QUALITY ASSURANCE AND QUALITY CONTROL MANUAL FOR ENVIRONMENTAL SAMPLE ANALYSIS

STANDARD OPERATING PRACTICE

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ANNUAL REVIEW OF Q.A./Q.C. MANUAL

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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.

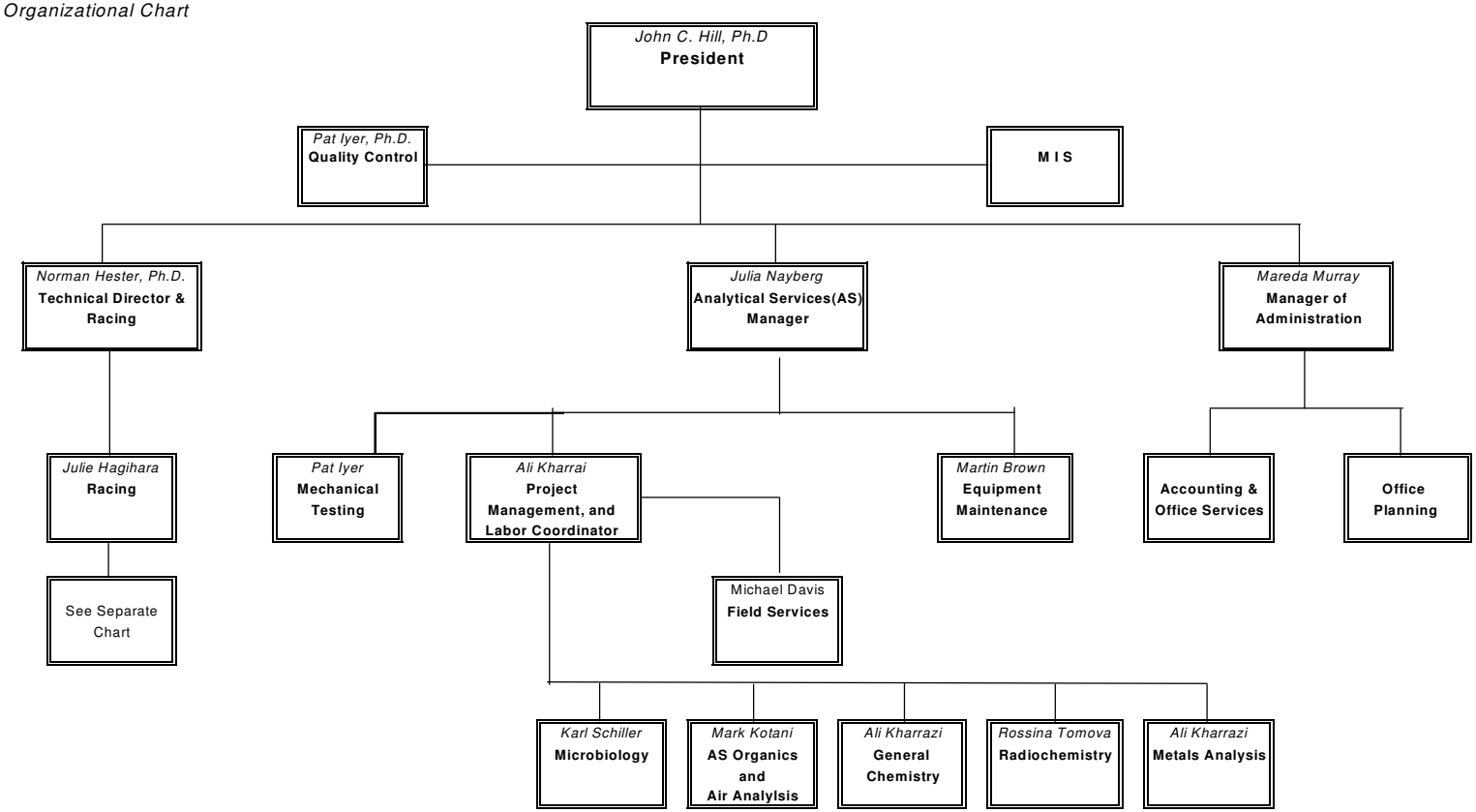
2.4 GEOGRAPHICAL AREA SERVED

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 Forensics

Accident reconstruction, failure analysis, product evaluation, mechanical, electrical, and safety investigations.

2.7.6 Safety Department

Safety manual, safety audits, safety meetings, material safety data sheets (MSDS), coordination and disposal of laboratory hazardous waste.

2.7.7 Quality Department

2.7.7.1 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.

2.7.7.2 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. 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.

2.7.8 Racing Chemistry Department

Routine Drug Testing for Equine, canine and human samples. Drug screening for stimulants, depressants, and medications. Special and legal samples.

2.7.9 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.

2.7.10 Field Services Department

Provides pickup and delivery services, sample collection for industrial waste monitoring, NPDES monitoring and assists engineer with Flow-Meter calibration.

2.7.11 Microbiology Laboratory

Bacteriological examinations, fungus contamination studies, fungus and bacteria resistance. Product efficacy testing. Asbestos determinations. Particle counts. Food contamination studies. Microscopic evaluations.

2.7.12 Instrumental Methods Department

Organic chemical analysis with modern instrumentation. Gas Chromatography, Gas Chromatography/Mass Spectrometry, High Pressure Liquid Chromatography, and UV Spectrometry.

2.7.13 Air Analysis Laboratory

Processes flows of stacks on boilers, dryers, and reactors, etc.

2.7.14 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.

2.7.15 Mechanical Testing Department

Analysis of physical, chemical, and mechanical properties; analysis of metals, testing of rubber, plastics, and composites; testing for product safety and qualification for assemblies. Makes microphotography. Laboratory facilities for consultants and legal investigations are available.

2.7.16 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.

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.

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.

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 to 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 that he directs and five years or more experience in one or more fields that 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 QA/QC Manager

The QA Manager shall preferably have, as a minimum of a master's degree in science or engineering with an applicable professional license or certificates in one or more fields. He must have three or more years of experience in his field.

2.10.4 Department Manager or Supervisor

A Department Manager or Supervisor shall have a bachelor's 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.

2.10.5 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.

2.10.6 Technicians

The technician shall be qualified by education and/or experience to perform inspections, testing or analysis and should be a high school graduate with some college training. The technician should strive for any applicable certificates in their field and should have sufficient on-the-job training and/or trade school experience. 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 ($4^{o}C$)), and frozen ($-20^{o}C$). 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 individual department supervisor shall be responsible for his own instruments. Outside vendors usually call Truesdail with the calibration due date and perform the calibration. A central file shall be created indicating the name of the instrument and calibration due date and will be kept by the Quality Assurance Manager. Inspections shall be performed by the quality department to ensure compliance. Any equipment found past due will be impounded or appropriately tagged. Substitute equipment is to be made available where needed. Equipment that is currently performing a test shall not be impounded without replacement.

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 checklist 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 goes to the department supervisor. A complete set of audit findings is submitted to the President.

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 that 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. The first and second floors of the laboratory are 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 that 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 that 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 that 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", by monitored inventory control, and by 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^{o}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^{o}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^{o}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.

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 client or 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 then 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 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 are 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. All chemicals not rapidly consumed in the course of testing shall be dated upon stocking and 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 after re-certification and establishment of a new expiration date.

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^{o}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

Copies of our certifications are given in Appendix F. We are currently certified or accredited by the following organizations:

- California Department of Health Services, Environmental Laboratory Accreditation Program (ELAP) Certificate
- Environmental Protection Agency (EPA) ICR Chemistry Laboratory Approval
- Environmental Protection Agency (EPA) UCMR Testing for Perchlorate
- 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
- IAMPO Research and Testing

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	Julia Nayberg

A.3 ANALYTICAL SERVICES GROUP

Manager	Julia Nayberg, M.S.

A.3.1 Group Leaders/Managers

Water and Waste	Sean Condon, B.S.
Instrumental Methods	Mark Kotani, B.S.
General Chemistry	Ali Khazzari, M.S.
Microbiology	Karl Schiller, M.S.
Field Services	Michael Davis
Radiochemistry	Rossina Tomova, M.S.
Metals	Ali Khazzari, M.S.

A.4 RACING CHEMISTRY

Manager	Dr. Norman Hester, Ph.D.
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	Dr. Pat Iyer, Ph.D., P.E.
Hazardous Waste Manager	Dr. Pat Iyer, Ph.D., P.E.

A.9 FACILITIES DEPARTMENT

Manager	Martin Brown, B.A.

APPENDIX B – SAMPLE FORMS

B.2-4 Quality Assurance Audit
B.5 Q.A. Corrective Action Request
B.6 Controlled Stamp Record
B.7 Calibration History Record
B.8 Laboratory Record “Green Sheet”
B.9 Laboratory Workbook Record
B.10 Survey Checklist – Calibration Services
B.11 Chain of Custody Form
B.12 Sampling Guide

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: _____

CONTROLLED STAMP RECORD

CALIBRATION HISTORY RECORD

LABORATORY RECORD "GREEN SHEET"

LABORATORY WORKBOOK RECORD

SURVEY CHECK LIST – CALIBRATION SERVICES

CHAIN OF CUSTODY FORM

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

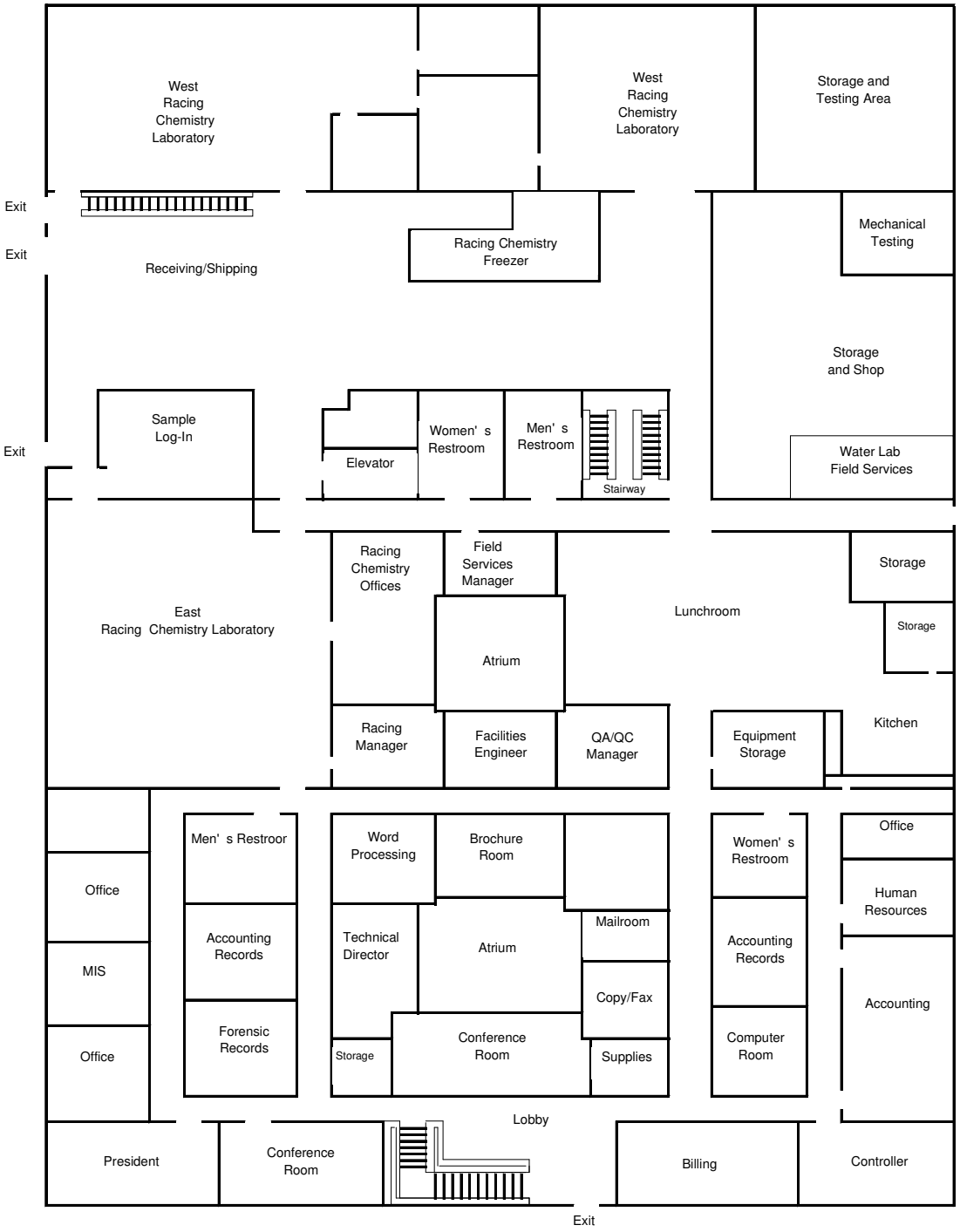
Soil samples are typically collected in brass or steel tubes and wide mouth jars (500ml) with Teflon-lined caps and preserved at 4°C.

G = Glass
P = Polyethylene
G-A = Amber Glass
VOA = Glass vial with Teflon-lined septum
G-TLC-A = Amber Glass with Teflon-lined cap

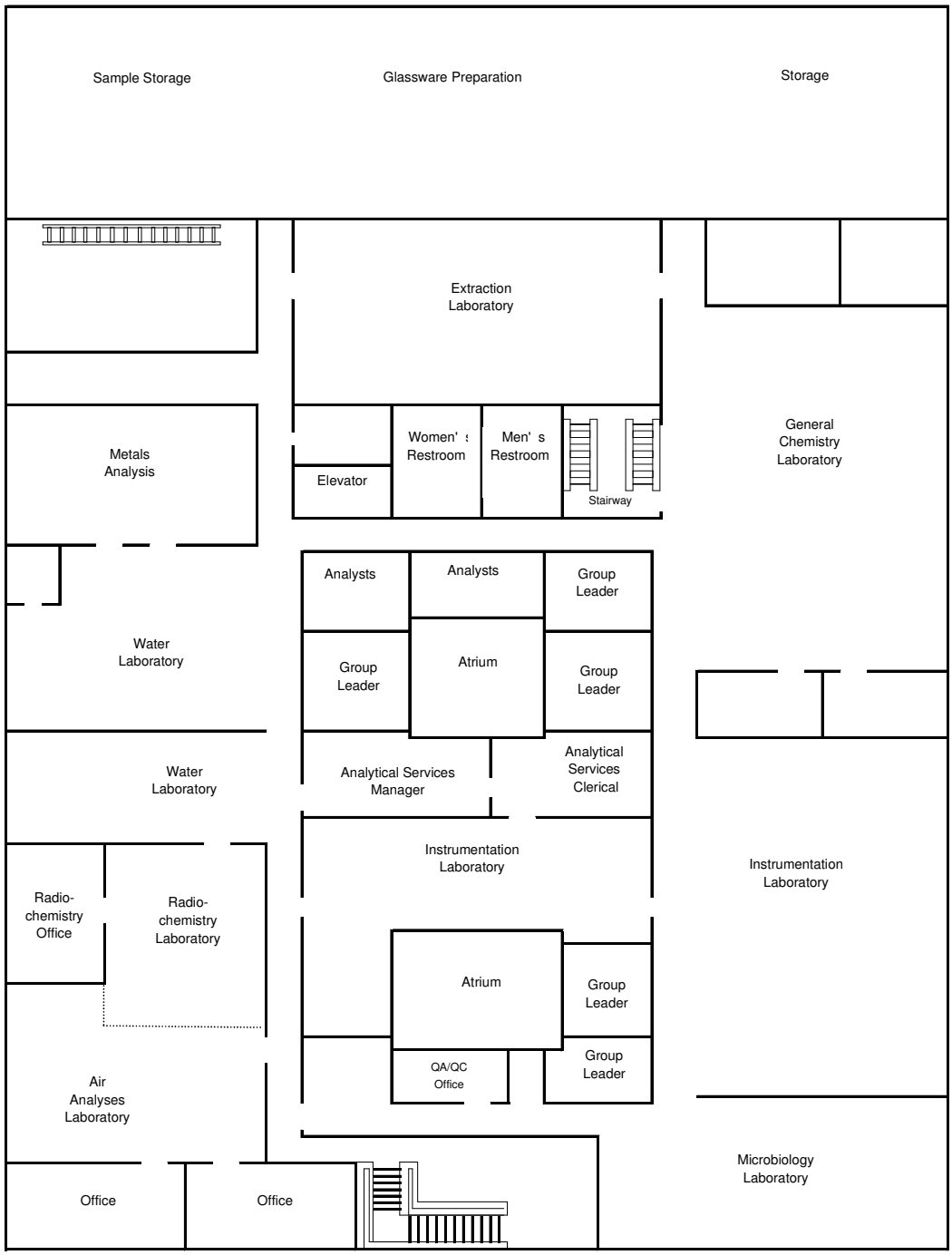
* The methods listed are EPA references, except for SM which references *Standard Methods for the Examination of Water and Wastes*, 19th. Edition. We also reference 40CFR, Part 136.

** 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^{o}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 areas, 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. Purchase dates are given in parentheses. All listed equipment is maintained and functional. GC/MS equipment is on service contracts. 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 with NIST Mass Spectral Library (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 - Aqilent (Hewlett-Packard 6890 GC Dual ECD' s, Chemstation Data System) (2004)

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)

5 - EZ Chrom Chromatography Workstations (Dual Instrument) (2000)

8 - Dynamic Solutions Chromatography Work Stations (1987-1991)

- NEC at Computer, 1.2 MB Disc, 20 MB Disc
- 8-Detector Data Acquisition Board

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 1700 square feet. This department is responsible for air contaminant analyses, CARB emissions determinations, air quality compliance testing, and emissions testing research and development.

The following major equipment items are available:

Analytical

4 - ORSAT Analyzer Absorption Spectrometer

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_____

A. QUALITY CONTROL CHARTS FOR ENVIRONMENTAL PARAMETERS

A discussion of the statistical basis for accuracy and precision determinations was given in Section 3.4. In this Appendix, we are presenting examples of some quality control charts for several parameters from different types of determinations.

- Volatile Organics by Gas Chromatography/Mass Spectroscopy

  EPA 524.2

  1,2-Dichloroethene

  Benzene

  Trichloroethane

- Semi-Volatile Organics by Gas Chromatography/Mass Spectroscopy

  Bis (2 ethylhexyl) phthlate

  Benzo(a)pyrene

- Herbicides by Gas Chromatography EPA 515.1

  Silvex

- Inorganics by Ion Chromatography EPA 300.0

  Chloride

  Nitrate

B. 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.

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
- 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

APPENDIX G – DISTRIBUTION LIST

Copy Number	Assigned To	Date
Original	President - John Hill	7/05
1	QA/QC Manager– Pat Iyer	7/05
2	Technical Director – Norman Hester	7/05
3	Technical Director – Norman Hester	7/05
4	Controller - Mareda Murray	7/05
5	Air Analysis – Jeff Swallow	7/05
6	Microbiology - Karl Schiller	7/05
7	Chemistry – Ali Khazzari	7/05
8	Water – Julia Nayberg	7/05
9	Radiochemistry – Rossina Tomova	7/05
10	Instrumentation – Mark Kotani	7/05
11	Instrumentation – Mark Kotani	7/05
12	Instrumentation – Mark Kotani	7/05
13	Extra Copy – Norman Hester	7/05
14	Extra Copy – Norman Hester	7/05
15	Word Processor -	7/05
16-25	Clients	7/05