-2-118*	47.1 µg/L	46.5	27.9 to 65.1	0.4215	1/6	Acceptable
tert-Butyl alcohol *4420 PEO-075 WS06-2-118*	20.7 µg/L	27.5	16.5 to 38.5	-1.2364	5/5	Acceptable
Carbon disulfide *4450 PEO-075 WS06-2*	49.0 µg/L	47.9	28.7 to 67.1		/2	Acceptable
Carbon disulfide *4450 PEO-075 WS06-2-118*	29.0 µg/L	30.6	18.4 to 42.8		/5	Acceptable
Ethyl-t-butylether (ETBE) *4770 PEO-075 WS06-2-118*	31.4 µg/L	30.5	18.3 to 42.7	0.1475	4/6	Acceptable
Methyl tert-butyl ether (MTBE) *5000 PEO-075 WS06-2-118*	27.6 µg/L	29.8	17.9 to 41.7	-0.3691	2/7	Acceptable
n-Propylbenzene *5090 PEO-075 WS06-2-118*	40.1 µg/L	46.8	28.1 to 65.5	-0.7158	6/6	Acceptable
n-Propylbenzene *5090 PEO-075 WS06-2*	41.0 µg/L	36.2	21.7 to 50.7		/2	Acceptable
Trichlorofluoromethane *5175 PEO-075 WS06-2*	37.0 µg/L	39.2	23.5 to 54.9		/2	Acceptable
Trichlorofluoromethane *5175 PEO-075 WS06-2-118*	26.2 µg/L	30.0	18.0 to 42.0	-56.0644	2/6	Acceptable
1,2,3-Trichloropropane *5180 PEO-075 WS06-2*	1.73 µg/L	1.83	1.10 to 2.56		/2	Acceptable
1,2,3-Trichloropropane *5180 PEO-075 WS06-2-118*	1.49 µg/L	1.72	1.03 to 2.41		/4	Acceptable
Trichlorotrifluoroethane (Freon 113) *5185 PEO-075 WS06-2-118*	28.9 µg/L	38.2	22.9 to 53.5	-1.2173	5/5	Acceptable
Trichlorotrifluoroethane (Freon 113) *5185 PEO-075 WS06-2*	30.5 µg/L	26.2	15.7 to 36.7	0.8206	2/2	Acceptable
Di-isopropylether (DIPE) *9375 PEO-075 WS06-2-118*	16.7 µg/L	16.4	3.28 to 29.5	0.0457	1/6	Acceptable

EPA 8015B
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
n-Butyl alcohol *4425 PEO-230 WS06-2*	<0.5 mg/L	0.00	0.0 to 0.0		/0	Acceptable
Ethanol *4750 PEO-230 WS06-2*	16.0 mg/L	16.1	9.66 to 22.5	-0.0311	1/1	Acceptable
Methanol *4930 PEO-230 WS06-2*	30.0 mg/L	28.5	17.1 to 39.9	0.2632	1/1	Acceptable

PCBs in Water

EPA 508
Gas Chromatography - Electron Capture Detection

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Aroclor-1016 (PCB-1016) *8880 PEO-003 WS06-2*	<0.1 µg/L	0.00	0.0 to 0.0		/1	Acceptable
Aroclor-1221 (PCB-1221) *8885 PEO-003 WS06-2*	<0.1 µg/L	0.00	0.0 to 0.0		/1	Acceptable
Aroclor-1232 (PCB-1232) *8890 PEO-003 WS06-2*	<0.1 µg/L	0.00	0.0 to 0.0		/1	Acceptable
Aroclor-1242 (PCB-1242) *8895 PEO-003 WS06-2*	1.83 µg/L	2.64	0.00 to 6.60	-0.6136	5/7	Acceptable
Aroclor-1254 (PCB-1254) *8905 PEO-003 WS06-2*	<0.1 µg/L	0.00	0.0 to 0.0		/1	Acceptable
Aroclor-1260 (PCB-1260) *8910 PEO-003 WS06-2*	<0.1 µg/L	0.00	0.0 to 0.0		/1	Acceptable
Decachlorobiphenyl *9105 PEO-003 WS06-2*	<0.1 µg/L	5.07	0.00 to 12.7		/1	Acceptable

Pesticides

EPA 508

Gas Chromatography - Electron Capture Detection

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Hexachlorobenzene *6275 PEO-005-2 WS06-2*	0.69 µg/L	0.852	0.383 to 1.13	-0.3531	4/9	Acceptable
Hexachlorocyclopentadiene *6285 PEO-005-2 WS06-2*	2.25 µg/L	2.42	0.319 to 3.68	0.2949	1/9	Acceptable
Aldrin *7025 PEO-005-1 WS06-2*	1.61 µg/L	1.56	0.661 to 1.96	0.9195	6/8	Acceptable
Aldrin *7025 PEO-005-1 WS06-2-118*	0.892 µg/L	1.76	0.747 to 2.21	-1.6053	13/14	Acceptable
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane) *7120 PEO-005-1 WS06-2*	4.20 µg/L	4.83	2.66 to 7.00	-0.5797	4/9	Acceptable
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane) *7120 PEO-005-1 WS06-2-118*	2.93 µg/L	2.70	1.49 to 3.91	0.3786	9/14	Acceptable
Chlordane (total) *7250 PEO-005-5 WS06-2*	5.72 µg/L	5.15	2.83 to 7.47	0.4919	4/7	Acceptable
Dieldrin *7470 PEO-005-1 WS06-2*	0.45 µg/L	0.623	0.392 to 0.872	-1.5143	7/8	Acceptable
Dieldrin *7470 PEO-005-1 WS06-2-118*	3.02 µg/L	3.10	1.93 to 4.00	0.1070	1/15	Acceptable
Endrin *7540 PEO-005-1 WS06-2-118*	3.64 µg/L	3.72	2.60 to 4.84	-0.1434	2/14	Acceptable
Heptachlor *7685 PEO-005-1 WS06-2*	4.22 µg/L	4.79	2.63 to 6.95	-0.5289	5/9	Acceptable
Heptachlor *7685 PEO-005-1 WS06-2-118*	0.474 µg/L	0.470	0.259 to 0.681	0.0378	6/15	Acceptable
Heptachlor epoxide *7690 PEO-005-2 WS06-2*	4.18 µg/L	4.49	2.47 to 6.51	-0.3069	3/9	Acceptable
Methoxychlor *7910 PEO-005-2 WS06-2*	51.4 µg/L	60.7	33.4 to 88.0	-0.6809	5/9	Acceptable
Propachlor (Ramrod) *8045 PEO-005-2 WS06-2*	2.39 µg/L	2.20	1.38 to 3.31	0.0947	1/6	Acceptable
Toxaphene (Chlorinated camphene) *8250 PEO-005-5 WS06-2*	3.59 µg/L	6.33	2.93 to 7.73	-1.4509	5/7	Acceptable
Trifluralin (Treflan) *8295 PEO-005-2 WS06-2*	2.97 µg/L	3.10	1.58 to 3.94	0.3552	1/7	Acceptable

EPA 525.2

Gas Chromatography - Mass Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Alachlor *7005 PEO-005-3 WS06-2*	3.26 µg/L	2.79	1.53 to 4.05	0.7487	5/9	Acceptable
Atrazine *7065 PEO-005-3 WS06-2*	24.7 µg/L	20.2	11.1 to 29.3	0.9901	9/9	Acceptable
Bromacil *7130 PEO-005-3 WS06-2*	13.1 µg/L	14.4	7.92 to 20.9	-0.4012	1/3	Acceptable
Butachlor *7160 PEO-005-3 WS06-2*	35.2 µg/L	30.6	19.1 to 42.1	0.8033	4/6	Acceptable
Metolachlor *7835 PEO-005-3 WS06-2*	24.5 µg/L	21.3	11.7 to 27.6	1.2257	4/6	Acceptable
Metribuzin *7845 PEO-005-3 WS06-2*	26.0 µg/L	41.5	8.84 to 58.1	-0.6068	1/6	Acceptable
Molinate *7875 PEO-005-3 WS06-2*	12.2 µg/L	13.4	7.37 to 19.4	-0.3980	3/3	Acceptable
Simazine *8125 PEO-005-3 WS06-2*	20.5 µg/L	15.9	3.62 to 23.1	1.4641	9/9	Acceptable

Regulated VOCs

EPA 504.1
Gas Chromatography - Electron Capture Detection

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
1,2-Dibromo-3-chloropropane (DBCP) *4570 PEO-007-4 WS06-2*	1.25 µg/L	1.60	0.960 to 2.24	-1.0938	9/12	Acceptable
1,2-Dibromoethane (EDB, Ethylene dibromide) *4585 PEO-007-4 WS06-2*	0.220 µg/L	0.280	0.168 to 0.392	-1.0714	10/12	Acceptable

EPA 524.2
Gas Chromatography - Mass Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Benzene *4375 PEO-007-2 WS06-2-118*	13.1 µg/L	13.8	11.0 to 16.6	-0.9179	15/22	Acceptable
Benzene *4375 PEO-007-2 WS06-2*	16.0 µg/L	16.5	13.2 to 19.8	-0.3518	4/20	Acceptable
Carbon tetrachloride *4455 PEO-007-1 WS06-2-118*	5.77 µg/L	5.90	3.54 to 8.26	-0.1102	3/22	Acceptable
Carbon tetrachloride *4455 PEO-007-1 WS06-2*	6.21 µg/L	5.42	3.25 to 7.59	0.7288	17/20	Acceptable
Chlorobenzene *4475 PEO-007-1 WS06-2*	5.14 µg/L	4.84	2.90 to 6.78	0.7662	12/20	Acceptable
Chlorobenzene *4475 PEO-007-1 WS06-2-118*	27.5 µg/L	28.0	22.4 to 33.6	-0.2223	5/22	Acceptable
1,2-Dichlorobenzene *4610 PEO-007-2 WS06-2*	16.7 µg/L	16.1	12.9 to 19.3	0.3307	7/19	Acceptable
1,2-Dichlorobenzene *4610 PEO-007-2 WS06-2-118*	18.8 µg/L	19.4	15.5 to 23.3	-0.3568	5/23	Acceptable
1,4-Dichlorobenzene *4620 PEO-007-2 WS06-2*	19.0 µg/L	18.5	14.8 to 22.2	0.2853	5/20	Acceptable
1,4-Dichlorobenzene *4620 PEO-007-2 WS06-2-118*	4.51 µg/L	4.21	2.53 to 5.89	0.6345	9/22	Acceptable
1,2-Dichloroethane *4635 PEO-007-1 WS06-2*	8.26 µg/L	7.27	4.36 to 10.2	1.4817	16/20	Acceptable
1,2-Dichloroethane *4635 PEO-007-1 WS06-2-118*	14.2 µg/L	15.6	12.5 to 18.7	-0.6871	16/23	Acceptable
1,1-Dichloroethylene *4640 PEO-007-1 WS06-2-118*	2.33 µg/L	2.48	1.49 to 3.47	-0.6465	10/22	Acceptable
cis-1,2-Dichloroethylene *4645 PEO-007-1 WS06-2-118*	20.1 µg/L	22.7	18.2 to 27.2	-1.0200	17/22	Acceptable
cis-1,2-Dichloroethylene *4645 PEO-007-1 WS06-2*	29.6 µg/L	28.4	22.7 to 34.1	0.4374	7/20	Acceptable
1,2-Dichloropropane *4655 PEO-007-1 WS06-2*	10.1 µg/L	9.75	5.85 to 13.6	0.4527	6/19	Acceptable
1,2-Dichloropropane *4655 PEO-007-1 WS06-2-118*	6.40 µg/L	6.51	3.91 to 9.11	-0.1696	4/22	Acceptable
trans-1,2-Dichloroethylene *4700 PEO-007-1 WS06-2-118*	34.5 µg/L	36.9	29.5 to 44.3	-0.5316	9/22	Acceptable
trans-1,2-Dichloroethylene *4700 PEO-007-1 WS06-2*	32.2 µg/L	26.9	21.5 to 32.3	1.7086	20/20	Acceptable
Ethylbenzene *4765 PEO-007-2 WS06-2*	4.45 µg/L	3.88	2.33 to 5.43	1.2572	15/19	Acceptable
Ethylbenzene *4765 PEO-007-2 WS06-2-118*	3.18 µg/L	3.21	1.93 to 4.49	-0.0834	4/22	Acceptable
Methylene chloride (Dichloromethane) *4975 PEO-007-1 WS06-2*	9.99 µg/L	9.38	5.63 to 13.1	0.6754	9/19	Acceptable
Methylene chloride (Dichloromethane) *4975 PEO-007-1 WS06-2-118*	18.4 µg/L	18.1	14.5 to 21.7	0.1651	4/21	Acceptable
Styrene *5100 PEO-007-1 WS06-2*	7.58 µg/L	8.11	4.87 to 11.4	-0.6325	11/19	Acceptable
Styrene *5100 PEO-007-1 WS06-2-118*	16.9 µg/L	17.2	13.8 to 20.6	-0.1437	5/22	Acceptable
Tetrachloroethylene (Perchloroethylene) *5115 PEO-007-1 WS06-2-118*	8.07 µg/L	8.65	5.19 to 12.1	-0.5364	10/22	Acceptable
Tetrachloroethylene (Perchloroethylene) *5115 PEO-007-1 WS06-2*	17.5 µg/L	16.8	13.4 to 20.2	0.4014	7/20	Acceptable
Toluene *5140 PEO-007-2 WS06-2-118*	13.7 µg/L	14.3	11.4 to 17.2	-0.7840	11/22	Acceptable
Toluene *5140 PEO-007-2 WS06-2*	10.1 µg/L	9.33	5.60 to 13.1	1.0168	16/20	Acceptable
1,2,4-Trichlorobenzene *5155 PEO-007-1 WS06-2-118*	2.90 µg/L	2.66	1.60 to 3.72	0.3386	8/21	Acceptable
1,1,1-Trichloroethane *5160 PEO-007-1 WS06-2*	10.5 µg/L	9.51	5.71 to 13.3	1.1581	15/20	Acceptable

EPA 524.2
Gas Chromatography - Mass Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
1,1,1-Trichloroethane *5160 PEO-007-1 WS06-2-118*	15.6 µg/L	16.1	12.9 to 19.3	-0.3755	4/22	Acceptable
1,1,2-Trichloroethane *5165 PEO-007-1 WS06-2*	17.3 µg/L	17.3	13.8 to 20.8	0.0000	1/19	Acceptable
1,1,2-Trichloroethane *5165 PEO-007-1 WS06-2-118*	16.8 µg/L	17.2	13.8 to 20.6	-0.4623	10/22	Acceptable
Trichloroethene (Trichloroethylene) *5170 PEO-007-1 WS06-2*	14.3 µg/L	12.9	10.3 to 15.5	1.1419	17/20	Acceptable
Trichloroethene (Trichloroethylene) *5170 PEO-007-1 WS06-2-118*	15.5 µg/L	15.9	12.7 to 19.1	-0.2848	7/22	Acceptable
Vinyl chloride *5235 PEO-007-1 WS06-2-118*	31.3 µg/L	32.0	19.2 to 44.8	-0.1633	2/22	Acceptable
Vinyl chloride *5235 PEO-007-1 WS06-2*	1.08 µg/L	1.49	0.894 to 2.09	-2.0118	10/20	Acceptable
Xylene, total *5260 PEO-007-2 WS06-2*	55.3 µg/L	47.8	38.2 to 57.4	1.4020	17/19	Acceptable
Xylene, total *5260 PEO-007-2 WS06-2-118*	16.2 µg/L	16.2	13.0 to 19.4	0.0000	1/22	Acceptable

EPA 524.2 SIM
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
1,2-Dibromo-3-chloropropane (DBCP) *4570 PEO-007-4 WS06-2*	1.26 µg/L	1.60	0.960 to 2.24	-1.0625	8/12	Acceptable
1,2-Dibromoethane (EDB, Ethylene dibromide) *4585 PEO-007-4 WS06-2*	0.285 µg/L	0.280	0.168 to 0.392	0.0893	2/12	Acceptable

Trace Metals

EPA 200.7
Atomic Emission - Inductvely Coupled Plasma Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Aluminum, Al *1000 PEI-016-1 WS06-2-118*	1753 µg/L	1680	1450 to 1860	0.9724	29/43	Acceptable
Antimony, Sb *1005 PEI-016-2 WS06-2*	9.26 µg/L	13.0	9.10 to 16.9	-2.0725	22/28	Acceptable
Arsenic, As *1010 PEI-016-1 WS06-2*	39.9 µg/L	44.9	31.4 to 58.4	-1.1291	30/38	Acceptable
Barium, Ba *1015 PEI-016-2 WS06-2*	715.2 µg/L	687	584 to 790	0.9197	21/34	Acceptable
Beryllium, Be *1020 PEI-016-1 WS06-2*	8.60 µg/L	8.69	7.39 to 9.99	0.1748	6/36	Acceptable
Boron, B *1025 PEI-016-2 WS06-2*	1278.5 µg/L	1280	1120 to 1420	0.1112	4/21	Acceptable
Cadmium, Cd *1030 PEI-016-1 WS06-2*	3.92 µg/L	3.94	3.15 to 4.73	-0.0506	1/42	Acceptable
Calcium, Ca *1035 PEI-010-12 WS06-2*	49.92 mg/L	49.9	43.8 to 54.7	0.2535	10/27	Acceptable
Chromium, Cr (total) *1040 PEI-016-1 WS06-2*	26.1 µg/L	28.3	24.1 to 32.5	-1.2459	32/41	Acceptable
Copper, Cu *1055 PEI-016-1 WS06-2*	257.8 µg/L	285	257 to 314	-1.5107	41/47	Acceptable
Iron, Fe *1070 PEI-016-1 WS06-2*	273.9 µg/L	262	221 to 299	0.7251	23/35	Acceptable
Lead, Pb *1075 PEI-016-1 WS06-2*	78.7 µg/L	77.3	54.1 to 100	0.2152	8/45	Acceptable
Magnesium, Mg *1085 PEI-016-2 WS06-2*	3150.5 µg/L	3160	2760 to 3650	-0.2793	9/22	Acceptable
Magnesium, Mg *1085 PEI-010-12 WS06-2*	2.98 mg/L	3.25	2.87 to 3.72	-1.4957	16/20	Acceptable
Manganese, Mn *1090 PEI-016-1 WS06-2*	135.0 µg/L	130	116 to 143	0.7864	25/36	Acceptable
Molybdenum, Mo *1100 PEI-016-2 WS06-2*	26.7 µg/L	30.0	25.2 to 34.2	-1.3261	17/23	Acceptable
Nickel, Ni *1105 PEI-016-1 WS06-2*	109.6 µg/L	106	90.1 to 122	0.6846	21/42	Acceptable
Potassium, K *1125 PEI-010-12 WS06-2*	32.02 mg/L	33.1	28.6 to 37.4	-0.4325	6/17	Acceptable
Selenium, Se *1140 PEI-016-1 WS06-2*	91.7 µg/L	90.9	72.7 to 109	0.1296	7/37	Acceptable
Silver, Ag *1150 PEI-016-2 WS06-2*	101.3 µg/L	96.8	91.0 to 116	-0.3533	5/31	Acceptable
Thallium, Tl *1165 PEI-016-2 WS06-2*	3.8 µg/L	4.14	2.90 to 5.38	-0.5748	12/27	Acceptable
Vanadium, V *1185 PEI-016-2 WS06-2*	727.8 µg/L	735	662 to 809	-0.2253	7/25	Acceptable
Zinc, Zn *1190 PEI-016-1 WS06-2*	727.8 µg/L	707	636 to 778	0.5386	18/37	Acceptable

EPA 200.8
Mass Spectrometry - Inductively Coupled Plasma

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Aluminum, Al *1000 PEI-016-1 WS06-2-118*	1677 µg/L	1680	1450 to 1860	0.2354	14/43	Acceptable
Antimony, Sb *1005 PEI-016-2 WS06-2*	11.91 µg/L	13.0	9.10 to 16.9	-0.6040	15/28	Acceptable
Arsenic, As *1010 PEI-016-1 WS06-2*	41.27 µg/L	44.9	31.4 to 58.4	-0.8197	25/38	Acceptable
Barium, Ba *1015 PEI-016-2 WS06-2*	648.7 µg/L	687	584 to 790	-1.2491	24/34	Acceptable
Beryllium, Be *1020 PEI-016-1 WS06-2*	8.97 µg/L	8.69	7.39 to 9.99	0.4448	15/36	Acceptable
Cadmium, Cd *1030 PEI-016-1 WS06-2*	3.92 µg/L	3.94	3.15 to 4.73	-0.0506	1/42	Acceptable
Chromium, Cr (total) *1040 PEI-016-1 WS06-2*	27.85 µg/L	28.3	24.1 to 32.5	-0.2548	13/41	Acceptable
Copper, Cu *1055 PEI-016-1 WS06-2*	277.4 µg/L	285	257 to 314	-0.4221	17/47	Acceptable
Iron, Fe *1070 PEI-016-1 WS06-2*	249.7 µg/L	262	221 to 299	-0.5103	18/35	Acceptable
Lead, Pb *1075 PEI-016-1 WS06-2*	77.2 µg/L	77.3	54.1 to 100	-0.0154	2/45	Acceptable
Manganese, Mn *1090 PEI-016-1 WS06-2*	123.9 µg/L	130	116 to 143	-0.8639	29/38	Acceptable
Molybdenum, Mo *1100 PEI-016-2 WS06-2*	29.6 µg/L	30.0	25.2 to 34.2	-0.0430	2/23	Acceptable
Nickel, Ni *1105 PEI-016-1 WS06-2*	100.3 µg/L	106	90.1 to 122	-1.0839	27/42	Acceptable
Selenium, Se *1140 PEI-016-1 WS06-2*	91.8 µg/L	90.9	72.7 to 109	0.1458	8/37	Acceptable
Silver, Ag *1150 PEI-016-2 WS06-2*	91.3 µg/L	96.8	91.0 to 116	-1.9543	25/31	Acceptable
Thallium, Tl *1165 PEI-016-2 WS06-2*	3.51 µg/L	4.14	2.90 to 5.38	-1.0650	19/27	Acceptable
Vanadium, V *1185 PEI-016-2 WS06-2*	713.7 µg/L	735	662 to 809	-0.6664	16/25	Acceptable
Zinc, Zn *1190 PEI-016-1 WS06-2*	725.6 µg/L	707	636 to 778	0.4816	17/37	Acceptable

EPA 245.1
Atomic Absorption - Cold Vapor Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Mercury, Hg *1095 PEI-016-1 WS06-2*	1.52 µg/L	1.47	1.03 to 1.91	0.3157	8/25	Acceptable

EPA 6010B
Atomic Emission - Inductvely Coupled Plasma Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Aluminum, Al *1000 PEI-016-1 WS06-2-119*	1753 µg/L	1680	1450 to 1860	0.9724	29/43	Acceptable
Antimony, Sb *1005 PEI-016-2 WS06-2*	9.26 µg/L	13.0	9.10 to 16.9	-2.0725	22/28	Acceptable
Arsenic, As *1010 PEI-016-1 WS06-2*	42.7 µg/L	44.9	31.4 to 58.4	-0.4968	16/38	Acceptable
Barium, Ba *1015 PEI-016-2 WS06-2*	703.0 µg/L	687	584 to 790	0.5218	15/34	Acceptable
Beryllium, Be *1020 PEI-016-1 WS06-2*	8.80 µg/L	8.69	7.39 to 9.99	0.1748	6/36	Acceptable
Boron, B *1025 PEI-016-2 WS06-2*	1261.0 µg/L	1280	1120 to 1420	-0.1263	5/21	Acceptable
Cadmium, Cd *1030 PEI-016-1 WS06-2*	3.92 µg/L	3.94	3.15 to 4.73	-0.0506	1/42	Acceptable
Calcium, Ca *1035 PEI-010-12 WS06-2*	49.51 mg/L	49.9	43.8 to 54.7	0.1034	4/27	Acceptable
Chromium, Cr (total) *1040 PEI-016-1 WS06-2*	26.9 µg/L	28.3	24.1 to 32.5	-0.7928	26/41	Acceptable
Copper, Cu *1055 PEI-016-1 WS06-2*	262.4 µg/L	285	257 to 314	-1.2552	38/47	Acceptable
Iron, Fe *1070 PEI-016-1 WS06-2*	281.1 µg/L	262	221 to 299	1.0927	26/35	Acceptable
Lead, Pb *1075 PEI-016-1 WS06-2*	82.5 µg/L	77.3	54.1 to 100	0.7993	29/45	Acceptable
Magnesium, Mg *1085 PEI-016-2 WS06-2*	3172.0 µg/L	3160	2760 to 3650	-0.1784	3/22	Acceptable
Magnesium, Mg *1085 PEI-010-12 WS06-2*	3.03 mg/L	3.25	2.87 to 3.72	-1.2591	13/20	Acceptable
Manganese, Mn *1090 PEI-016-1 WS06-2*	136.2 µg/L	130	116 to 143	0.9648	31/38	Acceptable
Molybdenum, Mo *1100 PEI-016-2 WS06-2*	28.0 µg/L	30.0	25.2 to 34.2	-0.7509	9/23	Acceptable
Nickel, Ni *1105 PEI-016-1 WS06-2*	107.5 µg/L	106	90.1 to 122	0.2852	7/42	Acceptable
Potassium, K *1125 PEI-010-12 WS06-2*	30.85 mg/L	33.1	28.6 to 37.4	-0.9646	15/17	Acceptable
Selenium, Se *1140 PEI-016-1 WS06-2*	94.9 µg/L	90.9	72.7 to 109	0.6478	18/37	Acceptable
Silver, Ag *1150 PEI-016-2 WS06-2*	99.2 µg/L	96.8	91.0 to 116	-0.6895	8/31	Acceptable
Thallium, Tl *1165 PEI-016-2 WS06-2*	3.8 µg/L	4.14	2.90 to 5.38	-0.5748	12/27	Acceptable
Vanadium, V *1185 PEI-016-2 WS06-2*	719.0 µg/L	735	662 to 809	-0.5006	12/25	Acceptable
Zinc, Zn *1190 PEI-016-1 WS06-2*	719.0 µg/L	707	636 to 778	0.3107	9/37	Acceptable

EPA 6020A
Mass Spectrometry - Inductively Coupled Plasma

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Aluminum, Al *1000 PEI-016-1 WS06-2-118*	1677 µg/L	1680	1450 to 1860	0.2354	14/43	Acceptable
Antimony, Sb *1005 PEI-016-2 WS06-2*	12.36 µg/L	13.0	9.10 to 16.9	-0.3546	10/28	Acceptable
Arsenic, As *1010 PEI-016-1 WS06-2*	40.72 µg/L	44.9	31.4 to 58.4	-0.9439	26/38	Acceptable
Barium, Ba *1015 PEI-016-2 WS06-2*	652.0 µg/L	687	584 to 790	-1.1415	23/34	Acceptable
Beryllium, Be *1020 PEI-016-1 WS06-2*	9.28 µg/L	8.69	7.39 to 9.99	0.9373	24/36	Acceptable
Cadmium, Cd *1030 PEI-016-1 WS06-2*	3.89 µg/L	3.94	3.15 to 4.73	-0.1265	7/42	Acceptable
Chromium, Cr (total) *1040 PEI-016-1 WS06-2*	28.42 µg/L	28.3	24.1 to 32.5	0.0680	3/41	Acceptable
Copper, Cu *1055 PEI-016-1 WS06-2*	281.1 µg/L	285	257 to 314	-0.2166	6/47	Acceptable
Iron, Fe *1070 PEI-016-1 WS06-2*	252.3 µg/L	262	221 to 299	-0.3776	14/35	Acceptable
Lead, Pb *1075 PEI-016-1 WS06-2*	74.9 µg/L	77.3	54.1 to 100	-0.3689	14/45	Acceptable
Manganese, Mn *1090 PEI-016-1 WS06-2*	126.6 µg/L	130	116 to 143	-0.4625	16/38	Acceptable
Molybdenum, Mo *1100 PEI-016-2 WS06-2*	29.49 µg/L	30.0	25.2 to 34.2	-0.0916	4/23	Acceptable
Nickel, Ni *1105 PEI-016-1 WS06-2*	98.1 µg/L	106	90.1 to 122	-1.5023	34/42	Acceptable
Selenium, Se *1140 PEI-016-1 WS06-2*	95.4 µg/L	90.9	72.7 to 109	0.7288	20/37	Acceptable
Silver, Ag *1150 PEI-016-2 WS06-2*	94.3 µg/L	96.8	91.0 to 116	-1.4740	17/31	Acceptable
Thallium, Tl *1165 PEI-016-2 WS06-2*	3.59 µg/L	4.14	2.90 to 5.38	-0.9298	18/27	Acceptable
Vanadium, V *1185 PEI-016-2 WS06-2*	708.0 µg/L	735	662 to 809	-0.8447	17/25	Acceptable
Zinc, Zn *1190 PEI-016-1 WS06-2*	711.3 µg/L	707	636 to 778	0.1113	5/37	Acceptable

Trihalomethanes

EPA 502.2
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Bromodichloromethane *4395 PEO-002 WS06-2*	10.6 µg/L	12.3	9.84 to 14.8	-1.3821	15/20	Acceptable
Bromoform *4400 PEO-002 WS06-2*	42.3 µg/L	39.5	31.6 to 47.4	0.7089	9/20	Acceptable
Chloroform *4505 PEO-002 WS06-2*	22.3 µg/L	23.7	19.0 to 28.4	-0.5907	10/20	Acceptable
Dibromochloromethane *4575 PEO-002 WS06-2*	26.0 µg/L	29.7	20.8 to 38.6	-1.2458	14/20	Acceptable
Total trihalomethanes *5205 PEO-002 WS06-2*	101 µg/L	105	73.5 to 137	-0.3810	9/20	Acceptable

EPA 524.2
Gas Chromatography - Mass Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Bromodichloromethane *4395 PEO-007-3A WS06-2*	<0.5 µg/L	0.00	0.0 to 0.0		/1	Acceptable
Bromodichloromethane *4395 PEO-007-3A WS06-2-118*	<0.5 µg/L	0.00	0.0 to 0.0		/2	Acceptable
Bromoform *4400 PEO-007-3A WS06-2-118*	<0.5 µg/L	0.00	0.0 to 0.0		/2	Acceptable
Bromoform *4400 PEO-007-3A WS06-2*	<0.5 µg/L	0.00	0.0 to 0.0		/2	Acceptable
Chloroform *4505 PEO-007-3A WS06-2*	<0.5 µg/L	0.00	0.0 to 0.0		/1	Acceptable
Chloroform *4505 PEO-007-3A WS06-2-118*	<0.5 µg/L	0.00	0.0 to 0.0		/2	Acceptable
Dibromochloromethane *4575 PEO-007-3A WS06-2-118*	<0.5 µg/L	0.00	0.0 to 0.0		/2	Acceptable
Dibromochloromethane *4575 PEO-007-3A WS06-2*	<0.5 µg/L	0.00	0.0 to 0.0		/1	Acceptable

Unregulated VOCs

EPA 504.1
Gas Chromatography - Electron Capture Detection

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
1,2,3-Trichloropropane *5180 PEO-007-4 WS06-2*	39.4 µg/L	43.8	26.3 to 61.3	-0.5023	5/8	Acceptable

EPA 524.2
Gas Chromatography - Mass Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
Bromobenzene *4385 PEO-007-3B WS06-2*	7.50 µg/L	6.55	3.93 to 9.17	1.2336	15/16	Acceptable
Bromobenzene *4385 PEO-007-3B WS06-2-118*	47.3 µg/L	47.8	38.2 to 57.4	-0.1225	4/16	Acceptable
Bromochloromethane *4390 PEO-007-3B WS06-2-118*	22.4 µg/L	22.2	17.8 to 26.6	0.1516	2/16	Acceptable
n-Butylbenzene *4435 PEO-007-3B WS06-2-118*	37.8 µg/L	36.3	29.0 to 43.6	0.2943	3/17	Acceptable
n-Butylbenzene *4435 PEO-007-3B WS06-2*	46.5 µg/L	44.5	35.6 to 53.4	0.2927	4/16	Acceptable
sec-Butylbenzene *4440 PEO-007-3B WS06-2-118*	46.3 µg/L	38.9	31.1 to 46.7	1.8759	17/17	Acceptable
sec-Butylbenzene *4440 PEO-007-3B WS06-2*	6.09 µg/L	5.12	3.07 to 7.17	1.7276	15/16	Acceptable
tert-Butylbenzene *4445 PEO-007-3B WS06-2-118*	31.4 µg/L	29.2	23.4 to 35.0	0.4692	4/17	Acceptable
tert-Butylbenzene *4445 PEO-007-3B WS06-2*	21.3 µg/L	18.8	15.0 to 22.6	1.2336	13/16	Acceptable
Chloroethane *4485 PEO-007-3A WS06-2*	37.0 µg/L	38.1	22.9 to 53.3	-0.1444	3/14	Acceptable
Chloroethane *4485 PEO-007-3A WS06-2-118*	17.9 µg/L	23.2	13.9 to 32.5	-1.1422	11/17	Acceptable
2-Chlorotoluene *4535 PEO-007-3B WS06-2*	26.4 µg/L	23.1	18.5 to 27.7	1.2387	14/16	Acceptable
2-Chlorotoluene *4535 PEO-007-3B WS06-2-118*	15.7 µg/L	15.7	12.6 to 18.8	0.0000	1/16	Acceptable
4-Chlorotoluene *4540 PEO-007-3B WS06-2*	31.8 µg/L	28.2	22.6 to 33.8	1.2649	12/16	Acceptable
4-Chlorotoluene *4540 PEO-007-3B WS06-2-118*	16.9 µg/L	14.9	8.94 to 20.9	0.8063	7/16	Acceptable
Dibromomethane *4595 PEO-007-3B WS06-2*	49.8 µg/L	41.7	33.4 to 50.0	1.8865	16/16	Acceptable
Dibromomethane *4595 PEO-007-3B WS06-2-118*	37.2 µg/L	37.9	30.3 to 45.5	-0.3200	7/17	Acceptable
1,3-Dichlorobenzene *4615 PEO-007-3A WS06-2*	27.0 µg/L	24.4	19.5 to 29.3	1.1545	12/16	Acceptable
1,3-Dichlorobenzene *4615 PEO-007-3A WS06-2-118*	7.60 µg/L	7.29	0.00 to 299	0.3486	5/17	Acceptable
1,3-Dichlorobenzene *4615 PEO-007-2 WS06-2-118*	32.2 µg/L	33.2	26.6 to 39.8	-0.2944	5/23	Acceptable
1,3-Dichlorobenzene *4615 PEO-007-2 WS06-2*	36.0 µg/L	34.5	27.6 to 41.4	0.3898	7/17	Acceptable
Dichlorodifluoromethane *4625 PEO-007-3A WS06-2-118*	<0.5 µg/L	0.00	0 to 0		/0	Acceptable
Dichlorodifluoromethane *4625 PEO-007-3A WS06-2*	<0.5 µg/L	0.00	0.0 to 0.0		/0	Acceptable
1,1-Dichloroethane *4630 PEO-007-3A WS06-2-118*	44.2 µg/L	49.0	0.00 to 1030	-0.8007	11/17	Acceptable
1,3-Dichloropropane *4660 PEO-007-3B WS06-2-118*	47.0 µg/L	48.8	39.0 to 58.6	-0.3868	8/15	Acceptable
1,3-Dichloropropane *4660 PEO-007-3B WS06-2*	42.3 µg/L	39.9	31.9 to 47.9	0.8118	11/16	Acceptable
2,2-Dichloropropane *4665 PEO-007-3B WS06-2*	46.6 µg/L	47.4	37.9 to 56.9	-0.1238	1/16	Acceptable
2,2-Dichloropropane *4665 PEO-007-3B WS06-2-118*	15.8 µg/L	14.8	8.88 to 20.7	0.5322	7/16	Acceptable
1,1-Dichloropropene *4670 PEO-007-3B WS06-2*	<0.5 µg/L	0.00	0.0 to 0.0		/1	Acceptable
1,1-Dichloropropene *4670 PEO-007-3B WS06-2-118*	<0.5 µg/L	0.00	0.0 to 0.0		/2	Acceptable
cis-1,3-Dichloropropene *4680 PEO-007-3A WS06-2-118*	38.1 µg/L	37.4	0.00 to 785	0.1745	1/16	Acceptable
cis-1,3-Dichloropropene *4680 PEO-007-3A WS06-2*	6.83 µg/L	5.89	3.53 to 8.25	2.1115	16/16	Acceptable
trans-1,3-Dichloropropene *4685 PEO-007-3A WS06-2*	41.5 µg/L	40.1	32.1 to 48.1	0.3810	7/16	Acceptable

EPA 524.2
Gas Chromatography - Mass Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
trans-1,3-Dichloropropene *4685 PEO-007-3A WS06-2-118*	17.6 µg/L	16.8	0.00 to 353	0.6845	7/16	Acceptable
Hexachlorobutadiene *4835 PEO-007-3B WS06-2-118*	31.5 µg/L	29.1	23.3 to 34.9	0.7724	10/16	Acceptable
Isopropylbenzene *4900 PEO-007-3B WS06-2-118*	17.8 µg/L	17.7	14.2 to 21.2	0.0362	1/17	Acceptable
Isopropylbenzene *4900 PEO-007-3B WS06-2*	53.2 µg/L	45.9	36.7 to 55.1	1.4484	13/16	Acceptable
4-Isopropyltoluene *4901 PEO-007-3B WS06-2*	37.6 µg/L	35.6	28.5 to 42.7	0.5333	7/16	Acceptable
4-Isopropyltoluene *4901 PEO-007-3B WS06-2-118*	13.4 µg/L	14.0	8.40 to 19.6	-0.3014	4/17	Acceptable
Methyl bromide (Bromomethane) *4950 PEO-007-3A WS06-2*	37.7 µg/L	37.7	22.6 to 52.8	0.0000	1/15	Acceptable
Methyl bromide (Bromomethane) *4950 PEO-007-3A WS06-2-118*	17.0 µg/L	22.7	0.00 to 931	-2.0519	10/17	Acceptable
Methyl chloride (Chloromethane) *4960 PEO-007-3A WS06-2*	17.0 µg/L	20.2	12.1 to 28.3	-1.1577	8/16	Acceptable
Methyl chloride (Chloromethane) *4960 PEO-007-3A WS06-2-118*	27.6 µg/L	29.1	0.00 to 1190	-0.2963	3/16	Acceptable
Methyl tert-butyl ether (MTBE) *5000 PEO-007-2 WS06-2-118*	18.6 µg/L	20.7	12.4 to 29.0	-1.5917	15/21	Acceptable
Naphthalene *5005 PEO-007-2 WS06-2-118*	3.74 µg/L	3.00	1.80 to 4.20	0.9267	13/21	Acceptable
n-Propylbenzene *5090 PEO-007-3B WS06-2-118*	25.5 µg/L	25.0	20.0 to 30.0	0.1467	7/17	Acceptable
n-Propylbenzene *5090 PEO-007-3B WS06-2*	48.9 µg/L	43.4	34.7 to 52.1	1.0839	13/16	Acceptable
1,1,1,2-Tetrachloroethane *5105 PEO-007-3B WS06-2-118*	23.2 µg/L	24.1	19.3 to 28.9	-0.3252	8/16	Acceptable
1,1,2,2-Tetrachloroethane *5110 PEO-007-3A WS06-2-118*	35.4 µg/L	38.2	0.00 to 802	-0.6600	10/17	Acceptable
1,1,2,2-Tetrachloroethane *5110 PEO-007-3A WS06-2*	14.4 µg/L	14.0	11.2 to 16.8	0.4028	6/16	Acceptable
1,2,3-Trichlorobenzene *5150 PEO-007-3B WS06-2*	15.4 µg/L	18.9	15.1 to 22.7	-2.1827	15/16	Acceptable
1,2,3-Trichlorobenzene *5150 PEO-007-3B WS06-2-118*	38.3 µg/L	43.5	34.8 to 52.2	-0.7867	9/16	Acceptable
Trichlorofluoromethane *5175 PEO-007-3A WS06-2-118*	6.99 µg/L	7.51	0.00 to 308	-0.6139	10/17	Acceptable
Trichlorofluoromethane *5175 PEO-007-3A WS06-2*	26.6 µg/L	25.1	15.1 to 35.1	0.3761	2/15	Acceptable
1,2,3-Trichloropropane *5180 PEO-007-3B WS06-2*	13.3 µg/L	10.1	6.06 to 14.1	2.7001	15/15	Acceptable
1,2,3-Trichloropropane *5180 PEO-007-3B WS06-2-118*	31.2 µg/L	32.9	26.3 to 39.5	-0.3690	4/16	Acceptable
1,2,4-Trimethylbenzene *5210 PEO-007-3B WS06-2*	22.4 µg/L	19.6	15.7 to 23.5	1.5164	14/16	Acceptable
1,2,4-Trimethylbenzene *5210 PEO-007-3B WS06-2-118*	13.6 µg/L	13.7	8.22 to 19.2	-0.0638	1/17	Acceptable
1,2,4-Trimethylbenzene *5210 PEO-007-2 WS06-2*	7.12 µg/L	5.91	3.55 to 8.27	1.4997	16/17	Acceptable
1,2,4-Trimethylbenzene *5210 PEO-007-2 WS06-2-118*	12.6 µg/L	14.7	11.8 to 17.6	-1.1831	19/22	Acceptable
1,3,5-Trimethylbenzene *5215 PEO-007-2 WS06-2*	21.5 µg/L	19.4	15.5 to 23.3	0.9924	13/17	Acceptable
1,3,5-Trimethylbenzene *5215 PEO-007-2 WS06-2-118*	13.0 µg/L	13.4	10.7 to 16.1	-0.2336	3/21	Acceptable
1,3,5-Trimethylbenzene *5215 PEO-007-3B WS06-2-118*	19.5 µg/L	19.0	15.2 to 22.8	0.1935	3/17	Acceptable
m+p-Xylene *5240 PEO-007-2 WS06-2*	39.1 µg/L	36.7	29.4 to 44.0	0.7083	7/17	Acceptable
m+p-Xylene *5240 PEO-007-2 WS06-2-118*	6.06 µg/L	6.28	3.77 to 8.79	-0.3401	10/22	Acceptable
o-Xylene *5250 PEO-007-2 WS06-2*	16.2 µg/L	14.5	11.6 to 17.4	1.1892	13/17	Acceptable

EPA 524.2
Gas Chromatography - Mass Spectrometry

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
o-Xylene *5200 PEO-007-2 WS06-2-118*	10.1 µg/L	9.88	5.93 to 13.8	0.2668	7/23	Acceptable

EPA 524.2 SIM
Other

	Reported Value	Assigned Value	Acceptance Limits	Z Score	Rank	Evaluation
1,2,3-Trichloropropane *5180 PEO-007-4 WS06-2*	40.7 µg/L	43.8	26.3 to 61.3	-0.3539	4/8	Acceptable

RTC
2931 Soldier Springs Road
Laramie, WY 82070
307.742.5452
www.rt-corp.com

Performance Evaluation Report

WSCHEM **WS05-2**

Commenced 13-Apr-2005 | Concluded 27-May-2005

RT Labcode RT1142

NVLAP Labcode: 200393-0

This report may contain data that are not covered by the NVLAP accreditation.

Truesdail Laboratories, Inc.
ATTN: Pat Iyer
14201 Franklin Ave.
Tustin, CA 92780
US

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EPA Lab CA00062
PHONE (714)730-6239
FAX (714)730-6462
EMAIL

PEI-010-12

Corrosivity/Sodium

Program: WSCHEM

Evaluation

PEI-010-12

Analyte	Result	Units	Method	Method ID	Evaluation	z
1810 Conductivity*	510	µmhos/cm	EPA 120.1	10006209	Acceptable	-1.61
1550 Calcium hardness as CaCO3	191	mg/L	EPA 130.2	10007008	Acceptable	0.297
1625 Corrosivity (pH)*	9.03		EPA 150.1	10008205	Acceptable	0.714
1955 Residue-filterable (TDS)	357	mg/L	EPA 160.1	10009004	Acceptable	-0.576
1035 Calcium*	78.1	mg/L	EPA 200.7	10013408	Acceptable	0.568
1155 Sodium	17.0	mg/L	EPA 200.7	10013408	Acceptable	1.23
1575 Chloride*	132	mg/L	EPA 300.0	10053006	Acceptable	-1.34
1505 Alkalinity as CaCO₃	35.5	mg/L	EPA 310.1	10054601	Acceptable	-0.325

Study Summary

PEI-010-12

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
1035 Calcium*	mg/L	75.8	76.0	75.9	5.98	67.7 - 84.0	
1155 Sodium	mg/L	15.9	16.0	15.8	0.975	14.0 - 17.7	
1505 Alkalinity as CaCO3	mg/L	36.0	36.0	35.9	1.54	32.0 - 39.6	
1550 Calcium hardness as CaCO3	mg/L	188	189	189	16.9	168 - 209	
1575 Chloride*	mg/L	140	140	138	7.70	128 - 152	
1810 Conductivity*	µmhos/cm	537	537	537	16.8	483 - 591	
1625 Corrosivity (pH)*		8.90	8.86	8.86	0.182	7.97 - 9.75	
1955 Residue-filterable (TDS)	mg/L	398	398	398	76.5	258 - 540	

PEI-010-3

pH (20 mL)

Program: WSCHEM

Evaluation

PEI-010-3

Analyte	Result	Units	Method	Method ID	Evaluation	z
1900 pH	5.47	UNITS	EPA 150.1	10008205	Acceptable	5.05

Study Summary

PEI-010-3

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
1900 pH	UNITS	5.25	5.28	5.25	0.0436	5.08 - 5.48	

PEI-011

Anions

Program: WSCHEM

Evaluation

PEI-011

Analyte	Result	Units	Method	Method ID	Evaluation	z
1125 Potassium*	23.9	mg/L	EPA 200.7	10013408	Acceptable	-1.22
1730 Fluoride	3.68	mg/L	EPA 300.0	10053006	Acceptable	1.08
1810 Nitrate as N	7.73	mg/L	EPA 300.0	10053006	Acceptable	-0.931
1840 Nitrite as N	1.12	mg/L	EPA 354.1	10068403	Acceptable	2.07
1870 Orthophosphate as P	0.765	mg/L	EPA 365.2	10070209	Acceptable	-0.671

Study Summary

PEI-011

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
1125 Potassium*	mg/L	26.1	26.0	25.7	1.69	22.0 - 29.7	
1730 Fluoride	mg/L	3.45	3.35	3.46	0.213	3.11 - 3.90	
1810 Nitrate as N	mg/L	8.12	8.12	8.12	0.419	7.31 - 8.93	
1840 Nitrite as N	mg/L	0.992	0.992	0.997	0.0818	0.843 - 1.14	
1870 Orthophosphate as P	mg/L	0.812	0.804	0.785	0.0404	0.672 - 0.952	

NVLAP Lab code: 200393-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

PEI-012
Residual Free Chlorine (RFC)

Program: WSCHEM

Evaluation

PEI-012

Analyte	Result Units	Method	Method ID	Evaluation	z
1945 Residual free chlorine	0.890 mg/L	EPA 330.1	10057804	Acceptable	-0.0107

Study Summary

PEI-012

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
1945 Residual free chlorine	mg/L	0.891	0.891	0.891	0.0704	0.704 - 1.08	

PEI-013
Sulfate/TOC

Program: WSCHEM

Evaluation

PEI-013

Analyte	Result Units	Method	Method ID	Evaluation	z
2000 Sulfate	193 mg/L	EPA 300.0	10053006	Acceptable	-0.442
2040 Total organic carbon (TOC)	4.74 mg/L	EPA 415.2	10078601	Acceptable	-0.628

Study Summary

PEI-013

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
2000 Sulfate	mg/L	198	198	198	14.0	173 - 220	
2040 Total organic carbon (TOC)	mg/L	4.99	5.00	4.96	0.152	4.20 - 5.79	

PEI-014
Turbidity

Program: WSCHEM

Evaluation

PEI-014

Analyte	Result Units	Method	Method ID	Evaluation	z
2055 Turbidity	2.19 NTU	EPA 180.1	10011402	Acceptable	0.0980

Study Summary

PEI-014

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
2055 Turbidity	NTU	2.17	2.06	2.16	0.183	1.75 - 2.58	

PEI-015
Total Cyanide

Program: WSCHEM

Evaluation

PEI-015

Analyte	Result Units	Method	Method ID	Evaluation	z
1635 Cyanide	0.379 mg/L	EPA 335.2	10060205	Acceptable	1.49

Study Summary

PEI-015

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
1635 Cyanide	mg/L	0.315	0.320	0.299	0.0430	0.230 - 0.400	

NVLAP Labcode: 200393-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

PEI-016-1
Trace Metals 1

Program: WSCHEM

Evaluation

PEI-016-1

Analyte	Result	Units	Method	Method ID	Evaluation	z
1000 Aluminum*	3570	µg/L	EPA 200.7	10013408	Acceptable	0.583
1010 Arsenic	72.0	µg/L	EPA 200.7	10013408	Acceptable	1.07
1020 Beryllium	9.11	µg/L	EPA 200.7	10013408	Acceptable	-0.0345
1030 Cadmium	51.4	µg/L	EPA 200.7	10013408	Acceptable	0.864
1040 Chromium	129	µg/L	EPA 200.7	10013408	Acceptable	-0.395
1055 Copper	16.7	µg/L	EPA 200.7	10013408	Acceptable	0.100
1070 Iron*	1089	µg/L	EPA 200.7	10013408	Acceptable	0.181
1075 Lead	54.5	µg/L	EPA 200.7	10013408	Acceptable	-0.648
1090 Manganese	625	µg/L	EPA 200.7	10013408	Acceptable	-1.20
1105 Nickel	247	µg/L	EPA 200.7	10013408	Acceptable	-0.263
1140 Selenium	26.3	µg/L	EPA 200.7	10013408	Acceptable	0.504
1190 Zinc	2398	µg/L	EPA 200.7	10013408	Acceptable	0.199
1000 Aluminum*	3655	µg/L	EPA 200.8	10014401	Acceptable	1.02
1010 Arsenic	71.6	µg/L	EPA 200.8	10014401	Acceptable	0.050
1020 Beryllium	9.22	µg/L	EPA 200.8	10014401	Acceptable	0.155
1030 Cadmium	52.2	µg/L	EPA 200.8	10014401	Acceptable	1.19
1040 Chromium	130	µg/L	EPA 200.8	10014401	Acceptable	-0.264
1055 Copper	16.2	µg/L	EPA 200.8	10014401	Acceptable	-0.0669
1070 Iron*	1119	µg/L	EPA 200.8	10014401	Acceptable	0.725
1075 Lead	57.1	µg/L	EPA 200.8	10014401	Acceptable	0.239
1090 Manganese	675	µg/L	EPA 200.8	10014401	Acceptable	0.515
1105 Nickel	252	µg/L	EPA 200.8	10014401	Acceptable	0.0658
1140 Selenium	26.5	µg/L	EPA 200.8	10014401	Acceptable	0.581
1190 Zinc	2426	µg/L	EPA 200.8	10014401	Acceptable	0.397
1095 Mercury	2.64	µg/L	EPA 245.1	10036201	Acceptable	0.000

Study Summary

PEI-016-1

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
1000 Aluminum*	µg/L	3450	3520	3510	138	3040 - 3870	
1010 Arsenic	µg/L	67.3	67.3	68.8	4.36	47.1 - 87.5	
1020 Beryllium	µg/L	9.13	9.13	9.24	0.580	7.76 - 10.5	
1030 Cadmium	µg/L	49.3	49.3	49.3	2.43	39.4 - 59.2	
1040 Chromium	µg/L	132	132	132	7.59	112 - 152	
1055 Copper	µg/L	16.4	16.4	16.4	1.99	10.8 - 22.0	
1070 Iron*	µg/L	1080	1090	1090	48.1	971 - 1190	
1075 Lead	µg/L	56.4	56.4	56.4	2.93	39.5 - 73.3	
1090 Manganese	µg/L	660	668	671	22.5	602 - 718	
1095 Mercury	µg/L	2.64	2.64	2.62	0.271	1.85 - 3.43	
1105 Nickel	µg/L	251	251	251	15.2	213 - 289	
1140 Selenium	µg/L	25.0	25.0	24.9	2.58	19.9 - 30.1	
1190 Zinc	µg/L	2370	2370	2360	151	2130 - 2610	

NVLAP Lab code: 200393-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

PEI-016-2
Trace Metals 2

Evaluation

Program: WSCHEM

PEI-016-2

Analyte	Result Units	Method	Method ID	Evaluation	z
1005 Antimony	17.2 µg/L	EPA 200.7	10013408	Acceptable	-2.07
1015 Barium	776 µg/L	EPA 200.7	10013408	Acceptable	-1.57
1025 Boron	533 µg/L	EPA 200.7	10013408	Acceptable	-1.09
1085 Magnesium*	2.95 mg/L	EPA 200.7	10014003	Acceptable	-0.343
1100 Molybdenum	117 µg/L	EPA 200.7	10013408	Acceptable	0.000
1150 Silver*	162 µg/L	EPA 200.7	10013408	Acceptable	0.669
1165 Thallium	<0.010 µg/L	EPA 200.7	10013408	Not acceptable	
1185 Vanadium*	1968 µg/L	EPA 200.7	10013408	Acceptable	0.442
1005 Antimony	17.6 µg/L	EPA 200.8	10014401	Acceptable	-1.90
1015 Barium	799 µg/L	EPA 200.8	10014401	Acceptable	-0.620
1100 Molybdenum	114 µg/L	EPA 200.8	10014401	Acceptable	-0.436
1150 Silver*	164 µg/L	EPA 200.8	10014401	Acceptable	0.892
1165 Thallium	9.35 µg/L	EPA 200.8	10014401	Acceptable	0.676
1185 Vanadium*	2006 µg/L	EPA 200.8	10014401	Acceptable	0.796

Study Summary

PEI-016-2

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
1005 Antimony	µg/L	22.1	22.1	22.0	2.37	15.5 - 28.7	
1015 Barium	µg/L	814	814	819	24.2	692 - 936	
1025 Boron	µg/L	566	562	573	30.2	505 - 626	
1085 Magnesium*	mg/L	3.02	2.98	2.99	0.176	2.62 - 3.43	
1100 Molybdenum	µg/L	117	119	119	10.9	104 - 131	
1150 Silver*	µg/L	156	157	156	9.60	136 - 176	
1165 Thallium	µg/L	8.60	8.60	8.57	1.11	6.02 - 11.2	
1185 Vanadium*	µg/L	1920	1920	1920	113	1730 - 2110	

PEI-017-1
Inorganic Disinfection By-Products (Sample 1)

Evaluation

Program: WSCHEM

PEI-017-1

Analyte	Result Units	Method	Method ID	Evaluation	z
1540 Bromide	280 µg/L	EPA 300.0	10053006	Acceptable	-0.778

Study Summary

PEI-017-1

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
1540 Bromide	µg/L	308	307	271	22.0	236 - 380	

PEI-203
Anionic Surfactant

Evaluation

Program: WSCHEM

PEI-203

Analyte	Result Units	Method	Method ID	Evaluation	z
2025 Surfactants - MBAS*	0.411 mg/L	EPA 425.1	10080407	Acceptable	-0.748

Study Summary

PEI-203

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
2025 Surfactants - MBAS*	mg/L	0.446	0.450	0.413	0.0747	0.352 - 0.540	

PEI-224
Chlorine (combined & total)

Evaluation

Program: WSCHEM

PEI-224

Analyte	Result Units	Method	Method ID	Evaluation	z
1585 Total chlorine*	0.890 mg/L	EPA 330.1	10057804	Acceptable	-0.0107

Study Summary

PEI-224

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
1585 Total chlorine*	mg/L	0.891	0.891			0.704 - 1.08	

NVLAP Labcode: 200593-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

PEI-227
Silica

Program: WSCHEM

Evaluation

PEI-227

Analyte	Result	Units	Method	Method ID	Evaluation	z
1990 Silica as SiO₂*	10.4	mg/L	EPA 370.1	10071804	Acceptable	0.000

Study Summary

PEI-227

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
1990 Silica as SiO2*	mg/L	10.4	10.4	10.4	0.338	8.84 - 12.0	

PEI-229
Chromium VI

Program: WSCHEM

Evaluation

PEI-229

Analyte	Result	Units	Method	Method ID	Evaluation	z
1045 Chromium VI*	67.0	µg/L	EPA 7196A	10162400	Acceptable	-0.119

Study Summary

PEI-229

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
1045 Chromium VI*	µg/L	67.4	67.5			60.7 - 74.1	

PEO-002
Trihalomethanes

Program: WSCHEM

Evaluation

PEO-002

Analyte	Result	Units	Method	Method ID	Evaluation	z
4395 Bromodichloromethane	14.3	µg/L	EPA 502.2	10082005	Acceptable	-1.21
4400 Bromoform	41.6	µg/L	EPA 502.2	10082005	Acceptable	-0.763
4505 Chloroform	31.9	µg/L	EPA 502.2	10082005	Acceptable	-0.649
4575 Dibromochloromethane	37.1	µg/L	EPA 502.2	10082005	Acceptable	-0.613
5205 Total trihalomethanes	125	µg/L	EPA 502.2	10082005	Acceptable	-0.800

Study Summary

PEO-002

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
4395 Bromodichloromethane	µg/L	16.4	16.0	16.4	1.74	12.9 - 19.9	
4400 Bromoform	µg/L	45.1	46.1	45.1	4.78	23.0 - 69.2	
4505 Chloroform	µg/L	33.6	34.1	33.6	2.62	17.0 - 51.2	
4575 Dibromochloromethane	µg/L	39.9	41.1	39.9	4.57	20.5 - 61.7	
5205 Total trihalomethanes	µg/L	135	137	135	12.5	68.5 - 206	

PEO-003
PCBs

Program: WSCHEM

Evaluation

PEO-003

Analyte	Result	Units	Method	Method ID	Evaluation	z
8870 PCBs, total*	0.85	µg/L	EPA 508	10085004	Acceptable	1.91

Study Summary

PEO-003

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
8870 PCBs, total*	µg/L	0.670	0.70			0.00 - 1.40	

PEO-005-1
Organochlorine Pesticides (Sample 1)

Program: WSCHEM

Evaluation

PEO-005-1

Analyte	Result	Units	Method	Method ID	Evaluation	z
7025 Aldrin	0.42	µg/L	EPA 508	10085004	Acceptable	-0.617
7120 gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	1.29	µg/L	EPA 508	10085004	Acceptable	-1.27
7470 Dieldrin	2.20	µg/L	EPA 508	10085004	Acceptable	-0.879
7540 Endrin	0.61	µg/L	EPA 508	10085004	Acceptable	-1.56
7685 Heptachlor	0.45	µg/L	EPA 508	10085004	Acceptable	-1.11

NVLAP Labcode: 200393-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

Study Summary

PEO-005-1

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
7025 Aldrin	µg/L	0.499	0.60	0.581	0.147	0.243 - 0.756	
7120 gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	µg/L	1.72	1.72	1.54	0.339	0.946 - 2.49	
7470 Dieldrin	µg/L	2.60	2.71	2.36	0.302	1.69 - 3.51	
7540 Endrin	µg/L	0.820	0.82	0.757	0.135	0.574 - 1.07	
7685 Heptachlor	µg/L	0.620	0.62	0.574	0.153	0.341 - 0.899	

PEO-005-2

Organochlorine Pesticides (Sample 2)

Program: WSCHEM

Evaluation

PEO-005-2

Analyte	Result	Units	Method	Method ID	Evaluation	z
6275 Hexachlorobenzene	3.01	µg/L	EPA 508	10085004	Acceptable	0.780
6285 Hexachlorocyclopentadiene	9.85	µg/L	EPA 508	10085004	Acceptable	-0.997
7690 Heptachlor epoxide	4.37	µg/L	EPA 508	10085004	Acceptable	0.720
7810 Methoxychlor	75.6	µg/L	EPA 508	10085004	Acceptable	-0.246
8045 Propachlor (Ramrod)	2.46	µg/L	EPA 508	10085004	Acceptable	-0.771
8295 Trifluralin (Treflan)	2.88	µg/L	EPA 508	10085004	Acceptable	0.441

Study Summary

PEO-005-2

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
6275 Hexachlorobenzene	µg/L	2.56	2.85	2.65	0.780	1.41 - 3.72	
6285 Hexachlorocyclopentadiene	µg/L	15.9	19.9	15.9	6.65	3.75 - 28.0	
7690 Heptachlor epoxide	µg/L	3.70	3.70	3.76	0.930	2.04 - 5.37	
7810 Methoxychlor	µg/L	79.1	79.1	72.3	14.2	43.5 - 115	
8045 Propachlor (Ramrod)	µg/L	2.91	2.96	2.54	0.224	1.74 - 4.07	
8295 Trifluralin (Treflan)	µg/L	2.63	2.96	2.49	0.807	1.50 - 3.77	

PEO-005-3

Organonitrogen Pesticides

Program: WSCHEM

Evaluation

PEO-005-3

Analyte	Result	Units	Method	Method ID	Evaluation	z
7005 Alachlor	19.6	µg/L	EPA 525.2	10089608	Acceptable	1.20
7065 Atrazine	28.1	µg/L	EPA 525.2	10089608	Acceptable	0.246
7130 Bromacil*	<1.0	µg/L	EPA 525.2	10089608	Acceptable	
7160 Butachlor	86.9	µg/L	EPA 525.2	10089608	Acceptable	1.21
7835 Metolachlor	<1.0	µg/L	EPA 525.2	10089608	Acceptable	
7845 Metribuzin	23.2	µg/L	EPA 525.2	10089608	Acceptable	-0.931
7875 Molinate*	<1.0	µg/L	EPA 525.2	10089608	Acceptable	
8125 Simazine	28.2	µg/L	EPA 525.2	10089608	Acceptable	0.873

Study Summary

PEO-005-3

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
7005 Alachlor	µg/L	16.6	16.6	16.4	3.63	9.13 - 24.1	
7065 Atrazine	µg/L	27.1	27.1	27.5	5.14	14.9 - 39.3	
7130 Bromacil*	µg/L		0			0 - 0	
7160 Butachlor	µg/L	69.6	78.2	75.7	15.1	40.9 - 98.2	
7835 Metolachlor	µg/L		0			0 - 0	
7845 Metribuzin	µg/L	35.3	43.8	34.9	10.5	9.32 - 61.3	
7875 Molinate*	µg/L		0			0 - 0	
8125 Simazine	µg/L	21.4	26.2	23.9	5.49	5.83 - 37.0	

NVLAP Lab code: 200383-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

PEO-005-4
Herbicides

Program: WSCHEM

Evaluation

PEO-005-4

Analyte	Result Units	Method	Method ID	Evaluation	z
▼ Summary for Method EPA 515.4				Overall method evaluation Acceptable	
8500 4-Nitrophenol*	<2.0 µg/L	EPA 515.4	10088503	Acceptable	
8605 Pentachlorophenol	38.8 µg/L	EPA 515.4	10088503	Acceptable	0.241
8505 Acifluorfen	24.0 µg/L	EPA 515.4	10088503	Acceptable	-1.17
8530 Bentazon*	<2.0 µg/L	EPA 515.4	10088503	Acceptable	
8540 Chloramben*	<1.0 µg/L	EPA 515.4	10088503	Acceptable	
8545 2,4-D	26.4 µg/L	EPA 515.4	10088503	Acceptable	-0.590
8550 Dacthal (DCPA)*	<1.0 µg/L	EPA 515.4	10088503	Acceptable	
8555 Dalapon	<1.0 µg/L	EPA 515.4	10088503	Acceptable	
8560 2,4-DB*	<2.0 µg/L	EPA 515.4	10088503	Acceptable	
8565 DCPA mono-acid*	<1.0 µg/L	EPA 515.4	10088503	Acceptable	
8595 Dicamba	49.8 µg/L	EPA 515.4	10088503	Acceptable	0.840
8600 3,5-Dichlorobenzoic acid*	<1.0 µg/L	EPA 515.4	10088503	Acceptable	
8605 Dichloroprop*	<2.0 µg/L	EPA 515.4	10088503	Acceptable	
8620 Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	22.7 µg/L	EPA 515.4	10088503	Acceptable	0.866
8645 Picloram	25.0 µg/L	EPA 515.4	10088503	Acceptable	-0.225
8650 Silvex (2,4,5-TP)	10.9 µg/L	EPA 515.4	10088503	Acceptable	
8655 2,4,5-T*	32.8 µg/L	EPA 515.4	10088503	Acceptable	-0.667
▲ Summary for Method EPA 515.4	Analytes Evaluated 17		Acceptable 17	Acceptance Percentage 100.0%	

Study Summary

PEO-005-4

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
8500 4-Nitrophenol*	µg/L		0			0 - 0	
8605 Pentachlorophenol	µg/L	36.2	36.2	35.0	10.8	18.1 - 54.3	
8505 Acifluorfen	µg/L	34.4	36.6	36.1	9.38	16.6 - 52.2	
8530 Bentazon*	µg/L		0			0 - 0	
8540 Chloramben*	µg/L		0			0 - 0	
8545 2,4-D	µg/L	31.5	31.5	24.9	8.64	15.8 - 47.3	
8550 Dacthal (DCPA)*	µg/L		0			0 - 0	
8555 Dalapon	µg/L	47.1	74.6	34.1	17.7	0.000 - 103	
8560 2,4-DB*	µg/L		0			0 - 0	
8565 DCPA mono-acid*	µg/L		0			0 - 0	
8595 Dicamba	µg/L	38.8	46.7	47.8	2.08	12.5 - 65.0	
8600 3,5-Dichlorobenzoic acid*	µg/L		0			0 - 0	
8605 Dichloroprop*	µg/L		0			0 - 0	
8620 Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	µg/L	17.0	21.6	20.7	2.92	3.68 - 30.2	
8645 Picloram	µg/L	27.2	33.1	29.8	4.55	7.61 - 46.7	
8650 Silvex (2,4,5-TP)	µg/L	12.7	12.7	11.5	1.63	6.35 - 19.1	
8655 2,4,5-T*	µg/L	40.0	46.8	37.4	12.4	18.4 - 61.6	

PEO-005-5
Chlordane (Total)

Program: WSCHEM

Evaluation

PEO-005-5

Analyte	Result Units	Method	Method ID	Evaluation	z
7250 Chlordane, total	12.6 µg/L	EPA 508	10085004	Acceptable	-2.44

Study Summary

PEO-005-5

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
7250 Chlordane, total	µg/L	17.6	17.6	16.1	2.05	9.68 - 25.5	

PEO-005-6
Toxaphene (Total)

Program: WSCHEM

Evaluation

PEO-005-6

Analyte	Result Units	Method	Method ID	Evaluation	z
8250 Toxaphene (Chlorinated camphene)	5.92 µg/L	EPA 508	10085004	Acceptable	-0.734

NVLAP Labcode: 200583-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

Study Summary

PEO-005-6

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
8250 Toxaphene (Chlorinated camphene)	µg/L	6.86	6.86	6.59	1.28	3.77 - 9.95	

PEO-006-1
Adipate/Phthalate

Program: WSCHEM

Evaluation

PEO-006-1

Analyte	Result	Units	Method	Method ID	Evaluation	z
5580 Benzo(a)pyrene	0.70	µg/L	EPA 525.2	10089608	Acceptable	-0.933
6062 bis(2-ethylhexyl)adipate	21.7	µg/L	EPA 525.2	10089608	Acceptable	0.130
6065 bis(2-ethylhexyl)phthalate	11.8	µg/L	EPA 525.2	10089608	Acceptable	0.374

Study Summary

PEO-006-1

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
5580 Benzo(a)pyrene	µg/L	0.908	1.05	0.922	0.238	0.462 - 1.35	
6062 bis(2-ethylhexyl)adipate	µg/L	20.9	22.8	20.0	4.96	8.56 - 33.2	
6065 bis(2-ethylhexyl)phthalate	µg/L	10.6	11.1	11.1	1.89	4.15 - 17.0	

PEO-006-2
PNAs

Program: WSCHEM

Evaluation

PEO-006-2

Analyte	Result	Units	Method	Method ID	Evaluation	z
▼ Summary for Method EPA 525.2					Overall method evaluation Acceptable	
5005 Naphthalene*	19.7	µg/L	EPA 525.2	10089608	Acceptable	-2.84
5500 Acenaphthene*	22.9	µg/L	EPA 525.2	10089608	Acceptable	-0.602
5505 Acenaphthylene*	<0.5	µg/L	EPA 525.2	10089608	Acceptable	
5555 Anthracene*	7.25	µg/L	EPA 525.2	10089608	Acceptable	-1.75
5575 Benzo(a)anthracene*	<0.5	µg/L	EPA 525.2	10089608	Acceptable	
5585 Benzo(b)fluoranthene*	7.68	µg/L	EPA 525.2	10089608	Acceptable	-0.490
5590 Benzo(g,h,i)perylene*	9.22	µg/L	EPA 525.2	10089608	Acceptable	0.0570
5600 Benzo(k)fluoranthene*	<0.5	µg/L	EPA 525.2	10089608	Acceptable	
5670 Butyl benzyl phthalate*	<0.5	µg/L	EPA 525.2	10089608	Acceptable	
5855 Chrysene*	<0.5	µg/L	EPA 525.2	10089608	Acceptable	
5895 Dibenz(a,h) anthracene*	4.51	µg/L	EPA 525.2	10089608	Acceptable	-1.85
5925 Di-n-butyl phthalate*	17.8	µg/L	EPA 525.2	10089608	Acceptable	0.997
6070 Diethyl phthalate*	22.6	µg/L	EPA 525.2	10089608	Acceptable	0.622
6135 Dimethyl phthalate*	31.2	µg/L	EPA 525.2	10089608	Acceptable	-0.0144
6200 Di-n-octyl phthalate*	28.6	µg/L	EPA 525.2	10089608	Acceptable	0.152
6205 Fluoranthene*	<0.5	µg/L	EPA 525.2	10089608	Acceptable	
6270 Fluorene*	<0.5	µg/L	EPA 525.2	10089608	Acceptable	
6315 Indeno(1,2,3-cd) pyrene*	<0.5	µg/L	EPA 525.2	10089608	Acceptable	
6380 1-Methylnaphthalene*	15.3	µg/L	EPA 525.2	10089608	Acceptable	
6385 2-Methylnaphthalene*	33.6	µg/L	EPA 525.2	10089608	Acceptable	
6615 Phenanthrene*	9.12	µg/L	EPA 525.2	10089608	Acceptable	
6665 Pyrene*	<0.5	µg/L	EPA 525.2	10089608	Acceptable	
▲ Summary for Method EPA 525.2	Analytes Evaluated 22		Acceptable 22		Acceptance Percentage 100.0%	

Study Summary

PEO-006-2

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
5005 Naphthalene*	µg/L	28.5	28.5	21.9	3.10	17.1 - 39.9	
5500 Acenaphthene*	µg/L	25.8	25.8	21.4	4.82	12.9 - 38.7	
5505 Acenaphthylene*	µg/L	0.000	0			0.000 - 0.000	
5555 Anthracene*	µg/L	8.98	8.98	7.64	0.991	4.49 - 13.5	
5575 Benzo(a)anthracene*	µg/L	0.000	0			0.000 - 0.000	
5585 Benzo(b)fluoranthene*	µg/L	8.41	8.41	7.09	1.49	4.21 - 12.6	
5590 Benzo(g,h,i)perylene*	µg/L	9.09	9.09	7.54	2.28	4.50 - 13.6	
5600 Benzo(k)fluoranthene*	µg/L	0.000	0			0.000 - 0.000	
5670 Butyl benzyl phthalate*	µg/L	0.000	0			0.000 - 0.000	

NVLAP Labcode: 200583-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

Study Summary

PEO-006-2

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
5855 Chrysene*	µg/L	0.000	0			0.000 - 0.000	
5895 Dibenz(a,h) anthracene*	µg/L	5.52	5.52	4.63	0.546	2.76 - 8.28	
5925 Di-n-butyl phthalate*	µg/L	14.0	14.0	13.5	3.81	5.60 - 22.4	
6070 Diethyl phthalate*	µg/L	20.0	20.0	20.0	4.18	8.00 - 32.0	
6135 Dimethyl phthalate*	µg/L	31.3	31.3	29.9	6.96	12.5 - 50.1	
6200 Di-n-octyl phthalate*	µg/L	27.6	27.6	23.6	6.59	11.0 - 44.2	
6265 Fluoranthene*	µg/L	0.000	0			0.000 - 0.000	
6270 Fluorene*	µg/L	0.000	0			0.000 - 0.000	
6315 Indeno(1,2,3-cd) pyrene*	µg/L	0.000	0			0.000 - 0.000	
6380 1-Methylnaphthalene*	µg/L	22.1	22.1			11.1 - 33.2	
6385 2-Methylnaphthalene*	µg/L	43.8	43.8			21.9 - 65.7	
6615 Phenanthrene*	µg/L	8.93	8.93	8.80	0.523	4.47 - 13.4	
6665 Pyrene*	µg/L	0.000	0			0.000 - 0.000	

PEO-007-1

Regulated VOCs (Sample 1)

Program: WSCHEM

Evaluation

PEO-007-1

Analyte	Result	Units	Method	Method ID	Evaluation	z
▼ Summary for Method EPA 524.2					Overall method evaluation Acceptable	
4455 Carbon tetrachloride	10.7	µg/L	EPA 524.2	10088605	Acceptable	-1.08
4475 Chlorobenzene	4.04	µg/L	EPA 524.2	10088605	Acceptable	0.309
4635 1,2-Dichloroethane	16.2	µg/L	EPA 524.2	10088605	Acceptable	-0.986
4640 1,1-Dichloroethylene	3.21	µg/L	EPA 524.2	10088605	Acceptable	-0.953
4645 cis-1,2-Dichloroethylene	22.1	µg/L	EPA 524.2	10088605	Acceptable	-0.808
4665 1,2-Dichloropropane	4.85	µg/L	EPA 524.2	10088605	Acceptable	-0.681
4700 trans-1,2-Dichloroethylene	3.44	µg/L	EPA 524.2	10088605	Acceptable	-0.773
4975 Methylene chloride (Dichloromethane)	6.81	µg/L	EPA 524.2	10088605	Acceptable	0.238
5100 Styrene	6.71	µg/L	EPA 524.2	10088605	Acceptable	-0.105
5115 Tetrachloroethylene (Perchloroethylene)	14.9	µg/L	EPA 524.2	10088605	Acceptable	1.44
5155 1,2,4-Trichlorobenzene	14.3	µg/L	EPA 524.2	10088605	Acceptable	0.203
5160 1,1,1-Trichloroethane	10.6	µg/L	EPA 524.2	10088605	Acceptable	-1.45
5165 1,1,2-Trichloroethane	17.9	µg/L	EPA 524.2	10088605	Acceptable	-0.345
5170 Trichloroethene (Trichloroethylene)	9.15	µg/L	EPA 524.2	10088605	Acceptable	-0.943
5235 Vinyl chloride	20.4	µg/L	EPA 524.2	10088605	Acceptable	-0.346
▲ Summary for Method EPA 524.2	Analytes Evaluated 15		Acceptable 15		Acceptance Percentage 100.0%	

Study Summary

PEO-007-1

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
4455 Carbon tetrachloride	µg/L	12.2	12.6	12.2	1.39	10.1 - 15.1	
4475 Chlorobenzene	µg/L	3.96	4.05	3.96	0.259	2.43 - 5.67	
4635 1,2-Dichloroethane	µg/L	17.6	17.6	17.6	1.42	14.1 - 21.1	
4640 1,1-Dichloroethylene	µg/L	3.82	3.73	3.82	0.640	2.24 - 5.22	
4645 cis-1,2-Dichloroethylene	µg/L	24.8	25.1	24.8	3.34	20.1 - 30.1	
4665 1,2-Dichloropropane	µg/L	5.23	5.20	5.23	0.558	3.12 - 7.28	
4700 trans-1,2-Dichloroethylene	µg/L	3.73	3.34	3.73	0.375	2.00 - 4.68	
4975 Methylene chloride (Dichloromethane)	µg/L	6.52	6.75	6.52	1.22	4.05 - 9.45	
5100 Styrene	µg/L	6.79	7.22	6.79	0.763	4.33 - 10.1	
5115 Tetrachloroethylene (Perchloroethylene)	µg/L	12.2	13.2	12.2	1.88	10.4 - 16.0	
5155 1,2,4-Trichlorobenzene	µg/L	14.0	14.9	14.0	1.48	10.4 - 19.4	
5160 1,1,1-Trichloroethane	µg/L	12.5	12.6	12.5	1.31	10.1 - 15.1	
5165 1,1,2-Trichloroethane	µg/L	18.6	18.9	18.6	2.03	15.1 - 22.7	
5170 Trichloroethene (Trichloroethylene)	µg/L	9.97	10.4	9.97	0.870	8.32 - 12.5	
5235 Vinyl chloride	µg/L	22.0	22.0	22.0	4.62	13.2 - 30.8	

NVLAP Labcode: 200383-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

PEO-007-2
Regulated VOCs (Sample 2)

Program: WSCHEM

Evaluation

PEO-007-2

Analyte	Result Units	Method	Method ID	Evaluation	z
▼ Summary for Method EPA 524.2				Overall method evaluation Acceptable	
4375 Benzene	11.9 µg/L	EPA 524.2	10088605	Acceptable	-0.546
4610 1,2-Dichlorobenzene	7.40 µg/L	EPA 524.2	10088605	Acceptable	0.686
4615 1,3-Dichlorobenzene	30.4 µg/L	EPA 524.2	10088605	Acceptable	-0.339
4620 1,4-Dichlorobenzene	8.06 µg/L	EPA 524.2	10088605	Acceptable	-0.472
4765 Ethylbenzene	5.25 µg/L	EPA 524.2	10088605	Acceptable	0.0212
5000 Methyl tert-butyl ether (MTBE)	25.6 µg/L	EPA 524.2	10088605	Acceptable	-0.597
5005 Naphthalene*	20.8 µg/L	EPA 524.2	10088605	Acceptable	0.231
5140 Toluene	13.3 µg/L	EPA 524.2	10088605	Acceptable	0.355
5210 1,2,4-Trimethylbenzene*	17.6 µg/L	EPA 524.2	10088605	Acceptable	0.000
5215 1,3,5-Trimethylbenzene*	14.7 µg/L	EPA 524.2	10088605	Acceptable	-0.119
5240 m+p-Xylene*	15.1 µg/L	EPA 524.2	10088605	Acceptable	0.475
5250 o-Xylene*	7.41 µg/L	EPA 524.2	10088605	Acceptable	0.805
5260 Xylene, total	22.5 µg/L	EPA 524.2	10088605	Acceptable	0.796
▲ Summary for Method EPA 524.2	Analytes Evaluated 13	Acceptable 13	Acceptance Percentage 100.0%		

Study Summary

PEO-007-2

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
4375 Benzene	µg/L	12.4	12.8	12.4	0.915	10.2 - 15.4	
4610 1,2-Dichlorobenzene	µg/L	7.02	7.10	7.02	0.554	4.26 - 9.94	
4615 1,3-Dichlorobenzene	µg/L	31.4	31.6	31.4	2.95	25.3 - 37.9	
4620 1,4-Dichlorobenzene	µg/L	8.50	8.52	8.50	0.853	5.11 - 11.9	
4765 Ethylbenzene	µg/L	5.24	5.38	5.24	0.471	3.23 - 7.53	
5000 Methyl tert-butyl ether (MTBE)	µg/L	27.6	27.6	26.9	3.35	16.6 - 38.6	
5005 Naphthalene*	µg/L	20.0	20.2	20.0	3.47	12.1 - 28.3	
5140 Toluene	µg/L	13.0	13.6	13.0	0.846	10.9 - 16.3	
5210 1,2,4-Trimethylbenzene*	µg/L	17.6	17.2	17.6	1.82	13.8 - 20.8	
5215 1,3,5-Trimethylbenzene*	µg/L	14.9	15.0	14.9	1.68	11.9 - 18.1	
5240 m+p-Xylene*	µg/L	14.8	15.4	14.8	0.631	12.3 - 18.5	
5250 o-Xylene*	µg/L	6.94	7.17	6.94	0.584	4.30 - 10.0	
5260 Xylene, total	µg/L	21.6	22.6	21.6	1.15	18.1 - 27.1	

PEO-007-3A
Unregulated VOCs (Sample 1)

Program: WSCHEM

Evaluation

PEO-007-3A

Analyte	Result Units	Method	Method ID	Evaluation	z
▼ Summary for Method EPA 524.2				Overall method evaluation Acceptable	
4395 Bromodichloromethane	<0.5 µg/L	EPA 524.2	10088605	Acceptable	
4400 Bromoform	<0.5 µg/L	EPA 524.2	10088605	Acceptable	
4485 Chloroethane	12.5 µg/L	EPA 524.2	10088605	Acceptable	
4505 Chloroform	<0.5 µg/L	EPA 524.2	10088605	Acceptable	
4575 Dibromochloromethane	<0.5 µg/L	EPA 524.2	10088605	Acceptable	
4615 1,3-Dichlorobenzene	31.6 µg/L	EPA 524.2	10088605	Acceptable	
4625 Dichlorodifluoromethane	2.50 µg/L	EPA 524.2	10088605	Acceptable	0.162
4630 1,1-Dichloroethane	47.9 µg/L	EPA 524.2	10088605	Acceptable	0.165
4680 cis-1,3-Dichloropropene	7.57 µg/L	EPA 524.2	10088605	Acceptable	-0.246
4685 trans-1,3-Dichloropropylene	13.4 µg/L	EPA 524.2	10088605	Acceptable	-0.0455
4950 Methyl bromide (Bromomethane)	16.3 µg/L	EPA 524.2	10088605	Acceptable	0.256
4960 Methyl chloride (Chloromethane)	18.3 µg/L	EPA 524.2	10088605	Acceptable	0.0678
5000 Methyl tert-butyl ether (MTBE)	28.9 µg/L	EPA 524.2	10088605	Acceptable	-0.245
5110 1,1,2,2-Tetrachloroethane	42.5 µg/L	EPA 524.2	10088605	Acceptable	0.323
5175 Trichlorofluoromethane	8.18 µg/L	EPA 524.2	10088605	Acceptable	
▲ Summary for Method EPA 524.2	Analytes Evaluated 15	Acceptable 15	Acceptance Percentage 100.0%		

NVLAP Labcode: 200383-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

Study Summary

PEO-007-3A

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
4395 Bromodichloromethane	µg/L	0.000	0			0.000 - 0.000	
4400 Bromoform	µg/L	0.000	0			0.000 - 0.000	
4485 Chloroethane	µg/L	12.0	12.0	11.7	2.60	7.20 - 16.8	
4505 Chloroform	µg/L	0.000	0			0.000 - 0.000	
4575 Dibromochloromethane	µg/L	0.000	0			0.000 - 0.000	
4615 1,3-Dichlorobenzene	µg/L	NaN	35.1	35.0	3.68	28.1 - 42.1	
4625 Dichlorodifluoromethane	µg/L	2.40	2.40	2.35	0.617	1.44 - 3.36	
4630 1,1-Dichloroethane	µg/L	47.2	48.6	47.2	4.23	36.4 - 58.0	
4660 cis-1,3-Dichloropropene	µg/L	7.78	9.43	7.78	0.852	5.66 - 13.2	
4665 trans-1,3-Dichloropropylene	µg/L	13.5	14.5	13.5	2.20	8.70 - 20.3	
4950 Methyl bromide (Bromomethane)	µg/L	15.1		14.9	4.69	7.55 - 22.7	
4960 Methyl chloride (Chloromethane)	µg/L	18.1	17.7	18.1	2.95	10.6 - 25.4	
5000 Methyl tert-butyl ether (MTBE)	µg/L	29.8	29.8	29.1	3.67	17.9 - 41.7	
5110 1,1,2,2-Tetrachloroethane	µg/L	44.4	47.0	44.4	5.89	35.5 - 56.4	
5175 Trichlorofluoromethane	µg/L	9.54	9.54	9.19	1.52	5.72 - 13.4	

PEO-007-3B

Unregulated VOCs (Sample 2)

Program: WSCHEM

Evaluation

PEO-007-3B

Analyte	Result Units	Method	Method ID	Evaluation	z
▼ Summary for Method EPA 524.2				Overall method evaluation Acceptable	
4385 Bromobenzene	20.6 µg/L	EPA 524.2	10088605	Acceptable	1.10
4390 Bromochloromethane	34.1 µg/L	EPA 524.2	10088605	Acceptable	-0.464
4435 n-Butylbenzene	26.1 µg/L	EPA 524.2	10088605	Not acceptable	-2.12
4440 sec-Butylbenzene	22.4 µg/L	EPA 524.2	10088605	Acceptable	-0.403
4445 tert-Butylbenzene	14.3 µg/L	EPA 524.2	10088605	Acceptable	
4535 2-Chlorotoluene	12.1 µg/L	EPA 524.2	10088605	Acceptable	0.282
4540 4-Chlorotoluene	56.7 µg/L	EPA 524.2	10088605	Acceptable	1.18
4595 Dibromomethane	9.99 µg/L	EPA 524.2	10088605	Acceptable	-1.59
4660 1,3-Dichloropropane	22.9 µg/L	EPA 524.2	10088605	Acceptable	-1.81
4665 2,2-Dichloropropane	23.2 µg/L	EPA 524.2	10088605	Acceptable	-0.277
4670 1,1-Dichloropropene	<0.5 µg/L	EPA 524.2	10088605	Acceptable	
4835 Hexachlorobutadiene	12.9 µg/L	EPA 524.2	10088605	Acceptable	0.714
4900 Isopropylbenzene	46.4 µg/L	EPA 524.2	10088605	Acceptable	-0.106
4910 4-Isopropyltoluene	22.9 µg/L	EPA 524.2	10088605	Acceptable	0.0651
5090 n-Propylbenzene	37.1 µg/L	EPA 524.2	10088605	Acceptable	0.257
5105 1,1,1,2-Tetrachloroethane	24.2 µg/L	EPA 524.2	10088605	Acceptable	0.0660
5150 1,2,3-Trichlorobenzene	39.5 µg/L	EPA 524.2	10088605	Acceptable	1.03
5180 1,2,3-Trichloropropane	15.7 µg/L	EPA 524.2	10088605	Acceptable	0.284
5210 1,2,4-Trimethylbenzene	52.6 µg/L	EPA 524.2	10088605	Acceptable	1.19
5215 1,3,5-Trimethylbenzene	46.9 µg/L	EPA 524.2	10088605	Acceptable	0.760
▲ Summary for Method EPA 524.2	Analytes Evaluated 20		Acceptable 19		Acceptance Percentage 95.0%

Study Summary

PEO-007-3B

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
4385 Bromobenzene	µg/L	18.7	18.5	18.7	1.72	14.8 - 22.2	
4390 Bromochloromethane	µg/L	35.6	38.2	35.6	3.23	30.6 - 45.8	
4435 n-Butylbenzene	µg/L	36.7	37.8	36.7	5.00	30.2 - 45.4	
4440 sec-Butylbenzene	µg/L	23.9	23.9	23.9	3.72	19.1 - 28.7	
4445 tert-Butylbenzene	µg/L	NaN	15.1	15.6	2.88	12.1 - 18.1	
4535 2-Chlorotoluene	µg/L	11.7	11.6	11.7	1.42	6.96 - 16.2	
4540 4-Chlorotoluene	µg/L	51.5	49.9	51.5	4.39	39.9 - 59.9	
4595 Dibromomethane	µg/L	11.8	12.4	11.8	1.14	7.44 - 17.4	
4660 1,3-Dichloropropane	µg/L	27.8	29.2	27.8	2.71	22.2 - 33.4	
4665 2,2-Dichloropropane	µg/L	24.5	27.6	24.5	4.70	13.8 - 41.4	
4670 1,1-Dichloropropene	µg/L		0			0 - 0	
4835 Hexachlorobutadiene	µg/L	14.8	15.7	14.6	2.38	12.6 - 18.8	

NVLAP Lab code: 200393-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

Study Summary

PEO-007-3B

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
4900 Isopropylbenzene	µg/L	47.0	47.4	47.0	5.64	37.9 - 56.9	
4910 4-Isopropyltoluene	µg/L	22.6	24.4	22.6	4.61	13.4 - 31.8	
5090 n-Propylbenzene	µg/L	36.2	37.4	36.2	3.50	29.9 - 44.9	
5105 1,1,1,2-Tetrachloroethane	µg/L	24.0	24.0	24.0	3.03	19.2 - 28.8	
5150 1,2,3-Trichlorobenzene	µg/L	35.3	35.4	35.3	4.09	28.3 - 42.5	
5180 1,2,3-Trichloropropane	µg/L	15.1	15.8	15.1	2.11	12.5 - 19.0	
5210 1,2,4-Trimethylbenzene	µg/L	47.3	48.4	47.3	4.45	37.8 - 56.8	
5215 1,3,5-Trimethylbenzene	µg/L	43.7	45.3	43.7	4.21	36.2 - 54.4	

PEO-007-4

EDB/DBCP

Program: WSCHEM

Evaluation

PEO-007-4

Analyte	Result	Units	Method	Method ID	Evaluation	z
4570 1,2-Dibromo-3-chloropropane (DBCP)	1.54	µg/L	EPA 504.1	10082607	Acceptable	-0.833
4585 1,2-Dibromoethane (EDB, Ethylene dibromide)	1.47	µg/L	EPA 504.1	10082607	Acceptable	0.485
5180 1,2,3-Trichloropropane	25.9	µg/L	EPA 504.1	10082607	Acceptable	-2.47
4570 1,2-Dibromo-3-chloropropane (DBCP)	1.50	µg/L	EPA 524.2 SIM	0	Acceptable	-0.972
4585 1,2-Dibromoethane (EDB, Ethylene dibromide)	1.38	µg/L	EPA 524.2 SIM	0	Acceptable	0.0485
5180 1,2,3-Trichloropropane	26.9	µg/L	EPA 524.2 SIM	0	Acceptable	-1.78

Study Summary

PEO-007-4

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
4570 1,2-Dibromo-3-chloropropane (DBCP)	µg/L	1.78	1.78	1.72	0.288	1.07 - 2.49	
4585 1,2-Dibromoethane (EDB, Ethylene dibromide)	µg/L	1.37	1.37	1.36	0.206	0.822 - 1.92	
5180 1,2,3-Trichloropropane	µg/L	29.5	29.5	26.1	1.46	17.7 - 41.3	

PEO-075

Gasoline Additives

Program: WSCHEM

Evaluation

PEO-075

Analyte	Result	Units	Method	Method ID	Evaluation	z
4370 T-amylmethylether (TAME)*	21.4	µg/L	EPA 524.2	10088605	Acceptable	
4450 Carbon disulfide*	<0.5	µg/L	EPA 524.2	10088605	Acceptable	
4770 Ethyl-t-butylether (ETBE)*	20.4	µg/L	EPA 524.2	10088605	Acceptable	
5000 Methyl tert-butyl ether (MTBE)*	<0.5	µg/L	EPA 524.2	10088605	Acceptable	
5090 n-Propylbenzene*	<0.5	µg/L	EPA 524.2	10088605	Acceptable	
5175 Trichlorofluoromethane*	<0.5	µg/L	EPA 524.2	10088605	Acceptable	
5185 Trichlorotrifluoroethane (Freon 113)*	23.9	µg/L	EPA 524.2	10088605	Acceptable	
9375 Di-isopropylether (DIPE)*	44.7	µg/L	EPA 524.2	10088605	Acceptable	

Study Summary

PEO-075

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
4370 T-amylmethylether (TAME)*	µg/L	19.1	19.1			11.5 - 26.7	
4450 Carbon disulfide*	µg/L		0			0 - 0	
4770 Ethyl-t-butylether (ETBE)*	µg/L	19.1	19.1			11.5 - 26.7	
5000 Methyl tert-butyl ether (MTBE)*	µg/L		0			0 - 0	
5090 n-Propylbenzene*	µg/L		0			0 - 0	
5175 Trichlorofluoromethane*	µg/L		0			0 - 0	
5185 Trichlorotrifluoroethane (Freon 113)*	µg/L	30.2	30.2			18.1 - 42.3	
9375 Di-isopropylether (DIPE)*	µg/L	43.6	43.6			26.2 - 61.0	

NVLAP Labcode: 200393-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

PEO-098

Organic Disinfection By-Products

Program: WSCHEM

Evaluation

PEO-098

Analyte	Result	Units	Method	Method ID	Evaluation	z
9312 Bromoacetic acid	50.3	µg/L	EPA 552.2	10095600	Acceptable	0.219
9315 Bromochloroacetic acid	14.9	µg/L	EPA 552.2	10095600	Acceptable	0.105
9336 Chloroacetic acid	29.0	µg/L	EPA 552.2	10095600	Acceptable	-0.805
9357 Dibromoacetic acid	45.7	µg/L	EPA 552.2	10095600	Acceptable	0.0367
9360 Dichloroacetic acid	41.8	µg/L	EPA 552.2	10095600	Acceptable	-0.334
9642 Trichloroacetic acid	31.8	µg/L	EPA 552.2	10095600	Acceptable	0.278

Study Summary

PEO-098

Analyte	Units	Certified Value	Assigned Value	Study Mean	Study Std. Dev.	Acceptance Limits	Warning Limits
9312 Bromoacetic acid	µg/L	48.2	48.2	49.6	9.61	24.1 - 72.3	
9315 Bromochloroacetic acid	µg/L	14.7	14.7	14.7	1.90	7.35 - 22.1	
9336 Chloroacetic acid	µg/L	33.0	33.0	29.6	4.97	16.5 - 49.5	
9357 Dibromoacetic acid	µg/L	45.3	45.3	45.3	10.9	22.7 - 68.0	
9360 Dichloroacetic acid	µg/L	44.1	44.1	42.3	6.89	22.1 - 66.2	
9642 Trichloroacetic acid	µg/L	30.4	30.4	33.7	5.03	15.2 - 45.6	

Authorized for release by _____ Date 6/16/2005
Certifying Officer - QA/QC Manager

Questions / Comments?
Christopher Rucinski
phone: (307) 742-5452
email: reports@rt-corp.com

NVLAP Labcode: 200383-0

RTC

WSCHEM **WS05-2**
Concluded 27-May-2005

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Performance Evaluation Report
RTC Laboratory Proficiency Testing Program
Study WS04-2 (WSCHEM 0018)

2931 Soldier Springs Rd. - Laramie WY 82070 - (307) 742-5452

RTC Labcode: RT1142 EPA Labcode: CA00062 State Labcode:ELAP

May 28, 2004

RECEIVED
JUN 21 2004

Truesdail Laboratories, Inc.
Attention: Pat Iyer
14201 Franklin Ave.
Tustin, CA 92780

Thank you for participating in Water Supply Study WS04-2. If you have any additional questions about your report, please contact Chris Rucinski at (307) 742-5452 or e-mail: reports@rt-corp.com. We have provided the assigned values for all the analytes in the samples you reported. You can use your second set of inorganic ampules for a QC set.

Analyte	Method Description	Reported Value	Assigned Value	Units	Acceptance Limits	Evaluatic
Sample: PEI-010-12 Corrosivity/Sodium						Lot
Specific Conductance (at 25C)	USEPA 120.1	577	542	umhos/cm	484 to 599	Accepta
Calcium Hardness (as CaCO3)	USEPA 130.2	215	206	mg/L	193 to 220	Accepta
Corrosivity (pH)*	USEPA 150	9.05	9.03	units	8.13 to 9.93	Accepta
Total Filterable Residue	USEPA 160.1	374	409	mg/L	262 to 556	Accepta
Calcium (dissolved)*	USEPA 200.7	91.7	81.3	mg/L	68.9 to 93.7	Accepta
Sodium	USEPA 200.7	15.8	14.2	mg/L	12.8 to 16.0	Accepta
Chloride*	USEPA 300.0	154	145	mg/L	122 to 168	Accepta
Alkalinity (as CaCO3)	USEPA 310.1	34.0	32.3	mg/L	30.6 to 36.8	Accepta
Sample: PEI-010-3 pH						Lot
pH	USEPA 150	5.82	5.85	units	5.26 to 6.44	Accepta
Sample: PEI-011 Nitrate/Nitrite/Fluoride/Orthophosphate						Lot
Potassium*	USEPA 200.7	23.5	24.8	mg/L	20.7 to 28.9	Accepta
Fluoride - IC*	USEPA 300.0	2.17	2.12	mg/L	1.91 to 2.33	Accepta
Nitrate as N	USEPA 300.0	7.00	6.907	mg/L	6.22 to 7.60	Accepta
Nitrite as N	USEPA 354.1	1.78	1.789	mg/L	1.52 to 2.06	Accepta
Orthophosphate as P	USEPA 365.2	0.71	0.733	mg/L	0.637 to 0.829	Accepta
Sample: PEI-012 Residual Free Chlorine						Lot
Residual Free Chlorine	USEPA 330.1	0.73	0.745	mg/L	0.576 to 0.914	Accepta
Sample: PEI-013 Sulfate/TOC						Lot
Sulfate	USEPA 300.0	382	403	mg/L	366 to 440	Accepta
Total Organic Carbon (TOC)	USEPA 415.2	2.77	2.72	mg/L	2.39 to 3.21	Accepta
Sample: PEI-014 Turbidity						Lot
Turbidity	USEPA 180.1	1.76	1.74	NTU	1.48 to 2.22	Accepta
Sample: PEI-015 Total Cyanide						Lot
Cyanide	USEPA 335.2	0.46	0.4019	mg/L	0.302 to 0.502	Accepta

*Not Part of NVLAP Scope
ND = Not Detected, NR = Not Reported, NP = Not Present, "Chk. for Err." = Check for Error

Performance Evaluation Report
RTC Laboratory Proficiency Testing Program
Study WS04-2 (WSCHEM 0018)

RTC

NVLAP

2931 Soldier Springs Rd. - Laramie WY 82070 - (307) 742-5452

RTC Labcode: RT1142 | EPA Labcode: CA00062 | State Labcode:ELAP 1

Analyte	Method Description	Reported Value	Assigned Value	Units	Acceptance Limits	Evaluatio
Sample: PEO-003 Polychlorinated Biphenyls						Lot
PCBs (Aroclor 1221)	USEPA 508	1.44	1.64	ug/L	0.00 to 3.28	Acceptal
Aroclor 1232	USEPA 508	< 0.1	0	ug/L		Acceptal
Aroclor 1248	USEPA 508	< 0.1	0	ug/L		Acceptal
Aroclor 1254	USEPA 508	< 0.1	0	ug/L		Acceptal
Aroclor 1260	USEPA 508	< 0.1	0	ug/L		Acceptal
Sample: PEO-005-1 Pesticides						Lot
Aldrin	USEPA 508	1.44	1.29	ug/L	0.54 to 1.62	Accepta
gamma-BHC (Lindane)	USEPA 508	0.962	1.10	ug/L	0.605 to 1.6	Accepta
Dieldrin	USEPA 508	1.08	1.12	ug/L	0.781 to 1.4	Accepta
Endrin	USEPA 508	3.27	3.47	ug/L	2.43 to 4.51	Accepta
Heptachlor	USEPA 508	3.06	3.23	ug/L	1.78 to 4.68	Accepta
Sample: PEO-005-2 Pesticides						Lot
Hexachlorobenzene	USEPA 508	0.215	0.220	ug/L	0.09 to 0.342	Accepta
Hexachlorocyclopentadiene	USEPA 508	3.13	3.50	ug/L	0.106 to 7.01	Accepta
Heptachlor Epoxide (beta)	USEPA 508	4.14	3.67	ug/L	2.02 to 5.32	Accepta
Methoxychlor	USEPA 508	46.4	47.90	ug/L	26.3 to 69.5	Accepta
Propachlor	USEPA 508	3.34	3.34	ug/L	2.08 to 4.58	Accepta
Trifluralin	USEPA 508	2.23	2.05	ug/L	1.18 to 2.92	Accepta
Sample: PEO-005-3 Pesticides						Lot
Alachlor	USEPA 525.2	12.8	16.83	ug/L	9.23 to 24.4	Accepta
Atrazine	USEPA 525.2	20.7	27.71	ug/L	15.2 to 40.2	Accepta
Simazine	USEPA 525.2	1.32	4.00	ug/L	1.07 to 7.07	Accepta
Sample: PEO-005-4 Herbicides						Lo
4-Nitrophenol*	USEPA 515.4	< 2.0	0	ug/L		Accepta
Pentachlorophenol	USEPA 515.4	63.7	51.5	ug/L	25.7 to 77.3	Accepta
Acifluorfen	USEPA 515.4	17.0	16.0	ug/L	0.501 to 28.1	Accepta
Bentazon*	USEPA 515.4	< 2.0	0	ug/L		Accepta
Chloramben*	USEPA 515.4	< 1.0	0	ug/L		Accepta
2,4-D & 2,4-D butyl ester	USEPA 515.4	10.5	10.4	ug/L	5.19 to 15.6	Accepta
Dalapon	USEPA 515.4	60.4	89.1	ug/L	0.00 to 122	Accepta
2,4-DB	USEPA 515.4	< 2.0	0	ug/L		Accepta
DCPA*	USEPA 515.4	< 1.0	0	ug/L		Accepta
Dicamba	USEPA 515.4	48.0	37.9	ug/L	10.3 to 52.9	Accepta
3,5-Dichlorobenzoic Acid*	USEPA 515.4	30.7	25.2	ug/L	12.6 to 37.8	Accepta
Dichloroprop*	USEPA 515.4	< 2.0	0	ug/L		Accepta
Dinoseb	USEPA 515.4	36.9	32.0	ug/L	0.985 to 48.0	Accepta
5-Hydroxydicamba*	USEPA 515.4	< 2.0	0	ug/L		Accepta
Picloram	USEPA 515.4	15.1	36.4	ug/L	0.134 to 49.7	Accepta
2,4,5-TP (Silvex)	USEPA 515.4	41.0	32.1	ug/L	16.1 to 48.1	Accepta
2,4,5-T	USEPA 515.4	18.0	17.9	ug/L	8.95 to 26.9	Accepta
Sample: PEO-005-5 Chlordane						L
Chlordane (total)	USEPA 508	13.7	13.0	ug/L	7.17 to 18.8	Accep
Sample: PEO-005-6 Toxaphene						L
Toxaphene (total)	USEPA 508	9.12	8.20	ug/L	4.51 to 11.9	Accep
Sample: PEO-006-1 Regulated SOCs						L
Benzo(a)pyrene	USEPA 525.2	2.52	2.56	ug/L	0.588 to 3.27	Accep
bis(2-Ethylhexyl)adipate	USEPA 525.2	30.9	33.4	ug/L	13.6 to 48.2	Accep
bis(2-Ethylhexyl)phthalate	USEPA 525.2	14.1	15.0	ug/L	5.89 to 23.1	Accep

*Not Part of NVLAP Scope
ND = Not Detected, NR = Not Reported, NP = Not Present, "Chk. for Err." = Check for Error

Performance Evaluation Report
RTC Laboratory Proficiency Testing Program
Study WS04-2 (WSCHEM 0018)

NVLAP Lab Code: 200370-0

2931 Soldier Springs Rd. - Laramie WY 82070 - (307) 742-5452

RTC Labcode: RT1142 | EPA Labcode: CA00062 | State Labcode:ELAP 12

Analyte	Method Description	Reported Value	Assigned Value	Units	Acceptance Limits	Evaluation
Sample: PEI-016-1 Trace Metals						Lot #:
Iron*	USEPA 200.7	622	570.2	ug/L	519 to 623	Acceptable
Aluminum*	USEPA 200.8	2331	2390	ug/L	1990 to 2780	Acceptable
Arsenic	USEPA 200.8	143	142.2	ug/L	125 to 159	Acceptable
Beryllium	USEPA 200.8	6.4	6.471	ug/L	5.5 to 7.44	Acceptable
Cadmium	USEPA 200.8	30.1	30.41	ug/L	24.3 to 36.5	Acceptable
Chromium	USEPA 200.8	53.1	52.68	ug/L	44.8 to 60.6	Acceptable
Copper	USEPA 200.8	930	932.2	ug/L	839 to 1030	Acceptable
Lead	USEPA 200.8	21.8	22.61	ug/L	15.8 to 29.4	Acceptable
Manganese	USEPA 200.8	706	711	ug/L	653 to 768	Acceptable
Nickel	USEPA 200.8	142	141.9	ug/L	121 to 163	Acceptable
Selenium	USEPA 200.8	80.6	79.29	ug/L	63.4 to 95.2	Acceptable
Zinc	USEPA 200.8	674	720.9	ug/L	661 to 777	Acceptable
Mercury (total)	USEPA 245.1	3.01	2.836	ug/L	1.99 to 3.69	Acceptable
Sample: PEI-016-2 Trace Metals						Lot #
Boron	USEPA 200.7	862	840	ug/L	730 to 950	Acceptab
Magnesium*	USEPA 200.7	8200	7049	ug/L	6380 to 7680	Not Accept
Antimony	USEPA 200.8	18.1	17.04	ug/L	11.9 to 22.1	Acceptab
Barium	USEPA 200.8	2930	2885	ug/L	2450 to 3310	Acceptab
Molybdenum	USEPA 200.8	85.6	92.58	ug/L	77.9 to 107	Acceptab
Silver*	USEPA 200.8	386	407.4	ug/L	369 to 447	Acceptab
Thallium	USEPA 200.8	6.8	7.193	ug/L	5.03 to 9.35	Acceptab
Vanadium*	USEPA 200.8	2969	2920	ug/L	2690 to 3150	Acceptab
Sample: PEI-203 MBAS						Lot
MBAS	USEPA 425.1	0.56	0.551	mg/L	0.386 to 0.716	Acceptal
Sample: PEI-224 CA Specific						Lot
Combined Chlorine	USEPA 330.1	0.77	0.745	mg/L	0.576 to 0.914	Acceptal
Sample: PEI-225 UV-254						Lot
UV-254 Absorbance	SM 19ED 5910 B	0.314	0.303	cm-1	0.282 to 0.524	Acceptal
Sample: PEI-226 Perchlorate in Water						Lot
Perchlorate*	USEPA 314.0	49.8	52.7	ug/L	42.2 to 63.2	Accepta
Sample: PEI-227 Silica						Lot
Silica as SiO2	USEPA 370.1	8.23	8.16	mg/L	6.53 to 9.79	Accepta
Sample: PEI-229 CA Metals						Lot
Chromium VI	USEPA 7196A	293	285	ug/L	221 to 331	Accepta
Sample: PEO-002 Trihalomethanes						Lo
Bromodichloromethane	USEPA 502.1	13.5	14.54	ug/L	11.6 to 17.4	Accept
Bromoform	USEPA 502.1	6.73	6.02	ug/L	4.82 to 7.22	Accept
Chloroform	USEPA 502.1	7.82	7.98	ug/L	6.38 to 9.58	Accept
Chlorodibromomethane	USEPA 502.1	37.8	41.68	ug/L	33.4 to 50	Accept
Total Trihalomethanes	USEPA 502.1	65.8	70.22	ug/L	56.2 to 84.2	Accept
Bromodichloromethane	USEPA 524.2	13.9	14.54	ug/L	11.6 to 17.4	Accept
Bromoform	USEPA 524.2	6.06	6.02	ug/L	4.82 to 7.22	Accept
Chloroform	USEPA 524.2	7.86	7.98	ug/L	6.38 to 9.58	Accept
Chlorodibromomethane	USEPA 524.2	40.6	41.68	ug/L	33.4 to 50	Accept
Total Trihalomethanes	USEPA 524.2	68.4	70.22	ug/L	56.2 to 84.2	Accept

of NVLAP Scope
Detected, NR = Not Reported, NP = Not Present, "Chk. for Err." = Check for Error

2931 Soldier Springs Rd. - Laramie WY 82070 - (307) 742-5452

RTC Labcode: RT1142 EPA Labcode: CA00062 State Labcode: ELAP

Analyte	Method Description	Reported Value	Assigned Value	Units	Acceptance Limits	Evaluati
Sample: PEO-006-2 Regulated SOCs						
Naphthalene*	USEPA 525.2	8.05	31.9	ug/L		Lot
Acenaphthene*	USEPA 525.2	23.2	21.6	ug/L	15.9 to 47.9	Not Accep
Acenaphthylene*	USEPA 525.2	10.7	24.3	ug/L	10.8 to 32.4	Accepta
Anthracene*	USEPA 525.2	10.5	25.2	ug/L	12.1 to 36.5	Not Accep
Benzo(a)anthracene*	USEPA 525.2	22.2	25.4	ug/L	12.6 to 37.8	Not Accep
Benzo(b)fluoranthene*	USEPA 525.2	43.5	49.9	ug/L	12.7 to 38.1	Accepta
Benzo(g,h,i)perylene*	USEPA 525.2	< 0.5	0	ug/L	24.9 to 74.9	Accepta
Benzo(k)fluoranthene*	USEPA 525.2	< 0.5	0	ug/L		Accepta
Butylbenzylphthalate*	USEPA 525.2	50.6	49.7	ug/L		Accepta
Chrysene*	USEPA 525.2	27.8	31.2	ug/L	24.9 to 74.5	Accepta
Dibenz(a,h)anthracene*	USEPA 525.2	< 0.5	0	ug/L	15.6 to 46.8	Accepta
Di-n-butylphthalate*	USEPA 525.2	11.3	14.7	ug/L		Accepta
Di-ethylphthalate*	USEPA 525.2	< 0.5	0	ug/L	7.37 to 22.0	Accepta
Dimethylphthalate*	USEPA 525.2	26.5	32.1	ug/L		Accepta
Di-n-octylphthalate*	USEPA 525.2	35.5	33.5	ug/L	16.1 to 48.1	Accepta
Fluoranthene*	USEPA 525.2	26.1	27.5	ug/L	16.7 to 50.3	Accepta
Fluorene*	USEPA 525.2	< 0.5	0	ug/L	13.8 to 41.2	Accepta
Indeno(1,2,3-cd)pyrene*	USEPA 525.2	< 0.5	0	ug/L		Accepta
1-Methylnaphthalene*	USEPA 525.2	27.2	29.6	ug/L		Accepta
2-Methylnaphthalene*	USEPA 525.2	42.0	46.8	ug/L	14.8 to 44.4	Accepta
Phenanthrene*	USEPA 525.2	29.9	38.99	ug/L	23.4 to 70.2	Accepta
Pyrene*	USEPA 525.2	26.3	28.72	ug/L	19.5 to 58.5	Accepta
					14.3 to 43.1	Accepta
Sample: PEO-007-1 Regulated VOCs						
Tetrachloroethene	USEPA 502.1	16.4	17.6	ug/L		Lot
Trichloroethene	USEPA 502.1	16.4	17.8	ug/L	14.1 to 21.1	Acceptat
Carbon Tetrachloride	USEPA 524.2	3.15	3.53	ug/L	14.2 to 21.4	Acceptat
Chlorobenzene	USEPA 524.2	30.3	31.3	ug/L	2.12 to 4.94	Acceptat
1,2-Dichloroethane	USEPA 524.2	7.35	7.90	ug/L	25.0 to 37.6	Acceptat
1,1-Dichloroethene	USEPA 524.2	11.4	12.9	ug/L	4.74 to 11.1	Acceptat
cis-1,2-Dichloroethene	USEPA 524.2	12.4	15.6	ug/L	10.3 to 15.5	Acceptat
Dichloromethane	USEPA 524.2	11.2	12.0	ug/L	12.4 to 18.7	Acceptat
1,2-Dichloropropane	USEPA 524.2	4.45	4.62	ug/L	9.60 to 14.4	Acceptat
trans-1,2-Dichloroethene	USEPA 524.2	2.77	2.93	ug/L	2.77 to 6.47	Acceptat
Styrene	USEPA 524.2	16.1	17.5	ug/L	1.76 to 4.10	Acceptat
Tetrachloroethene	USEPA 524.2	16.5	17.6	ug/L	14.0 to 21.0	Acceptat
1,2,4-Trichlorobenzene	USEPA 524.2	5.78	7.67	ug/L	14.1 to 21.1	Acceptat
1,1,1-Trichloroethane	USEPA 524.2	4.43	4.96	ug/L	4.60 to 10.7	Acceptat
1,1,2-Trichloroethane	USEPA 524.2	13.4	13.7	ug/L	2.98 to 6.94	Acceptat
Trichloroethene	USEPA 524.2	16.5	17.8	ug/L	11.0 to 16.4	Acceptat
Vinyl chloride	USEPA 524.2	11.6	17.7	ug/L	14.2 to 21.4	Acceptat
					10.6 to 24.8	Acceptat

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2931 Soldier Springs Rd. - Laramie WY 82070 - (307) 742-5452

RTC Labcode: RT1142 EPA Labcode: CA00062 State Labcode:ELAP

Analyte	Method Description	Reported Value	Assigned Value	Units	Acceptance Limits	Evaluat
Sample: PEO-007-2 Regulated VOCs						
Methyl tert-butyl ether (MTBE)	USEPA 502.1	13.0	16.2	ug/L		Lc
Benzene	USEPA 524.2	15.1	15.1	ug/L	9.72 to 22.7	Accept
1,2-Dichlorobenzene	USEPA 524.2	13.6	12.2	ug/L	12.1 to 18.1	Accept
1,3-Dichlorobenzene	USEPA 524.2	29.6	29.0	ug/L	9.76 to 14.6	Accept
1,4-Dichlorobenzene	USEPA 524.2	9.59	9.27	ug/L	23.2 to 34.8	Accept
Ethylbenzene	USEPA 524.2	10.5	9.94	ug/L	5.56 to 13.0	Accept
Methyl tert-butyl ether (MTBE)	USEPA 524.2	14.7	16.2	ug/L	5.96 to 13.9	Accept
Toluene	USEPA 524.2	16.8	15.9	ug/L	9.72 to 22.7	Accept
m&p-Xylene*	USEPA 524.2	< 0.5	0	ug/L	12.7 to 19.1	Accept
o-Xylene*	USEPA 524.2	11.1	10.4	ug/L		Accept
Xylenes (Total)	USEPA 524.2	11.1	10.4	ug/L	8.32 to 12.5	Accepta
					8.32 to 12.5	Accepta
Sample: PEO-007-3A Unregulated VOCs						Lot
Bromodichloromethane	USEPA 524.2	41.2	46.6	ug/L	37.3 to 55.9	Accepta
Bromoform	USEPA 524.2	28.0	31.8	ug/L	25.4 to 38.2	Accepta
Chloroethane	USEPA 524.2	7.62	6.65	ug/L	3.99 to 9.31	Accepta
Chloroform	USEPA 524.2	29.2	28.5	ug/L	22.8 to 34.2	Accepta
Chlorodibromomethane	USEPA 524.2	46.1	46.6	ug/L	37.3 to 55.9	Acceptal
1,3-Dichlorobenzene	USEPA 524.2	23.6	23.9	ug/L	19.1 to 28.7	Acceptal
Dichlorodifluoromethane	USEPA 524.2	< 0.5	0	ug/L		Acceptal
1,1-Dichloroethane	USEPA 524.2	10.4	9.63	ug/L	5.78 to 13.5	Acceptal
cis-1,3-Dichloropropene	USEPA 524.2	9.46	9.76	ug/L	5.86 to 13.7	Acceptal
trans-1,3-Dichloropropene	USEPA 524.2	12.3	12.62	ug/L	10.1 to 15.1	Acceptal
Bromomethane	USEPA 524.2	9.45	8.78	ug/L	5.27 to 12.3	Acceptal
Chloromethane	USEPA 524.2	9.68	11.4	ug/L	6.84 to 16.0	Acceptal
1,1,2,2-Tetrachloroethane	USEPA 524.2	11.6	13.1	ug/L	10.4 to 15.8	Acceptal
Fluorotrichloromethane	USEPA 524.2	4.36	4.50	ug/L	2.70 to 6.30	Acceptal
Sample: PEO-007-3B Unregulated VOCs						Lot #
Bromobenzene	USEPA 524.2	11.7	10.9	ug/L	8.72 to 13.1	Acceptal
Bromochloromethane	USEPA 524.2	9.24	9.55	ug/L	5.73 to 13.4	Acceptal
n-Butylbenzene	USEPA 524.2	2.61	2.67	ug/L	1.60 to 3.74	Acceptal
sec-Butylbenzene	USEPA 524.2	12.1	12.2	ug/L	9.76 to 14.6	Acceptal
tert-Butylbenzene	USEPA 524.2	4.34	4.20	ug/L	2.52 to 5.88	Acceptal
2-Chlorotoluene	USEPA 524.2	14.3	14.0	ug/L	11.2 to 16.8	Acceptal
4-Chlorotoluene	USEPA 524.2	13.3	14.5	ug/L	11.6 to 17.5	Acceptal
Dibromomethane	USEPA 524.2	12.6	13.0	ug/L	10.4 to 15.6	Acceptal
1,3-Dichloropropane	USEPA 524.2	14.4	14.8	ug/L	11.8 to 17.8	Acceptal
2,2-Dichloropropane	USEPA 524.2	12.3	15.4	ug/L	12.3 to 18.5	Acceptal
1,1-Dichloropropene	USEPA 524.2	< 0.5	0	ug/L		Acceptal
Hexachlorobutadiene	USEPA 524.2	8.33	8.29	ug/L	4.97 to 11.6	Acceptal
Isopropylbenzene	USEPA 524.2	8.49	7.73	ug/L	4.64 to 10.8	Acceptal
4-Isopropyltoluene	USEPA 524.2	17.6	17.2	ug/L	13.8 to 20.7	Acceptal
n-Propylbenzene	USEPA 524.2	11.3	11.6	ug/L	9.28 to 13.9	Acceptal
1,1,1,2-Tetrachloroethane	USEPA 524.2	4.97	5.19	ug/L	3.11 to 7.27	Acceptal
1,2,3-Trichlorobenzene	USEPA 524.2	12.7	14.5	ug/L	11.6 to 17.4	Acceptal
1,2,3-Trichloropropane	USEPA 524.2	11.5	11.5	ug/L	6.90 to 16.1	Acceptal
1,2,4-Trimethylbenzene	USEPA 524.2	16.8	17.1	ug/L	13.7 to 20.5	Acceptal
1,3,5-Trimethylbenzene	USEPA 524.2	15.7	15.1	ug/L	12.1 to 18.1	Acceptal

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RTC

Performance Evaluation Report
RTC Laboratory Proficiency Testing Program
—Study WS04-2 (WSCHEM 0018)

NVLA

2931 Soldier Springs Rd. - Laramie WY 82070 - (307) 742-5452

RTC Labcode: RT1142 EPA Labcode: CA00062 State Labcode:ELAP 1

Analyte	Method Description	Reported Value	Assigned Value	Units	Acceptance Limits	Evaluatio
Sample: PEO-007-4 EDB/DBCP						
1,2-Dibromo,3-Chloropropane (DBCP)	USEPA 504.1	1.34	1.70	ug/L	1.02 to 2.38	Lot Acceptat
Ethylene Dibromide (EDB)	USEPA 504.1	1.12	1.15	ug/L	0.69 to 1.61	Acceptab
1,2,3-Trichloropropane	USEPA 504.1	9.53	10.08	ug/L	6.07 to 14.1	Acceptab
1,2-Dibromo,3-Chloropropane (DBCP)	USEPA 524.2 S/M	62.3	85	ng/L	51 to 119	Acceptab
Ethylene Dibromide (EDB)	USEPA 524.2 S/M	49.5	57.5	ng/L	34.5 to 80.5	Acceptab
1,2,3-Trichloropropane	USEPA 524.2 S/M	501	504	ng/L	303.5 to 705	Acceptab
Sample: PEO-075 Volatiles-California*						
T-amylmethylether (TAME)	USEPA 524.2	38.7	39.5	ug/L	31.6 to 47.4	Lot # Acceptab
Carbon disulfide	USEPA 524.2	< 0.5	0	ug/L		Acceptab
Ethyl-t-butylether (ETBE)	USEPA 524.2	18.3	18.2	ug/L	14.6 to 21.8	Acceptab
Methyl tert-butyl ether (MTBE)	USEPA 524.2	17.8	18.0	ug/L	10.8 to 25.2	Acceptab
n-Propylbenzene	USEPA 524.2	28.3	29.1	ug/L	23.3 to 34.9	Acceptab
Fluorotrichloromethane	USEPA 524.2	10.9	10.1	ug/L	8.08 to 12.1	Acceptab
Trichlorotrifluoroethane	USEPA 524.2	23.3	25.0	ug/L	20.0 to 30.0	Acceptab
Di-isopropylether (DIPE)	USEPA 524.2	11.1	11.3	ug/L	9.04 to 13.6	Acceptab
1-phenylpropane	USEPA 524.2	28.3	29.1	ug/L	23.3 to 34.9	Acceptab
Sample: PEO-077 Chloral Hydrate						
Chloral Hydrate	USEPA 551	5.69	5.13	ug/L	0.350 to 8.37	Lot # Acceptabl
Sample: PEO-098 Haloacetic Acids						
Monobromoacetic Acid	USEPA 552.1	10.5	11.2	ug/L	4.59 to 16.4	Lot # Acceptabl
Bromochloroacetic Acid	USEPA 552.1	23.5	20.7	ug/L	9.99 to 27.8	Acceptabl
Monochloroacetic Acid	USEPA 552.1	7.08	7.49	ug/L	2.27 to 12.3	Acceptabl
Dibromoacetic Acid	USEPA 552.1	18.1	17.8	ug/L	9.80 to 24.4	Acceptabl
Dichloroacetic Acid	USEPA 552.1	29.4	35.0	ug/L	15.8 to 38.8	Acceptabl
Trichloroacetic Acid	USEPA 552.1	20.2	19.4	ug/L	9.15 to 23.0	Acceptabl
Sample: PEO-230 TBA in Water*						
tert-Butyl Alcohol	USEPA 524.2	2.20	2.49	ug/L	1.49 to 3.49	Lot # Acceptabl

Authorized for Release by: _____ Date: 6/4/2004

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ND = Not Detected, NR = Not Reported, NP = Not Present, "Chk. for Er." = Check for Error

RTC

Performance Evaluation Report
RTC Laboratory Proficiency Testing Program
Study Offstudy 04-2

2931 Soldier Springs Rd. - Laramie WY 82070 - (307) 742-5452

RTC Labcode: RT1142 EPA Labcode: CA00062 State Labcode: ELAP 1;

8/2/2004

Truesdail Laboratories, Inc.
Attention: Pat Iyer
14201 Franklin Ave.
Tustin, CA 92780

Assigned values are listed for all analytes you reported. If you have any questions about your report, please contact Chris Rucinski at 307)742-5452 or e-mail at reports@rt-corp.com.

Analyte	Analyte No.	Method Description	Reported Value	Units	Assigned Value	Acceptance Limits	Evaluation
Sample: PEI-016-2 Trace Metals				**WSCHEM**			**Lot #:**
Magnesium*	1085	USEPA 200.7	2860	ug/L	2960	2690 to 3250	Acceptable

RECEIVED
AUG 0 9 2004

Authorized for Release by: _____ Date: 8/3/2004

ND = Not Detected, NP = Not Present, ( ) = Informational Values Only, NR = Not Reported
* = Part of NVLAP Scope

APPENDIX F – CERTIFICATIONS

Copies of our certifications are attached as follows:

- California Department of Health Services, Environmental Laboratory Accreditation Program (ELAP) Certificate - Tustin Facility
- California Department of Health Services, Environmental Laboratory Accreditation Program (ELAP) Certificate - Hesperia Facility
- Environmental Protection Agency (EPA) ICR Chemistry Laboratory Approval
- Environmental Protection Agency (EPA) UCMR Testing for Perchlorate
- California Air Resources Board (ARB) Independent Contractors Program, Certifications
- South Coast Air Quality Management District, Laboratory Approval Program
- Naval Energy and Environmental Support Activity (NEESA) Approval
- Los Angeles County Sanitation District Certification
- American National Standards Institute (ANSI), Accreditation Certificates
- IAPMO Research and Testing

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

ENVIRONMENTAL LABORATORY CERTIFICATION

Is hereby granted to

TRUESDAIL LABORATORIES, INC.

14201 FRANKLIN AVENUE

TUSTIN, CA 92780

Scope of certification is limited to the
"Accredited Fields of Testing"
which accompanies this Certificate.

Continued certification status depends on successful completion of site visit, proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **1237**

Expiration Date: **07/31/2008**

Effective Date: **07/01/2006**

Richmond, California
subject to forfeiture or revocation

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

State of California—Health and Human Services Agency
Department of Health Services

Sandra Shewry
Director

Arnold Schwarzenegger
Governor

July 1, 2006

Certificate No.: **1237**

NORMAN E. HESTER, Ph.D
TRUESDAIL LABORATORIES, INC.
14201 FRANKLIN AVENUE
TUSTIN, CA 92780

Dear NORMAN E. HESTER, Ph.D:

This is to advise you that the laboratory named above continues to be certified as an environmental testing laboratory pursuant to the provisions of the California Environmental Laboratory Improvement Act (Health and Safety Code (HSC), Division 101, Part 1, Chapter 4, Section 100825, et seq.). Certification for all currently certified Fields of Testing that the laboratory has applied for renewal shall remain in effect until **07/31/2008** unless revoked.

Please note that the renewal application for certification is subject to an on-site visit, and continued use of the certificate is contingent upon:

* **successful completion of the site visit;**
* **acceptable performance in the required performance evaluation (PE) studies;**
* **timely payment of all fees, including an annual fee due before July 31, 2007;**
* **compliance with Environmental Laboratory Accreditation Program (ELAP) statutes (HSC, Section 100825, et seq.) and Regulations (California Code of Regulations (CCR),Title 22, Division 4, Chapter 19).**

An updated "Approved Fields of Testing" will be issued to the laboratory upon completion of the renewal process. The application for the next renewal must be received 90 days before the expiration of this certificate to remain in force according to the CCR, Section 64801 through 64827.

Please note that the laboratory is required to notify ELAP of any major changes in the laboratory such as the transfer of ownership, change of laboratory director, change in location, or structural alterations which may affect adversely the quality of analyses (HSC, Section 100845(b)(d)). Please include the above certificate number in all your correspondence to ELAP.

If you have any questions, please contact ELAP at (510) 620-3155.

Sincerely,

George C. Kulasingam

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

CALIFORNIA DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
Accredited Fields of Testing

TRUESDAIL LABORATORIES, INC. **Lab Phone** (714) 730-6239

14201 FRANKLIN AVENUE
TUSTIN, CA 92780

Certificate No: 1237 **Renew Date:** **7/31/2006**

Field of Testing:	101 - Microbiology of Drinking Water		
101.010	001	Heterotrophic Bacteria	SM9215B
101.020	001	Total Coliform	SM9221A,B
101.021	001	Fecal Coliform	SM9221E (MTF/EC)
101.050	001	Total Coliform	SM9222A,B,C
101.051	001	Fecal Coliform	SM9221E (MF/EC)
101.060	002	Total Coliform	SM9223
101.060	003	E. coli	SM9223
101.070	002	Total Coliform	Colisure
101.070	003	E. coli	Colisure
101.120	001	Total Coliform (Enumeration)	SM9221A,B,C
101.130	001	Fecal Coliform (Enumeration)	SM9221E (MTF/EC)
101.140	001	Total Coliform (Enumeration)	SM9222A,B,C
101.160	001	Total Coliform (Enumeration)	SM9223
Field of Testing:	102 - Inorganic Chemistry of Drinking Water		
102.030	001	Bromide	EPA 300.0
102.030	003	Chloride	EPA 300.0
102.030	005	Fluoride	EPA 300.0
102.030	006	Nitrate	EPA 300.0
102.030	007	Nitrite	EPA 300.0
102.030	008	Phosphate, Ortho	EPA 300.0
102.030	010	Sulfate	EPA 300.0
102.045	001	Perchlorate	EPA 314.0
102.050	001	Cyanide	EPA 335.4
102.100	001	Alkalinity	SM2320B
102.120	001	Hardness	SM2340B
102.121	001	Hardness	SM2340C
102.130	001	Conductivity	SM2510B
102.140	001	Total Dissolved Solids	SM2540C
102.145	001	Total Dissolved Solids	EPA 160.1
102.150	001	Chloride	SM4110B
102.150	002	Fluoride	SM4110B
102.150	003	Nitrate	SM4110B
102.150	004	Nitrite	SM4110B
102.150	005	Phosphate, Ortho	SM4110B
102.150	006	Sulfate	SM4110B
102.163	001	Free & Total Chlorine	SM4500-Cl G
102.170	001	Chloride	SM4500-Cl- B
102.171	001	Chloride	SM4500-Cl- D
102.180	001	Chlorine Dioxide	SM4500-ClO2 D
102.182	001	Chlorite	SM4500-ClO2 E
102.190	001	Cyanide, Total	SM4500-CN E
102.192	001	Cyanide, amenable	SM4500-CN G
102.200	001	Fluoride	SM4500-F C
102.220	001	Nitrite	SM4500-NO2 B

As of 4/13/2005 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

102.230	001	Nitrate	SM4500-NO3 D
102.240	001	Phosphate, Ortho	SM4500-P E
102.251	001	Sulfate	SM4500-SO4 E
102.262	001	Total Organic Carbon	SM5310C
102.263	001	DOC	SM5310C
102.270	001	Surfactants	SM5540C
102.280	001	UV254	SM5910B
102.510	001	Calcium	SM3120B
102.510	002	Magnesium	SM3120B
102.510	003	Potassium	SM3120B
102.510	004	Silica	SM3120B
102.510	005	Sodium	SM3120B
102.510	006	Hardness (calc.)	SM3120B
102.520	001	Calcium	EPA 200.7
102.520	002	Magnesium	EPA 200.7
102.520	003	Potassium	EPA 200.7
102.520	004	Silica	EPA 200.7
102.520	005	Sodium	EPA 200.7
102.520	006	Hardness (calc.)	EPA 200.7
102.533	001	Silica	SM4500-Si D
Field of Testing: 103 - Toxic Chemical Elements of Drinking Water			
103.060	001	Aluminum	SM3120B
103.060	002	Arsenic	SM3120B
103.060	003	Barium	SM3120B
103.060	004	Beryllium	SM3120B
103.060	005	Cadmium	SM3120B
103.060	007	Chromium	SM3120B
103.060	008	Copper	SM3120B
103.060	009	Iron	SM3120B
103.060	011	Manganese	SM3120B
103.060	012	Nickel	SM3120B
103.060	015	Silver	SM3120B
103.060	017	Zinc	SM3120B
103.130	001	Aluminum	EPA 200.7
103.130	002	Arsenic	EPA 200.7
103.130	003	Barium	EPA 200.7
103.130	004	Beryllium	EPA 200.7
103.130	005	Cadmium	EPA 200.7
103.130	007	Chromium	EPA 200.7
103.130	008	Copper	EPA 200.7
103.130	009	Iron	EPA 200.7
103.130	011	Manganese	EPA 200.7
103.130	012	Nickel	EPA 200.7
103.130	015	Silver	EPA 200.7
103.130	017	Zinc	EPA 200.7
103.130	018	Boron	EPA 200.7
103.140	001	Aluminum	EPA 200.8
103.140	002	Antimony	EPA 200.8
103.140	003	Arsenic	EPA 200.8
103.140	004	Barium	EPA 200.8
103.140	005	Beryllium	EPA 200.8
103.140	006	Cadmium	EPA 200.8
103.140	007	Chromium	EPA 200.8
103.140	008	Copper	EPA 200.8

103.140	009	Lead	EPA 200.8
103.140	010	Manganese	EPA 200.8
103.140	011	Mercury	EPA 200.8
103.140	012	Nickel	EPA 200.8
103.140	013	Selenium	EPA 200.8
103.140	014	Silver	EPA 200.8
103.140	015	Thallium	EPA 200.8
103.140	016	Zinc	EPA 200.8
103.140	017	Boron	EPA 200.8
103.140	018	Vanadium	EPA 200.8
103.160	001	Mercury	EPA 245.1
103.310	001	Chromium (VI)	EPA 218.6

Field of Testing: 104 - Volatile Organic Chemistry of Drinking Water

104.010	044	Tetrachloroethene	EPA 502.2
104.010	050	Trichloroethene	EPA 502.2
104.015	001	Bromodichloromethane	EPA 502.2
104.015	002	Bromoform	EPA 502.2
104.015	003	Chloroform	EPA 502.2
104.015	004	Dibromochloromethane	EPA 502.2
104.015	005	Trihalomethanes	EPA 502.2
104.020	002	Methyl tert-butyl Ether (MTBE)	EPA 502.2
104.030	001	1,2-Dibromoethane	EPA 504.1
104.030	002	1,2-Dibromo-3-chloropropane	EPA 504.1
104.035	001	1,2,3-Trichloropropane	SRL 524M-TCP
104.040	000	Volatile Organic Compounds	EPA 524.2
104.040	001	Benzene	EPA 524.2
104.040	007	n-Butylbenzene	EPA 524.2
104.040	008	sec-Butylbenzene	EPA 524.2
104.040	009	tert-Butylbenzene	EPA 524.2
104.040	010	Carbon Tetrachloride	EPA 524.2
104.040	011	Chlorobenzene	EPA 524.2
104.040	015	2-Chlorotoluene	EPA 524.2
104.040	016	4-Chlorotoluene	EPA 524.2
104.040	019	1,3-Dichlorobenzene	EPA 524.2
104.040	020	1,2-Dichlorobenzene	EPA 524.2
104.040	021	1,4-Dichlorobenzene	EPA 524.2
104.040	022	Dichlorodifluoromethane	EPA 524.2
104.040	023	1,1-Dichloroethane	EPA 524.2
104.040	024	1,2-Dichloroethane	EPA 524.2
104.040	025	1,1-Dichloroethene	EPA 524.2
104.040	026	cis-1,2-Dichloroethene	EPA 524.2
104.040	027	trans-1,2-Dichloroethene	EPA 524.2
104.040	028	Dichloromethane	EPA 524.2
104.040	029	1,2-Dichloropropane	EPA 524.2
104.040	033	cis-1,3-Dichloropropene	EPA 524.2
104.040	034	trans-1,3-Dichloropropene	EPA 524.2
104.040	035	Ethylbenzene	EPA 524.2
104.040	037	Isopropylbenzene	EPA 524.2
104.040	039	Naphthalene	EPA 524.2
104.040	041	N-propylbenzene	EPA 524.2
104.040	042	Styrene	EPA 524.2
104.040	044	1,1,2,2-Tetrachloroethane	EPA 524.2
104.040	045	Tetrachloroethene	EPA 524.2
104.040	046	Toluene	EPA 524.2

104.040	048	1,2,4-Trichlorobenzene	EPA 524.2
104.040	049	1,1,1-Trichloroethane	EPA 524.2
104.040	050	1,1,2-Trichloroethane	EPA 524.2
104.040	051	Trichloroethene	EPA 524.2
104.040	052	Trichlorofluoromethane	EPA 524.2
104.040	054	1,2,4-Trimethylbenzene	EPA 524.2
104.040	055	1,3,5-Trimethylbenzene	EPA 524.2
104.040	056	Vinyl Chloride	EPA 524.2
104.040	057	Xylenes, Total	EPA 524.2
104.045	001	Bromodichloromethane	EPA 524.2
104.045	002	Bromoform	EPA 524.2
104.045	003	Chloroform	EPA 524.2
104.045	004	Dibromochloromethane	EPA 524.2
104.045	005	Trihalomethanes	EPA 524.2
104.050	002	Methyl tert-butyl Ether (MTBE)	EPA 524.2
104.050	004	tert-Amyl Methyl Ether (TAME)	EPA 524.2
104.050	005	Ethyl tert-butyl Ether (ETBE)	EPA 524.2
104.050	006	Trichlorotrifluoroethane	EPA 524.2
104.050	007	tert-Butyl Alcohol (TBA)	EPA 524.2
104.050	008	Carbon Disulfide	EPA 524.2
104.050	009	Methyl Isobutyl Ketone	EPA 524.2

Field of Testing: 105 - Semi-volatile Organic Chemistry of Drinking Water

105.010	000	Pesticides	EPA 505
105.010	002	Alachlor	EPA 505
105.010	003	Atrazine	EPA 505
105.010	004	Chlordane	EPA 505
105.010	006	Endrin	EPA 505
105.010	007	Heptachlor	EPA 505
105.010	008	Heptachlor Epoxide	EPA 505
105.010	009	Hexachlorobenzene	EPA 505
105.010	010	Hexachlorocyclopentadiene	EPA 505
105.010	011	Lindane	EPA 505
105.010	012	Methoxychlor	EPA 505
105.010	013	Simazine	EPA 505
105.010	014	Toxaphene	EPA 505
105.010	015	PCBs as Aroclors (screen)	EPA 505
105.030	000	N-, P- Pesticides	EPA 507
105.030	001	Alachlor	EPA 507
105.030	002	Atrazine	EPA 507
105.030	007	Molinate	EPA 507
105.030	009	Simazine	EPA 507
105.030	010	Thiobencarb	EPA 507
105.040	000	Chlorinated Pesticides	EPA 508
105.040	003	Chlordane (total)	EPA 508
105.040	007	Endrin	EPA 508
105.040	008	Heptachlor	EPA 508
105.040	009	Heptachlor Epoxide	EPA 508
105.040	010	Hexachlorobenzene	EPA 508
105.040	011	Hexachlorocyclopentadiene	EPA 508
105.040	012	Lindane	EPA 508
105.040	013	Methoxychlor	EPA 508
105.040	015	Toxaphene	EPA 508
105.040	016	PCBs as Aroclors (screen)	EPA 508
105.083	001	2,4-D	EPA 515.4

105.083	002	Dinoseb	EPA 515.4
105.083	003	Pentachlorophenol	EPA 515.4
105.083	004	Picloram	EPA 515.4
105.083	005	2,4,5-TP	EPA 515.4
105.083	006	Dalapon	EPA 515.4
105.083	007	Bentazon	EPA 515.4
105.083	008	Dicamba	EPA 515.4
105.083	009	Chlorinated Acids	EPA 515.4
105.090	001	Alachlor	EPA 525.2
105.090	003	Atrazine	EPA 525.2
105.090	004	Benzo(a)pyrene	EPA 525.2
105.090	006	Chlordane	EPA 525.2
105.090	008	Di(2-ethylhexyl) Adipate	EPA 525.2
105.090	009	Di(2-ethylhexyl) Phthalate	EPA 525.2
105.090	029	Polynuclear Aromatic Hydrocarbons	EPA 525.2
105.090	030	Adipates	EPA 525.2
105.090	031	Phthalates	EPA 525.2
105.090	032	Other Extractables	EPA 525.2
105.180	001	Bromoacetic Acid	EPA 552.1
105.180	003	Chloroacetic Acid	EPA 552.1
105.180	005	Dibromoacetic Acid	EPA 552.1
105.180	006	Dichloroacetic Acid	EPA 552.1
105.180	007	Trichloroacetic Acid	EPA 552.1
105.180	008	Haloacetic Acids (HAA5)	EPA 552.1
Field of Testing:		106 - Radiochemistry of Drinking Water	
106.010	001	Gross Alpha	EPA 900.0
106.010	002	Gross Beta	EPA 900.0
106.050	001	Total Alpha Radium	EPA 903.0
106.051	001	Radium-226	EPA 903.1
106.080	001	Tritium	EPA 906.0
106.090	001	Uranium	EPA 908.0
106.092	001	Uranium	EPA 200.8
106.260	001	Gross Alpha	SM7110B
106.260	002	Gross Beta	SM7110B
106.270	001	Gross Alpha	SM7110C
106.350	001	Radium-226	SM7500-Ra C
106.380	001	Uranium	SM7500-U B
106.610	001	Radon-222	SM7500-Rn
Field of Testing:		107 - Microbiology of Wastewater	
107.010	001	Heterotrophic Bacteria	SM9215B
107.020	001	Total Coliform	SM9221B
107.040	001	Fecal Coliform	SM9221C,E (MTF/EC)
107.060	001	Total Coliform	SM9222B
107.100	001	Fecal Streptococci	SM9230B
107.100	002	Enterococci	SM9230B
Field of Testing:		108 - Inorganic Chemistry of Wastewater	
108.020	001	Conductivity	EPA 120.1
108.040	001	Hardness	EPA 130.2
108.050	001	pH	EPA 150.1
108.060	001	Residue, Filterable	EPA 160.1
108.070	001	Residue, Non-filterable	EPA 160.2
108.080	001	Residue, Total	EPA 160.3
108.090	001	Residue, Volatile	EPA 160.4

108.100	001	Residue, Settleable	EPA 160.5
108.110	001	Turbidity	EPA 180.1
108.112	001	Boron	EPA 200.7
108.112	002	Calcium	EPA 200.7
108.112	003	Hardness (calc.)	EPA 200.7
108.112	004	Magnesium	EPA 200.7
108.112	005	Potassium	EPA 200.7
108.112	006	Silica	EPA 200.7
108.112	007	Sodium	EPA 200.7
108.120	001	Bromide	EPA 300.0
108.120	002	Chloride	EPA 300.0
108.120	003	Fluoride	EPA 300.0
108.120	004	Nitrate	EPA 300.0
108.120	005	Nitrite	EPA 300.0
108.120	006	Nitrate-nitrite, Total	EPA 300.0
108.120	007	Phosphate, Ortho	EPA 300.0
108.120	008	Sulfate	EPA 300.0
108.130	001	Acidity	EPA 305.1
108.140	001	Alkalinity	EPA 310.1
108.170	001	Chlorine Residual, Total	EPA 330.1
108.180	001	Cyanide, amenable	EPA 335.1
108.181	001	Cyanide, Total	EPA 335.2
108.191	001	Fluoride	EPA 340.2
108.201	001	Ammonia	EPA 350.2
108.202	001	Ammonia	EPA 350.3
108.211	001	Kjeldahl Nitrogen	EPA 351.2
108.240	001	Nitrite	EPA 354.1
108.250	001	Dissolved Oxygen	EPA 360.1
108.262	001	Phosphate, Ortho	EPA 365.2
108.263	001	Phosphorus, Total	EPA 365.2
108.264	001	Phosphate, Ortho	EPA 365.3
108.265	001	Phosphorus, Total	EPA 365.3
108.270	001	Dissolved Silica	EPA 370.1
108.290	001	Sulfide	EPA 376.1
108.291	001	Sulfide	EPA 376.2
108.300	001	Sulfite	EPA 377.1
108.310	001	Biochemical Oxygen Demand	EPA 405.1
108.323	001	Chemical Oxygen Demand	EPA 410.4
108.330	001	Oil and Grease	EPA 413.1
108.350	001	Total Recoverable Petroleum Hydrocarbons	EPA 418.1
108.360	001	Phenols, Total	EPA 420.1
108.370	001	Surfactants	EPA 425.1
108.380	001	Oil and Grease	EPA 1664
108.390	001	Turbidity	SM2130B
108.400	001	Acidity	SM2310B
108.410	001	Alkalinity	SM2320B
108.420	001	Hardness (calc.)	SM2340B
108.421	001	Hardness	SM2340C
108.430	001	Conductivity	SM2510B
108.440	001	Residue, Total	SM2540B
108.441	001	Residue, Filterable	SM2540C
108.442	001	Residue, Non-filterable	SM2540D
108.443	001	Residue, Settleable	SM2540F
108.447	001	Boron	SM3120B

108.447	002	Calcium	SM3120B
108.447	003	Hardness (calc.)	SM3120B
108.447	004	Magnesium	SM3120B
108.447	005	Potassium	SM3120B
108.447	006	Silica	SM3120B
108.447	007	Sodium	SM3120B
108.462	001	Chlorine	SM4500-Cl D
108.470	001	Cyanide, Manual Distillation	SM4500-CN C
108.471	001	Cyanide, Total	SM4500-CN D
108.472	001	Cyanide, Total	SM4500-CN E
108.473	001	Cyanide, amenable	SM4500-CN G
108.480	001	Fluoride	SM4500-F C
108.490	001	pH	SM4500-H+ B
108.500	001	Ammonia	SM4500-NH3 C
108.501	001	Kjeldahl Nitrogen	SM4500-NH3 C
108.510	001	Nitrite	SM4500-NO2 B
108.531	001	Dissolved Oxygen	SM4500-O G
108.540	001	Phosphate, Ortho	SM4500-P E
108.541	001	Phosphorus, Total	SM4500-P E
108.550	001	Dissolved Silica	SM4500-Si D
108.560	001	Sulfite	SM4500-SO3 B
108.580	001	Sulfide	SM4500-S= D
108.590	001	Biochemical Oxygen Demand	SM5210B
108.591	001	Carbonaceous BOD	SM5210B
108.602	001	Chemical Oxygen Demand	SM5220D
108.611	001	Total Organic Carbon	SM5310C
108.630	001	Oil and Grease	SM5520B
108.640	001	Surfactants	SM5540C
108.660	001	Chemical Oxygen Demand	HACH8000
108.904	001	Calcium	SM3500-Ca D
Field of Testing: 109 - Toxic Chemical Elements of Wastewater			
109.010	001	Aluminum	EPA 200.7
109.010	002	Antimony	EPA 200.7
109.010	003	Arsenic	EPA 200.7
109.010	004	Barium	EPA 200.7
109.010	005	Beryllium	EPA 200.7
109.010	007	Cadmium	EPA 200.7
109.010	009	Chromium	EPA 200.7
109.010	010	Cobalt	EPA 200.7
109.010	011	Copper	EPA 200.7
109.010	012	Iron	EPA 200.7
109.010	013	Lead	EPA 200.7
109.010	015	Manganese	EPA 200.7
109.010	016	Molybdenum	EPA 200.7
109.010	017	Nickel	EPA 200.7
109.010	019	Selenium	EPA 200.7
109.010	021	Silver	EPA 200.7
109.010	023	Thallium	EPA 200.7
109.010	024	Tin	EPA 200.7
109.010	026	Vanadium	EPA 200.7
109.010	027	Zinc	EPA 200.7
109.020	001	Aluminum	EPA 200.8
109.020	002	Antimony	EPA 200.8
109.020	003	Arsenic	EPA 200.8

109.020	004	Barium	EPA 200.8
109.020	005	Beryllium	EPA 200.8
109.020	006	Cadmium	EPA 200.8
109.020	007	Chromium	EPA 200.8
109.020	008	Cobalt	EPA 200.8
109.020	009	Copper	EPA 200.8
109.020	010	Lead	EPA 200.8
109.020	011	Manganese	EPA 200.8
109.020	012	Molybdenum	EPA 200.8
109.020	013	Nickel	EPA 200.8
109.020	014	Selenium	EPA 200.8
109.020	015	Silver	EPA 200.8
109.020	016	Thallium	EPA 200.8
109.020	017	Vanadium	EPA 200.8
109.020	018	Zinc	EPA 200.8
109.104	001	Chromium (VI)	EPA 218.6
109.190	001	Mercury	EPA 245.1
109.430	001	Aluminum	SM3120B
109.430	002	Antimony	SM3120B
109.430	003	Arsenic	SM3120B
109.430	004	Barium	SM3120B
109.430	005	Beryllium	SM3120B
109.430	007	Cadmium	SM3120B
109.430	009	Chromium	SM3120B
109.430	010	Cobalt	SM3120B
109.430	011	Copper	SM3120B
109.430	012	Iron	SM3120B
109.430	013	Lead	SM3120B
109.430	015	Manganese	SM3120B
109.430	016	Molybdenum	SM3120B
109.430	017	Nickel	SM3120B
109.430	019	Selenium	SM3120B
109.430	021	Silver	SM3120B
109.430	023	Thallium	SM3120B
109.430	024	Vanadium	SM3120B
109.430	025	Zinc	SM3120B
Field of Testing:		110 - Volatile Organic Chemistry of Wastewater	
110.010	000	Halogenated Volatiles	EPA 601
110.020	000	Aromatic Volatiles	EPA 602
110.030	000	Acrolein, Acrylonitrile	EPA 603
110.040	040	Halogenated Hydrocarbons	EPA 624
110.040	041	Aromatic Compounds	EPA 624
110.040	042	Oxygenates	EPA 624
110.040	043	Other Volatile Organics	EPA 624
Field of Testing:		111 - Semi-volatile Organic Chemistry of Wastewater	
111.101	032	Polynuclear Aromatic Hydrocarbons	EPA 625
111.101	033	Adipates	EPA 625
111.101	034	Phthalates	EPA 625
111.101	036	Other Extractables	EPA 625
111.170	030	Organochlorine Pesticides	EPA 608
111.170	031	PCBs	EPA 608
Field of Testing:		112 - Radiochemistry of Wastewater	
112.010	001	Gross Alpha	EPA 900.0

112.010	002	Gross Beta	EPA 900.0
112.021	001	Radium-226	EPA 903.1
112.030	001	Gross Alpha	SM7110B
112.030	002	Gross Beta	SM7110B
112.050	001	Radium-226	SM7500-Ra C
Field of Testing: 114 - Inorganic Chemistry of Hazardous Waste			
114.010	001	Antimony	EPA 6010B
114.010	002	Arsenic	EPA 6010B
114.010	003	Barium	EPA 6010B
114.010	004	Beryllium	EPA 6010B
114.010	005	Cadmium	EPA 6010B
114.010	006	Chromium	EPA 6010B
114.010	007	Cobalt	EPA 6010B
114.010	008	Copper	EPA 6010B
114.010	009	Lead	EPA 6010B
114.010	010	Molybdenum	EPA 6010B
114.010	011	Nickel	EPA 6010B
114.010	012	Selenium	EPA 6010B
114.010	013	Silver	EPA 6010B
114.010	014	Thallium	EPA 6010B
114.010	015	Vanadium	EPA 6010B
114.010	016	Zinc	EPA 6010B
114.020	001	Antimony	EPA 6020
114.020	002	Arsenic	EPA 6020
114.020	003	Barium	EPA 6020
114.020	004	Beryllium	EPA 6020
114.020	005	Cadmium	EPA 6020
114.020	006	Chromium	EPA 6020
114.020	007	Cobalt	EPA 6020
114.020	008	Copper	EPA 6020
114.020	009	Lead	EPA 6020
114.020	010	Molybdenum	EPA 6020
114.020	011	Nickel	EPA 6020
114.020	012	Selenium	EPA 6020
114.020	013	Silver	EPA 6020
114.020	014	Thallium	EPA 6020
114.020	015	Vanadium	EPA 6020
114.020	016	Zinc	EPA 6020
114.025	001	Mercury	EPA 6020A
114.103	001	Chromium (VI)	EPA 7196A
114.106	001	Chromium (VI)	EPA 7199
114.140	001	Mercury	EPA 7470A
114.141	001	Mercury	EPA 7471A
114.221	001	Cyanide, Total	EPA 9012A
114.222	001	Cyanide	EPA 9014
114.230	001	Sulfides, Total	EPA 9034
114.240	001	pH	EPA 9040
114.241	001	pH	EPA 9045
114.250	001	Fluoride	EPA 9056
114.270	001	Fluoride	EPA 9214
Field of Testing: 115 - Extraction Test of Hazardous Waste			
115.010	001	Extraction Procedure Toxicity (EPTox)	EPA 1310A
115.020	001	Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311

115.030	001	Waste Extraction Test (WET)	CCR Chapter11, Article 5, Appendix II
115.040	001	Synthetic Precipitation Leaching Procedure (SPLP)	EPA 1312
Field of Testing:		116 - Volatile Organic Chemistry of Hazardous Waste	
116.020	030	Nonhalogenated Volatiles	EPA 8015B
116.020	031	Ethanol and Methanol	EPA 8015B
116.030	001	Gasoline-range Organics	EPA 8015B
116.040	041	Methyl tert-butyl Ether (MTBE)	EPA 8021B
116.040	062	BTEX	EPA 8021B
116.080	000	Volatile Organic Compounds	EPA 8260B
116.080	120	Oxygenates	EPA 8260B
116.110	001	Total Petroleum Hydrocarbons - Gasoline	LUFT
Field of Testing:		117 - Semi-volatile Organic Chemistry of Hazardous Waste	
117.010	001	Diesel-range Total Petroleum Hydrocarbons	EPA 8015B
117.016	001	Diesel-range Total Petroleum Hydrocarbons	LUFT
117.017	001	TRPH Screening	EPA 418.1
117.110	000	Extractable Organics	EPA 8270C
117.150	000	Carbonyl Compounds	EPA 8315A
117.210	000	Organochlorine Pesticides	EPA 8081A
117.220	000	PCBs	EPA 8082
117.240	000	Organophosphorus Pesticides	EPA 8141A
117.250	000	Chlorinated Herbicides	EPA 8151A
Field of Testing:		118 - Radiochemistry of Hazardous Waste	
118.010	001	Gross Alpha	EPA 9310
118.010	002	Gross Beta	EPA 9310
Field of Testing:		120 - Physical Properties of Hazardous Waste	
120.010	001	Ignitability	EPA 1010
120.030	001	Corrosivity	EPA 1110
120.040	001	Reactive Cyanide	Section 7.3 SW-846
120.050	001	Reactive Sulfide	Section 7.3 SW-846
120.070	001	Corrosivity - pH Determination	EPA 9040B
120.080	001	Corrosivity - pH Determination	EPA 9045C
Field of Testing:		126 - Microbiology of Recreational Water	
126.010	001	Total Coliform (Enumeration)	SM9221A,B,C
126.020	001	Total Coliform (Enumeration)	SM9222A,B
126.030	001	Fecal Coliform (Enumeration)	SM9221E
126.050	001	Total Coliform and E. coli	SM9223
126.080	001	Enterococci	IDEXX

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

ENVIRONMENTAL LABORATORY CERTIFICATION

Is hereby granted to

TRUESDAIL LABORATORIES, INC.

HESPERIA

9892 I AVENUE UNIT # 4

HESPERIA, CA 92345

Scope of certification is limited to the
"Accredited Fields of Testing"
which accompanies this Certificate.

Continued certification status depends on successful completion of site visit, proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **2445**

Expiration Date: **11/30/2008**

Effective Date: **11/01/2006**

Richmond, California
subject to forfeiture or revocation

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

State of California--Health and Human Services Agency
Department of Health Services

Sandra Shewry
Director

Arnold Schwarzenegger
Governor

November 1, 2006 Certificate No.: **2445**

,PMA MASSO,O
TRUESDAIL LABORATORIES, INC.
9892 I AVENUE UNIT #4
HESPERIA, CA 92345

Dear ,PMA MASSO,O:

This is to advise you that the laboratory named above continues to be certified as an environmental testing laboratory pursuant to the provisions of the California Environmental Laboratory Improvement Act (Health and Safety Code (HSC), Division 101, Part 1, Chapter 4, Section 100825, et seq.). Certification for all currently certified Fields of Testing that the laboratory has applied for renewal shall remain in effect until **11/30/2008** unless revoked.

Please note that the renewal application for certification is subject to an on-site visit, and continued use of the certificate is contingent upon:

* **successful completion of the site visit;**
* **acceptable performance in the required performance evaluation (PE) studies;**
* **timely payment of all fees, including an annual fee due before November 30, 2007;**
* **compliance with Environmental Laboratory Accreditation Program (ELAP) statutes (HSC, Section 100825, et seq.) and Regulations (California Code of Regulations (CCR),Title 22, Division 4, Chapter 19).**

An updated "Approved Fields of Testing" will be issued to the laboratory upon completion of the renewal process. The application for the next renewal must be received 90 days before the expiration of this certificate to remain in force according to the CCR, Section 64801 through 64827.

Please note that the laboratory is required to notify ELAP of any major changes in the laboratory such as the transfer of ownership, change of laboratory director, change in location, or structural alterations which may affect adversely the quality of analyses (HSC, Section 100845(b)(d)). Please include the above certificate number in all your correspondence to ELAP.

If you have any questions, please contact ELAP at (510) 620-3155.

Sincerely,

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

CALIFORNIA DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
Accredited Fields of Testing

TRUESDAIL LABORATORIES, INC.
HESPERIA
9892 I AVENUE UNIT # 4
HESPERIA, CA 92345

Lab Phone (760) 956-7648

Certificate No: 2445 **Renew Date: 11/30/2006**

Field of Testing: 101 - Microbiology of Drinking Water

101.010	001	Heterotrophic Bacteria	SM9215B
101.060	002	Total Coliform	SM9223
101.060	003	E. coli	SM9223
101.070	002	Total Coliform	Colisure
101.070	003	E. coli	Colisure
101.160	001	Total Coliform (Enumeration)	SM9223

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

Office of Ground Water and Drinking Water
Technical Support Center
December 20, 1996

Truesdail Laboratories Inc.
Chemistry Analyses
14201 Franklin Ave
Tustin, CA 92780-7008

Dear Laboratory Manager:

The applications submitted to EPA seeking ICR chemistry laboratory approval have been reviewed. The criteria used for the evaluation of your applications are given in the DBP/ICR Analytical Methods Manual (EPA 814-B96-002). Listed below are the analyte/methods for which you are presently approved to perform as part of the ICR.

ID#: ICRCA018

Parameter:	Method:	Approval Date:
Alkalinity	SM 2320 B	12/20/96
Ammonia	SM 4500-NH3	12/20/96
Calcium Hardness	EPA 200.7	12/20/96
Calcium Hardness	SM 3111 B	12/20/96
Calcium Hardness	SM 3120 B	12/20/96
Calcium Hardness	SM 3500 Ca D	12/20/96
Chlorine Dioxide	SM 4500-ClO2	12/20/96
Free Chlorine	SM 4500-Cl F	12/20/96
Ozone	SM 4500-O3 B	12/20/96
pH	SM 4500 H+B	12/20/96
pH	EPA 150.1	12/20/96
Temperature	SM 2550 B	12/20/96
Total Chlorine	SM 4500-Cl F	12/20/96
Total Hardness	SM 2340 B	12/20/96
Total Hardness	SM 2340 C	12/20/96
Total Organic Carbon	SM 5310 C	8/14/96
Total Organic Halides	SM 5320 B	12/20/96
Trihalomethanes (State)	EPA 502.2	12/20/96
Trihalomethanes (State)	EPA 524.2	12/20/96
Turbidity	EPA 180.1	12/20/96
Turbidity	SM 2130 B	12/20/96
UV Absorbance	SM 5910	12/20/96

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From: Hautman.Dan@epamail.epa.gov Save Address | Block
To: Hautman.Dan@epamail.epa.gov
Subject:
Date: Wed, 23 Jul 2003 16:51:06 -0400

UCMR Perchlorate approved laboratory,
The original laboratory approval letter sent from EPA, which granted your laboratory approval to analyze perchlorate under the UCMR, indicated that this approval would expire on January 28, 2004. Since some PWS may need a portion of 2004 to complete their UCMR monitoring requirement, EPA is extending your perchlorate approval to monitor under UCMR for an additional year, until January 28, 2005.

This is the only notice we will issue about this matter, make a note in your files. If you have any questions, do not hesitate to contact me.

Daniel P. Hautman, UCMR Implementation Team Co-Leader
USEPA, Office of Ground Water and Drinking Water,
Technical Support Center
26 W. Martin Luther King Dr.
Cincinnati, Ohio 45268
513-569-7274
fax 513-569-7191

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

Office of Ground Water and Drinking Water
Technical Support Center

May 23, 2000

Dr. Norman Hester
Truesdail Laboratories, Inc.
14201 Franklin Ave.
Tustin, CA 92780

This letter is to advise you that the laboratory named above has **PASSED** the Spring 2000 Perchlorate PT Study and has been granted **APPROVAL** to monitor for perchlorate as an assessment monitoring parameter under the Unregulated Contaminant Monitoring Rule (UCMR) *[Federal Register, Volume 64, Number 180, September 17, 1999, pages 50556-50620].* Laboratory approval is contingent upon maintaining certification to perform drinking water compliance monitoring of any inorganic parameter using an approved ion chromatographic method. If a laboratory maintains this certification, the approval to support the assessment monitoring of perchlorate under the UCMR remains active. This letter may be presented to any Public Water System (PWS) as evidence of laboratory approval for perchlorate analysis supporting the UCMR.

The data reported by your laboratory are presented below in Table 1 along with acceptable performance ranges. Only those laboratories which submitted acceptable results for both matrix conductance and perchlorate concentration passed the Spring 2000 Perchlorate PT study. See Table 2 for a summary of the performance of all laboratories.

Since you have passed the Spring 2000 Perchlorate PT study you do not have to participate in the Fall 2000 Perchlorate PT study and a PT sample will not automatically be sent to the laboratory.

Table 1. Spring 2000 Perchlorate PT Study Performance

Truesdail Laboratories, Inc.

Parameter	Laboratory Reported Result	Spring 2000 Study True Value (TV)	Acceptance Limits (75% - 125% of TV)
Conductivity	**468** uS/cm	471 uS/cm	353 uS/cm - 589 uS/cm
Perchlorate	**18.3** ug/L	20.3 ug/L	15.2 ug/L - 25.4 ug/L

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

December 28, 2006

Dr. Norman Hester
Truesdail Laboratories
14201 Franklin Avenue
Tustin, CA 92780

Dear Dr. Hester:

Subject: Laboratory Approval Program Approval
Reference #93LA0721

We completed our review of the renewal application you submitted for approval under the South Coast Air Quality Management District's Laboratory Approval Program). We are pleased to inform you that your firm is approved for the period beginning October 31, 2006 and ending October 31, 2007 for the following methods:

SCAQMD Method 302
SCAQMD Method 303
SCAQMD Method 304
SCAQMD Method 25.1 Analysis

However, we have not completed the evaluation of your application for LAP approval for SCAQMD Method 25.3.

Thank you for participating in the LAP. Your cooperation helps us to achieve the goal of the LAP: to maintain high standards of quality in the sampling and analysis of source emissions.

You may direct any questions or information to LAP Coordinator Ramiro Gonzalez. He may be reached by telephone at (909) 396-2228 or facsimile at (909) 396-2099.

Sincerely,

Rudy Eden, Senior Manager
Source Test Engineering

RG:svc
cc: Ramiro Gonzalez

MARTIN MARIETTA ENERGY SYSTEMS, INC.

POST OFFICE BOX 2003
OAK RIDGE, TENNESSEE 37831-7261

August 2, 1991

Ms. Kathy Ford
Naval Energy and Environmental Support Activity
Code 112E
Port Hueneme, California 93043-5014

Dear Ms. Ford:

Initial Site Approval of Truesdail Laboratory, Inc., Tustin, California
For: MCAS Tustin Site Inspection, Western Division

This is in response to your request (Ser 112E/227, dated January 14, 1991) for initial approval of Truesdail Laboratories, Inc., Tustin, California, in accordance with the Naval Energy and Environmental Support Activity (NEESA) document Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program, NEESA 20.2-047B. Our records at the Analytical Environmental Support Group (AESG), of Martin Marietta Energy Systems, Inc. indicate that:

1. The laboratory quality assurance plan (LQAP) was reviewed by AESG on March 19, 1991.

2. Performance Evaluation (PE) samples were submitted to the laboratory on February 19, 1991.

3. An audit of the laboratory facility was conducted on April 30, 1991.

4. The laboratory submitted a final response to the LQAP review on May 21, 1991.

5. The laboratory successfully completed the analysis of PE samples for volatiles, semivolatiles, pesticides, polychlorinated biphenyls, and metals. The laboratory submitted the final response to the remedial PE samples on May 17, 1991.

6. The laboratory satisfactorily responded to audit findings on June 28, 1991.

AESG disposition regarding Truesdail Laboratories, Inc., Tustin, California, is that the laboratory has completed the review process as outlined in the NEESA requirements document, and may be used to provide analytical support to the Navy Installation Restoration Program (IRP). The laboratory MUST adhere to U.S. Environmental Protection Agency (EPA) analytical method requirements, and any deviation from the EPA analytical methods MUST be approved by the Navy Remedial Project Manager. The laboratory should submit monthly progress reports for analytical support to the Navy IRP.

COUNTY SANITATION DISTRICTS
OF LOS ANGELES COUNTY

1955 Workman Mill Road / Whittier, California
Mailing Address: / P. O. Box 4998, Whittier, California 90607-4998
Telephone: (213) 699-7411 / From Los Angeles (213) 685-5217

CHARLES W. CARRY
Chief Engineer and General Manager

January 31, 1991

The County Sanitation Districts of Los Angeles County regularly review the qualifications of all laboratories submitting required wastewater analysis to the Districts. As part of this process, such laboratories are required to be certified by either the California Department of Health Services (DOHS) or the Districts for each constituent reported.

Your laboratory has been approved to perform tests and submit data related to implementation of the provisions of the Sanitation Districts' Industrial Waste Surcharge and Permit programs. This approval only applies to the constituents listed on the enclosed table. Please review this table carefully. If your laboratory has received any additional certifications from the DOHS not listed in this table, please notify the Districts in writing within 60 days of the date of this letter. Your response must include documentation from the appropriate agency certifying your claim.

Additional constituent certification may be obtained through the Districts' laboratory certification program or from the DOHS Environmental Laboratory certification program. To obtain information regarding the DOHS Environmental Laboratory Certification program, contact:

Department of Health Services
Division of Laboratories
Environmental Laboratory Accreditation Program
2151 Berkeley Way - Room 452
Berkeley, CA 94704
Telephone: (415) 540-2408

The Districts will only accept analyses your laboratory is certified to perform. Submission of non-certified analysis will not be accepted and subsequently returned to the discharger. Your laboratory's identification number appears on the label affixed to the outside of the envelope. This identification number must be included on all documents submitted to the Districts.

If you have any questions regarding laboratory approval, please contact David Whipple of the Sanitation Districts' Industrial Waste Section at extension 2909.

Very truly yours,

Charles W. Carry

Clifford P. Lum
Supervising Civil Engineer

Norman Hester
Truesdale Laboratories Inc
14201 Franklin Avenue
Tustin, CA 92680

CPL:DBW:jav

7		METHYL ETHYL KETONE (MEK)	
7		METHYL ISOBUTYL KETONE (MIBK)	
7		PARALDEHYDE (TRIMMER OF ACETALDEHYDE)	
7	623	ETHANOL	
6			
6			
6		AROMATIC VOLATILE ORGANICS	EPA METHOD 8020
6			DOHSHM 05-19-86
7	620	BENZENE	
7	611	CHLOROBENZENE	
7	819	1,2-DICHLOROBENZENE	
7	820	1,3-DICHLOROBENZENE	
7	821	1,4-DICHLOROBENZENE	
7	624	ETHYLBENZENE	
7	621	TOLUENE	
7	629	XYLENE-O	
7	667	XYLENE-O&P	
7	630	XYLENE-P	
7	666	XYLENE-M	
6			
6			
6			EPA METHOD 8030
7	654	ACROLEIN	DOHSHM 05-19-86
7	655	ACRYLONITRILE	
7	665	ACETONITRILE	
6			
6			
6		PHENOLS	
6			EPA METHOD 8040
7	845	2-CHLOROPHENOL	DOHSHM 05-19-86
7	847	2,4-DICHLOROPHENOL	
7	848	2,4 DIMETHYLPHENOL	
7	849	2,4 DINITROPHENOL	
7	850	2-METHYL-4,6 DINITROPHENOL	
7	851	2-NITROPHENOL	
7	852	4-NITROPHENOL	
7	853	4-CHLORO-3-METHYLPHENOL	
7	854	PENTACHLOROPHENOL	
7	855	PHENOL	
7	856	2,4,6-TRICHLOROPHENOL	
6			
6			
6		PHTHALATE ESTERS	
6			EPA METHOD 8060
7	812	2-ETHYLHEXYLPHTHALATE	DOHSHM 05-19-86
7	814	BUTYLBENZYLPHTHALATE	
7	823	DIETHYL PHTHALATE	
7	824	DIMETHYL PHTHALATE	
7	825	DI-N-BUTYL PHTHALATE	
7	828	DI-N-OCTYL PHTHALATE	
6			
6			
6		ORGANOCHLORINE PEST/ PCBS	
6			EPA METHOD 8080
			DOHSHM 05-19-86

7 616 1,1-DICHLOROETHANE
7 619 1,2-DICHLOROETHANE
7 605 1,1-DICHLOROETHENE
7 645 TRANS-1,2-DICHLOROETHENE
7 650 1,2-DICHLOROPROPANE
7 651 CIS-1,3-DICHLOROPROPENE
7 652 TRANS 1,3-DICHLOROPROPENE
7 1,4-DIFLUOROBENZENE
7 623 ETHANOL
7 624 ETHYLBENZENE
7 ETHYL METHACRYLATE
7 2-HEXANONE
7 IODOMETHANE
7 601 METHYLENE CHLORIDE
7 681 4-METHYL-2-PENTANONE
7 682 STYRENE
7 653 1,1,2,2-TETRACHLOROETHANE
7 621 TOLUENE
7 603 1,1,1-TRICHLOROETHANE
7 618 1,1,2-TRICHLOROETNANE
7 606 TRICHLOROETHENE
7 669 TRICHLOROFLUOROMETHANE
7 1,2,3-TRICHLOROPROPANE
7 625 VINYL ACETATE
7 612 VINYL CHLORIDE -
7 629 XYLENE-O
7 666 XYLENE-M
7 630 XYLENE-P
7 607 TETRACHLOROETHENE
7 817 CHRYSENE
7 818 DIBENZO(A,H)ANTHRACENE
7 830 FLUORANTHENE
7 831 FLUORENE
7 836 INDENO(1,2,3-CD)PYRENE
7 838 NAPTHALENE
7 842 PHENANTHRENE
7 843 PYRENE
6
6
6
6 METALS
6
7 725 ANTIMONY
7 705 ARSENIC
7 706 BARIUM
7 726 BERYLLIUM
7 708 CADMIUM
7 710 CHROMIUM(VI)
7 709 CHROMIUM(TOTAL)
7 711 COBALT
7 712 COPPER
7 714 LEAD
7 717 MERCURY
7 732 MOLYBDENUM

CARBAMATES — EPA METHOD 632, DOHSHM 05-19-86

- AMINOCARB
- BARBAN
- CARBARYL
- CARBOFURAN
- CHLORPROPHAM
- DIURON
- FENURON
- FENURON-TCA
- FLUOMETURON
- LINURON
- METHIOCARB
- METHOMYL
- MEXACARBATE
- MONURON
- MONURON-TCA
- NEBURON
- OXAMYL
- PROPHAM
- PROPOXUR
- SIDURON
- SWEP

GC/MS METHOD FOR VOLATILE ORGANICS — EPA METHOD 8240, DOHSHM 05-19-86

676	ACETONE
654	ACROLEIN
655	ACRYLONITRILE
620	BENZENE
	BROMOCHLOROMETHANE
608	BROMODICHLOROMETHANE
	4-BROMOFLUOROBENZENE
610	BROMOFORM
694	BROMOMETHANE
680	2-BUTANONE
	CARBON DISULFIDE
604	CARBON TETRACHLORIDE
611	CHLOROBENZENE
609	CHLORODIBROMOMETHANE
647	CHLOROETHANE
648	2-CHLOROETHYL VINYL ETHER
602	CHLOROFORM
649	CHLOROMETHANE
	DIBROMOMETHANE
	1,4-DICHLORO-2-BUTANE
	DICHLORODIFLUOROMETHANE
616	1,1-DICHLOROETHANE
609	DIBROMOCHLOROMETHANE
819	1,2-DICHLOROBENZENE
820	1,3-DICHLOROBENZENE
821	1,4-DICHLOROBENZENE

CERTIFICATE OF ACCREDITATION
PRODUCT CERTIFICATION PROGRAM

The American National Standards Institute hereby affirms that

TRUESDAIL LABORATORIES, INC.
TUSTIN, CA

Certification ID #0303

meets the ANSI accreditation program requirements
and those set forth in

ISO/IEC GUIDE 65:1996
GENERAL REQUIREMENTS FOR BODIES OPERATING PRODUCT CERTIFICATION SYSTEMS

for programs within the following

SCOPE OF ACCREDITATION

Plumbing Products

ANSI Accredited Since 1997

May 31, 2008
Valid Through

Lance Hollenbeck
ANSI Vice President, Accreditation Services

June 1, 2006
Date

ANSI Accredited Program
PRODUCT CERTIFICATION

IAPMO RESEARCH AND TESTING, INC.

A NON-PROFIT CORPORATION
5001 E. Philadelphia Street Ontario, CA 91761 (909) 472-4100 Fax (909) 472-4150

TRUESDAIL LABORATORIES, INC.
of
TUSTIN, CA United States

is recognized by IAPMO Research and Testing, Inc. as an independent Testing Laboratory. IAPMO Research and Testing, Inc. agrees to accept these results prepared by the Laboratory in accordance with the policies and procedures agreed to by the laboratory in the Laboratory Listing Agreement. The Laboratory has satisfactorily demonstrated it's compliance to ISO/IEC 17025-1999, and has been verified as capable of performing tests in the following categories:

•Cement/Slder/Joint Compound• •Metal Pipe/Fittings• •NSF 61.9• •Toxicity Testing• •Valves/Faucets• •Water Filters/Conditioners•

IAPMO Research and Testing, Inc. will accept from the Laboratory only results of testing conducted under the direct control and supervision of employees of the Laboratory.

This Laboratory Listing is valid beginning 10/31/2005 and expires after **10/31/2006**. This recognition is subject to the conditions set forth by IAPMO Research and Testing, Inc. and is not to be construed as approval, recommendation, endorsement of guarantee by IAPMO Research and Testing, Inc. of the qualifications or services offered b the Laboratory. Any alteration or falsification of this certificate may constitute grounds for delisting of the Laboratory. Reproduction of this certificate, in whole or in part, for advertising purposes without the expressed written permission of IAPMO Research and Testing, Inc. is strictly prohibited.

Shahin Moinian
Senior Director of Research and Testing

Jin Luo
Director of Laboratory Recognition

APPENDIX G – DISTRIBUTION LIST

Copy Number	Assigned To	Date
Original	President - John Hill	6/07
1	QA/QC Manager– Pat Iyer	6/07
2	Technical Director – Norman Hester	6/07
3	Technical Director – Norman Hester	6/07
4	Controller - Mareda Murray	6/07
5	Air Analysis – Jeff Swallow	6/07
6	Microbiology – Paymon Abri	6/07
7	Chemistry – Ali Kharrazi	6/07
8	Analytical Services Manager – Mona Nassimi	6/07
9	Radiochemistry – Rossina Tomova	6/07
10	Instrumentation – Mark Kotani	6/07
11	Instrumentation – Mark Kotani	6/07
12	Instrumentation – Mark Kotani	6/07
13	Extra Copy – Norman Hester	6/07
14	Extra Copy – Norman Hester	6/07
15	Word Processor -	6/07
16-25	Clients	6/07

Vista
Analytical Laboratory

QUALITY MANUAL

Revision 8

Effective Date: March 2007

William J. Luksemburg
President

Rose M. Harrelson
Quality Assurance Manager

Martha M. Maier
Laboratory Director

James M. Hedin
Director of Instrumentation Laboratory

TABLE OF CONTENTS

FOREWORD

The Quality Manual (QM) describes the Quality System implemented at Vista Analytical Laboratory in El Dorado Hills, California. The policies and procedures outlined in this QM are designed and developed to comply with the established NELAC Standards. It is the intent of Vista to meet or exceed the Quality Assurance/Quality Control (QA/QC) requirements set by ISO 17025, NELAC, the USEPA or other appropriate governmental or private entities to assure that all analytical data generated are scientifically valid, defensible, comparable, and of known acceptable precision and accuracy.

The QM shall be amended to reflect any changes to Vista's capability, location or Quality System. The Quality Assurance Manager is responsible for the maintenance and annual review of the QM.

1. INTRODUCTION

Vista Analytical Laboratory in El Dorado Hills, CA was established in 1990 and is a privately owned California corporation. Vista provides state-of-the-art mass spectrometry services to chemical manufacturers, environmental engineering firms, and the pulp and paper industry as well other industrial and governmental clients. Vista operates with the intent of providing data of the highest quality with responsive service in a short turnaround time.

Vista has an expanding national and international client base attributable to its reliable reputation in performing difficult trace level analyses. Vista's expertise lies in the analysis of semivolatile organic compounds such as Dioxin/Furans (PCDD/PCDF), Polynuclear Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs), Polychlorinated Naphthalenes (PCNs), Hexachlorobenzene (HCB), Hexachlorocyclopentadiene (HCP), and Polybrominated Diphenyl Ethers (PBDEs).

1.1. Policy

It is the policy of Vista to meet the specific quality requirements and to satisfy the needs of the client, the regulatory authorities or organizations providing recognition throughout data generation and process operations. A Quality System has been established to achieve this policy. The system encompasses all of the applicable elements of the established NELAC Standards. It is Vista's intent to provide full compliance with this Quality System throughout all phases of client services and to ensure that only an acceptable final product is presented to the client.

1.1.1. It is Management's responsibility to instill a commitment of the quality standards throughout the company, and to ensure each employee has a clear understanding of the Quality System.

- Quality is the responsibility of all Vista employees.
- All Vista employees must comply with all QA/QC procedures as it pertains to their function.
- All employees shall be accountable for the quality of their individual assignments and functional responsibilities.
- Employees shall be responsible for reporting any non-conformance to Management or the QA Manager.
- The laboratory shall have sufficient personnel with necessary education training, technical knowledge and experience for the assigned positions.

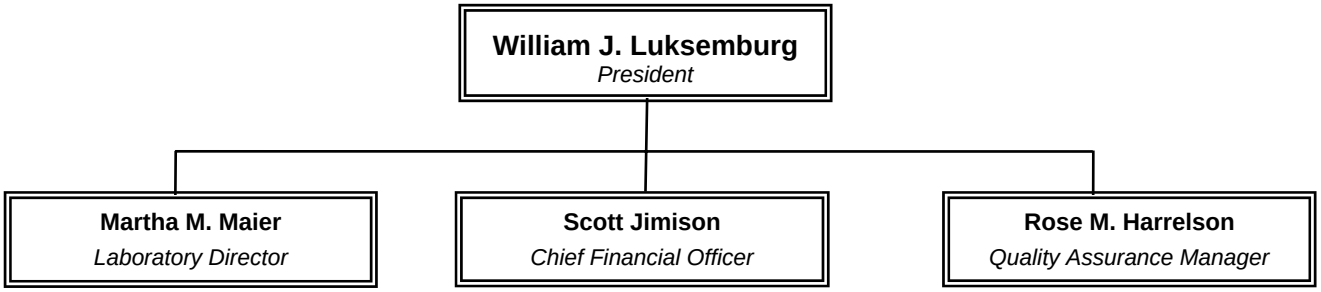
1.1.2. Management is responsible to ensure personnel are free from any commercial, financial, and other undue pressures, which might affect the quality of work.

1.1.3. All Vista employees shall be confident in their independence of judgment and maintain integrity at all times.

2. ORGANIZATION AND FACILITIES

The management staff of Vista consists of a Laboratory President and five Vice Presidents. In the absence of the Laboratory President, one of the Vice Presidents will be named as interim successor. Any of the five Vice Presidents can fulfill the responsibilities of the remaining Vice Presidents.

The organization and management structure of Vista Analytical Laboratory is shown in the following organizational chart.



2.1. Management Responsibilities

2.1.1. President

The President is responsible for the management of financial/technical operations, as well as implementation of corporate goals, objectives and policies and review of laboratory operations. This includes directing the routine analysis and method development work and overseeing marketing of laboratory services. In addition, the President is responsible for overseeing the Quality Assurance Department and ensuring that the Quality System is in compliance with applicable regulations.

2.1.2. Chief Financial Officer

The Chief Financial Officer is responsible for all financial and facility services. The management of the facility includes overseeing building maintenance. The Chief Financial Officer supervises all administrative personnel.

2.1.3. Laboratory Director

The Laboratory Director manages the production scheduling and client management for the laboratory, is responsible for final review and interpretation of analytical data and final reports, and also servers as technical director.

2.1.4. Quality Assurance Manager

The Quality Assurance Manager is responsible for managing the QA activities of the entire laboratory. The Quality Assurance

Manager reports directly to the President of the laboratory. The Quality Assurance Manager serves as the focal point for QA/QC and is responsible for the oversight and/or review of quality control data. When QA oversight is necessary, the QA Manager functions must be independent from the laboratory operations. The QA Manager works with management to ensure that the Vista QM and associated SOPs are followed as written. QA Manager maintains a position that is free from outside influence in order to evaluate the data and perform all other QA Manager responsibilities objectively.

2.2. Approved signatories

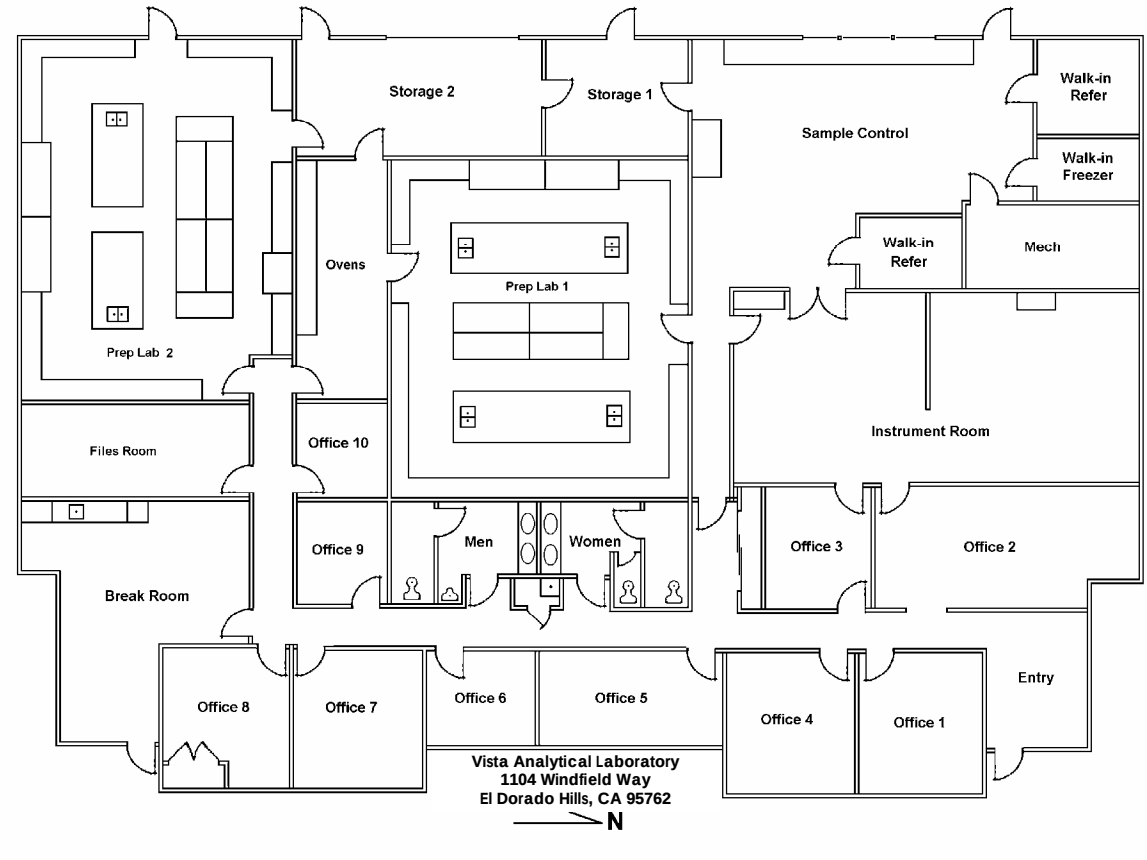
2.2.1. Approved signatories include the laboratory President, the Laboratory Director, the QA Manager and the Principal Scientist. These responsible parties are listed on the QM title page.

2.3. Facilities

2.3.1. Vista Analytical Laboratory operates from El Dorado Hills, CA. The facility consists of 9,000 square feet.

2.3.2. The facility has been constructed and maintained to ensure that results are not invalidated or do not adversely affect the required accuracy of measurement.

2.3.3. Layout – 1104 Windfield Way, El Dorado Hills, CA


Storage 2
Storage 1
Walk-in Refer
Sample Control
Walk-in Freezer
Ovens
Prep Lab 1
Walk-in Refer
Mech
Prep Lab 2
Instrument Room
Files Room
Office 10
Office 9
Men
Women
Office 3
Office 2
Break Room
Office 8
Office 7
Office 6
Office 5
Office 4
Office 1
Entry
Vista Analytical Laboratory
1104 Windfield Way
El Dorado Hills, CA 95762
N

3. QUALITY SYSTEM

The Quality System applies to Vista Analytical Laboratory.

The company's Quality System is designed to comply with the applicable requirements of NELAC Standards and to satisfy the needs of the client or organization providing recognition. All policies, systems, and procedures are documented to assure quality of the data. Personnel shall familiarize themselves with quality documentation and implement the policies and procedures in their work.

Senior Management will review the effectiveness and suitability of the Quality System at least annually. The reviews shall address issues that impact quality. The results of the reviews shall be used to design and implement improvements to the system. The reviews include reports from management and supervisory personnel, recent internal audits, external audits, proficiency testing, client feedback, and corrective action reports. The QA Manager will maintain records of the review meeting, findings, and corrective actions.

3.1. Quality Documents

3.1.1. The Quality System is outlined and documented in the Quality Manual and supporting quality documents. The documented quality system assures that services provided to clients comply with specified quality criteria.

3.1.2. The Quality Manual contains Quality Policies covering the applicable requirements of the NELAC quality standard.

3.1.3. Program specific quality criteria are specified in the Quality Assurance Program Plan (QAPP).

3.1.4. Procedural activities that affect quality are described in more detail in the Standard Operating Procedures (SOPs).

3.2. Use of Quality Documents

3.2.1. Management will review and approve all quality documents prior to issuance. All quality documentation shall be communicated to, understood by, available to, and implemented by the appropriate personnel.

3.2.2. A QAPP or other project-specific requirements submitted by the client will be reviewed to determine whether they are within the scope of the Analytical Procedures. Any discrepancies will be discussed with the client and documented prior to commencement of the project.

3.2.3. The Quality Manual will be understood and implemented throughout the company. The QAPP and SOPs will be understood and implemented throughout applicable operations.

3.2.4. Quality documents shall be periodically reviewed to ensure continuing suitability and compliance with applicable requirements. The Quality System will be reviewed on an ongoing basis and revised as needed to ensure that it effectively encompasses the company's quality criteria. The QA Manager will maintain the Quality Manual. Revisions to the Quality Manual may be made by replacing individual policies or the entire manual.

3.2.5. Any departures from policies or planned activities that affect quality will be approved by management prior to occurrence.

3.2.6. The QAPP will be maintained by the designated responsible manager, or the QA Manager. Revision may be made to individual sections of the entire plan.

3.2.7. Standard Operating Procedures will be maintained as designated in the specific SOP with revisions being made on an as needed basis.

3.3. Document Control

Standard Operating Procedures (SOPs) or any documents that specify quality requirements or otherwise affect quality are Controlled Documents. All controlled documents will be prepared, issued and revised in accordance with the applicable SOPs. The SOPs are presented in Table 3.1.

3.3.1. Procedures are established to control and maintain the issue, distribution, and revisions of all controlled documentation.

3.3.2. Appropriate documents shall be made available at all locations where operations essential to the effective functioning of the laboratory are performed.

3.3.3. Complete and current copies of the controlled documents shall be made available upon issuance, and obsolete copies will be removed from all points of issue or use. The controlled document copies will be stamped, in red, as an "Official QA Copy".

3.3.4. All original controlled documents are archived by QA Manager.

3.3.5. A master list will be used to ensure that the correct revision of each SOP is available for use, and that obsolete revisions are removed from service. Each controlled document has an associated revision number and effective date to enable tracking of current revisions.

3.3.6. Document changes are reviewed and approved by the appropriate personnel.

3.3.7. Documents are periodically reviewed and, where necessary, revised to ensure continuing suitability and compliance with

applicable requirements. The Quality Manual (QM) will be revised as needed and reviewed annually.

3.3.8. QA Manager will maintain records of revisions for Controlled Documents and the QAPP.

Table 3.1 List of Standard Operating Procedures	
SOP #	**Title**
1	Laboratory Security
2	Laboratory Audits
3	Standard Operating Procedures
5	Data Collection, Reporting, and Archival
6	Corrective Actions
7	Control Charts
8	Method Detection Limits
9	Manual integrations
10	Instrument Maintenance Logbooks and Schedule
11	Laboratory Support instrument Calibration
12	Sample Receiving and Sample Control Procedures
13	Consignment Tracking
14	Bottle Order Preparation
15	Reagents and Standards – Preparation, Handling, and Documentation
16	Sample Preparation and Analysis of PUF Samples for PCDD/PCDFs by EPA Method TO-9A
17	Preparation and Shipping of Air Sampling Media for in Field Use
18	Sample Preparation pf MM5 Train for Analysis of PAHs by Method CARB 429
19	Sample Preparation of MM5 Train for Analysis of PCBs and PCDD/PCDFs by Methods CARB 428 and Method 23 or Method 0023A
20	Sample Preparation and Analysis of Sampling Trains and PUFs and PUF/XAD2 for Analysis of PCBs by Modified Method 1668
21	Sample Preparation and Analysis of Sampling Trains and PUFs and PUF/XAD for Analysis of PBDEs by Modified Method 1614 (Draft)
22	Preparation of Surface Wipes
23	Polychlorinated Dibenzo Dioxin/Furans by USEPA Method 8280A
24	Polychlorinated Dibenzo Dioxin/Furans by USEPA Method 8290
25	Tetrachlorodibenzodioxin in Aqueous Samples by Modified USEPA Method 613
26	Polychlorinated Dibenzo Dioxin/Furans by Method 1613B
27	Sample Extractions
28	Sample Analysis of HCB/B by Modified Method 1625B
29	Modified Method 8290 for the Analysis for PCDD/PCDFs, Coplanar, and mono-ortho PCBs in Human Serum or Blood
30	Polybrominated Dibenzo-Dioxin/Furans by Modified EPA Method 8290
31	Analysis of Polychlorinated Biphenyls (PCBs) by Method 1668
32	Analysis of Various Matrices for Polybrominated Diphenyl Ethers (PBDE) by EPA Method 1614
33	Analysis of Polychlorinated Naphthalenes (PCN) by Modified EPA Method 1668A
34	Preparation And Analysis Of Human Serum/Blood Using Modified Method 8290 For PCDD/PCDFs And Modified Method 1668A For Coplanar/Mono-Ortho PCBs
12A	System Security

Table 3.1 List of Standard Operating Procedures	
SOP #	**Title**
12B	System Back-up Procedures
12C	System Maintenance
12D	System Validation Procedures
12E	Computer Operations
12F	Computer Media Archive
12G	Disaster Prevention and Recovery
12H	Change Control Procedures

3.4. Quality Assurance Objectives and Quality Control Procedures

Quality assurance objectives employed at Vista provide routine mechanisms of ongoing control and evaluation of measurement data quality. The quality control (QC) procedures routinely followed evaluate method performance in terms of accuracy and criteria specified by the method or protocol.

3.4.1. Accuracy and precision

Accuracy and precision objectives for HRMS analyses are listed in Table 3.2. Vista's internal quality control procedures include the analysis of method blanks, duplicate samples, laboratory control samples, and matrix spikes.

3.4.2. Definitions

3.4.2.1. **Accuracy:** Accuracy is the nearness of a measurement to the true or theoretical value. Accuracy is assessed by determining recoveries from laboratory control samples, matrix spikes or by comparing values obtained from reference samples.

3.4.2.2. **Analytical Batch:** An analytical batch is a set of samples of the same matrix that are analyzed together using the same method, reagents, and standards. QC results associated with individual analytical batches such as ongoing precision and recovery samples, laboratory control samples, method blanks, matrix spike samples, and duplicate samples are evaluated together to assess data quality. Each batch will be assigned a unique batch number, which will be used to associate sample results with quality control data. All samples associated with a particular batch must be extracted on the same day.

3.4.2.3. **Clean-up Recovery Standard:** A clean-up recovery standard is a reference substance that is an isotopically labeled analyte that is added to the sample extract prior to any clean-up procedures. This standard is used to quantitatively assess losses occurring throughout the clean-up process.

3.4.2.4. **Control/Warning Limits:** Warning and control limits are limits used in laboratory control charts tracking average recovery and relative percent difference. For a Means Chart, typical warning and control levels are ± 2 and ± 3 standard deviations (s) from the central line (i.e., average mean recovery), respectively. Similarly, the warning and control limits for a RPD Chart are usually set at + 2s and + 3s above the mean RPD, respectively.

3.4.2.5. **Detection Limit (DL):** The lowest concentration of an analyte within an environmental matrix that a method or equipment can detect.

3.4.2.6. **Duplicate Sample (DS):** Duplicate samples are two separate aliquots taken from the same source. Duplicate samples are analyzed independently to assess laboratory precision.

3.4.2.7. **Estimated Maximum Possible Concentration (EMPC):** The EMPC is calculated when the response has a S/N in excess of 2.5, but the ion abundance criteria are not met.

3.4.2.8. **Internal Standards (IS):** An internal standard is a reference substance that is an isotopically labeled analyte which is added to the sample prior to extraction and used in the quantitation and identification of native analytes.

3.4.2.9. **Laboratory Control Sample:** A laboratory control sample is prepared by adding a known quantity of native standards to an interferant free matrix.

3.4.2.10. **Method Blank (MB):** A method blank is a sand, XAD or deionized water preparation that is free of native analyte or interferants that has been prepared and analyzed using the same procedures followed for the rest of the analytical batch. The method blank is used to determine the level of background laboratory contamination, if present.

3.4.2.11. **Method Detection Limit:** The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero in the matrix tested. MDLs follow 40 CFR Part 136.

3.4.2.12. **Method Quantitation Limit (MQL):** The method quantitation limit is defined as the quantity of native analyte that corresponds to the lowest concentration of the calibration curve. The Method Quantitation Limit is also know as the Reporting Limit.

3.4.2.13. **Matrix Spike (MS/MSD):** A matrix spike sample is prepared by adding a known quantity of native standards to a sample matrix prior to extraction. Matrix spike concentration levels will vary according to the matrix encountered and study objectives.

3.4.2.14. **Native Standard:** A native standard is a reference substance that is a non-isotopically labeled analyte. Native standards are used in conjunction with internal standards to determine response factors and quantitatively assess accuracy.

3.4.2.15. **Ongoing Precision and Recovery (OPR):** A laboratory blank spiked with known quantities of analytes. The OPR is analyzed exactly like a sample. Its purpose is to assure that the results produced by the laboratory remain within the specified limits.

3.4.2.16. **Precision:** Precision is the agreement between a set of replicate measurements. RPD is used as the principal measure of precision and is based on the analysis of duplicate quality control samples.

3.4.2.17. **Pre-Spike Standards:** A pre-spike standard is an isotopically labeled analyte that is spiked into an MM5 resin cartridge or PUF prior to sampling. The recoveries of pre-spike standards provide a measure of the air sampling efficiency for native analytes.

3.4.2.18. **Quality Control Sample:** Quality control samples are analyzed to access the various aspects of the analytical process in order to monitor quality within the laboratory. The most frequently used QC samples are method blanks, duplicates, matrix spikes, matrix spike duplicates and LCS pairs.

3.4.2.19. **Recovery Standard:** A recovery standard is a reference substance that is an isotopically labeled analyte which is added to the sample extract after clean-up and prior to injection. This standard is used to quantitatively assess the absolute recoveries of the internal and clean-up recovery standards.

3.4.2.20. **Resin QC:** A resin QC is an XAD-2 preparation that is analyzed to assess possible background contamination originating from the resin.

3.4.2.21. **Reporting Limit:** See Method Quantitation Limit.

3.4.2.22. **Signal to Noise Ratio:** Dimensionless measure of the relative strength of an analytic signal to the average strength of background instrument noise.

3.4.3. Calculations

3.4.3.1. Percent Recovery (%R): Percent recovery is a measure of accuracy and is calculated according to the following expression:

$$\%R = \frac{(Amount\ \ Found)}{(Amount\ \ Spiked)}\ X\ 100$$

3.4.3.2. Relative Percent Difference (RPD): Percent Recovery (%R) from duplicate LCS or matrix spike analyses are used to calculate RPD using the following expression:

$$RPD\ = \frac{|\%\ R_1 - \%\ R_2\ |}{\left(\frac{(\%\ R_1 + \%\ R_2\ )}{2}\right)} \times 100$$

3.4.3.3. Similarly, the RPD for duplicate sample analyses, is calculated using the sample concentration (C), as follows:

$$RPD_{DS} = \frac{|C_1 - C_2|}{\frac{(C_1 + C_2)}{2}} \times 100$$

3.4.3.4. Relative Standard Deviation (RSD): Also known as the coefficient of variation.

$$RSD = \frac{SD}{Mean} \times 100$$

3.4.4. Quality Control Procedures

3.4.4.1. Method Blanks:

A method blank is run with each analytical batch or 20 samples (whichever is less) per method and matrix type.

For any method involving the determination of native 2,3,7,8-substituted isomers except hepta- or octa-PCDD/PCDF, the levels measured in the method blank must be less than the MQL, or ten times lower than the concentration found in samples within the analytical batch.

All samples within an analytical batch are re-extracted and analyzed if the method blank associated with that batch does not meet internal standard recovery criteria or contamination limits specified above. Otherwise, the data is qualified appropriately.

3.4.4.2. Ongoing Precision and Recovery/Laboratory Control Samples

A single OPR or a pair of LCS is analyzed with every batch of clients' samples.

All samples within an analytical batch are re-extracted and analyzed if the native or internal standard recoveries from the LCS do not fall within the acceptable control range for accuracy or if the RPD falls outside the specified precision limit established by the method. If the OPR/LCS is not within the acceptable control range and the analytes are not detected in the samples, then it is at the discretion of the Laboratory Director to re-extract the QC sample or qualify the data that is reported.

3.4.4.3. Matrix Spike and Duplicate Sample Analyses

An MS, MS/MSD, or duplicates are analyzed upon client request, method requirements, or at the discretion of the Laboratory Director.

If the RPD from duplicate samples exceeds 25% or the MS/MSD exceeds 20%, corrective action will be taken as directed in the method, unless there is demonstrated matrix effect.

3.4.5. Quality Control Charts

Quality control data are calculated as needed by the QA Manager and distributed to the Laboratory Director for review. A set of current QC control charts is maintained in QA Manager to monitor QC trends on a real time basis. Original copies of the QC charts and any associated tabular data are stored in QA Manager. QC control charts are available upon written request of clients or regulatory agencies or may be reviewed during facility audits.

Table 3.2 Accuracy and Precision Objectives

DATA ACCEPTANCE/REJECTION CRITERIA Precision/Accuracy and QC Requirements					
METHOD	**Method Blank**	**Internal Standard Recovery Limits**	**OPR Recovery Limits (ng/mL)**	**Duplicate Sample Analysis**	**MS/MSD**
EPA 8280/ 8280A	One/extraction batch ≤ML, report in ng/g or ng/L ≤5% regulatory limit or amount in sample	25-150%	70-130%	By client request RPD≤25%	By client request RPD≤20%
EPA 8290/0023A	One/extraction batch Run between calibration std and 1st sample	40-135%	70-130%	By client request RPD≤25%	By client request RPD≤20%
EPA 23	One/extraction batch Run between calibration std and 1st sample	Surrogate 70-130% IS Tetra-Hexa 40-130% Hepta-Octa 25-130%	70-130%	Not applicable	Not applicable
T0-9A	One/extraction batch Run between calibration std and 1st sample	Surrogate 70-130% IS Tetra-Hexa 50-120% Hepta-Octa 40-120%	70-130%	Not applicable	Not applicable
EPA 613	One/extraction batch	25-150%	70-130%	By client request RPD≤25%	10% of samples or 1/month RPD≤20%
EPA 1613A EPA 1613B	One/extraction batch after OPR Must be ≤ 1/3 of minimum level (10 pg/L or regulatory compliance level whichever is greater).	Tables 7 and Table 7A	See Tables 6 and 6A	By client request RPD≤25%	By client request RPD≤20%
EPA 1668	One/extraction batch ≤ 10X amount in sample	Samples = 25-150% OPR Recovery per SOP 31	OPR Recovery per SOP 31	By client request RPD≤25%	By client request RPD≤20%

Table 3.2 Accuracy and Precision Objectives

DATA ACCEPTANCE/REJECTION CRITERIA Precision/Accuracy and QC Requirements					
METHOD	**Method Blank**	**Internal Standard Recovery Limits**	**OPR Recovery Limits (ng/mL)**	**Duplicate Sample Analysis**	**MS/MSD**
NCASI 551	Method Blank IS & RS Recovery >40%	40-120% or S/N > 10:1 if %R is >20% "H" Qualifier	70-130%	By client request RPD≤25%	By client request RPD≤20%
CARB 428 PCB's	One/extraction batch ≤ 10X amount in sample	40-120% or S/N >10:1	60-140%	Not applicable	Not applicable
CARB 428 D/F	One/extraction batch Must be ≤ ML	Surrogates= 60-140% IS= 40-120% or S/N >10:1	60-140%	Not applicable	Not applicable
CARB 429	One/extraction batch ≤ 5% amount in sample	50-150% or S/N > 10:1 "H" Qualifier	Field Spikes 50-150%	By client request RPD≤25%	Not applicable
EPA 1614 (DRAFT)	Method Blank ≤ML; ≤1/3 regulatory limit or amount in sample	Tetra-Hepta: 30-140% Tetra-Hepta: 25-150% Samples Deca: 20-200%	Tetra-Hepta: 50-150% Deca: 40-200%	By client request RPD≤25%	By client request RPD≤20%
Mod 1668A (PCN)	One/extraction batch	30-140% 25-150% Samples	50-150%	By client request RPD≤25%	By client request RPD≤20%
Method 1625	One/extraction batch	Method Table 8	Method Table 8	By client request RPD≤25%	By client request RPD≤20%

4. PURCHASING

4.1. Quality Materials and Services

Materials and services that affect the quality of the company's services will be designated as quality material and services. Purchases shall be made only from approved suppliers (based on historical experience or quality certifications).

4.2. Control of Quality Materials and Services

Quality Materials and Services and, where appropriate, potential suppliers' Quality Systems, shall be evaluated to ensure that specified quality requirements are met. Any purchased equipment and consumable materials, whenever possible, shall be inspected, calibrated, or otherwise verified as complying with any standard specifications relevant to the calibrations or tests concerned prior to use. Records of actions taken to check compliance shall be maintained.

4.3. Procurement Documents

Procurement documents will clearly specify all information and requirements necessary to ensure that the correct materials and services are purchased and received. Any discrepancies between request and contracts shall be resolved before any work commences. Request and contracts shall be reviewed to determine the effect of financial, legal and time schedule aspects. Any amendments to the request or contract after work has commenced shall require another review process.

5. SAMPLE CONTROL

Samples and other material received from clients shall be handled and maintained in accordance with laboratory SOPs.

5.1. Receipt of Materials

5.1.1. Samples and materials received from clients, and any other materials received from an outside source in the regular course of business, will be inspected upon receipt to insure that they meet specified quality requirements. All conditions, including any abnormalities or departures from standard conditions, shall be recorded according to SOPs.

5.1.2. Immediately after inspection samples will be logged into the laboratory computer system. A unique laboratory identification number is assigned to each sample at the time of login. This unique laboratory identification allows the sample to be controlled and tracked during storage, handling, and disposal.

5.1.3. Other materials will be properly identified upon verification that they meet specified quality requirements.

5.2. Storage, Handling, and Disposal

5.2.1. Samples and materials received from clients will be stored and handled in a manner that protects integrity, and ensures the quality characteristics are maintained.

5.2.1.1. All samples are stored away from all standards; reagents, food, or any other potentially contaminating sources in such a manner as to prevent cross contamination.

5.2.2. Samples, sample extracts, and any other sample preparation fractions are stored according to the conditions specified by preservation protocols or according to the appropriate test method.

5.2.3. Samples are stored for a minimum of 90 days. If the client provides any relevant instructions regarding sample storage, then the samples are stored according to the client's request.

5.2.4. Samples will be disposed of in a manner that:

- Protects the environment
- Complies with applicable regulatory requirements
- Complies with any project specific requirements

5.2.5. Excess materials will either be returned to the client, or disposed of in accordance with the applicable SOPs.

5.2.6. Access to laboratories and sample storage facilities will be restricted to authorized personnel to further ensure that sample integrity is maintained.

5.2.7. Ambient conditions will be monitored in storage facilities and laboratories where control of those conditions is necessary to maintain the integrity of the sample.

5.3. Notification of Problems

Clients or suppliers will be notified if the integrity of their samples or materials is jeopardized either upon receipt or while in the possession of the company.

5.4. Records

Records of all procedures to which a sample is subjected to while in the laboratory shall be maintained. Chain of custody records shall establish an intact, continuous record of the physical possession, storage, and disposal of all samples.

Table 5 Sample Containers, Preservatives and Maximum Holding Times

Method	Sample Type	Maximum Holding Times	Container Type	Preservation
EPA Method 8280	Aqueous Solid	Extraction: 30 days (1) Analysis: 45 days (2)	Amber Glass Glass Container	4°C 4 °C
EPA Method 8290	Aqueous Solid Fish/Tissue	Extraction: 30 days (1) Analysis: 45 days (2)	Amber Glass Glass Container Glass Container	4 °C dark 4 °C -20 °C
EPA Method 1668	Aqueous Solid Fish/Tissue	Extraction: 1 year (1) Analysis: 1 year (2)	AGB AGJ AGJ	0 – 4 °C (3,6) dark < 4 °C dark (7) < -10 °C dark (8) < 4 °C dark (7) < -10 °C dark (8)
EPA Methods 1613A & 1613B	Aqueous Solid Fish/Tissue	Extraction: 1 year (1) Analysis: 1 year (2)	AGB AGB AGJ	0 – 4 °C (3) dark < 4 °C dark (7) < -10 °C dark (8) < 4 °C dark (7) < -10 °C dark (8)
EPA Method 613	Aqueous	Extraction: 7 days (1) Analysis: 40 days (2)	AGB	4 °C (3) dark
EPA Method 513	Aqueous	Extraction: 90 days (1) Analysis: 40 days (2)	AGB	Ambient dark
EPA Method 23	MM5 Train	Extraction: 30 days (1) Analysis: 45 days (2) Trap Prep: 30 days	Train and/or AGB	Adsorbents on ice (7)
EPA Method T0-9A (4)	PUF	Extraction: 7 days (1) Analysis: 40 days (2) PUF Prep: 30 days		< 4 °C

Table 5 Sample Containers, Preservatives and Maximum Holding Times

Method	Sample Type	Maximum Holding Times	Container Type	Preservation
CARB Method 428 [4]	MM5 Train	Extraction: 30 days [1] Analysis: 45 days [2] Trap Prep: 30 days	Train and/or AGB	0 – 4 °C dark [5]
CARB Method 429	MM5 Train	Extraction: 21 days [1] Analysis: 40 days [2] Resin QC Date: 21 days	Train and/or AGB	4 °C dark
NCASI 551 [4]	All Samples			4 °C
EPA Method 1614 (Draft)	Aqueous [3] Solid Fish/Tissue	Extraction: 1 year [1] Analysis: 1 year [2]	AGB AGJ AGJ	0 – 4 °C [3] dark < 6 °C dark < -10 °C dark < 6 °C dark < -10 °C dark
PCN	Aqueous Solid Fish/Tissue	Extraction: 1 year [1] Analysis: 1 year [2]	AGB AGJ AGJ	0 – 4 °C [3] dark < -10 °C dark < -10 °C dark < -10 °C dark
EPA Method 1625	All samples	Extraction: 7 days [1] Analysis: 40 days [2]	Amber Glass Containers	0 – 4 °C [3] dark

(1) From collection
(2) From extraction
(3) If residual chlorine is present sodium thiosulfate is added as per the method
(4) Holding times set by Vista Analytical Laboratory
(5) Recommended by Vista Analytical Laboratory
(6) Adjust sample to pH 2-3 with sulfuric acid
(7) From collection until laboratory receipt
(8) Storage at laboratory

6. TRACEABILITY OF MATERIALS

Procedures for identifying, controlling, and tracking items purchased from vendors, items developed in-house, samples received from clients, and client reports are detailed in SOPs.

Purchased materials and supplies will be checked to confirm that they meet quality specifications.

6.1. Verification of Items Developed In-house

6.1.1. Items developed in-house such as computer programs, equipment, and procedures, will be tested to verify that they meet the intended objectives. Test records will be maintained so that client reports can be traced to specific items.

6.2. Control of Laboratory Samples

6.2.1. Each sample will be assigned a unique laboratory ID number that will be used to track the sample as it is processed through the laboratory. This unique ID number is also used to associate the analytical results with the sample.

6.2.2. Samples will be batched for analysis. Each batch will be assigned a unique batch number that will be used to associate sample results with quality control data.

6.3. Standards and Reagents Traceability

6.3.1. Documented procedures shall exist for the purchase, reception, and storage of consumable materials used for the technical operations within the laboratory. Certificate of Analysis records for all standards shall be retained by QA Manager. Reagent and standard preparation documentation shall indicate traceability to purchased stock or neat compounds, reference to method of preparation, date of preparation, expiration date, and preparer's initials.

6.4. Quality Control Records

6.4.1. Records will be maintained to trace calibration standards and instrument calibration data to NIST or USEPA standards as appropriate. If NIST or USEPA standards are not available other standards will be used which are acceptable to specific project requirements.

6.4.2. Each instrument will be assigned a unique ID number. Records will be maintained to document the performance and maintenance of each instrument.

6.4.3. Records will be maintained to identify the individuals responsible for preparing calibration standards, analyzing samples, and reviewing analytical data.

6.4.4. Quality control records will be maintained to demonstrate that individual test procedures have been verified. Individual analytical results will be traceable to these quality control records.

6.5. Certificates of Analysis

6.5.1. All client reports and certificate of Analysis will be uniquely identified. Where appropriate, contract or purchase order numbers will be referenced on client reports. When requested, test procedures will be referenced on Certificates of Analysis.

6.6. Instruments and Equipment

6.6.1. All measuring operations and testing equipment effecting accuracy or validity of tests shall be calibrated and verified before being put into service and on a continuing basis.

7. PROCESS CONTROL

Analytical procedures and other processes that directly affect the quality of services will be conducted under controlled conditions using SOPs that are written at a level of detail appropriate to the complexity of the process.

Personnel will be properly trained before being given responsibility for an analytical procedure or other process that directly affects the quality of a service.

7.1. Instruments and Facilities

7.1.1. Analytical instruments will be maintained in a condition, which will ensure that they are able to meet specified operating conditions.

7.1.2. Laboratory facilities will be designed to meet specific operating conditions, and maintained in a condition, which will ensure that the operating conditions are consistently met.

7.1.3. Results of quality control checks will be recorded.

7.2. Performance Audits

7.2.1. The laboratory shall ensure the quality of results provided to clients by implementing checks to monitor the quality of the laboratories analytical activities.

7.2.1.1. Internal QC procedures.

7.2.1.2. Participation in proficiency testing or other interlaboratory comparisons.

7.2.1.3. Use of certified reference materials.

8. LABORATORY INSTRUMENTATION

All laboratory instrumentation and testing equipment used by the company will be maintained and calibrated in accordance with SOPs to verify proper operation. Table 8 details a list of current laboratory instrumentation for analysis.

Instrumentation will be placed into service dependent upon the capability of achieving the accuracy required and shall comply with relevant specifications to the instrument.

Authorized personnel shall operate laboratory instrumentation and testing equipment.

Instrumentation and equipment will be used in a manner that ensures that measurement uncertainty is known and consistent with specified quality requirements.

Methods and intervals of calibration specified for each instrument will be based on the individual operating characteristics of the instrument and the quality requirements of the analytical procedure.

8.1. Calibration Standards and Instruments

8.1.1. Calibration and verification procedures will use standards and instruments, whenever applicable, that are traceable to recognized national or international standards. Where traceability to national standards does not exist, the basis for the calibration will be documented.

8.1.2. Prior to use, laboratory instrumentation and testing equipment shall be calibrated and checked to establish that it meets the laboratory's specification requirements and complies with the relevant standard specifications.

8.1.3. Where applicable, reference standards and instrumentation will be checked periodically between calibration and verification procedures.

8.2. Calibration Records

8.2.1. Except for procedures requiring reanalysis, calibration prior to each analysis and previous calibration data will be reviewed when an instrument is out of calibration to determine whether or not the analytical results are acceptable.

8.2.2. Instruments that are unable to maintain calibration or not operating properly will be taken out of service. Instruments will not be placed back into service until they have been repaired and verified to be operating properly.

8.2.3. The records for each test or calibration shall contain sufficient information to indicate whether specified quality or process parameters are achieved. Each instrument will be assigned a

unique ID number. Records will be maintained to document the performance and maintenance of each instrument.

Table 8 Instrument List

Name	ID	Acquired
Waters Autospec Ultima High Resolution Mass Spectrometer	VG-5	1998
Waters Autospec Ultima High Resolution Mass Spectrometer	VG-6	2000
Waters Autospec Ultima High Resolution Mass Spectrometer	VG-7	2001
Waters Autospec Ultima High Resolution Mass Spectrometer	VG-8	2001
Waters Autospec Ultima High Resolution Mass Spectrometer	VG-9	2004

9. QUALITY RECORDS

Procedures for identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records shall be in accordance with SOPs. Quality records shall include internal audits and management reviews as well as records of corrective actions and preventative actions. Technical records include original observations, calculations and derived data, calibration records and a copy of final report.

9.1. Documentation of Quality Records

9.1.1. Quality records will be generated in accordance with the specification of applicable procedures, programs, and contracts. These records will be maintained to demonstrate that specified quality requirements are met, and that the Quality System is functioning successfully.

9.1.2. Quality records of subcontractor services which affect the quality of the company's services will be required to meet the conditions of this section.

9.1.3. Documents will be clean and legible, and will reference back to the specific activities or procedures to which they apply.

9.2. Quality and Technical Records

9.2.1. Quality and technical records shall be conducted in accordance with SOPs.

9.2.2. History of all samples must be traceable and readily understood through the documentation.

9.2.3. Instruments may not be used in analytical procedures unless maintenance and calibration records indicate that specified quality requirements are achieved. The results of instrument maintenance and calibration inspections will be clearly identified either on the instrument or in maintenance and calibration documents

9.2.4. Work must pass specified quality requirements before it will be released to the succeeding step in the process or, finally, to the clients. The results of quality control checks on work processes will be documented in a manner that clearly indicates the status of the work to the responsible personnel.

9.2.5. Individuals authorized to conduct instrument maintenance and calibration procedures and quality control checks will be identified in the documentation.

9.3. Records Management and Storage

9.3.1. The laboratory shall retain on record all original observations, calculations and derived data, calibration records and a copy of report for a minimum of five years. This applies to both manual and electronic data.

- Individual records will be reviewed and noted if storage requirements longer then five years are required based on client, project or state specific regulations.

9.3.2. Records must provide sufficient information for an adequate audit trail that produces the same results for the sample analytical data. The sample from receipt to analysis must be readily understood through documentation.

9.3.3. All records shall be safely stored, held secure and in confidence to the clients. NELAP related records shall be available to the accrediting authority

9.3.4. All records shall be archived and protected from fire, theft, loss, and environmental deterioration. Any access to archived information shall be documented in the Archive Access Log

9.3.5. Quality documents will be stored in a manner that protects them from loss, damage, unauthorized alterations, and held in confidence to the client.

9.3.6. Documents will be indexed and filed in a manner that allows them to be readily retrieved. Clients will be provided access to records that document the quality of work done for them.

9.3.7. If the laboratory were to transfer ownership, the procedures on handling documents would remain the same. The transfer would ensure that the procedures in place prior to transfer show little significant change for client ease into transition.

9.3.8. If the laboratory were to go out of business, the laboratory would contact the client with the option of how they would like to proceed with their data. All data would be handled according to client or Vista approval for proper destruction or safekeeping.

10. CORRECTIVE ACTION

Nonconforming conditions are when any aspect of the quality system or technical operations does not conform to procedures or to client requirements. Nonconforming conditions have an adverse effect to the quality specifications and are handled in accordance with SOPs. If a nonconformance occurs, where necessary, the client shall be notified.

The applicable SOPs provide instructions for determining the root cause of nonconforming conditions, designing and implementing corrective action, and evaluating the effectiveness of the corrective action.

10.1. Causes of Nonconformance

Procedures will be implemented to determine the root cause of nonconformance conditions, and the corrective action will be designed to eliminate the root cause and prevent reoccurrence.

10.2. Corrective Action

10.2.1. Corrective actions are taken immediately, together with any decision about the acceptability of the nonconforming work. Procedures that result in or allow nonconformance conditions will be revised. If necessary, new procedures will be written.

10.2.2. The revised or new procedures will be implemented and evaluated to ensure that the corrective action steps taken effectively eliminate the nonconformance conditions.

10.3. Documentation

10.3.1. Results of root cause analyses and corrective action steps implemented to eliminate nonconformance conditions will be documented and reported to appropriate levels of management in accordance with laboratory SOPs. Records of corrective actions are maintained by QA Manager.

11. REPORTS

Handling, storage, packaging, and, when applicable, delivery of client reports will be conducted in accordance with SOPs to ensure that specified quality requirements and confidentiality of the reports are maintained. The reports shall include all the information requested by the client or required by the method used. Reports may also include electronic data. Electronic data will follow the same criteria as reports. Any information not reported to the client shall be readily available in the laboratory.

11.1. Handling and Storage of Reports

11.1.1. Reports and files will be handled in a manner that ensures that client confidentiality is maintained, and that the reports are protected from loss, damage, or unauthorized alterations.

11.1.2. All reports and files will be coded for ease of identification and retrieval.

11.1.3. File cabinets and storage rooms will be designed to protect filed copies of reports from loss, damage, or unauthorized alterations.

11.1.4. Computer files will be backed up to electronic storage media and stored in a manner that protects them from loss, damage, or unauthorized personnel.

11.1.5. The condition of reports and files in storage will be periodically evaluated to ensure that there is no deterioration, and that the reports remain readily accessible to authorized personnel.

11.1.6. NELAP related records shall be made available to the accrediting authority, and shall be maintained for a minimum of five years.

- Individual records will be reviewed and noted if storage requirements longer then five years are required based on client, project or state specific regulations.

11.2. Packaging and Delivery of Reports

11.2.1. Client reports will be inspected prior to delivery to ensure that they meet specified quality requirements. Then the reports will be packaged for delivery to the client in a manner that ensures protection while in transit.

11.2.2. When required by specific contractual stipulations, the company will assume responsibility for protection of client reports while en route to the client.

11.3. Laboratory Report Format and Content

All laboratory reports shall include, at least, the following information:

11.3.1. A title, indicating the nature of the document (i.e. Test Report, Laboratory Results);

11.3.2. Name and address of the laboratory, location analysis was conducted if different from the address of the laboratory, and a phone number with name of a contact person;

11.3.3. Unique identification of the report and of each page, and the total number of pages. It must be clear that discrete pages are associated with a specific report, and that the report contains a specified number of pages;

11.3.4. NELAC accredited logo and a statement certifying that the report meets all requirements of NELAC and cannot be reproduced;

11.3.5. Name and address of client, where appropriate and project name if applicable;

11.3.6. Description and unambiguous identification of the tested sample including the client identification code;

11.3.7. Identification of test results derived from any sample that did not meet NELAC sample acceptance requirements such as improper container, holding time, or temperature;

11.3.8. Date of receipt of sample, date and time of sample collection, date(s) of performance test, and time of sample preparation and/or analysis if the required holding time for either activity is less than or equal to 72 hours;

11.3.9. Identification of the test method used, or unambiguous description of any non-standard method used;

11.3.10. If the laboratory collected the sample, reference to sampling procedure;

11.3.11. Any deviations from, additions to or exclusions from the test method, and any non-standard conditions that may have affected the quality of results, and including the use and definitions of data qualifiers

11.3.12. Measurements, examinations and derived results, supported by tables, graphs, sketches and photographs as appropriate, and any failures identified; identify whether data are calculated on a dry weight or wet weight basis, identify the reporting units

11.3.13. A signature and title, or an equivalent electronic identification of the person(s) accepting responsibility for the content of the report, and date of issue;

11.3.14. Clear identification of all test data provided by outside sources, such as subcontracted laboratories, clients, etc.

- The original report from subcontracted laboratories should be included in the client laboratory report.

11.3.15. Reports shall, when required, include a statement of compliance/non-compliance with requirements and/or specifications, including identification or test results derived from any sample that did not meet NELAC sample acceptance requirements such as improper container, holding time, or temperature.

11.3.16. Additional information, which may be required by specific methods, clients or groups of clients.

11.3.17. After issuance of the report, the report remains unchanged.

11.3.18. Any report that requires amending must clearly state that the report has been revised. The amended report must also meet the requirements set forth within Chapter 5 of the NELAC standards.

DATA QUALIFIERS & ABBREVIATIONS

B	This compound was also detected in the method blank.
D	The amount reported is the maximum possible concentration due to possible chlorinated diphenylether interference.
E	The reported value exceeds the calibration range of the instrument.
H	The signal-to-noise ratio is greater than 10:1.
I	Chemical interference
J	The amount detected is below the Lower Calibration Limit of the instrument.
*	See Cover Letter
Conc.	Concentration
DL	Sample-specific estimated Detection Limit
MDL	The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero in the matrix tested.
EMPC	Estimated Maximum Possible Concentration
NA	Not applicable
RL	Reporting Limit – concentrations that corresponds to low calibration point
ND	Not Detected
TEQ	Toxic Equivalency

Unless otherwise noted, solid sample results are reported in dry weight. Tissue samples are reported in wet weight.

12. PERFORMANCE AND SYSTEM AUDITS

Performance, System, and External audits are conducted to verify conformance with Vista's quality assurance program, to determine the effectiveness of the QA program, and to continually improve Vista's data quality.

12.1. System Audits

12.1.1. Internal audits (facility audits) of activities affecting the quality of the company's services will be conducted by the QA Manager on a regular schedule in accordance with laboratory SOPs. Internal audits are performed biannually. The QA Manager is trained and qualified as an auditor who, wherever possible, is independent of the activities being audited. Internal audits verify that operations continue to comply with the requirements of the quality system and NELAC standards.

12.1.2. It is the responsibility of the QA Manager to plan and organize audits based on a predetermined schedule or as requested by management.

12.1.3. SOPs and checklists will be used to focus the internal audit on specific activities of the area to be audited.

12.1.4. Personnel will not be allowed to audit activities for which they are responsible or in which they are directly involved, unless it is demonstrated that an effective, nonbiased, audit can be performed.

12.1.5. Results of internal audits will be documented by the audit team and submitted to the manager(s) in charge of the audited area and the management of the QA Manager.

12.1.6. Appropriate corrective action steps will be promptly taken to address any deficiencies or areas for improvement identified by the internal audit. Laboratory management shall ensure that these actions are within the agreed time frame.

12.1.7. Laboratory management shall immediately notify, in writing, any client whose work may have been affected by any found deficiencies.

12.1.8. All records of internal facility inspections and responses will be maintained by the QA Manager.

12.2. Management Reviews

12.2.1. Management shall review the quality system annually to evaluate its continuing suitability and effectiveness and make any necessary changes or improvements.

12.2.2. The review may include account reports from managerial and supervisory personnel, the outcome of recent internal audits, assessments by external bodies, the results of interlaboratory comparisons or proficiency tests, any changes in the volume and type of work undertaken, feedback from clients, corrective actions and other relevant factors.

12.3. Performance Audits

12.3.1. Performance audits are conducted as single blind assay samples. A performance evaluation sample (PE), purchased from an independent contractor, is analyzed twice a year. The acceptable result for the PE sample is unknown until after the experimental result is reported to the contractor. Other externally originated PEs are analyzed when supplied by the client as either a single blind or as a double blind sample and are scheduled through the laboratory as routine samples. All performance audits are handled in the same manner as real environmental samples including staff, method, procedures, equipment, facilities, and frequency.

12.4. External Audits

12.4.1. External audits are performed on an on-going basis by clients, regulating agencies (State and Federal), or other third party auditors. These audits are pre-scheduled with the client and Quality Assurance Manager to ensure that the appropriate laboratory personnel are available to address all audit inquiries. All deviations or deficiencies noted during the audit are to be addressed in the time frame provided by the auditor.

12.5. Data Audits

12.5.1. Data audits at Vista utilize a three tier data review system involving laboratory directors, client managers and the QA Manager.

12.5.2. Tier 1. In the initial phase, the analyst, defined as the instrument operator, completes final data calculations, enters the data and submits the results to a laboratory director for review. In the case of anomalies, the laboratory director may require the analyst to prepare a corrective action report (CAR) discussing the potential causes for the problems encountered as well as the recommended corrective action. The analyst reviews the data, signs and dates the raw data and any CARs (if applicable). The laboratory director after review of the data will approve all final datasheets.

12.5.3. Tier 2. The second tier review requires the project manager, defined as the laboratory director signing the cover letter of the final report, to review and approve the data package. The project manager examines the data for completeness and assesses

whether the package as a whole meets the data quality objectives set by the client. The project manager is required to discuss or explain any data anomalies in the text of the cover letter.

12.5.4. Tier 3. The third tier review is performed by the Quality Assurance Manager. The QA Manager will audit approximately 5% of the data packages and review all aspects of the data package covered during the second and third tier reviews. The QA Manager review may result in a request to the laboratory director for additional information regarding the data set and if necessary, re-analysis of selected samples.

13. TRAINING

Training assessments and all related training documentation shall be conducted in accordance with SOPs.

13.1. Initial On-Site Training

13.1.1. The training requirement of each employee will be assessed periodically to ensure the competency of their job responsibilities that career development objectives are being met, and that general-purpose educational opportunities are being utilized. The training program shall be relevant to the present and anticipated tasks of the laboratory.

13.1.2. Previous training, education, and experience will be considered when evaluating the training needs of each employee.

13.1.3. Manuals, texts, SOPs, journals, analytical methods and inhouse Analytical Procedures are available for all new trainees, with on the job training performed by senior staff.

13.2. Training Programs

13.2.1. Job related training will be provided through regularly scheduled in-house seminars and courses, university courses, conferences and seminars, and one-on-one on the job tutorials.

13.2.2. Specified performance criteria must be successfully met while under supervision before personnel will be made responsible for activities that affect the quality objectives of the company.

13.3. Training Documentation

13.3.1. Training records will be maintained in each individual's training file. These records will be readily available to supervisors to ensure that employees have demonstrated capability prior to performing activities for which they are responsible. Employees are responsible for keeping their training file up-to-date. The training files shall maintain records of competence, education and professional qualifications, training, skills and experience of all technical personnel, including contracted personnel.

13.3.2. Evidence on file demonstrating each employee has read and understood the current version of in-house quality documents (QM, QAPP, SOPs).

13.3.3. Documentation of training courses.

13.3.4. Documentation of continued proficiency at least once per year.

14. CLIENT SERVICES

Routine client service as well as responses to client inquires, audit reports, recommendations, and complaints will be handled in accordance with SOPs.

14.1. Routine Services

14.1.1. Each client will be assigned a Project Manager who will be responsible for ensuring that the needs of the client are clearly understood and communicated to the appropriate areas of the company.

14.1.2. The Project Manager reviews all new work to ensure that it has the appropriate facilities and resources before commencing such work. Once the Project Manager accepts the new work, an acknowledgement letter is sent to the client for confirmation.

14.1.3. Clients will be given the opportunity to verify that the company's services conform to specified requirements. Regardless of whether or not client verifications are conducted, the Quality System will be responsible for ensuring that all services conform to specified requirements.

14.1.4. As the client's representative, the Project Manager will be responsible for ensuring that the client's needs are met. The Project Manager will maintain good communication, advice and guidance in technical matters, and opinions and interpretations based on results.

14.1.5. All client data are managed and maintained with the utmost care and diligence to ensure that the protection of clients' confidential information and proprietary rights are a primary concern.

14.2. Contract Review

14.2.1. For all analytical service to be provided contract review is accomplished through the generation of a written quote or contract. Sales and client services personnel are responsible for implementing and documenting contract review. Client requirements are defined and documented in the written quote or contract.

14.3. Responses to Client Audits, Inquiries, and Complaints

14.3.1. The QA Manager will be responsible for coordinating responses to client audits.

14.3.2. Complaints received from clients or other parties regarding data or laboratory activities will be directed to the appropriate project manager and reported to the laboratory president or vice presidents.

14.3.3. If a corrective action(s), which may require completion of a CAR (corrective action report), is taken, this will be documented and archived with the appropriate project data.

14.3.4. All complaints will be documented and records of actions in response to any complaints will be maintained.

14.3.5. If a complaint raises doubt regarding the laboratory's policies or compliance with NELAP or other standards, those areas shall be promptly reviewed or audited by the laboratory QA Manager.

15. STATISTICAL TECHNIQUES

Statistical techniques used to monitor the performance of activities that directly affect quality objectives will be conducted in accordance with SOPs.

15.1. Statistical Process Control Procedures

15.1.1. Statistical Process Control will be used to monitor analytical procedure performance indicators such as accuracy and precision, and process performance indicators such as turnaround time and Nonconformance reports.

15.1.2. Results of SPC analyses will be used to improve processes that affect quality objectives.

16. SUBCONTRACTING

16.1. Vista Analytical may subcontract services, or may refer a client directly to another lab, for a particular analysis. Subcontracted laboratories are held responsible for the implementation of their own QM and meeting their data quality objectives.

16.2. Clients shall be notified prior to subcontracting any portion of their testing to another laboratory.

16.3. Services requiring NELAC accreditation will only be subcontracted to a laboratory with NELAC accreditation.

16.4. For DoD clients, subcontractor laboratories must have documented compliance with DoD QSM requirements, must be approved by the specific DoD laboratory approval process, must demonstrate the ability to generate acceptable results through the analysis of proficiency testing samples, and must receive project-specific approval from the DoD client before any samples are analyzed.

16.5. For services associated with projects outside of California, individual state accreditations may need to be met.

16.6. Vista Analytical shall retain records demonstrating that the above requirements have been met. Original reports received from a subcontracted laboratory will be included with the clients test report.

17. DATA INTEGRITY AND ETHICS

Vista Analytical Laboratory expects employee compliance with all laboratory SOPs and applicable regulatory guidelines and standards. Vista encourages participation in cooperative and educational efforts designed to promote and inform laboratory personnel of the necessity of active compliance.

17.1. Vista does not condone and will not tolerate the fraudulent manipulation or falsification of data, intentional non-compliance, gross negligence, or any other unethical conduct. Employees who are aware of, or reasonably suspicious of, any case fraudulent or unethical conduct shall notify the laboratory President, Director, or QA Manager. Allegations of unethical conduct may be reported anonymously and will be fully investigated under the direction of the Quality Assurance Manager.

17.2. Any employee who knowingly manipulates and/or falsifies data or documents or engages in any unethical conduct is subject to immediate release from employment and other serious consequences.

17.3. Vista Analytical Laboratory provides mandatory initial and annual or as needed, Laboratory Ethics and Data Integrity refresher training to all employees. Topics covered are approved by management, documented in writing, and provided to all trainees.

17.3.1. Training topics include:

- Quality System requirements
- Personnel training requirements
- Vista Analytical Laboratory Ethics policy
- Examples of actions that are strictly prohibited
- Other breaches of data integrity
- Pertinent SOPs and other quality documents
- Potential consequences of misconduct
- Confidential mechanism for reporting allegations
- Investigation procedures and documentation

17.3.2. All employees sign an ethics statement and documentation of training attendance that demonstrates they have participated and understand their obligations related to data integrity. This sheet is maintained in individual training records.

17.4. Upon hire, new employees are required to read and sign a confidentiality statement. This signed statement is maintained in personnel files.

APPENDIX

Key Resumes

Certifications

William J. Luksemburg

President

EDUCATION

B.S. Chemistry, California State University, Fresno, CA (1974)

EXPERIENCE

Present **President, Vista Analytical Laboratory**
Responsible for the management of business planning including venture funding, sales and marketing and the review of laboratory operations of Vista Analytical Laboratory, formerly Alta Analytical Laboratory.

1990 - 2000 **Director of HRMS Services, Alta Analytical Laboratory**
Mr. Luksemburg, a co-founder, directed the routine analysis and method development work in the High Resolution Mass Spectrometry department. He was responsible for marketing HRMS dioxin services to environmental engineering firms, the pulp and paper industry, government agencies and other industrial clients. Mr. Luksemburg was also responsible for the development of new markets using HRMS instrumentation. In addition Mr. Luksemburg directed routine and special projects, reviewed and interpreted data, and interfaced with clients.

1986 - 1990 **Principal Scientist/HRMS Manager, Enseco-Cal Lab**
As Principal Scientist in the Special Services department at Enseco-Cal Lab Mr. Luksemburg coordinated the operation and maintenance of five high resolution magnetic sector instruments. He was responsible for developing a business that now is one of the major suppliers of HRMS PCDD/PCDF analysis to the pulp and paper industry in the U.S. Mr. Luksemburg also coordinated the training and development of the staff in the operation and maintenance of HRMS instruments.

1979 - 1986 **Senior Chemist, Radian Corporation**
In Radian's Sacramento laboratory, Mr. Luksemburg was GC/MS supervisor for ABN and VOA analysis. He coordinated the activities of five chemists in the operation and maintenance of four quadrupole mass spectrometers.

1974 - 1979 **Chemist, Carnation Company**
As a staff chemist, Mr. Luksemburg was involved in the analysis of products and ingredients used in Carnation's animal feed division.

QUALIFICATIONS

Mr. Luksemburg has over 30 years experience in production analytical laboratories including 25 years experience in the field of environmental mass spectrometry. Much of this experience has involved PCDD/PCDF analysis of environmental samples, concentrated on High Resolution Mass Spectrometry analysis of PCDDs/PCDFs in a variety of matrices. Mr. Luksemburg is recognized throughout the pulp and paper industry for his research and production work on dioxins and furans. He recently was recognized on the international level when his chapter on dioxin analysis of pulp and paper (Rappe, 1991), was published by the World Health Organization. He is one of the few individuals in the world to successfully adapt the high-resolution magnetic sector instruments to "production" analysis of environmental samples at the picogram and femtogram levels.

RECENT PUBLICATIONS AND PRESENTATIONS

"Determination of Method Detection Limits in Pulp and Paper Mill Effluents," in Rotorua, New Zealand, at the *ISWPC Post Symposium Workshop*, May 1991.

"Comparison of NCASI Method 551, EPA Method 1613A, and the Proposed FDA Method for the Analysis of 2,3,7,8-TCDD and 2,3,7,8-TCDF in Food Packaging Material," in Boston, MA, at the *1993 TAPPI Environmental Conference*, March 1993.

“Extraction of Large Volumes of Aqueous Samples Using Solid Phase Extraction Disks,” in Portland, OR at the *1994 TAPPI Environmental Conference*, April 1994.

“PCDDs and PCDFs in Urban Stormwater Discharged to San Francisco Bay, California,” in Amsterdam at the *1996 Dioxin 16th Symposium on Chlorinated Dioxins and Related Compounds*, August 1996.

NCASI Technical Bulletin No. 551, "NCASI Procedures for the Preparation and Isomer Specific Analysis of Pulp and Paper Industry Samples for 2,3,7,8,-TCDD and 2,3,7,8-TCDF," LaFleur, L., Ramage, K., Bousquet, T., Brunck, R., Luksemburg, W., Miille, M., Peterson, R., and Valmores, S., (1989).

"Optimization of Extraction Procedures for the Analysis of TCDD/TCDF in Pulp, Paper Base Stocks, and Pulp Industry Solid Wastes," Lafleur, L., Ramage, K., Gillespie, W., Luksemburg, L., Miille, M., and Valmores, S., Chemosphere, Vol. 19, pp 643-648, 1989.

"Analytical Procedures for the Analysis of TCDD and TCDF in Food Sources," LaFleur, L., Bousquet, T., Ramage, K., Davis, T., Luksemburg, W., and Peterson, R., Presented by L. Lafleur at Dioxin '89, Toronto, Canada. Waiting publication in Chemosphere.

"Determination of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans in Pulp and Paper Industry Wastewaters, Solid Wastes, Ashes and Bleached Pulps," Luksemburg, W., Environmental Carcinogens-Methods of Analysis and Exposure Measurement-Volume 11, World Health Organization, Christopher Rappe, Editor, 1991.

“Potential Sources of Polychlorinated Dibenzothiophenes in the Passaic River, New Jersey,” Huntley, S., Wenning, R., Paustenbach, D., Wong, A., and Luksemburg, W., Chemosphere, Vol. 29, No.2, pp 257-273, 1994.

"Polychlorinated Dioxins and Dibenzofurans in Environmental Samples From China," Luksemburg, W., Mitzel, R., Huaidong, Z., Hedin, J., Silverbush, B. and Wong, A., Dioxin `96, Vol. 28, pp 262-263, 1996.

"Transport of Chlorinated Dioxin and Furan Contaminants in Pentachlorophenol-treated Wood to Milk and Adipose Tissue of Dairy Cattle," Fries, G., Wenning, R., Paustenbach, D., Mathur, D., and Luksemburg, W., Dioxin '96, Vol. 29, pp 447-449, 1996.

"Polychlorinated Dioxins and Dibenzofurans in Environmental Samples from China," Luksemburg, W., Mitzel, R. S., Hedin, J. M., Silverbush, B. B., Wong, A. S., Zhou, H. D., Dioxin `96, Vol. 28, pp. 262, 1996.

"Polychlorinated Dioxins and Dibenzofurans (PCDDs/PCDFs) in Environmental and Human Hair Samples Around a Pentachlorophenol Plant in China," Luksemburg, W., Mitzel, R.S., Hedin, J. M., Silverbush, B. B., Wong, A. S., Zhou, H. D., Dioxin `97, Vol. 32, p. 38, 1997.

"A Congener Specific Evaluation of Transfer of Chlorinated Dibenzo-p-dioxins and Dibenzofurans to Milk of Cows Following Ingestion of Pentachlorophenol-Treated Wood", Fries, G., Paustenbach, D., Mather, D., Luksemburg, W., Env. Sci. Technol., Vol. 33, p. 1165-1170, 1999.

"Complete Mass Balance O Dietary Polychlorinated Dibenzo-p-dioxins and Dibenzo furans in Dairy Cattle and Characterization of the Apparent Synthesis of Hepta- and Octachlorodioxins", Fries, G., Paustenbach, D., Luksemburg, W., J. of Ag. And Food Chem., Vol. 50, #15, pp. 4226-4231 2002.

"Occupational Contamination with PCDD/F During Recycling of Non-Gamma HCH in a Chinese Chemical Factory. Part IV Comparison of Samples In and Outside the Factory with Isomer and Congener Patterns", Olie, K., Coenraads, P., Tang, N., Wong, A., Dioxin 2002, Vol. 56, pp. 307-310, 2002.

"Polychlorinated Dibenzodioxins and Dibenzofurans (PCDDs/PCDFs) Levels in Environmental and Juman Hair Samples Around an Electronic waste Processing Site in Guiyu, Guangdong Province, China", Luksemburg, W., Mitzel, R., Peterson, R., Hedin, J., Maier, M., Schuld, M., Zhou, H., Wong, A., Dioxin 2002, Vol. 55, pp. 347-350, 2002.
"Benthic, Infaunal Community, Sediment Toxicity and Bioaccumulation Potential of PCDD/Fs in Sediments from Arcata Bay, California", Moore, D., Diener, D., Irwin, M., Wenning, R., Mackey, L., Luksemburg, W., Dioxin 2003, Vol. 62, pp. 5-8, 2003.

Levels of Polybrominated Diphenyl Ethers (PBDEs) in Fish, Beef, and Fowl Purchased in Food Markets in Northern California USA, Luksemburg, W., Wenning, R., Patterson, A., and Maier, M., Presented at BFR 2004, June, 2004, Toronto, Canada.

Levels of PCDD/PCDF, PCBs and PBDEs inWild and Farm Raised Fish, Luksemburg, W., Maier, M., Patterson, A., USEPA National Forum on Contaminants in Fish, San Diego, CA USA (2004).

Levels of Polybrominated Diphenyl Ethers(PBDEs) in the Hackensack River and Newark Bay, New Jersey USA, Wenning, R., Von Burg, A., and Luksemburg, W., Presented at BFR 2004, June, 2004, Toronto, Canada.

PROFESSIONAL AFFILIATIONS

American Society for Mass Spectrometry
American Chemical Society
Technical Association of the Pulp and Paper Industry
Society of Environmental Toxicology and Chemistry
American Association for the Advancement of Science

Martha M. Maier

Laboratory Director

EDUCATION

B.S.	Chemistry, University of Wisconsin, Madison, WI (1983)
B.S.	Philosophy, University of Wisconsin, Madison, WI (1983)

EXPERIENCE

Present — **Laboratory Director, Vista Analytical Laboratory, Inc.**
The Laboratory Director for Vista Analytical Laboratory, formerly Alta Analytical, oversees the routine operations of the laboratory. Performs the interpretation and final review of analytical data, and issues final reports. Acts as a liaison between the laboratory and the Quality Assurance department. Project manager for routine and special projects.

1999-2001 — **Director, Ultra-Trace Analyses Group, Paradigm Analytical Laboratories, Inc**
Responsible for extractions, analyses, final review and processing of all data generated by the group. Served as project manager. Oversaw the development of analytical procedures for the analysis for PCBs by HRMS (Method 1668A), as well as the implementation of NELAP certification.

1998-1999 — **Bioanalytical Project Manager, Alta Analytical Laboratory**
Liaison between pharmaceutical clients and the Liquid Chromatography Mass Spectrometry (LCMS) Services group, ensuring efficient study management and timely reporting of laboratory results. Directed all phases of study conduct, including: review of study protocols and sponsor Standard Operating Procedures; initiation, maintenance and review of study and raw data files; scheduling of sample analyses; and preparation of final reports.

1992-1998 — **Associate Scientist, Alta Analytical Laboratory**
Involved in sales and project management. Directed sample analysis, reviewed data and prepared reports. Presented papers and gave educational seminars and presentations on dioxin/furan analysis. Arranged exhibit schedule and represented the laboratory at technical meetings and industry conferences. From 1992-1997, acted as laboratory representative for the Eastern U.S., both in sales and project management capacities.

1990-1992 — **Technical Sales, Enseco-Cal Lab**
Coordinated the dioxin/furan marketing program. Prepared bids, organized exhibits, and oversaw the production of marketing materials. Acted as a liaison between the salespeople and the dioxin/furan laboratory.

1988-1990	**HR GC/MS Operator, Enseco-Cal Lab** Dioxin/furan analysis of pulp, food, and low-level environmental samples using high resolution GC/MS. Promoted to scientist position in December 1989. Involved in data review and project management.
1987-1988	**GC/MS Operator, Enseco-Cal Lab** Dioxin/furan analysis using low-resolution GC/MS systems. Promoted to lead person in May 1988.
1986-1987	**GC/MS BNA Operations Supervisor, Radian Corporation** Responsible for the scheduling and completion of all semi volatile analyses. Trained other operators in BNA analysis and routine instrument maintenance.
1984-1986	**GC/MS Operator, Radian Corporation** Analyzed environmental samples for volatile and semi volatile organic pollutants using EPA Methods 624, 625, SW-8240, SW-8270, and by EPA Contract Lab Protocol. Performed routine maintenance on all systems. Responsible for interfacing the GC/MS lab with the laboratory database management system.
1984-1984	**Analytical Chemist, Wisconsin Department of Agriculture** Assayed pesticide formulations using HPLC, GC, and TLC. Researched, developed and modified methods.

QUALIFICATIONS

Ms. Maier has over 22 years of experience in the environmental laboratory, including 19 years of specialization in dioxin/furan analysis.

AFFILIATIONS

Air & Waste Management Association
American Chemical Society
Technical Association of the Pulp & Paper Industry

Rose M. Harrelson

Quality Assurance Manager

EDUCATION

B.S. Physiology, University of California, Davis (1989)

EXPERIENCE

Present **Quality Assurance Manager, Vista Analytical Laboratory**
Ensure compliance to the laboratory Quality System according to the National Environmental Laboratory Accreditation Program (NELAP) standards and Alta's Quality Manual (QM); review and manage performance of MDLs, IPRs, PE samples; review data packages for compliance and completeness; maintain state certifications; maintain and update SOPs; maintain and update control charts; provide employee orientation and training; maintain and update QM and SOQ.

2001 – 2005 **Quality Assurance Specialist, Air Toxics Ltd.**
Technical and QA review of analytical data, technical liaison between clients and laboratory operations; create, implement, and maintain QA controls and documentation; review and revise SOPs; collection and assessment of QC data; internal and external lab audit reports and responses; implement preventive and corrective actions; manage laboratory certifications; develop, implement, and manage the internal training program; serve as project manager for proficiency testing samples.

1992 – 1999 **Quality Assurance Specialist, Quanterra Environmental Services**
Facilitated the implementation of Quality Assurance policies at the facility; performed as the QA Unit for the pesticide registration GLP program; reviewed work proposals and project plans for quality assurance aspects; coordinated audit activities at the facility; conducted QA training courses; responded to auditors regarding audits and performance evaluation samples; recommended corrective action as appropriate; maintained state certifications and agency approvals; maintained records pertaining to control charts, method validation and method detection limits, performance evaluation results, audit results, QC database, and customer service; assisted in the standardization and development of laboratory SOPs.

QUALIFICATIONS

Ms. Harrelson has over 18 years of experience in the environmental laboratory, including 15 years of specialization in laboratory Quality Assurance.

James M. Hedin

Director of Instrumentation Laboratory

EDUCATION

B.S. B.S. Chemistry, University of Minnesota, Duluth, MN (1986)

EXPERIENCE

Present **Director of Instrumentation Laboratory, Vista Analytical Laboratory**
Mr. Hedin performs routine analysis and method development work in the High Resolution Mass Spectrometry department at Vista Analytical Laboratory, formerly Alta Analytical Laboratory. He is responsible for routine maintenance of HR/MS instruments. Mr. Hedin also aids in the training of new staff, reviews and interprets data, and interfaces with clients.

1990 – 1999 **Associate Scientist, Alta Analytical Laboratory**
Mr. Hedin performs routine analysis and method development work in the High Resolution Mass Spectrometry department. He is responsible for routine maintenance of HR/MS instruments. Mr. Hedin also aids in the training of new staff, reviews and interprets data, and interfaces with clients.

1988 – 1990 **GC/MS Chemist, Enseco-Cal Lab**
As GC/MS Chemist at Enseco-Cal Lab Mr. Hedin was responsible for the operation and maintenance of quadrapole GC/MS instruments. His duties entailed sample analysis by EPA methods for volatiles and semi-volatiles. Mr. Hedin also aided in the training of the staff in the department.

1987 – 1988 **Extraction Chemist, Enseco-Cal Lab**
Mr. Hedin's duties entailed sample extraction for Dioxin/Furan Analysis by High Resolution Mass Spectrometry. He assisted in the training of new staff, and the development of new extraction techniques.

QUALIFICATIONS

Mr. Hedin has over 20 years experience in production analytical laboratories and environmental mass spectrometry. Most of this experience has involved PCDD/PCDF analysis of environmental samples and High Resolution Mass Spectrometry analysis of PCDD's/PCDFs in a variety of matrices.

PROFESSIONAL AFFILIATIONS

American Society for Mass Spectrometry

CERTIFICATIONS

Accrediting Authority	Certificate Number
State of Alaska, DEC	CA413-07
State of Arizona	AZ0639
State of Arkansas, DEQ	06-016-0
State of Arkansas, DOH	Reciprocity through CA
State of California – NELAP Primary AA	02102CA
State of Colorado	N/A
State of Connecticut	PH-0182
State of Florida, DEP	E87777
State of Indiana Department of Health	C-CA-02
Commonwealth of Kentucky	90063
State of Louisiana, Health and Hospitals	LA060002
State of Louisiana, DEQ	01977
State of Maine	2006014
State of Michigan	9932
State of Mississippi	Reciprocity through CA
Naval Facilities Engineering Service Center	NFESC413
State of Nevada	CA004132007A
State of New Jersey	CA003
State of New Mexico	Reciprocity through CA
State of New York, DOH	11411
State of North Carolina	06700
State of North Dakota, DOH	R-078
State of Oklahoma	D9919
State of Oregon	CA200001-005
State of Pennsylvania	68-00490
State of South Carolina	87002001
State of Tennessee	02996
State of Texas	T104704189-06-TX
U.S. Army Corps of Engineers	N/A
State of Utah	9169330940
Commonwealth of Virginia	00013
State of Washington	C1285
State of Wisconsin	998036160
State of Wyoming	8TMS-Q

Current certificates and lists of licensed parameters are located in the Quality Assurance office and are available upon request.