ENVIROMATRIX ANALYTICAL, INC.

QUALITY ASSURANCE PROGRAM MANUAL

This document has been prepared by EnviroMatrix Analytical, Inc. (EMA) and is approved by EMA Management. It will be reviewed on an annual basis and modified as necessary.

The material contained herein is not to be disclosed to or made available to any third party without the prior expressed written approval of the EMA Quality Assurance Director.

Document Approval and Release

Leland S. Pitt President/CEO		1/15/07
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1.0 Quality Assurance Policy

The entire EnviroMatrix Analytical, Inc. (EMA) staff is dedicated to providing reliable, superior quality analytical data to our clients. EMA management believes that Quality Assurance is not simply a management function, but that **every individual** in the laboratory is responsible for ensuring the quality of their analytical data. Therefore, each person within the laboratory is fully trained in evaluating data, monitoring control limits, and taking the corrective action necessary to assure a reliable, superior product for all EMA clients.

1.1 Purpose

The purpose of the Quality Assurance Program is to ensure that all information, data, and resulting decisions compiled under a specific task are technically sound, statistically reliable, and properly documented.

The EMA Quality Assurance Program Manual communicates to employees, clients, and certification organizations EMA's quality assurance policies and procedures.

The Quality Assurance Program Manual defines the purpose, organizational structure, and operating principles of the laboratory. The Quality Assurance Program Manual governs all activities and personnel of EMA including all aspects of administration, sample receipt, sample control, sample preparation, inorganic analysis, organic analysis, quality assurance, sample and waste disposal, data entry, and report production. Any deviation from this program must be approved by the Quality Assurance Director.

Quality Assurance is the structure within an organization which plans, designs, and monitors the frequency and methods of the checks, audits, and reviews necessary to identify problems and dictate corrective actions.

Quality Control is the mechanism or activities through which Quality Assurance achieves its goals. It is the methodical maintenance of strict quality through all activities from sample receipt through report generation; including standard preparation, instrument maintenance, calculation, recording of results, etc.

Quality Control is the function and responsibility of each individual within the laboratory.

1.2 General Description

EMA Quality Policy Statement

"The entire EMA staff is committed to consistently providing our clients with data which is statistically reliable, technically sound, and of the highest quality."

The contents of this Quality Assurance Program Manual describe the activities which are utilized in order to ensure this commitment is maintained.

Written analytical procedures (Standard Operating Procedures – SOP) are used to ensure strict adherence to approved analytical methods throughout the laboratory. Bench-level quality control measures with established acceptance criteria are included in each analytical procedure employed by the laboratory. Laboratory records and quality control data are monitored by management on a regular basis.

This manual describes the Quality Assurance Program adhered to by EMA and has been written by EMA personnel and approved by Management. All EMA staff has received copies of this manual and is required to comply with the program's stated goals, requirements, and responsibilities. The Quality Assurance Director has been designated to monitor the program and report program findings to the President and the Laboratory Director.

EMA is a State of California Department of Health Services fully accredited laboratory under the Environmental Laboratory Accreditation Program. EMA is evaluated by external audit under this program and certification is granted for a term of two years. Additional information as to the scope and expiration of this certification is presented in Appendix H.

EMA has been granted approval from the United States Department of Agriculture to handle foreign soil. This approval grants EMA permission to import and ship foreign soil as well as soils from Hawaii, Guam, Puerto Rico, and the US Virgin Islands. The approval is granted for a term of five years and expires March 31, 2007, whereupon it will be renewed.

1.3 Objective

The Quality Assurance Program is designed to provide EMA and its clients with accurate and reliable data.

The Quality Assurance Program ensures that EMA produces valid data for all analytical procedures. In order to accomplish this objective, the following criteria must be achieved:

1. All procedures and practices must be accepted by both the client and/or regulatory agency.

2. A program must be in place to monitor, document, and improve the performance of EMA.
3. There must be a mechanism for correcting problems which are determined by the Quality Assurance Program.

Specific objectives of our performance standards are:

1. Laboratory practices and methodologies are routinely updated and developed as new and improved methods and practices become available.
2. Only trained personnel having the appropriate expertise perform assigned tasks.
3. All data is reviewed prior to release to ensure validity, completeness, accuracy, and precision.

1.4 Intended Use of Data

This Quality Assurance Program Manual applies to the generation of analytical data for environmental monitoring and assessment programs. This Quality Assurance Program has been designed to meet the requirements of various federal and state regulatory agencies with which clients need to comply. The data generated under this Quality Assurance Program is provided in support of investigations or monitoring of sites that will have significant environmental impact on the public and private sector.

2.0 Laboratory Organization and Responsibility

EMA is a full-service environmental laboratory specializing in analytical services and is the sole laboratory operating under this quality management system. EMA maintains three locations that include the main facility and two auxiliary laboratories:

Main Facility	Auxiliary Facility
4340 Viewdridge Avenue	4380 Viewridge Avenue
Suite A	Suite B
San Diego, CA 92123	San Diego, CA 92123
858-560-7717	858-430-0379

EMA provides analytical testing services for the environmental industry. Services include:

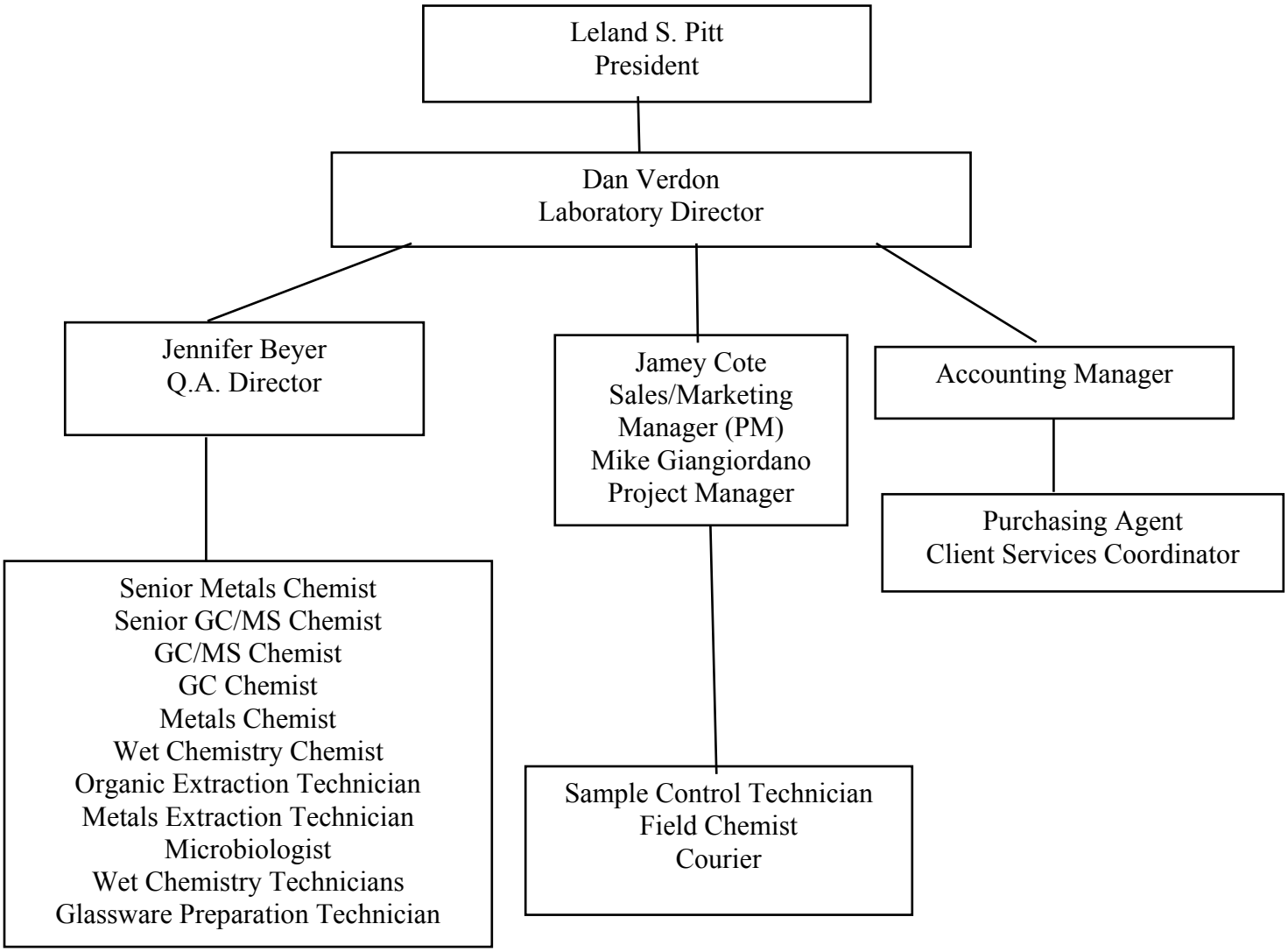
- Classical chemistry (titrametric, gravimetric, colorimetric, infrared, etc.),
- Inorganic chemistry by Atomic Absorption (cold vapor), Inductively Coupled Plasma-Mass Spectrometry, and Inductively Coupled Plasma-Atomic Emission Spectrometry,
- Organic chemistry by Gas Chromatography (GC) and Gas Chromatography/Mass Spectrometry (GC/MS),
- Microbiology by Multiple Tube Fermentation, Presence/Absence Media, and Plate Count.

A list of analytical services and methods performed by EMA is presented in Appendix E.

A list of major instrumentation and equipment used by EMA is presented in Appendix F. EMA has been operating as an analytical laboratory since 1974. EnviroMatrix Analytical, Inc. (EMA) was incorporated in the State of California on July 10, 1992.

The success of the quality assurance program is the responsibility of key laboratory personnel. All laboratory chemists and technicians are vested with the authority to stop work in response to quality related problems. Personnel notify their supervisor and the Quality Assurance Director immediately if any quality related problems or out-of-control events occur. In the temporary absence of their supervisor, lab personnel notify another member of laboratory management.

EnviroMatrix Analytical, Inc.
Organizational Chart



2.1 The President

The President of EMA approves overall policy, including the Quality Assurance policy and goals contained in this Quality Assurance Program. The president maintains the ultimate responsibility and authority for quality related matters.

2.2 Laboratory Director

The Laboratory Director is ultimately responsible for the timeliness and reliability of all analytical data.

The Laboratory Director's responsibilities with respect to the Quality Assurance Program are to:

- Supervises all department supervisors and chemistry laboratory personnel;
- Oversee and coordinate instrument and equipment maintenance;
- Review work procedures and daily laboratory practices;
- Training of laboratory personnel;
- Implement and develop new methodologies;
- Oversee the implementation of valid and reliable quality control procedures;
- Oversee the administration of quality control procedures;
- Oversee the implementation of corrective action(s);
- Oversee performance evaluation and auditing;
- Review analytical data and reporting to clients.

2.3 Quality Assurance Director

The Quality Assurance Director is responsible for the operational budgeting, laboratory management, and the Quality Assurance Program activities.

Duties are to:

- Prepare and maintain the financial operational budget;
- Develop mechanisms to carry out quality objectives;
- Administrate quality control procedures;
- Implement corrective action(s);
- Manage a document control numbering system;
- Performance evaluation and auditing;
- Liaison with regulatory agencies;
- Propose Quality Assurance Program amendments, provide feedback, and conduct Quality Assurance training.
- Train and monitor chemists and technicians in implementation of Quality Assurance/Quality Control procedures;
- Review final analytical reports for accuracy and completeness;
- Manages all facets of the EMA safety program.

2.4 Project Managers/Project Coordinators/Sales Manager

The Project Managers and Project Coordinators have responsibilities relating to the Quality Assurance Program. They are to:

- Respond promptly to client needs and inquiries;
- Track project reports to ensure they are delivered on time;
- Communicate any client inquires or concerns promptly to the appropriate management person (i.e.: President, Vice-President/Laboratory Director, or other Project Manager);
- Ensure that all client inquires are resolved by continued communication and follow-up;
- Act as client advocate;
- Determine any client project specific quality assurance or deliverable needs and communicate those needs to the laboratory through written and verbal notification;
- Define, document, and communicate work requirements for specific projects to the laboratory through written and verbal notification;
- Communicate changes in project requirements during the course of work to laboratory personnel through written and verbal notification.

2.5 Sample Control Technician (Sample Receiving Coordinator)

The Sample Control Technician is responsible for sample integrity, sample holding time adherence at receipt, proper container usage, proper sample storage, and sample custody.

Duties include to:

- Receives all client samples and enters project and samples into the EMA LIMS system;
- Labels all client samples and tracks the internal chain-of-custody.
- Prepares preserved sample containers and adds preservatives to incoming samples where indicated (includes documentation of pH for all metal samples);
- Document sample condition as received;
- Inform client, and/or Laboratory Director or chemists of any holding time considerations;
- Maintains internal chain-of-custody through sample control;
- Ensure and document proper sample container type;
- Control sample storage;
- Implement prescribed procedures for sample receipt and log-in;
- Document project-specific requirements or changes in project requirements during the course of work on the daily in-house aging report;
- Maintains logbook of daily verification of all laboratory balances (as well as refrigerator temperatures).

2.6 Department Supervisors/Senior Chemists

The Laboratory Department Supervisors are responsible for the daily operation of their respective area.

Their duties as they relate to the Quality Assurance Program are to:

- Make recommendations for technical decisions to the Laboratory Director;
- Develop, review, and evaluate test procedures;
- Assist in the training and monitoring of chemists and technicians in implementation of Quality Assurance/Quality Control procedures;
- Ensure completion of analytical work within the requested turn-around time and prior to expiration of sample holding time;
- Initiate or respond to required corrective action(s);
- Perform method detection limit and instrument detection limit studies on instruments used.

2.7 Laboratory Chemists and Technicians

The Chemist's duties as they relate to the Quality Assurance Program are to:

- Comply with Quality Assurance Program requirements and method specified Quality Control;
- Maintain a clean and safe working environment;
- Implement any prescribed corrective action(s);
- Utilize only methodologies as approved by EMA and follow EMA Standard Operating Procedures (SOPs);
- Keep accurate laboratory records;
- Routinely check expiration dates of reagents prior to initiating work, and make fresh reagents when necessary.

2.8 Purchasing Agent

The Purchasing Agent's duties in relation to the Quality Assurance Program are to notify Laboratory Director immediately if incoming purchase requisitions request materials of a different quality or source (vendor) than prior orders. Purchase requisitions that request materials that vary from prior approved materials must have an indication that the Laboratory Director has approved such action.

2.9 Client Services Coordinator/Administrative Assistant

The Client Services Coordinator duties in relation to the Quality Assurance Program are to:

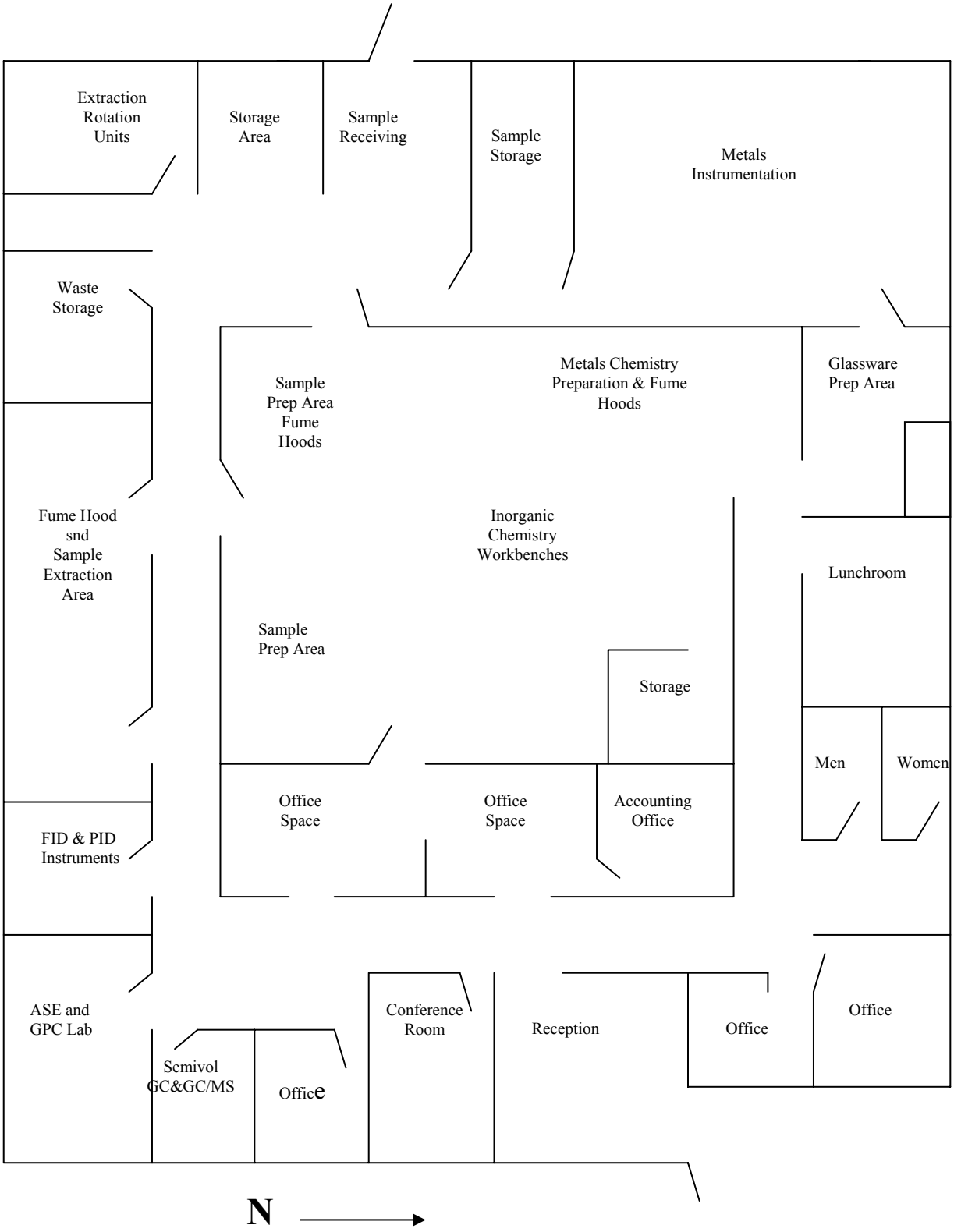
- Use approved report formats;
- Double check work prior to sending by proofreading;
- Ensure completion of report deliverable prior to due date;

- Files and maintains copies of all analytical reports and project information.
- Scans all incoming COCs into the EMA Server Files.
- Creates and emails PDF reports when required.

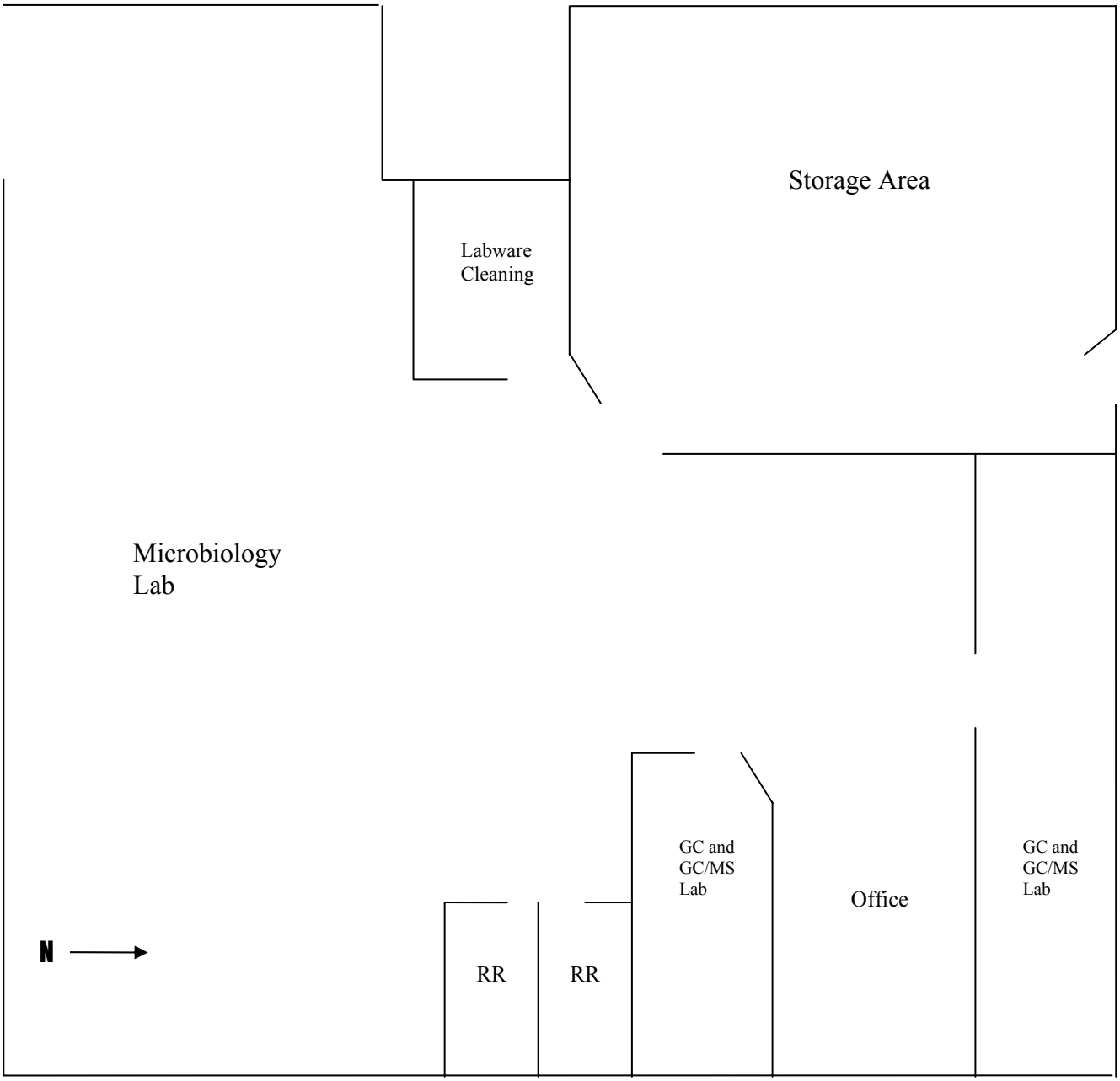
3.0 Facilities

EMA occupies one approximately 6,000 square foot building of which 90% is dedicated to the analytical laboratories. EMA maintains two additional auxiliary laboratories which include one approximately 1800 square foot building within the same business complex of which 65% is dedicated to the analytical laboratories and one approximately 900 square foot building located in National City to provide additional hood space for extractions and digestions. Separate laboratory areas are dedicated to volatile analyses, semivolatile analyses, inorganic analyses, microbiological analyses, extraction for organic analyses, digestion for metals analyses, sample receiving/sample preparation, metals analyses, and glassware cleaning.

Facility Map of 4340 Viewridge Ave. Ste. A



Facility Map of 4380 Viewridge Ave. Ste. B



4.0 Personnel Training

EMA provides all personnel with extensive training to assure all employees are provided with the necessary information to make educated, decisive and merited decisions. The guidelines set forth create parameters for all employees to follow that will aid in quality of all laboratory processes.

4.1 Quality Commitment

EMA staff is committed to providing superior service and quality. EMA management believes that achieving excellence requires the dedication of all employees and has established training programs throughout the organization to foster employee involvement and growth.

4.2 Safety Training and Compliance

A formal safety program is established in accordance with local, state and federal requirements. Safety training is provided for all laboratory employees initially upon hire and thereafter on a routine basis. The safety program is maintained by the Safety Officer with the help of the Safety Coordinator and Waste Management Coordinator.

4.3 Qualifications of Laboratory Personnel

EMA is very proud of its highly qualified and professional staff and is committed to furthering the skills of employees at all levels.

Technical training is performed by management and qualified individuals to ensure method proficiency. The staff is updated as to current technical advances at an as-needed basis. All laboratory personnel are required to acknowledge through signature that they have read and understand the SOPs appropriate for their area. All training beyond acknowledgment of SOPs is documented. Continuing qualification of laboratory personnel is demonstrated through systems and performance audits conducted by the Quality Assurance Director. Additionally, Quality Assurance training sessions are conducted by the Quality Assurance Director on a regular basis. External courses and conferences are attended when appropriate. The EMA staff further their expertise through membership in professional organizations such as:

- San Diego Environmental Professionals (SDEP)
- American Council of Independent Laboratories (ACIL)
- Professional Environmental Marketing Association (PEMA)
- Association of Environmental Professionals (AEP)
- San Diego Dry Weather monitoring workgroup

All new employees receive a comprehensive orientation to quality assurance, quality control, and safety programs administered by the Quality Assurance Director within approximately the first week of employment. All new personnel, or personnel performing a new analysis, must demonstrate proficiency through the analysis of Quality Control check samples prior to the analyst conducting independent analysis of client samples.

Copies of all training records, including the results of Precision and Accuracy Studies and single- and double-blind performance evaluations, are maintained in the Quality Assurance program files. Appendix G presents professional profiles of key personnel. Professional profiles of additional EMA staff members are available for review during a facility visit or upon special request.

5.0 Quality Assurance Objectives

The objectives of EMA are to supply precise, accurate data reports to clients which are representative of the sample supplied. All data reported are generated and calculated according to recognized standards of the environmental laboratory industry. Data reported by EMA are calculated and reported in units that are consistent with data produced by other organizations. EMA strives to present data reports that are complete and contain all data elements and supporting documentation for the type of deliverable requested by the client.

The precision and accuracy control limits utilized by EMA are based upon limits contained in the published methods. When warranted by EMA's experience with a particular method, more restrictive control limits than those cited in the method are set.

Method performance characteristics are determined prior to method use for analytical methods. This is accomplished through Precision and Accuracy, Method Detection Limit, and Instrument Detection Limit Studies performed according to standard operating procedures. Additionally, Quality Control reference materials are analyzed to verify method performance characteristics. All method performance data is compiled by the individual analyst and is documented and maintained by the Quality Assurance Director in the Quality Assurance program files.

5.1 Data Quality Characteristics

There are five recognized characteristics of data quality. They are:

Accuracy
The degree of agreement of a measurement (or measurement average) with an accepted reference or true value. It is a measure of system bias. It is usually expressed as the difference of "measured" from "true" values, or as a percentage of the difference. The accuracy of laboratory analyses can be evaluated through the concurrent analyses of standard reference materials, if available.

Precision
A measure of agreement among individual measurements of the same property under similar conditions. It is expressed in terms of percent difference between replicates or in terms of the standard deviation.

Completeness
A measure of the amount of valid data obtained compared to the amount expected to be collected under normal conditions; it is usually expressed as a percentage. The completeness objective is calculated on those samples analyzed, not the remainder archived. Data from samples are

considered to be complete if the samples have been properly collected, labeled, stored, prepared, and analyzed and the associated quality control criteria have been met.

Representativeness
Expresses the degree to which data accurately and precisely represents a characteristic of a data population, process condition, or a sample. The samples expected characterization would be compared to that obtained by laboratory analyses to evaluate the representativeness of the data to the expected data.

Comparability
Expresses the confidence with which one data set can be compared to another. To achieve comparability, the data generated will be reported using units specified in the Standard Operating Procedures as appropriate. Analytical results will be comparable to those produced from similar laboratories using the same instrumentation and methodology. This is accomplished through the following practices:

- Demonstrate traceability of standards to NIST or EPA sources.
- Use of standard and approved methodologies.
- Standardized units of measure.
- Standardized Quality Control Acceptance Criteria
- Analysis of Performance Evaluation (PE) samples to demonstrate laboratory performance.

5.2 Completeness, Representativeness, and Comparability

Prior to the results being disseminated, the report is reviewed and evaluated for completeness, representativeness, and comparability.

The report and associated data is evaluated to ensure that it is; sufficient for its intended use, representative of the matrix and conditions being measured, and representative of the method and instrument utilized.

The Laboratory Director will review and approve all EMA reports to clients.

6.0 Sample Custody

The Sample Control Technician is responsible for initiating and maintaining external and internal chain-of-custody, managing and tracking sample storage and distribution, ensuring proper containers, preservation, temperature requirements and adherence to holding time requirements. In the absence of the Sample Control Technician, only properly trained personnel may receive samples with all activities reviewed by the Sample Control Technician or the Laboratory Director. All samples received are sent through an additional review process by a qualified employee to ensure the laboratory adheres to the client's needs and representations.

Samples are physical evidence and are handled at EMA according to certain procedural safeguards. The strict adherence to chain-of-custody procedures is critical to legal proceedings and an integral part of a Quality Assurance Program. Chain-of-custody procedures are initiated during sampling events in the field and continued through laboratory analysis, and finally, the ultimate disposal or return of the sample.

EMA chain-of-custody procedures ensure traceability through proper sample handling, Quality Control procedures and internal chain-of-custody. The components of the chain-of-custody procedure include chain-of-custody documentation forms and unique sample identification numbers.

The National Enforcement Investigations Center of EPA defines custody of evidence in the following ways:

1. In a person's physical possession,
2. In view of the person after possession has taken place,
3. Secured by that person so that the sample cannot be tampered with, or
4. Secured by that person in an area which is restricted to unauthorized personnel.

6.1 Laboratory Custody Procedures

EMA has implemented the following standard operating procedures with regard to laboratory internal chain-of-custody:

- Samples are stored in a secure area except when being analyzed or prepared.
- Non-employee access to the laboratory is controlled through the use of limited access points at the facility. Outside personnel can access the building either through the front reception area or the sample receiving area.
- The designated Sample Control Technician controls access to the sample storage area.
- Samples remain in secured sample storage until removed for sample preparation or analysis.
- Each sample container is assigned a unique identifier and this identifier is used to track the sample location and status throughout the analytical process, storage and disposal.
- After the sample is assigned an identifier and logged in, sample tracking is utilized to trace the transfer of the sample from the Sample Control Technician to the chemists.
- Sample tracking is maintained through the internal chain-of-custody program in the EMA LIMS in order to document sample location and responsible party within the laboratory.
- All samples are to be returned to the Sample Control Technician and documented within the chain-of-custody program in the LIMS system.
- Any remaining samples are archived in locked storage areas, returned to the client, or disposed of properly as required by the client and federal and state regulations.

The Sample Control Technician is responsible for ensuring that all samples are maintained in a secure area while being logged-in.

Internal sample chain-of-custody is maintained through sample tracking program in the EMA LIMS. This program is used to log samples in and out of sample storage and indicate sample custody at all times. It is the responsibility of all personnel to document when a sample is in their custody.

Coolers containing samples are received through the sample receiving/sample management area. Upon sample receipt at the laboratory, samples are assigned a unique identification number and entered into the sample receipt logbook. All samples are entered into the EMA LIMS system. Details include client name, laboratory identification number, parameters requested, date received, date due and relinquishing parties.

For sample shipments that contain a temperature blank (i.e.: a separate water-filled container for verifying receipt temperature), the temperature of the water in the designated bottles will be obtained using an NIST calibrated thermometer. The thermometer will be inserted into the temperature blank as soon as possible after sample receipt; once equilibrium is reached the temperature will be recorded. In the event that there is no temperature blank present, the temperature of the samples are taken with a probe which indicates the temperature of the sample bottles. The temperature or condition of the samples on receipt will be recorded on the associated chain-of-custody.

If samples are not received within the temperature requirements or if the samples are received outside of the protocol holding time requirements, the client will be contacted and notified of the discrepancy. In the event the client cannot be contacted, the samples will be processed on an as received basis. The discrepancy is noted on the chain-of-custody.

The samples are carefully removed from the shipping container. The condition of the samples will be noted on the associated chain-of-custody form (intact, broken, leaking, etc.). The client will be contacted immediately if there is evidence of damage. Broken/damaged sample bottles will be transferred to the EMA waste drums. The coolers containing the broken samples will be rinsed several times with water; the water will be transferred to the waste drums if necessary.

The Sample Control Technician will verify agreement between the labeled sample containers and the chain-of-custody. In the event of a discrepancy, the client will be contacted immediately.

The samples will be visually inspected to determine that adequate sample volume was collected for the parameters requested, correct sample containers were utilized, and proper preservation was indicated on the label. This will be documented on the chain-of-custody form. Any problems will warrant immediate client contact.

All liquid samples requiring any metals analysis must be verified to have a pH < 2. The Sample Control Technician will maintain a logbook which will contain pH upon receipt, amount of acid added (if necessary) and pH of sample after 16 hours. Samples with pH < 2 are ready for analysis. Those which are above the required pH must be maintained at a pH of 2 or below for alt east 16 hours.

If a problem is not resolved with the client during sample delivery, the client will be notified by telephone to clarify any discrepancies found during sample log-in and stipulate corrective actions. All samples that are affected by the problem are placed in the appropriate contaminant free refrigerator and maintained at 4°C until resolved. A record of the telephone call will be kept with the chain-of-custody information in the LIMS system.

If no problems are observed, the samples are placed in sample storage areas controlled by the Sample Control Technician until analysis. Maximum holding times for samples are observed and strict sample control is maintained by the Sample Control Technician.

In the absence of the Sample Control Technician, only personnel who have been trained in sample receipt and sample custody procedures have access to samples in the sample control area.

Controlled custody of digestates and extracts is maintained by transfer documentation on extraction/digestion log forms. Digestates and extracts are stored for thirty days after analysis and are promptly disposed of thereafter.

6.2 Chain-of-custody

To trace sample possession from the time of collection, a chain-of-custody record is completed and accompanies the sample(s).

The chain-of-custody contains the following information:

- Client sample identification number;
- Signature of the collector and any person who has had the sample in their possession;
- Date and time collected;
- Sample type;
- Client name and address,
- Inclusive date of possession;
- Analyses requested;
- Intact seals present on sample containers (if applicable);
- Sample condition when received (temperature, proper container, etc.);
- Samples properly preserved, as applicable;
- Time and date sample was received and by whom.

The chain-of-custody establishes the documentation and control necessary to identify and trace a sample from sample collection to final analysis. It includes sample labeling to ensure proper identification of each sample, secure custody, and provides the recorded support information for potential litigation.

Chain-of-custody forms are used to document the integrity of all samples. To maintain a record of sample collection, transfer between personnel, shipment and receipt by the laboratory, a chain-of-custody form will be filled out for each sample or batch of samples provided by the client.

Whenever the possessions of the samples are transferred, the individual relinquishing the sample(s) signs and records the date and time of sample transfer on the chain-of-custody document. The individual receiving the sample(s) repeats the procedure. This record represents the official documentation for all sample custody transfers until the samples have arrived at the laboratory.

A copy of the chain-of-custody is provided to the client when samples are logged in at the laboratory.

7.0 Sample Security, Storage, and Disposal

The Sample Control Technician is responsible for ensuring that samples are maintained in secured storage areas under the appropriate conditions and are properly disposed of once deemed suitable.

7.1 Sample Security

Samples are kept in secured storage areas except during laboratory analysis. All laboratory personnel who receive samples are responsible for the care and custody of samples from the time each sample is received into that person's possession until the sample is returned to the Sample Control Technician.

The following security measures are employed:

- Doors to the sample storage area are secured at all times.
- Authorized personnel escort all visitors and deliveries through the laboratory from the rear receiving area or the main reception area.
- Laboratory personnel are responsible for the control and maintenance of sample integrity while they have custody of samples.

Information provided by the client about samples, recorded on the chain-of-custody or project documents, is available to analysts and can prove useful guidance when analyzing samples. EMA policies prohibit disclosure of confidential client information to third parties. All laboratory personnel are instructed to maintain confidentiality of client project information.

7.2 Sample Storage

Once samples are logged into the sample tracking system, the Sample Control Technician is responsible for ensuring the following procedures:

- Water samples for volatile analyses are stored in a separate refrigerator reserved only for volatile samples to avoid contamination. Solid samples that are to be analyzed for volatile organic compounds are to be sub-sampled prior to any other analyses being performed on those samples.
- Samples for microbiological analyses are delivered to the analyst and processed immediately. These samples are not stored due to method recommendations.
- Samples are stored in a secured area.

- Samples are removed from the shipping container or cooler and stored in their original containers unless damaged.
- Damaged samples are documented and reported to the Project Manager.
- Sample storage areas are kept secured and tidy at all times.
- Samples are removed from storage only by authorized personnel trained in sample custody procedures.
- Standards are not stored with samples.

7.3 Sample and Waste Disposal

Upon completion of the analysis, any remaining sample will be placed into long-term storage, returned to the client, or disposed of in compliance with all applicable federal, state, and local laws. All samples disposed of are documented in the LIMS system by the Sample Control Technician.

When sample analysis and all Quality Control checks have been completed and a final report has been issued, the unused sample will be stored for a period of no less than 30 days after the sample was received.

Any unused portions requested by the client shall be returned.

Laboratory waste is collected in individual laboratory areas in appropriate satellite containers labeled with water-proof labels. Labels identify the hazardous waste collected and all pertinent information from the Material Safety Data Sheets (MSDS). When filled, containers are taken to the Hazardous Waste Room and composited into larger containers for storage until transport to a designated disposal facility. The Safety Officer works with the waste transporters to obtain disposal of waste which meets regulatory standards.

Non-hazardous waters may be disposed of in sink drains as permitted by a wastewater permit granted from the City of San Diego Metropolitan Wastewater Department.

7.4 Sample Preservation and Holding Times

It is critical to sample integrity and data validity that EMA analyze samples within the method stated holding times. EMA follows regulatory guidelines for sample preservation and holding time requirements as specified by the method references. Sample holding time begins with the collection of the sample.

Appendix A contains the Sample Holding Times and Preservation Requirements which identifies holding time requirements by method and parameter for water and soil/wastes.

Adherence to holding time requirements is maintained through several laboratory policies:

- When a sample holding time is identified in terms of hours, the chain-of-custody must indicate the time of sampling.

- The Sample Control Technician verbally notifies the appropriate analyst immediately upon receipt of samples with holding times of 72 or less hours.
- All laboratory personnel receive a daily in-house aging report listing the status of requested analyses for current samples.
- All data is subject to supervisory review and audits in which adherence to holding time requirements are monitored.
- Time of analysis is reported with analytical results when requested.

Accurate sample preservation is critical for following procedural guidelines dictated by recognized standards of the environmental laboratory industry. Preservation of samples is noted in the LIMS system and if contradictory to the standardized procedure noted within the chain-of-custody. All liquid samples to be analyzed for metals must be documented in a designated logbook, recording the pH of the sample upon arrival. Liquid samples for metals analysis must be at a pH of 2 or below. Additional acid may be needed to accomplish this requirement (with an adjustment period of 16 hours before analysis). Occasionally samples will come in unpreserved whereupon the Sample Receiving Technician must sub-sample into correct containers pertaining to requested analyses.

8.0 Material Procurement and Control

Only chemicals and supplies of the quality specified in the appropriate method or Standard Operating Procedure shall be used for analyses. Purchase requisitions require review by the Laboratory Director for suitability prior to being issued. The Laboratory Director is responsible for ensuring that the materials being ordered are of the appropriate grade/quality for the methodologies.

The Purchasing Agent verifies that materials ordered are of the same grade/quality previously ordered and are requested from an approved vendor. If any deviations are noted the Purchasing Agent immediately notifies the Laboratory Director for approval/disapproval prior to placing order.

Upon receipt of orders, the purchase order is compared to the grade of material shipped to ensure that the correct quality/grade was received prior to acceptance by the laboratory.

8.1 Containers and Reagents

EMA provides required bottles, ultra-pure water (for use for trip blanks), coolers, sampling instructions, labels, ice packs, and chain-of-custody forms for sample collection. EMA utilizes EPA approved, pre-cleaned glassware for sample collection. Sample container preservatives are certified free from analytes of interest and contaminants. Compliance certificates that indicate freedom from contamination are maintained by the Sample Control Technician for each lot number of preservative and sample container.

Sample containers and preservatives are fully traceable to their sources and lot numbers through use of a logbook maintained by the Sample Control Technician. Containers provided to clients are labeled with the date the containers were prepared. All container and preservative lot numbers used for each day are recorded in a container preparation logbook along with the date that the preservative lot number was in use.

Upon request, EMA will provide trip blanks to clients.

8.2 Calibration Standards and Reagents

The chemicals and reagents used by EMA are selected with care. Reagent lot numbers are recorded for every analytical batch processed. Analytical reagent grade is the minimum quality used within the laboratory. Ultra pure/trace metal free acids are employed for low detection limit metals analysis. Pesticide grade solvents are used for all organic extractions. The extraction solvents are treated to all steps of the sample preparation and analysis process.

The following acceptance criteria applies to solvents:

- No analyte present at concentrations equal to or greater than one-half the reported detection limit.
- No non-analyte peak present in the test chromatogram greater than 10% of the closest internal standard for GC/MS analysis or which would interfere with the identification and quantitation process for GC analysis.

Records showing the reagent lots employed are maintained for all analyses. The method blank serves as a continual verification of the quality of the reagents as well as the quality of the analytical laboratory environment.

8.3 Equipment Procurement

Only equipment and supplies of the quality specified in the appropriate method or Standard Operating Procedure shall be used for analyses. Purchase requisitions require review by the Laboratory Director for suitability prior to purchase orders being issued, The Laboratory Director is responsible for ensuring that the materials being ordered are of appropriate grade/quality for the methodologies.

Upon receipt of orders, the purchase order and requisition are compared to the grade of the material shipped to ensure that the correct quality/grade was received prior to acceptance by the laboratory. The Sample Control Technician is responsible for receiving products and is required to date and initial the invoice as verification of material acceptance.

9.0 Analytical Procedures

EMA utilizes methodologies from the following accepted standard references:

- Methods for the Chemical Analysis of Water and Wastes,
- EPA-600/4-79-020, Revised 1983.
- Test Methods for Evaluating Solid Waste, EPA-SW-846, Revised 1996.
- Federal Register, 40 CFR Part 136, 2000.
- California Code of Regulations, Title 22, Divisions 4 and 4.5.

Additional methods are taken from:

- Inland Testing Manual, EPA 823-B-98-004, February 1998.
- Recommended Guidelines for Measuring Metals, Organics Compounds in Puget Sound Marine Water, Sediment and Tissue Samples, and related QA/QC Guideleines.
- LUFT Field Manual for Leaking Underground Fuel Tanks, DHS, Rev. March 1989.
- Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.
- American Society for Testing and Materials (ASTM).
- The United States Geological Survey (USGS).
- Association of Official Analytical Chemists (AOAC).
- NIOSH Analytical Manual.
- Air Resources Board Manual.

Additionally, EMA has developed proprietary in-house methods for some parameters.

Clients are notified by EMA Project Managers through written and/or verbal communication when non-standard or significantly modified methods are to be used. Written or documented verbal client approval is required prior to use of new, non-standard, or significantly modified methods for client sample analysis. In the absence of client direction, selection of a method to be used for analysis is determined by the Laboratory Director.

Each data report issued by EMA includes a reference to the exact method employed for the analysis.

As new methods become promulgated and the laboratory demonstrates capability of performing new methods, SOPs are revised and updated accordingly to replace existing methods. Only the most recent revision for a method is used. Revised SOPs issued to personnel are accompanied by a form which personnel sign and date indication that they have read and understand the procedure.

Capability of performing an analytical method must be demonstrated prior to client sample analysis for all new and modified methods, This is accomplished through personnel training, QC Check sample analysis, Method Detection Limit, Instrument Detection Limit and Precision and Accuracy Studies.

Method capability data is maintained by the Quality Assurance Director in the Quality Assurance program files. The Quality Assurance Director is also responsible for ensuring that the laboratory staff is aware of the most current version for all methods.

10.0 Calibration Procedures

Calibration procedures are required in all areas of a laboratory setting. It is an essential component of quality control providing the correctness (or lack thereof) of laboratory procedures and instrumentation/equipment, to ensure that all aspects of data processing are of the utmost integrity.

10.1 Calibration Procedures and Frequencies

Instrument calibration is critical to generating accurate analytical data. EMA maintains strict controls on the calibration procedures for the various types of analytical equipment. Each instrument is calibrated prior to sample analysis in accordance with method criteria. The specific criteria for calibration can be found in each method SOP. Corrective action must be taken to remedy any out-of-control situations prior to analysis of any samples. Deviations from stated criteria are not acceptable.

Initial demonstration of capability for each instrument and analyst must be conducted before analysis of any samples. This includes performing instrument detection limit (IDL) and method detection limit (MDL) studies as well as having each analyst demonstrate proficiency to perform the method and obtain acceptable results for each analyte. IDL and MDL studies are updated according to each instrument SOP, occurring yearly in some cases or when major changes to the instrumentation are involved.

Instruments are calibrated in accordance with the appropriate analytical method and the manufacturer instructions. The analytical methods cite the appropriate calibration procedures and frequencies. In the event that the calibration specifications are not listed, a minimum correlation coefficient (R^2) of 0.99 or better is required.

Prior to the ongoing of analysis of samples, instruments are either calibrated or their calibrations verified. Calibration curves of signal versus concentration are generated on each analytical instrument. Calibration curves are established for each analyte of interest.

Most methods use either four or five (with a minimum of two) different calibration points for standardization. Current calibration curves are evaluated daily using a continuing calibration curve verification standard (CCV) or a laboratory control sample (LCS) or laboratory blank spike (LBS).

It is EMA's policy to validate all new standards against existing standards prior to use. The new standard's response factor (RF) should be within 10% of the previous standard's RF.

Hardcopy records of all instrument calibrations are maintained in the individual laboratory areas. These records are reviewed and are included in internal audits.

When calibration acceptance criteria or guidelines are available in a method, those criteria, or that of which is more stringent, are utilized. In the absence of method-stated criteria or guidelines, calibration acceptance criteria or guidelines from a similar method are considered to be technically sound.

10.2 Laboratory Standards and Reagents

Analytical standards utilized for method calibration and preparation of quality control samples are traceable to standard reference materials, or a certificate of analyses provided by the manufacturer.

Standards are purchased from approved and reputable commercial vendors such as Aldrich, Fisher Scientific, Supelco, etc. for use in all laboratory analyses. Certificates of analysis and expiration date information are received with standards and are maintained by each analyst.

Standards and reagents are dated upon opening, and the date of expiration recorded (expiration dates are determined by the vendor or indicated in the individual method SOP). This procedure establishes the order of use and eliminates the possibility of exceeding shelf life. A stock or working standard will be assigned an expiration date of the component with the shortest time of expiration.

Standards are protected from degradation, deterioration and contaminations based upon storage requirements and are stored properly to ensure chemical compatibility and integrity.

Each analytical batch corresponds to a sample preparation log (i.e., bench sheet) where all applicable reagent and standard lot numbers are recorded. Control check samples are analyzed with each analytical batch for all analytical procedures to ensure that the reagents used have not degraded or become contaminated.

Stock and working standard solutions are prepared fresh as required by their stability, and are checked regularly for signs of deterioration. Standards are properly labeled as to name, concentration, date prepared, solvent/medium, signature of person preparing the standard, and expiration date. Standards are traceable to analytical batches through the use of standard preparation logs and recorded dates on extraction/preparation logs.

The laboratory has established the following guidelines for the preparation of analytical standards:

1. Laboratory chemists who prepare standards are trained and experienced in calibration and the use of analytical measuring techniques.
2. Analytical reagent grade materials are utilized in preparation of standards.
3. Analytical measurement tools are calibrated to obtain accurate measurements.
4. All data generated are documented immediately in the appropriate standard preparation notebook.
5. Standards are properly labeled and referenced to standard preparation notebooks.

Laboratory contamination is minimized through implementation of a standard operation procedure (SOP) for glassware and lab-ware cleaning. The SOP is followed to ensure the removal of all traces of parameter(s) of interest and contaminants that could interfere with analysis.

Three grades of reagent water are used in the laboratory:

1. City water - The tap water used in the laboratory is supplied from the City of San Diego water supply. Its primary use is for the washing of glassware.
2. De-ionized water - This water is produced by passing tap water through a demineralization system. This water is used for some STLC preparations and as the final rinse for laboratory glassware.

3. Ultra-pure distilled water - This higher quality water is provided to the laboratory by an external supplier and meets specifications for Type I ASTM Reagent Water. This water is used for preparing inorganic and organic reagent blanks, reagent, solutions and standards.

Ultra-pure distilled waters are analyzed upon receipt of a new lot number to make sure that they meet pH and conductivity criteria for ASTM Type I and II Reagent Waters.

10.3 General Laboratory Equipment Calibration Requirements

Laboratory equipment requiring calibration, but not operational calibration, is checked on a routine basis for accuracy. These include; balances, ovens, refrigerators, freezers, automatic pipettes, and thermometers. Additionally, calibration is also performed and documented following maintenance and repair to show a return to control.

Each piece of support equipment is calibrated for every day of use. Calibration is documented in calibration logbooks for each piece of equipment. Acceptance criteria and correction factors observed are stated below or found in the support documents for individual pieces of support equipment. All out-of-control measurements and their resulting actions are documented on a corrective action form. The Laboratory Director and Quality Assurance Director are notified immediately of the out-of-control event. Non-compliant equipment is not used in the process of analyzing client samples. All out-of-compliance monitoring and corrective action measures are documented.

Equipment is calibrated against a standard traceable to NBS or other recognized physical or chemical constants. Calibration procedures are specified by the manufacturer, regulatory agency or method SOP. Procedures provide step-by-step detail for obtaining and documenting results. The data are kept on file in the laboratory and allow traceability to data generated under each equipment calibration. Calibration due dates are maintained by the Quality Assurance Director to maintain proper calibration intervals.

Balances
The calibration of balances are verified before each use with standard Class-S calibration referenced weights to within 0.001 grams of "true weight," and are calibrated annually by a licensed specialist across the full weight range of the balance.

Ovens/Furnace
Oven temperatures will be recorded during each use. The required temperature tolerance is $\pm 2^{o}$ C at the operating range of 60 - 300° C for ovens and 500 - 1500°C for furnaces. If the temperature is found to be out-of-control during analysis, the results of that analysis will not be reported and the analysis will be repeated after the oven has stabilized for 8 hours.

Refrigerators/freezers
The temperature in all the refrigerators shall be recorded each working day in the refrigerator logs and maintained at $4^{o}C \pm 2^{o}C$. In cases where temperatures are out of these limits, the temperature will be adjusted accordingly with the Laboratory Director's approval. Freezer control limits are

-14°C ± 2°C.

Thermometers
Every thermometer must be checked annually against an NBS thermometer of equal or greater precision. The procedures of ASTM E77-92 for calibration are followed. Errors in temperature indications of the thermometer should not exceed the scale errors as expressed in Table 1 of ASTM E1-83.

Pipets
All automatic pipets are calibrated daily according to ASTM gravimetric methods and acceptance criteria. Automatic pipets are calibrated and preventative maintenance is performed annually by an external service.

Syringes
Calibration certificates from the manufacturer and frequent replacement of syringes ensure accuracy of measurements.

10.4 Sample Storage Temperature Monitoring

Maintaining appropriate temperature during sample storage is of critical importance in the task of attaining valid data. The following procedures must be followed in order to maintain and monitor appropriate sample storage temperatures.

Upon sample receipt, samples for analysis are transferred to the appropriate storage refrigerators. A daily temperature check is performed to verify refrigerator temperature and these temperature readings are recorded on a log sheet for that refrigerator. Each refrigerator has a unique identification number and a separate Daily Temperature Log is maintained for each refrigerator. The thermometer in each refrigerator is immersed in a liquid such as glycerin or water. If a daily temperature reading exceeds the $4^{o} \pm 2^{o}C$ acceptance criterion, all project samples will be transferred to another refrigerator that is documented to be within the acceptable temperature range. The problem will be corrected, and corrective actions will be documented for the faulty refrigerator.

11.0 Analytical Requirements

Analytical instruments are calibrated at regular intervals recommended by the manufacturer and as required by ASTM, EPA, or other standard methods. Calibration of all equipment used and documentation of the calibration will be performed by individual chemists/ technicians as assigned by the Laboratory Director or by independent calibration firm.

11.1 GC/MS System Calibration

The gas chromatograph/mass spectrometer (GC/MS) systems are calibrated for mass and then tuned using specific instrument and method parameters. They are then calibrated for quantitation using the internal standard technique. Specific methods impose variations and/or different acceptance criteria

on both the tuning and the calibration practices. These specific requirements are followed per the particular method Standard Operating Procedure.

Mass Calibration and Tuning:

The calibration of each instrument is verified at frequencies specified in the methods. Calibration and tuning the GC/MS systems is instrument specific and includes the following:

- GC/MS mass calibration using perfluorotributylamine (PFTBA);
- The tune of each system is checked using 4-bromofluorobenzene (BFB) for determinations of volatiles and with dacafluorotriphenylphosphine (DFTPP) for determination of semi-volatiles;
- The required ion abundance criteria must be met before determination of any analytes.

The background subtraction performed per the methodologies is straightforward and designed to eliminate column bleed or instrument background ions. Background subtraction actions resulting in spectral distortions for the sole purpose of meeting special requirements are contrary to the objectives of quality assurance and are unacceptable.

11.2 Gas Chromatography System Calibration

The gas chromatography systems are calibrated using either the external or internal standard techniques. The specific acceptance criterion varies for different methods and can be located in the method in question or the EMA Standard Operating Procedure.

External Standard Calibration Procedure
For each analyte, or group of analytes, five or more concentration levels of standard are prepared by adding aliquots of one or more stock standards to volumetric flasks. The standard solutions are then diluted to volume with the appropriate solvent for the method. The lowest concentration standard should be at the concentration of the method detection limit (MDL). The other concentrations should define the working range of the system.

Each of the calibration standards are injected into the GC system using the same technique employed for actual environmental sample extracts. (i.e., 1-5 ul liquid injections, purge & trap, etc.) A series of calibration factors (CFs) are calculated for each analyte, at each standard concentration. The calibration curve is a plot of the relative response vs. the amount injected.

The CF = amount injected/total response (area). Multi-response (multi-peak) compounds use the total area of all peaks for quantitation or the average concentration of several peaks.

Each of the calibration standards is injected into the GC system using the same technique as actual samples. A series of response factors (RFs) are calculated for each analyte, at each standard concentration for the mass peak of interest for each analyte. The linearity (%RSD) is to be

determined and compared to the method requirement. If the criterion is not met, the standard analyses must be repeated if quantitation of unknown samples is desired.

If the quantitation criteria are not met, in certain cases, the documentation of the ability to detect the minimum detectable concentration is sufficient to determine the presence or absence of target compounds with "estimated only" concentrations provided or a qualitative determination only.

The working average calibration factor or calibration curve must be verified each working day by the injection of a continuing calibration curve verification standard (CCV). The frequency of verification is detector dependent and varies from once per day to an average of once every five samples. If the response of any analyte is outside the acceptable response for the specified method, a new calibration curve must be prepared for that analyte.

Internal Standard Calibration Procedure:

For each analyte, or group of analytes, five concentration levels of standards are prepared by adding aliquots of one or more stock standards to volumetric flasks. In addition, a known and constant amount of one or more internal standards (IS) is added to each volumetric flask and they are then diluted to volume with an appropriate solvent. The lowest concentration should be at the method detection limit. The other concentrations should define the working range of the system.

Each of the calibration standards is injected into the GC system using the same technique as actual samples. A series of response factors (RFs) are calculated for each analyte, at each standard concentration for the mass peak of interest for each analyte. The linearity (%RSD) is to be determined and compared to the method requirement. If the criterion is not met, the standard analyses must be repeated if quantitation of unknown samples is desired.

The working average response factor must be verified on each working day by the analysis of continuing calibration verification (CCV) standard. The frequency of verification is method specific.

If the response of any analyte is outside the acceptable response for the specified method, a corrective action must be taken before the analysis continues.

If the quantitation criterion is not met, in certain cases, the documentation of the ability to detect the minimum detectable concentration is sufficient to determine the presence or absence of target compounds with "estimated only" concentrations provided or a qualitative determination only.

11.3 Inductively Coupled Plasma – Optical Emission Spectroscopy (ICP-OES) and ICP-Mass Spectroscopy Calibration

The ICP-OES system is calibrated daily by an external standard calibration process. The ICP-MS is calibrated daily using an external and internal standard method calibration process. The calibration specifications may vary from method to method and can be found in the particular reference or EMA SOP for that method.

Daily Standard Calibration Procedures:

For each analyte, or group of analytes, a calibration curve is generated by preparing standards from one or more stock solutions according to the method outlined in the appropriate EMA SOP. Continuing calibration standards, containing the same analyte(s) as the calibration standards are prepared in the same manner at an appropriate concentration within the calibration curve for the specified method.

Before the analysis and determination of elemental concentrations of interest can be determined, the instrument must be calibrated. This is done by creating a calibration curve from the measurement of emission for standard solutions and a blank. To ensure calibration correctness, an initial calibration verification solution (ICV) is analyzed immediately after calibration. The ICV must be prepared from a second source vendor, i.e.; source different from calibration stock standards. Continuation of calibration validation is monitored through the use of a continuing calibration verification (CCV) solution. The CCV standard is analyzed after every 10 samples. Laboratory control samples, matrix control samples, and duplicates are also used to verify calibration and method preparation techniques. Results are generally accepted if they have a percent relative deviation (%RSD) of ≤ 20. If this criterion is not met, the sample or standard analysis must be repeated.

Results from continuing calibration standards must fall within the method specified acceptance limits. If this criterion is not met, the standard analysis must be repeated. If upon reanalysis, the standard again fails to meet this criterion, a corrective action must be taken, and the entire standardization procedure must be repeated (after source of error is indicated and resolved).

12.0 Detection and Reporting Limits

Detection levels are determined to signify the smallest amount of an analyte that can be detected in a given procedure and within a stated confidence level. These levels (limits) are defined by their purpose, ranging from levels of instrument noise, to method confidence.

12.1 Method Detection Limits

The method detection limit is the minimum concentration of a substance that can be measured with 99% confidence that the analyte concentration is greater than zero. A constituent is added to soil and water matrices to make a concentration near (within one to five times) the expected detection limit. Seven or more replicates of this sample are processed through the entire analytical method.
The MDL is determined using the standard deviation of the replicates. EMA performs Method Detection Limit Studies (MDLs) accordingly, based on each individual method criteria and for all new or modified methods. The results of all MDL studies will be reviewed by the Laboratory Director for approval before client samples are analyzed. For all analysis, the MDLs may not be higher than the regulatory limits for that parameter of interest, (taking into consideration the instrument and method limitations). MDLs must be performed for new or modified analytical methods before the analysis of client samples. All MDL data and documentation are maintained by the QA Director in the QA program files. Experimentally derived MDLs are evaluated by the QA

Director and checked against method specific MDL guidelines to ensure method performance comparable to that of peer laboratories.

12.2 Instrument Detection Limits

EMA performs Instrument Detection Limit Studies (IDLs), for initial setup and verification for an analytical instrument and any time there is a major change in or maintenance of instrumentation for a particular method. A standard with a concentration near (within one to three times) the expected instrument detection limit is made. Seven aliquots of this standard is analyzed each day on three non-consecutive days and the IDL is calculated using the pooled standard deviation. The IDL is the minimum concentration of a substance that can be identified by an instrument with 99% confidence that the analyte concentration is greater than zero.

12.3 Reporting Limits

Reporting limits take into account the sample size, matrix effects, and any dilution factors. The Reporting Limit is always greater than or equal to the MDL.

Reporting Limits are evaluated by the QA Director to verify that reporting limits are greater than or equal to the experimentally determined MDL and less than or equal to project-specific reporting limit requirements.

12.4 Practical Quantitation Limits

The practical quantitation limit (PQL) is the lower limit of concentration or amount of substance that must be present before a method is considered to provide quantitative results.

13.0 Analytical Quality Control

When a referenced method contains definitive acceptance criteria and performance criteria or guidelines for QC and calibration samples, those criteria, or more stringent criteria are required by the method SOP. Data is reviewed by the analyst to SOP criteria and accepted or rejected on that basis. When QC and calibration criteria are not listed in the method, criteria from similar methods are considered technically sound for that method.

Documenting that an approach is technically sound belongs to the analyst developing a method and is reviewed for technical merit by the Laboratory Director.

13.1 Quality Control Checks

Method blanks, laboratory control samples, and matrix spikes are required for every analytical batch. Additional QC and calibration checks may be required. The corresponding frequency and performance acceptance criteria are specified in each individual method's SOP. In the absence of SOP instruction, the Laboratory Director is consulted.

The procedures used in the laboratory to ensure analytical data quality include:

Matrix Spike, Matrix Spike Duplicate, and Duplicates - are analyzed with every analytical batch or once in twenty samples, whichever is greater. Analytes stipulated by the method or applicable regulations are spiked into the matrix spike and matrix spike duplicate sample. Selection of the sample to be spiked and/or split depends on the information required and the variety of conditions within a typical sample matrix. In some situations, requirements of the site being sampled may dictate that the person sampling select a sample to be spiked and/or split based on a pre-visit evaluation or on-site inspection. This does not preclude the laboratory's spiking a sample of its own selection. In most cases, the laboratory's selection is based on the attempt to determine the extent of matrix bias or interference on the analyte recovery and sample to sample precision.

Trip Blanks - Analysis of a sealed ultrapure water sample which accompanied samples during transit, collection, and storage. The trip blank measures cumulative contamination derived from the travel blank source water, sample transit, the sample site, and the sample storage.

Field Blank - Similar to a trip blank; the field blank is opened during the sample collection process to measure the same contamination that the trip blank measures as well as the volatile airborne contaminants which may be present at the sample location that will not infiltrate the closed sample container.

Rinse Blank - Pure water which has been poured over field sampling equipment prior to sample collection to determine the possibility of equipment contamination. The rinse blank should be collected prior to use of equipment at each sampling point. It measures the possible combined contamination associated with field sampling equipment, rinse blank source water, sample transit, the sample site, and sample storage.

Source Water Blank - Analysis of the water used to prepare the rinse blanks which measure the background contaminants present in the water used for the rinse blanks.

Laboratory Water Blank - The water used to prepare trip blanks sent out by the laboratory (stored at the laboratory). They are analyzed only if the trip blank demonstrates contamination. The laboratory blank water measures contaminants derived from the laboratory pure water and laboratory sample storage facilities.

Instrument Blank - Laboratory pure water or other pure solvent analyzed at the initiation of an analytical run sequence by an instrument or between high level samples. It measures contamination which may be present in the instrument from carry-over following the analysis of a high level sample. If contamination is present, the chemist must perform maintenance on the instrument prior to analyzing client samples.

Method Blank/Reagent Blank - Laboratory pure water that has been processed exactly the same as sample as dictated by the method procedure. It contains all of the method reagents and measures combined contamination from the laboratory pure water, the instrument, the reagents, and the

sample preparation steps. This type of blank is important in distinguishing between low level field contamination and lab contamination.

Surrogates – A pure compound added to a sample in the laboratory just before processing (according to the appropriate analytical methods) which provide information on the sample extraction procedure and/or the purge efficiency. Surrogate spike recoveries should fall within the control limits set by the laboratory in accordance with the procedures specified in the method.

Laboratory Control Spike and Laboratory Control Spike Duplicate – A certified standard reference material that is spiked into a reagent blank. It is carried through all steps of sample preparation to demonstrate method performance inclusive of sample preparation steps.

Reference Standards/Reference Samples - Purchased reference standards and matrix standards are used routinely to evaluate method/analyst performance. These standards are purchased from reputable sources with certified true values.

Calibration Blanks - A standard prepared in the same manner as other standards except that it contains no analyte. Calibration blanks are used to verify a calibration curve at a low concentration.

Calibration Verification Samples – A standard used to determine the state of calibration of an instrument between periodic calibrations, or after every 10 samples of analysis, depending on method.
Internal Standards - An element or compound that is not an analyte which is added to a prepared sample and is used to quantitate analytes.

Post Digestion Spikes - Post digestion spikes are performed when a new matrix is analyzed. An analyte of interest is spiked into a sample after digestion and analyte recoveries are determined based on the analyte concentration observed.

Interference Check Samples - One or more standards with high concentrations of interfering analytes are analyzed to check compensation for interferences.
Method of Standard Additions - A sample is analyzed and then an aliquot is spiked with the analyte of interest and re-analyzed. The original sample concentration is derived based on the recovery of the standard addition sample. This practice allows for compensation for some matrix effects.

Instrument Adjustment - Requirements and procedures are instrument and method specific. Analytical instrumentation is tuned and aligned in accordance with requirements which are specific to the instrumentation procedures employed. Additionally, EMA has service contracts with instrument manufacturers. All adjustments are documented in the instrument logbook.

Calibration - Performed in accordance with the manufacturers' requirements and the procedures specified in the applicable method. All calibration procedures are documented.

Gases – Only ultra-high purity gases, filtered on line through a 5-micron molecular sieve are used. All carrier gases also flow through an oxygen removal system and a hydrocarbon trap.

Analytical batches - A unique analytical batch number is assigned to each and every set of samples and their corresponding QC Checks. These batch numbers are created by the individual chemist or technician according to standard operating procedures and are documented in notebooks. The QC requirements and number of samples composing an analytical batch vary for each method and are specified in the individual method SOP. An analytical batch consists of a group of samples with similar matrices, which are analyzed together with the same preparation sequence and the same lots of reagents. They are prepared and analyzed within the same time period or in continuous sequential time periods. An analytical batch consists of no more than 20 samples.

Certified Reference Materials – When project requirements call for analysis of certified reference materials (CRMs), applicable CRMs are purchased through the National Institute for Standards & Technology (NIST) or other applicable vendor.

13.2 Control Chart Monitoring

Control charts are used to monitor real-time and long term assessment of data quality. Control charts for each analyte of control are prepared for both water and soil matrices. For organic analyses, the analytes which are charted are those analytes required to be present in the spiking solution based upon the current SW-846 methodology.

Each control chart consists of a center line, an upper and lower warning limit, and an upper and lower control limit. For each chart, a minimum of 20 points is included. Control charts are updated periodically to ensure quality control of analytical methods.

- The center line of the control chart is the mean of the time ordered points.
- The upper/lower control limit is defined as the mean plus/minus 3 times the standard deviation of the points.
- The upper/lower warning limits are defined as the mean plus/minus 2 times the standard deviation of the mean.

A laboratory method will be considered out of statistical control when the following are observed from the control charts:

- Any one point is outside the control limits.
- Any three consecutive points are outside the warning limits.
- Any eight consecutive points are on the same side of the centerline.
- Any six consecutive points are such that each point is larger or smaller than its immediate predecessor
- Any obvious cyclic pattern is seen in the points.

The Laboratory and Quality Assurance Directors generate the control charts using the EMA LIMS system. Out-of-control events will illicit the response of direct notification to the appropriate departmental supervisor whereby an investigation will occur. If it is determined to be an out-of-control event, and not a possible random error, corrective actions such as instrument recalibration

and sample reanalysis will be taken. Corrective actions are determined on a case-by-case incidence. All corrective actions shall be documented and maintained in the QA program files.

14.0 Project Documentation

Guidelines set forth by the EPA and other regulatory bodies maintain that a comprehensive set of documentation pertaining to each sample must be thorough and complete. At EMA, Inc. our clients are ensured that all pertinent information, including project parameters scripted by the client, are included in our records for traceability and comparative reasons.

14.1 Recording Raw Data

Laboratory data can be generated in the following ways: instrument generation of electronic data files, local generation of data using instrument software and in-house spreadsheets, manual recording of observed measurements. Reporting forms are completed by the individual analyst. Raw data is maintained in completed notebooks or data packages. Reduced raw data will be checked for error by peer review, Senior Chemists/Supervisors, and the Laboratory Director and subject to spot checks during internal audits by the QA Director.

14.2 Project Documentation Storage

There are two document categories associated with a project. The first is the project file. This file contains the following documents:

- Contracts, purchase orders, task orders, and other work authorization
- Correspondence and documentation of telephone conversations
- Project Plans and Project QA Plans (if provided)
- Project specific Statements of Work (SOWs), (if applicable)
- Project related internal laboratory correspondence

This file is under the custody of the Project Manager/Q.A. Director and available to all whom may need to retrieve the information. A majority of the information is stored in the EMA LIMS system for direct access.

The second category of document storage pertains to the analytical data gathered for the specific project. The files maintained for this sort of information include a copy of the final project report/QC report, copies of any bench sheets and raw data, as well as references to the file location of the original raw data. These files are kept throughout the lab and are under the custody of all those involved in the data process. The files will be stored in an accessible format for 5 years.

14.3 Communication of Project Requirements

Upon receipt of samples, the Sample Control Technician notes any project-specific requirements on the chain-of-custody and verbally notifies chemists and technicians of any requirements that differ

from "standard" methods. These requirements are also documented on the daily in-house aging report issued to all personnel.

When project managers receive notice of changes to project requirements during the course of work, they communicate these changes verbally to the affected chemists or technicians and in a written communication log which is attached to the project documents. They also notify the Sample Control Technician, who documents the changes on the daily in-house aging report issued to all personnel.

15.0 Data Reduction, Validation and Reporting

Data reduction includes all processes that change either the form of expression (i.e.: units) or the quantity of the data values (rounding). Data reduction often involves statistical and mathematical analysis of data and usually results in a reduced subset of the original data set (i.e.: an average of three data points). Wherever employed, mathematical procedures will be verified for accuracy of computation.

All data are generated and reduced in accordance with the method SOPs. The data can be reduced by:

1. Manual computation directly found on an instrument/analysis logbook page or data sheet or
2. Computer processing of raw data via direct instrument linkage or manual entry.

The analyst who generates the data is directly responsible for ensuring that the computations are correct and complete and that all data reduction is documented appropriately for subsequent data review and validation. Any additional equations used in the data reduction process are required to be evident in the documentation. The computations are reviewed on a regular basis for accuracy by the Laboratory Director.

The analyst is responsible for verifying that the data reduction is correct for the project, sample numbers, calibration RFs and/or correlation coefficients, units, detection limits, dilution factors, volumes/weights used and moisture correction (when applicable).

15.1 Laboratory Data

All sample preparation activities are documented by the chemist or technician performing the work in laboratory notebooks or laboratory worksheets. These serve as the primary record for subsequent data reduction.

Laboratory data is generated in the following ways: instrument generation of electronic data files, local generation of data using instrument software and in-house spreadsheets, manual recording of observed measurements. Consistent data collection is achieved through the existence and use of SOPs.

Outputs from all instruments are monitored for readability and consistency. If clarity is less than desired, corrective actions are undertaken to rectify the output based on instrument manufacturers' recommendations.

Laboratory forms, data sheets, logbooks, and reporting forms have a standard format to ensure that all pertinent information is recorded consistently. These forms are generated by the QA Director and are regularly monitored to ensure compliance with established requirements.

Analysts have control over and access to all data they have generated. Limited access policies, including password codes for computer generated data access, maintain security of data.

Data are checked for accuracy and precision by the chemist, the QA Director, and the Laboratory Director. The validity of data shall be supported by the maintenance and inspection of the following records:

- Description of calibration
- Documentation of traceability of standards
- Documentation of analytical methodologies (SOPs) and QC Methodology
- Method blank results to check for contamination and interference
- Laboratory Control Sample results will be inspected as to whether they fall inside the acceptable control limits.

15.2 Laboratory Data Validation and Reporting

Data validation is the systematic process of data evaluation for acceptance or rejection based upon a set of criteria. It is a systematic procedure of reviewing a body of data against a set of criteria to provide assurance of validity prior to its intended use.

Chemistry data validation is performed by the Chemist, Senior Chemist, the Laboratory Director, and the QA Director. Validation is accomplished through routine audits of the data collection and flow procedures and by monitoring of QC sample results.

Data validation includes dated and signed entries by chemists on the worksheets and laboratory notebooks used for all samples; the use of sample tracking and numbering systems to track the progress of the sample in the laboratory; and the use of quality control criteria to reject or accept specific data.

The raw data is compared with the report forms for agreement. The raw data and/or report forms are compared to the final LIMS Generated report for agreement. This review is the final assessment of completeness and accuracy of the data. If there is a discrepancy of any type, the standard procedure for verification and confirmation is followed.

If raw data does not agree with the forms, the cause will be determined, the source of the problem will be corrected, and all incorrect data from the point of error will be corrected. A corrective action

form will be completed to indicate the corrective action for the results and/or laboratory samples affected. Audit trails are maintained for data changes through analytical batch preparation records.

After all appropriate changes are made; another review of the data in question is performed. This will ensure that forms and raw data agree.

15.3 Data Collection and Flow Audits

Data collection and flow audits are performed routinely and include:

- Review of sample documents for completeness
- Daily review of test results
- Daily review of performance indicators and QC sample results
- Random calculation checks
- Review of all reports prior to and subsequent to data entry
- Review and approval of final report by Laboratory Director

15.4 Data Review

Data review is performed prior to release of the data to the client. It is performed as soon as possible after data acquisition in order to provide sufficient time for corrective action if required.

In the data review process, the data undergo a minimum of two separate reviews. The data are compared to information such as the expected characteristics of the sample, the sample preparation steps, and QC sample data to evaluate the validity of the results.

Corrective action is minimized through the development and implementation of routine internal system controls. Chemists are provided with specific criteria that must be met for each procedure, operation, or measurement system.

In order to prevent transcription errors, all stages of data deliverable preparation are subject to audit, peer review, and supervisory review.

Supporting material, such as chromatograms are compiled by the analyst and incorporated into the data deliverables by the data processor.

The final deliverable is reviewed for transcription and typographical errors by the Laboratory Director prior to release to the client.

15.5 Documentation

Upon completion of the project or job task, the final report will be compiled and includes a brief narrative discussion of the analyses, the analytical results, and the QC results. The final report is reviewed and approved by both the QA Director and the Laboratory Director.

A documentation control system assures that all documents for a given project are accountable and traceable. It includes chain-of-custody records, all logbooks, graphs, raw data, and other miscellaneous items.

15.6 Recordkeeping

Documentation in the laboratory is initiated by the Sample Control Technician who receives samples, assigns laboratory numbers and maintains laboratory custody logbooks which document sample movement in the laboratory.

Samples are processed together in a batch by the analysts. A batch consists of a number of samples carried through the entire analytical procedure, along with QC samples and blanks. All work performed on a sample batch is documented in laboratory logbooks which are described as follows:

Sample Receiving Logbook

This logbook lists samples as they are received into the laboratory and assigned unique sample identification numbers. This number corresponds to the LIMS generated numbering system.

Instrument Maintenance Logbook

A unique logbook is maintained for each system and used to record the maintenance and upkeep of analytical instruments.

Standards Logbook

Used for tracing all laboratory prepared or purchased standards back to certified standards or stock solutions. All standards are entered into the EMA LIMS from the vendor certified standard sheets. It indicates standard traceability. Documented in this logbook are all activities associated with the standard preparation process.

Data Notebook or Bench sheets

This is used to document all activities associated with the analytical process and recording raw data of every batch.

In some instances, analytical data recording and standards preparation may be included in a single notebook.

15.7 Rules Governing the Use of Logbooks

1. Bound notebooks with pre-numbered pages are preferred record-keeping forms. Loose sheets, if used, are ultimately secured in notebooks.
2. All writing must be legible and in ink. All numbers are clear. Corrections are made by drawing one line through the incorrect entry, entering the correct information, initialing, and dating the entry.
3. Complete information should be entered so that in an examination, it can be determined what was done, when and what the results were.

4. If any data are determined to be invalid, reasons are indicated.
5. All relevant information is included (i.e.: the manufacturer and lot number of a chemical, the specific procedure reference, etc.)
6. When work is continued in another notebook or logbook, the number of the first notebook is written in the first page of the new notebook and vise-versa for easy reference.

15.8 Document Control

Document control is accomplished through the use of a centralized location of document inventories. Records, including raw data, supporting documentation, and electronic media are retained for a minimum of 5 years. After on-site storage for one full year, records may be transferred to a secured off-site storage facility. The QA Director maintains control of laboratory generated documents.

The EMA document control system, under the control of the QA Director, ensures that methods and procedures are followed in a consistent manner.

The document control system provides for the following:

- Managerial review and approval of documents prior to issue;
- A unique document control number for each document including the QA Program
- Manual and SOPs;
- A central location for all documents;
- A systematic method for distribution of all documents;
- A tracking system for existing documents;
- Identification of document revisions;
- A mechanism for periodic review of documents;
- Cataloging and archival of outdated materials in secured storage;
- Retrieval of raw data by authorized personnel only;
- A focal point for information exchange;
- Establishment of standardized methods and procedures;
- Scheduled review and revision of documents, including QA program documents.
- Internal systems audits confirm use of current SOPs
- All quality assurance program documents are revised by the QA Director; and,
- Current revisions of documents replace older versions.

15.9 Standard Operating Procedures

The laboratory maintains SOPs for each methodology or procedure used. SOPs are updated frequently for any revisions made. Changes in documents reflect actual procedures being followed. Before any revision is made, documents are submitted to the Quality Assurance Director for approval of the proposed revision. Minor changes are those which do not affect the content or quality of the action being prescribed in the document.

An addendum, subject to review and approval by the Quality Assurance Director, may be attached to a document to reflect policy and procedural changes which become effective between revisions. These changes are then incorporated into the body of the document at the time of the next revision.

15.10 Verification of Software

All computer software used to acquire, process, or report data shall be verified upon initial use and re-verified after any modification. Manual calculations are performed to verify all computer calculations for at least one sample from every analytical batch.

Limited access policies for software and data maintain security and integrity of these systems.

EMA currently uses local and instrument software, and the Element Datasystem Laboratory Information Management Systems (LIMs). Data is backed up on a daily basis and the data storage tape removed off site daily. Additional software quality assurance requirements will be added as deemed necessary.

16.0 Quality Assurance Project Plans

Project specific Quality Assurance Project Plans (QAPjPs) may be developed to meet contract and agency requirements on a project specific basis. These plans discuss specific terms, policies, objectives and QA activities to achieve the data quality objectives of the project.
QA Project Plans are generally written in accordance with the US EPA Document Guidelines and Specifications for Preparing Quality Assurance Project Plans.

The QAPjPs follow the format listed below as applicable (additional information is added, if required):

Section
- Title Page
- 1.0 Table of Contents
- 2.0 Approval Signatory Page
- 3.0 Introduction
  - 3.1 Project Description
  - 3.2 Background
  - 3.3 Definition of Terms
  - 3.4 Purpose
  - 3.5 Scope
- 4.0 Project Organization and Responsibilities
- 5.0 QA Objectives for Measurement Data, in terms of precision, accuracy, completeness, comparability and representativeness
- 6.0 Sampling Requirements
- 7.0 Sample Custody
- 8.0 Calibration Procedures and References
- 9.0 Analytical Procedures

10.0 Data Analysis, Validation, and Reporting
11.0 Quality Control
11.1 Internal QC Checks
11.2 Performance and System Audits
11.3 Preventative Maintenance Procedures and Schedules
12.0 Data Quality Assessment
13.0 Corrective Action
14.0 QA Reports to Management

17.0 Performance and System Audits

The laboratory is subject to both internal and external audits, in order to monitor the capability and performance of the total measurement systems.

Performance and systems audits are conducted semi-annually by the QA Director and encompass all activities of the laboratory, to assess compliance with established methods, policies and procedures. These audits are both scheduled and unscheduled.

An audit is defined as a systematic check to determine the quality of the laboratory operation and activities. The following are definitions of audit types:

Performance Audit - determines the accuracy of the total measurement system, or portions. Test samples are analyzed and results evaluated.

System Audit - an evaluation of all components of the lab's measurement systems to determine their proper selection and use, including QC procedures.

A copy of audit findings and any proficiency test results obtained are submitted to the EMA President and Laboratory Director in monthly quality assurance reports.

17.1 Performance Audit

A performance audit involves analysis of reference samples of concentrations unknown to laboratory personnel to evaluate analyst/method performance. Reference standards or matrix standards are purchased from reputable suppliers (Environmental Resource Associates and USEPA) or prepared using traceable standards and submitted to the laboratory by the QA Director. The true values or reference values are available only to the QA Director.

Internal performance audits are accomplished by the laboratory through the use of blind check samples (when available), replicate measurement evaluations, and individual proficiency test samples. Results are compared to "true" values and evaluated for accuracy and/or precision. Records are maintained by the QA Director.

EMA is a participant in the EPA Water Pollution (WP), Water Supply (WS) and Soil Proficiency programs. Performance evaluation check samples are analyzed on an annual basis and are submitted

to the California Department of Health Service, Environmental Laboratory Accreditation Program and EPA Region 9 for compliance under the State Certification. Please refer to Appendix H for a copy of our external certification.

17.2 Systems Audit

The laboratory systems audit is designed to verify that all QA/QC practices are being followed and that all procedures and protocols are fully understood and upheld by laboratory personnel. It also is used to find problems which may have entered the system or for which the QA/QC program is insufficient. General audit checklists which apply to all lab areas and procedures have been developed, and are used for documenting audit and surveillance findings.

Audits ensure that laboratory quality control criteria are adhered to and proper corrective action is implemented, when required. All inquires relative to data quality issues are reviewed and any corrective actions identified.

Additional audits performed by various regulatory agencies will be conducted periodically.

System audits are performed to provide an objective evaluation of compliance with established requirements, methods, and procedures. Audits also determine the adequacy of the QA program. Re-audits verify efficacy of corrective actions.
The audits include an evaluation of the work areas, activities, processes, review of documents and records, storage of standards and reagents, housekeeping, good laboratory practice, analytical procedures, and quality control.

The auditor uses a prepared audit checklist, documents the audit in writing, and signs the audit report. The audit report contains sufficient information to stand alone as a document.

Any deficiencies noted during the audit are discussed with the audited department within 5 days of the audit. All corrective actions are taken and a formal response submitted to the auditor following receipt of the audit report. The auditor re-audits the area to determine that the corrective action was implemented and the deficiency corrected.

System audits include an evaluation of the following:

1. Assessment of compliance with the QA Program
2. Verification of and adherence to written procedures
3. Data storage and record keeping
4. Analytical data review and validation procedures

17.3 External Audits

An on-site audit is performed every two years by the California Department of Health Service, Environmental Laboratory Accreditation Program to verify the laboratory has all equipment,

documentation, personnel, and standard operation procedures needed for performance of EPA requirements. Other agencies with which EMA has contracts may perform site audits.

17.4 Subcontracted Services Audits

EMA occasionally sends selected analyses to a subcontract laboratory. The most common reason for utilization of a subcontractor facility is that the procedure is not routinely performed by EMA. Subcontracting of analyses is not conducted without client approval.

All subcontract laboratories utilized by EMA on a continuing basis are overseen by EMA Project Managers and require approval of the QA Director prior to use. The subcontractor and EMA agree on the specific quality control, analytical requirements, and acceptance limits to be performed prior to use.

Subcontract laboratories may receive an on-site systems audit by a representative of EMA' staff or be subjected to double-blind performance evaluations.

All data produced by another laboratory is identified.

18.0 Instrument Maintenance Procedures

Preventative maintenance is the program of defensive actions for averting failure of equipment and ensuring optimal performance of instrumentation. These actions may include specification checks, lubrication, cleaning, reconditioning, adjusting, etc.

A preventative maintenance program for the instrumentation ensures fewer interruptions of analyses, personnel efficiency, and lower repair costs. It eliminates premature replacement of parts, and reduces discrepancy among test results.

All EMA laboratory employees using the instrumentation are fully trained; having developed troubleshooting skills that enable them to recognize problems, their causes and appropriate corrective actions, quickly and accurately to reduce equipment failure. Service contracts are maintained for several pieces of equipment to guarantee expedient service and reduce analytical down-time.

Instrument maintenance is deemed necessary when an instrument is inoperable, is not performing acceptably or as expected, or a change in the performance characteristics of the instrument is noted.

EMA maintains maintenance logs and several service contracts for all major instrumentation. Major maintenance and repair of instrumentation is only performed by qualified analysts and manufacturer recommended service representatives.

Following major instrument maintenance and repair activities, a return to analytical control must be demonstrated and documented through performance according to typical QA/QC requirements.

Written equipment maintenance records are kept to document all maintenance and repair activities. Instrument performance criteria are established to determine the need to make adjustments to the instrument operating conditions.

The following are examples of general measures that are performed throughout the laboratory as a part of the preventative maintenance program.

GC/MS Systems

- Injection port liners and gold seals are replaced daily or as deemed necessary.
- Two to three inches of the front of the pre columns or capillary columns are removed as deemed necessary.
- Septa are inspected and replaced (if necessary) before each batch sequence.
- Ion source is cleaned as required.
- Mass Spectrometers are tuned every 12 hours of use.
- Compressed gas cylinders are checked daily.
- Autosampler wash bottles are changed at the beginning of each sequence.
- Gas filters on carrier lines are checked weekly.

GC Systems

- Septa are replaced before starting a new sequence run.
- Compressed gas cylinders are checked daily.
- Solvent blank is injected before starting a new sequence run to demonstrate the system is free of interfering artifacts.
- Flows are checked before starting sequence.
- Autosampler wash bottles are changed at the beginning of each new sequence run.
- Gas filters on carrier lines are checked weekly.

ICP and ICP-MS

- Nebulizer and spray chamber are cleaned as needed.
- Torch, sample cones, center tubes and other consumables are cleaned on a regular basis.
- Tubing is replaced daily or every other day depending on use.
- Filters for the ICP-OES are cleaned weekly.
- Waste containers are disposed of in the proper waste receptacle weekly.
- Lenses are cleaned as deemed necessary.

pH Meters

- Gel-type electrodes are inspected prior to use and cleaned with Alconox-type soap solution to remove oily residues.
- Meter is calibrated daily before use using a two point calibration and verifying with a third point for the slope check. If calibration or slope has deteriorated, the electrode is cleaned and treated with 1N HCL, then recalibrated.
- pH electrodes are stored in fresh pH 7.0 buffer solution when not in use.

Analytical Balances

- All balance surfaces are cleaned daily and covered when not in use.
- Analytical balances are calibrated and cleaned annually by manufacturer's representatives.
- Labels are attached to each balance indicating date of last calibration.
- The accuracy of each balance is checked against "S" Class weights prior to use.

Autoclave

- All interior and exterior surfaces are cleaned daily.
- Sterilization temperatures are monitored to be in control for every sterilization task.

Incubators and Water-baths

- All interior and exterior surfaces are cleaned daily.
- Incubator and water-bath temperatures are monitored two times per day at least four hours apart for temperature control.

19.0 Procedures for Assessing Precision, Accuracy and Completeness

Definitions according to *Standard Methods For The Examination of Water and Wasterwater 20th Ed.*:

Precision: Measure of the degree of agreement among replicate analyses of a sample, usually expressed as the standard deviation.

Accuracy: Combination of bias and precision of an analytical procedure, which reflects the closeness of a measured value to a true value.

Bias: Consistent deviation of measured values from the true value, caused by systematic errors in a procedure.

19.1 Precision

Reproducibility among duplicate samples provides a determination of precision in analytical testing. Precision is determined by splitting actual samples which cover a wide range of concentrations and a variety of commonly encountered interfering materials.

Duplicates and Duplicate Matrix Spiked Samples are run at a frequency of every 10 to every 20 samples analyzed as specified in the particular method or SOP. Acceptable RPD (relative percent difference) results are <20% or <30% depending upon the sample matrix type analyzed and specific analysis performed.

Duplicate

A duplicate is a regular sample which is split and carried through the entire sample preparation and analysis procedure with the sample set. Duplicate results provide information regarding the sample matrix effects, and the method efficiency. Duplicate samples are run at a frequency of one for every 20 samples analyzed, or at a minimum of one per analyzed batch and matrix, whichever is greater.

Matrix Spike

A matrix spike is a regular sample that is split into three sub-samples and two of the replicates are spiked with analyte solution at the same concentration. The two spiked replicates are defined as the matrix spike and the matrix spike duplicate. The matrix spike and the matrix spike duplicate samples are carried through the sample preparation and analysis procedure with the sample set. Matrix spikes are run at a frequency of every 10 to 20 samples analyzed, or at a minimum of once per analyzed batch and matrix, whichever is greater. The matrix spike and matrix spike duplicate results provide information regarding the precision of the matrix spike and matrix spike duplicate, the sample matrix effects, and the method efficiency.

The difference between the matrix spike and the matrix spike duplicate are reported as RPD as calculated below.

$$RPD = \frac{MS - MSD}{\frac{(MS + MSD)}{2}} \times 100$$

RPD = relative percent difference
MS = Matrix Spike Result
MSD = Matrix Spike Duplicate Result

19.2 Accuracy

Accuracy is the degree of difference between observed and actual (known) values. Accuracy is determined by analyzing reference samples. Acceptable percent recoveries for matrix spikes are based upon statistical control limits. Control limits are equal to or narrower than the EPA published control limit ranges for each method.

Percent recovery calculations are determined through the following equation:

$$\% \text{ Recovery} = \frac{(C_o - C_S) \times 100}{C}$$

C_o = Concentration observed in analysis
C = True value of standard
Cs = Concentration observed in unspiked sample

Spike data can be indicative of matrix bias or interference on analyte recovery as well as sample preparation procedure performance. A spiked sample is a regular sample to which a known concentration of analyte is introduced. The sample is then carried through the entire workup or

extraction and analysis procedure with the other samples in the sample set. The spike is reported as percent recovery.

20.0 Corrective Actions

The purpose of a formal corrective action process is to identify areas that require improvement and to ensure that long term corrective action is put in place to resolve the problem in a permanent manner.

Corrective actions are required any time project or method requirements are not met or as a result of audit deficiency findings. The laboratory Director and QA Director are notified immediately and the approach and time frame of the corrective action is discussed. The out-of-control situation is documented and the client is notified.

Whenever possible, a long term resolution to the occurrence is desirable. In some instances involving unusual circumstances, a long term corrective action may not be appropriate. This process is designed to handle both types of occurrences and to document the action that was taken.
A fundamental goal of the corrective action process is to foster continual improvement in laboratory operations. Corrective actions are monitored to make certain that similar problems do not recur.

Daily quality control procedures are designed to identify the need for corrective action. Most corrective actions are performed by the chemists doing the analysis, and are usually as simple as re-calibrating an instrument should the instrument check sample or CCV fall outside it's acceptable range, or resulting because of a power failure. Most corrective actions are described in methods, standard operating procedures, and instrument manuals.

Corrective actions may also be initiated as a result of various quality assurance activities, including:

- Performance audits
- System audits
- Performance evaluation or check sample studies
- Program audits, and
- Review of raw data

Standard operating procedures for corrective actions are to:

- Define the problem
- Determine the cause(s) of the problem
- Determine possible solutions to the problem
- Implement corrective action
- Verify that the corrective action is effective, and
- Document the corrective action and it's effectiveness

All employees must immediately bring to their supervisor's attention any problem or practice which they feel may affect data quality. If control parameters are outside acceptability criteria analysis must cease immediately and all affected samples must be reanalyzed when the system is corrected.

The need for corrective action may result from:

- Instrument malfunction
- Failure of internal QA/QC checks
- Failure to follow-up on performance or system audit findings
- And non-compliance with QA requirements

Corrective actions taken depend on the type of analyses and the extent of the error and are discussed with the Laboratory Supervisor and/or Laboratory Director. If the problem is indeterminate and cannot be controlled, the laboratory evaluates its impact on the data.

The QA Director and Laboratory Director shall determine that corrective actions proposed and agreed upon are actually implemented and successful. When corrective actions are implemented, evidence of their success shall be documented. Corrective action documents are to be signed and dated by the Chemist, and the Laboratory Director.

All corrective action documents are reviewed and maintained by the QA Director in the QA program files.

20.1 Client Concerns

The corrective action procedure is used to handle routine client inquiries concerning data reports. In some cases, an investigation regarding the concern may indicate that no problem was found. In other situations, the investigation may reveal a problem and the corrective action to prevent that occurrence in the future will be required.

The corrective action process involves the following actions:

- Client concerns are addressed accurately and in a timely fashion.
- The concern is properly identified and documented.
- Responsibility for investigation is assigned.
- The cause of the problem is investigated and determined.
- The appropriate long-term corrective action is determined and implemented.
- The complete corrective action process is documented.

If a new data report needs to be issued as a result of the investigation, the Laboratory Director is responsible for issuance of the revised report. All revised data are marked as such.

20.2 Criteria Used for Determining an Out-of-Control Event

Factors that affect data quality require investigation and corrective actions. All out-of-control events are investigated to determine whether the condition indicates a procedure that is truly out-of-control, or a possible random error. Any corrective actions taken are to be documented, whether the analytical batch is repeated or the data was reviewed and released to the client (included in the documentation is the rationale behind this decision).

20.3 Procedures for Stopping Analysis

Whenever an analytical system is out-of-control, investigative-corrective action is initiated. Once corrective actions have been implemented, samples may be reanalyzed. If a sample batch reanalysis is out-of-control following corrective actions, all analytical work for the method will cease immediately. A detailed investigation shall be conducted to identify the source of the problem. Sample security, integrity of standards, glassware preparation, reagents, notebooks, instrument performance, and method adherence shall be included in this investigation.

All actions taken will be documented.

21.0 Timeliness of Data Reports

EMA recognizes the timeliness of data reports is assessed as an important part of the quality of our services from the client's perspective. High quality data when received several weeks late is not acceptable. In recognition of this, EMA tracks all projects from the time they are received to the report completion and mailing (or facsimile transmission) of results. EMA's tracking procedure is designed to monitor and maintain on-time report generation.
All staff queries for their respective analyses a daily basis. Project Managers track the status of all samples as they are processed from the moment they are received through the final delivery of the report. Weekly status meetings are held to assess the status of samples processed in the laboratory. When problems arise, clients are notified well in advance.

EMA monitors our success in the timely delivery of reports to clients on a monthly basis. The date clients are promised delivery is compared to the date actually mailed or faxed to the client. This monitoring serves to identify service trends, helps to maintain timeliness, and ensures that corrective action will be taken before problems occur.

22.0 Quality Assurance Reports to Management

The QA Director completes monthly reports issued to the President and Laboratory Director of EMA regarding quality activities of the laboratory.

- A typical report includes such information as:
- Proposed revisions in the QA program;
- Performance evaluation results;
- Systems audit results;

- Changes in certification status;
- Significant QA concerns and recommendations for resolution; and,
- Accomplishments since previous report.

Copies of quality assurance reports are maintained by the QA Director in the quality assurance program files.

23.0 Quality Assurance Program Revisions

Revisions to the EMA Quality Assurance Program Manual can be made upon written approval of the Laboratory Director and the QA Director. Program revisions are to be presented to the Laboratory staff for implementation immediately following approval. Client-requested QC procedures may be incorporated on a project basis provided the procedures are not in opposition to the objectives of quality assurance and the EMA Quality Assurance Program. Revisions must be documented and kept on file for review.

Appendix A
Sampling Guidelines

General Wet Chemistry Analyses

	METHOD			PRESERVATION		QUANTITY		
ANALYSIS/TEST	EPA	STANDARD or ASTM METHOD	CONTAINER	PRESERVATIVE	TEMPERATURE	MINIMUM SAMPLE REQUIRED	OPTIMUM CONTAINER SIZE	HOLDING TIME
Alkalinity	EPA 310.1	SMEWW 2320 B	Plastic	UNPRESERVED	Cool to 4°C	100 ml	250 ml	14 days
Ammonia	EPA 350.1	SMEWW 4500-NH3 D	Plastic	**H2SO4 to pH < 2**	Cool to 4°C	500 ml	500 ml	28 days
* BOD	EPA 405.1	SMEWW 5210 A-B	Plastic,Glass	UNPRESERVED	Cool to 4°C	1 L	1 L	48 hr
Bicarbonate	EPA 310.1	SMEWW 2320 B	Plastic	UNPRESERVED	Cool to 4°C	125 ml	250 ml	14 days
Carbonate	EPA 310.1	SMEWW 2320 B	Plastic	UNPRESERVED	Cool to 4°C	125 ml	250 ml	14 days
Chloride		SMEWW 4500 Cl- C	Plastic	UNPRESERVED	Cool to 4°C	50 ml; 50 g	250 ml; 4 oz. Glass	28 days
* Chlorine, Residual	EPA 330.5	SMEWW 4500 Cl G	Plastic	UNPRESERVED	Cool to 4°C	200 ml	250 ml	Immediate
COD	EPA 410.4		Plastic	**H2SO4 to pH < 2**	Cool to 4°C	10 ml	250 ml	28 days
* Coliform (Total+Fecal)	EPA 9131/9132	SMEWW 9221 B, E	Plastic	**Sodium Thiosulfate**	Cool to 4°C	100 ml	100 ml	6 hrs**/24hrs**
* Coliform (Total+E. Coli) by Colilert		SMEWW 9223	Plastic	**Sodium Thiosulfate**	Cool to 4°C	100 ml	100 ml	6 hrs**/24hrs**
Conductivity (E.C.)	EPA 120.1	SMEWW 2510 B	Plastic	UNPRESERVED	Cool to 4°C	20 ml	250 ml	28 days
Cyanide (liquid)	EPA 9010	SMEWW 4500 CN C	Plastic	**NaOH to pH > 12**	Cool to 4°C	500 ml	500 ml	14 days
Cyanide (solid)	EPA 335.2		Plastic	UNPRESERVED	Cool to 4°C	50 g	4 oz. Glass	14 days
* Fecal Streptococcus & Enterococcus Groups		SMEWW 9230	Plastic	**Sodium Thiosulfate**	Cool to 4°C	100 ml	100 ml	6 hrs**/24hrs**
Flashpoint	EPA 1010	ASTM D93-85	Plastic	UNPRESERVED	Cool to 4°C	70 ml; 50 g	250 ml; 4 oz. Glass	none
Fluoride	EPA 340.2	SMEWW 4500 F C	Plastic	UNPRESERVED	Cool to 4°C	300 ml; 50 g	500 ml; 4 oz. Glass	28 days
Hydroxide	EPA 310.1	SMEWW 2320 B	Plastic	UNPRESERVED	Cool to 4°C	125 ml	250 ml	14 days
* Heterotrophic Plate Count		SMEWW 9215 B	Plastic	**Sodium Thiosulfate**	Cool to 4°C	100 ml	100 ml	6 hrs**/24hrs**
* Hexavalent chrome (Cr+6)	EPA 3060/7196 A	SMEWW 3500 CR D	Plastic,Glass	UNPRESERVED	Cool to 4°C	250 ml; 100 g	250 ml; 4 oz. Glass	24 hr
* MBAS (Surfactants)	EPA 425.1	SMEWW 5540 C	Plastic	UNPRESERVED	Cool to 4°C	250 ml	500 ml	48 hr
* Nitrate		SMEWW 4500 NO3 E	Plastic	UNPRESERVED	Cool to 4°C	100 ml	250 ml	48 hr
* Nitrite	EPA 354.1	SMEWW 4500 NO2 B	Plastic	UNPRESERVED	Cool to 4°C	100 ml	250 ml	48 hr
Nitrogen; TKN	EPA 351.1-351.4		Plastic	**H2SO4 to pH < 2**	Cool to 4°C	200 ml	250 ml	28 days
* pH	EPA 150.1 (EPA 9045)		Plastic	UNPRESERVED	NOT REQUIRED	10 ml; 20 g	250 ml; 4 oz. Glass	Immediate
Phenols, total	EPA 420.1		Glass	UNPRESERVED	Cool to 4°C	125 ml	250 ml	28 days
* Phosphate, Ortho	EPA 365.3		Plastic	UNPRESERVED	Cool to 4°C	100 ml	250 ml	48 hr
Phosphorus, Total	EPA 365.3	SMEWW 4500 P E	Plastic	**H2SO4 to pH < 2**	Cool to 4°C	100 ml	250 ml	28 days
* Solids, settleable (SS)	EPA 160.5	SMEWW 2540 F	Plastic	UNPRESERVED	Cool to 4°C	1 liter	1 liter	48 hr
Solids, total dissolved (TDS)		SMEWW 2540 C	Plastic	UNPRESERVED	Cool to 4°C	100 ml	250 ml	7 days
Solids, total suspended (TSS)	EPA 160.2	SMEWW 2540 D	Plastic	UNPRESERVED	Cool to 4°C	100 ml	250 ml	7 days
Solids, total		SMEWW 2540 B	Plastic	UNPRESERVED	Cool to 4°C	100 ml	250 ml	7 days
Sulfate	EPA 375.4	SMEWW 4500 SO4 E	Plastic	UNPRESERVED	Cool to 4°C	200 ml; 100 g	200 ml; 8 oz. Glass	28 days
Sulfide, total	EPA 376.2	SMEWW 4500 S D	Plastic	**NaOH/Zn Acetate**	Cool to 4°C	100 ml	500 ml	7 days
Sulfide, dissolved	EPA 376.2	SMEWW 4500 S D	Plastic	UNPRESERVED	Cool to 4°C	100 ml	500 ml	7 days
Sulfide, Solids by distillation		PLUMB 1981	Glass	UNPRESERVED	Cool to 4°C	25 g	4 oz. Glass	7 days
* Sulfite	EPA 377.1	SMEWW 4500 SO3 B	Plastic	UNPRESERVED	Cool to 4°C	125 ml	250 ml	Immediate
Total Organic Carbon (TOC)	EPA 415.1		Glass	**H2SO4 to pH < 2**	Cool to 4°C	25 ml; 25 g	250 ml; 4 oz. Glass	28 days
* Turbidity	EPA 180.1	SMEWW 2130 A-B	Plastic	UNPRESERVED	Cool to 4°C	100 ml	250 ml	48 hr
Total Volatile Solids (TVS or VSS)		SMEWW 2540 E	Glass	UNPRESERVED	Cool to 4°C	100 ml	250 ml	28 days

g-gram ml-milliliter

* These analyses have short holding times. Please coordinate delivery time for these analyses.

** Recommended holding times for coliforms are 6 hours. Between 6 - 24 hours holding results become questionable. After 24 hours holding, results are considered unacceptable.

4340 Viewridge Ave., Suite A
San Diego, CA 92123
Phone/Fax: (858) 560-7717 / (858) 560-7763

Organic Analyses

	METHOD			PRESERVATION		QUANTITY		HOLDING TIME
ANALYSIS/TEST	**EPA**	**STANDARD or ASTM METHOD**	**CONTAINER**	**PRESERVATIVE**	**TEMPERATURE**	**MINIMUM SAMPLE REQUIRED Water;soil**	**OPTIMUM CONTAINER SIZE Water ; soil**	**water (before extract/after extract) ; soils**
Oil & Grease	EPA		G-TLC	**HCl to pH < 2 for liquids**	Cool to 4°C	1000 ml ; 40 g	1000 ml amber ; 4 oz. Glass	14/40 days
Oil & Grease	EPA		G-TLC	**H2SO4 to pH < 2 for liquids**	Cool to 4°C	500 ml ; 40 g	500 ml amber ; 4 oz. Glass	14/40 days
TRPH	EPA		G-TLC; BS-T	**H2SO4 to pH < 2 for liquids**	Cool to 4°C	500 ml ; 40 g	500 ml amber ; 4 oz. Glass	14/40 days
Chlorinated Herbicides	EPA		G-TLC; B-ST	UNPRESERVED	Cool to 4°C	1 L ; 40 g	1 Liter Amber ; 8 oz. Glass	7/40; 14 days
Purgeable Halocarbons (Chlorinated Solvents)	EPA		G-TLC/TLS; ZH; B-ST	**HCL for liquids**	Cool to 4°C	40 ml ;10 g	(2) 40 ml VOA Vials ; 4 oz. Glass	14 days
Quaternary		DOHS LUFT Method Xylene Extraction	G-TLC; B-ST	Cool 4°C	Cool to 4°C	50 g	8 oz. Glass	14 days
Aromatic Volatile Organics	EPA		G-TLC/TLS; ZH; B-ST	**HCL for liquids**	Cool to 4°C	40 ml ;10 g	(2) 40 ml VOA Vials ; 4 oz. Glass	14 days
Organochlorine Pesticides and PCBs	EPA		G-TLC; B-ST	UNPRESERVED	Cool to 4°C	1 L ; 40 g	1 Liter Amber ; 8 oz. Glass	7/40; 14 days
Organophosphorous Pesticides	EPA		G-TLC; B-ST	UNPRESERVED	Cool to 4°C	1 L ; 40 g	1 Liter Amber ; 8 oz. Glass	7/40; 14 days
Volatile Organic Compounds (VOCs) (Organic Solvents)	EPA		G-TLC/TLS; ZH; B-ST	**HCL for liquids**	Cool to 4°C	40 ml ;10 g	(2) 40 ml VOA Vials ; 4 oz. Glass	14 days
Semi Volatile Organics	EPA		G-TLC; B-ST	UNPRESERVED	Cool to 4°C	1 L ; 40 g	1 Liter Amber ; 8 oz. Glass	7/40; 14 days
Phenols	EPA		G-TLC; B-ST	UNPRESERVED	Cool to 4°C	1 L ; 40 g	1 Liter Amber ; 8 oz. Glass	7/40; 14 days
Polynuclear Aromatics (PNAs)	EPA		G-TLC; B-ST	UNPRESERVED	Cool to 4°C	1 L ; 40 g	1 Liter Amber ; 8 oz. Glass	7/40; 14 days
Phthalates	EPA		G-TLC; B-ST	UNPRESERVED	Cool to 4°C	1 L ; 40 g	1 Liter Amber ; 8 oz. Glass	7/40; 14 days
Total Tributyl	EPA		Plastic/Glass; B-ST	**H2SO4 to pH < 2 for liquids**	Cool to 4°C	25 ml ; 25 g	250 ml; 4 oz. Glass	28 days
Total Petroleum Hydrocarbons (TPH) gas+diesel (Liquid and Soil)	GCFPD	GCFPD	G-TLC; B-ST	UNPRESERVED	Cool to 4°C	1 L ; 40 g	1 Liter Amber ; 8 oz. Glass	7/40; 14 days
TPH	EPA	DOHS LUFT Method (liquid)	G-TLC/TLS; ZH; B-ST	**HCL to pH < 2 for liquids**	Cool to 4°C	40 ml ;10 g	(2) 40 ml VOA Vials ; 4 oz. Glass	14 days
	EPA	ASTM	G-TLC/TLS; ZH; B-ST	**HCL for liquids**	Cool to 4°C	40 ml ;10 g	(2) 40 ml VOA Vials ; 4 oz. Glass	14 days

Metals Analyses

	METHOD			PRESERVATION				HOLDING TIME
ANALYSIS/TEST	EPA	STANDARD or ASTM METHOD	CONTAINER	PRESERVATIVE	TEMPERATURE	MINIMUM SAMPLE REQUIRED	OPTIMUM CONTAINER SIZE	
* Hexavalent chrome (Cr+6)	EPA 3060/7196 A	SMEWW 3500 CR D	Plastic,Glass	UNPRESERVED	Cool to 4°C	250 ml; 100 g	500 ml; 8 oz. Glass	24 hr
Mercury	EPA 245.1/7420		Plastic,Glass	**HNO3 to pH < 2**	Cool to 4°C	100 ml; 20 g	250 ml; 4 oz. Glass	28 days
Metals	EPA 6010/6020/7000		Plastic,Glass	**HNO3 to pH < 2**	Cool to 4°C	500 ml; 100 g	500 ml; 8 oz. Glass	6 mos
STLC metals		Title 22-WET	Glass-TLC	UNPRESERVED	Cool to 4°C	500 ml; 200 g	500 ml; 8 oz. Glass	Method Dependant
SPLP metals	EPA 1312		Glass-TLC	UNPRESERVED	Cool to 4°C	500 ml; 200 g	500 ml; 8 oz. Glass	Method Dependant
TCLP metals	EPA 1311		Glass-TLC	UNPRESERVED	Cool to 4°C	500 ml; 200 g	500 ml; 8 oz. Glass	Method Dependant

Container descriptions: G-glass; TLC-Teflon lined cap; TLS-telflon lines septa; ZH-zero headspace; B-ST-Brass-Steel Tube g-gram ml-milliliter

Holding times are measured in days unless otherwise indicated. 7/40 refers to 7 days holding time for sample/40 day holding time for extract.

* These analyses have short holding times. Please coordinate delivery time for these analyses.

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San Diego, CA 92123
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Appendix B
Sample Report

EnviroMatrix Analytical, Inc.

03 November 2003

Enviromatrix Analytical, Inc
Attn: Dave Renfrew
4340 Viewridge Ave., Suite A
San Diego, CA 92123

EMA Log #: 0208147

Project Name: Soil 39

Enclosed are the results of analyses for samples received by the laboratory on 08/15/02 08:59. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that this data is in compliance both technically and for completeness.

Dan Verdon
Laboratory Director

CA ELAP Certification #: 1931

Client Name: Enviromatrix Analytical, Inc
Project Name: Soil 39

EMA Log #: 0208147

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Soil-39 Anions	0208147-01	Soil	08/15/02 08:00	08/15/02 08:59
Known Anions	0208147-02	Soil	08/15/02 08:00	08/15/02 08:59
Known pH	0208147-06	Soil	08/15/02 08:00	08/15/02 08:59
Known Cr+6	0208147-08	Soil	08/15/02 08:00	08/15/02 08:59

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name: Enviromatrix Analytical, Inc
Project Name: Soil 39

EMA Log #: 0208147

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Soil-39 Anions (0208147-01) Soil Sampled: 08/15/02 08:00 Received: 08/15/02 08:59									
Fluoride	**67.0**	3.00	mg/kg	2	2090409	09/03/02	09/03/02	EPA 9214	
Known Anions (0208147-02) Soil Sampled: 08/15/02 08:00 Received: 08/15/02 08:59									
Chloride	**320**	0.5	mg/kg	1	2091809	09/17/02	09/17/02	SM4500 Cl C	A-01a
Fluoride	**87.5**	7.50	"	5	2090409	09/03/02	09/03/02	EPA 9214	
Sulfate as SO4	**2660**	50.0	"	1	2092006	09/19/02	09/19/02	SM4500 SO4 E	
Known pH (0208147-06) Soil Sampled: 08/15/02 08:00 Received: 08/15/02 08:59									
pH	**4.28**	0.10	pH Units	1	2082706	08/26/02	08/26/02	EPA 9045B	A-01
Known Cr+6 (0208147-08) Soil Sampled: 08/15/02 08:00 Received: 08/15/02 08:59									
Hexavalent Chromium	**90.2**	4.00	mg/kg	5	2082908	08/26/02	08/27/02	EPA 7196A	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name: Enviromatrix Analytical, Inc	**EMA Log #: 0208147**
Project Name: Soil 39	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2082706										
Reference (2082706-SRM1)				Prepared & Analyzed: 08/26/02						
pH	8.85	0.10	pH Units	9.10		97	96.7-103.3			
Batch 2082908										
Blank (2082908-BLK1)				Prepared: 08/26/02 Analyzed: 08/27/02						
Hexavalent Chromium	ND	0.800	mg/kg							
LCS (2082908-BS1)				Prepared: 08/26/02 Analyzed: 08/27/02						
Hexavalent Chromium	32.0	0.800	mg/kg	40.0		80	80-120			
LCS Dup (2082908-BSD1)				Prepared: 08/26/02 Analyzed: 08/27/02						
Hexavalent Chromium	32.4	0.800	mg/kg	40.0		81	80-120	1	20	
Duplicate (2082908-DUP1)		**Source: 0208147-08**		Prepared: 08/26/02 Analyzed: 08/27/02						
Hexavalent Chromium	89.6	4.00	mg/kg		90.2			0.7	20	
Batch 2090409										
Blank (2090409-BLK1)				Prepared & Analyzed: 09/03/02						
Fluoride	ND	1.50	mg/kg							
LCS (2090409-BS1)				Prepared & Analyzed: 09/03/02						
Fluoride	1.00	0.100	mg/kg	1.00		100	80-120			
LCS Dup (2090409-BSD1)				Prepared & Analyzed: 09/03/02						
Fluoride	1.00	0.100	mg/kg	1.00		100	80-120	0	20	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name: Enviromatrix Analytical, Inc
Project Name: Soil 39

EMA Log #: 0208147

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2090409										
Duplicate (2090409-DUP1)		**Source: 0208147-01**		Prepared & Analyzed: 09/03/02						
Fluoride	67.0	3.00	mg/kg		67.0			0	20	
Batch 2091809										
Blank (2091809-BLK1)				Prepared & Analyzed: 09/17/02						
Chloride	ND	0.05	mg/kg							
LCS (2091809-BS1)				Prepared & Analyzed: 09/17/02						
Chloride	194	0.05	mg/kg	200		97	80-120			
LCS Dup (2091809-BSD1)				Prepared & Analyzed: 09/17/02						
Chloride	200	0.05	mg/kg	200		100	80-120	3	20	
Batch 2092006										
Blank (2092006-BLK1)				Prepared & Analyzed: 09/19/02						
Sulfate as SO4	ND	50.0	mg/kg							
LCS (2092006-BS1)				Prepared & Analyzed: 09/19/02						
Sulfate as SO4	10.3	10.0	mg/kg	10.0		103	80-120			
LCS Dup (2092006-BSD1)				Prepared & Analyzed: 09/19/02						
Sulfate as SO4	10.5	10.0	mg/kg	10.0		105	80-120	2	20	
Duplicate (2092006-DUP1)		**Source: 0208147-02**		Prepared & Analyzed: 09/19/02						
Sulfate as SO4	2960	50.0	mg/kg		2660			11	20	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name: Enviromatrix Analytical, Inc Project Name: Soil 39	**EMA Log #: 0208147**

Notes and Definitions

A-01	24 hour holding time does not apply to PT samples.
A-01a	Sample for internal QC
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Appendix C
Chain-Of-Custody Form

CHAIN-OF-CUSTODY RECORD

EnviroMatrix Analytical, Inc.

4340 Viewridge Ave., Ste. A - San Diego, CA 92123 - Phone (858) 560-7717 - Fax (858) 560-7763

EMA LOG #:

EMA DATE/TIME STAMP

Client:

Address:

Attn: Phone:

Sampled by: Fax:

Billing Address:

Project: PO #:

REQUESTED ANALYSIS

EMA ID #	Client Sample ID	Sample Date	Sample Time	Sample Matrix	Container(s) #	Container(s) Type*	418.1 (TRPH)	Oil & Grease 413.1___ 413.2___ 1664__	TPH (8015B) Gas___ Diesel___	TPH-Extended 8015B ___ ASTM D2887___	602 / 8021 B BTXE___ MTBE___	601 / 8021 B (Volatile Organics)	EPA 8021 B Aromatics__ Halogenated__	608 / 8081 (Pesticides)	608 / 8082 (PCB's)	624 / 8260 (Volatile Organics)	625 / 8270 (Semi Volatile Organics)	TTLC Metals (CAC Title 22)	STLC Metals (CAC Title 22)	TCLP (RCRA) Metals___ Organics___	Cd Cr Cu Pb Ni Ag Zn	pH EC TSS							
1																													
2																													
3																													
4																													
5																													
6																													
7																													
8																													
9																													
10																													

*Container Types: B=Brass Tube; V=VOA; G=Glass; P=Plastic; O=Other (list)

Tamper-Proof Seals Intact: Yes No N/A

Correct Containers: Yes No

Sample(s): Cold Ambient Warm

VOAs w/ZHS: Yes No N/A

All Samples Properly Preserved: Yes No N/A

Disposal: N/C (aqueous) *EMA (@$5.00/sample) Return Hold

Turnaround Time: 24 hr 48 hr 3 day 4 day 5 day Normal

Comments:

RELINQUISHED BY	DATE/TIME	RECEIVED BY
Signature		Signature
Print		Print
Company:		Company:
Signature		Signature
Print		Print
Company:		Company:
Signature		Signature
Print		Print
Company:		Company:

* EMA reserves the right to return samples that do not match our waste profile.

White - EMA Canary - Accounting Pink - Client (w/Report) Goldenrod - Client (Relinquish Samples

Appendix D
Corrective Action Form

EnviroMatrix Analytical, Inc.

CORRECTIVE ACTION FORM

ISSUED TO: RESPONSE REQUIRED BY:

CORRECTIVE ACTION REQUESTED BY:
DATE:

_____(ISSUER) WILL PROVIDE A BRIEF DESCRIPTION OF HOW PROCEDURE WAS DETERMINED TO BE OUT-OF-CONTROL:

OUT-OF-CONTROL PROCEDURE(s):

LIST SAMPLE I.D.(s) AFFECTED:

DESCRIBE IMMEDIATE ACTION TAKEN TO REMEDY SITUATION:

DESCRIBE FINAL PLANNED ACTION WHICH WILL CORRECT PROBLEM, EXPECTED DATE OF FINAL PLANNED ACTION, AND HOW YOU INTEND TO PREVENT RECURRENCE OF THE PROBLEM:

SIGNATURE:_____ DATE:_____

REVIEWED BY:_____ DATE:_____

Appendix E
List of Analytical Services and Methods

Analytical Services and Methods

ANALYSIS	40 CFR	SW-846	OTHER
Oil & Grease			EPA METHODS 413.1/413.2/1664
Total Recoverable Petroleum Hydrocarbons (TRPH)			EPA 418.1
Purgeable Halocarbons	EPA 601	EPA 8021 (8010)	
Purgeable Aromatics	EPA 602	EPA 8021 (8020)	
Organochlorine Pesticides	EPA 608	EPA 8081 (8080)	
Organophosphorus Pesticides (OPP)		EPA 8041A	
Chlorinated Herbicides		EPA 8150	
Volatile Organics	EPA 624	EPA 8260	
Semi-Volatile Organics	EPA 625	EPA 8270	
Benzene, Toluene, Xylenes Ethylbenzene, (MTBE)	mod EPA 602	EPA 8021 (8020)	
Total Petroleum Hydrocarbons (TPH)			EPA 8015 B / ASTM D2887
PCBs	EPA 608	EPA 8082 (8080)	
Extraction Methods		EPA 3510/3520/3540C 3550/3580	
Clean-up Methods		EPA 3610/3620/3630/ 3640A/3660/3665	
Multiple Extraction Procedure		EPA 1320	
SPLP		EPA 1312	
STLC			Title 22-WET
TCLP		EPA 1311	
Title 22			Title 22
Tributyltins (TBT)			GCFPD

Analytical Services and Methods (continued)

ANALYSIS	40 CFR	SW-846	OTHER
Aluminum	EPA 200.7, 200.8	EPA 6010, 6020	
Antimony	EPA 200.7, 200.8	EPA 6010, 6020	
Arsenic	EPA 200.8	EPA 6020	
Barium	EPA 200.7, 200.8	EPA 6010, 6020	
Beryllium	EPA 200.7, 200.8	EPA 6010, 6020	
Boron	EPA 200.7	EPA 6010	
Cadmium	EPA 200.7, 200.8	EPA 6010, 6020	
Calcium	EPA 200.7	EPA 6010	
Chromium	EPA 200.7, 200.8	EPA 6010, 6020	
Cobalt	EPA 200.7, 200.8	EPA 6010, 6020	
Copper	EPA 200.7, 200.8	EPA 6010, 6020	
Gold	EPA 200.7	EPA 6010	
Hardness			SMEWW 2340 B
Iron	EPA 200.7, 200.8	EPA 6010, 6020	
Lead	EPA 200.7, 200.8	EPA 6010, 6020	
Magnesium	EPA 200.7	EPA 6010	
Manganese	EPA 200.7, 200.8	EPA 6010, 6020	
Mercury	EPA 245.1	EPA 7470, 7471	
Molybdenum	EPA 200.7, 200.8	EPA 6010, 6020	
Nickel	EPA 200.7, 200.8	EPA 6010, 6020	
Potassium	EPA 200.7	EPA 6010	
Selenium	EPA 200.8	EPA 6020	
Silver	EPA 200.7, 200.8	EPA 6010, 6020	
Sodium	EPA 200.7	EPA 6010	
Thallium	EPA 200.7, 200.8	EPA 6010, 6020	
Tin	EPA 200.7	EPA 6010	
Titanium	EPA 200.7	EPA 6010	
Vanadium	EPA 200.7, 200.8	EPA 6010, 6020	
Zinc	EPA 200.7, 200.8	EPA 6010, 6020	
Digestion Methods	EPA 200.7, 200.8, 272.1	EPA 3005/3010/3015/ 3020/3050/7760	

Analytical Services and Methods (continued)

ANALYSIS	40 CFR	SW-846	OTHER
Acidity		2310 B	EPA 305.1
Alkalinity - Carbonate, Bicarbonate		2320 B	EPA 310.1
Ammonia		4500-NH_3 D	EPA 350.1
AVS-SEM			EPA 821R-91-100
BOD		5210 B	
Bromide		4500-Br^- B	
Carbon Dioxide		4500 CO2 C	
cBOD		5210 B	
COD			EPA 410.4
Chloride		4500-Cl^- C	
Chlorine, Residual		4500-Cl G	EPA 330.5
Chromium VI		3500 Cr D	EPA 7196
Coliforms (Total and Fecal)		9221 B/E	
Coliforms (Total) and E. Coli by Colilert		9223	
Color (True & Apparent)		2120 B	
Color (Solid)			Munsel Chart
Conductivity		2510 B	EPA 120.1
Cyanide		4500-CN C	EPA 335.2/9010
Dissolved Oxygen			EPA 360.1
Enterolert ®			Enterolert ®
Fecal Streptococcus and Enterococcus Groups		9230	
Flash Point (Ignitability)	D93-85		EPA 1010 / 1030
Fluoride		4500-F C	EPA 340.2
Heterotrophic Plate Count		9215 B	
MBAS		5540 C	EPA 425.1
Nitrate		4500-NO_3 E	
Nitrogen, TKN		4500 N C	
Nitrite		4500-NO_2 B	EPA 354.1

Analytical Services and Methods (continued)

ANALYSIS	40 CFR	SW-846	OTHER
Odor		2150 B	
Oxidizer Hazcat			Hazcat
Oxygen Consumption Rate		2710 B	
Paint Filter			EPA 9095 A
pH			EPA 150.1/9040
Reactivity to Water			HAZCAT
Phenols			EPA 420.1
Phosphate(Ortho+Total)			EPA 365.3
Settleable Solids		2540 F	
% Solids/Dry Weight		2540 G	
Solids, Total/Dissolved		2540 B	
Solids, Total Suspended		2340 C	
Sulfate		4500-SO_4^{2-} E	EPA 375.4
Sulfide		4500-S^{2-} D	EPA 376.2
Sulfite		4500-SO_3 B	EPA 377.1
Sulfur	D129		
Suspended Sediment Concentration	D3977-97		
Total Organic Carbon (TOC)			EPA 415.1/9060
Turbidity		2130 A	
VSS, VDS		2540 E	

Appendix F
List of Instrumentation and Equipment

Instrumentation

To meet our needs for accurate analytical results, EMA uses sophisticated instruments. Our instruments are calibrated to comply with regulatory detection limits in the parts per billion (ppb) and parts per million (ppm) detection range. Listed below are the key instruments that we use for inorganic and organic analyses.

#	INORGANIC INSTRUMENTS	MAKE	MODEL
	Inductively Coupled Argon Plasma-Mass Spectrometry (ICP-MS)		
1	ICP-MS Spectrophotometer	Hewlett-Packard	4500
	Inductively Coupled Argon Plasma-Atomic Emission Spectrometry (ICP-AES)		
1	ICP-AES Spectrophotometer	Perkin-Elmer	5300-DV
1	Automated Mercury Analyzer (Cold Vapor/Atomic Absorption Spectrophotometer)	Leeman Labs	PS200 II
1	Ion Chromatograph	Dionex	ICS2000
	Miscellaneous		
2	48-Well Block Digestor	CPI International	ModBlock
2	10-Position Distillation Block	Enviromental Express	

#	ORGANIC INSTRUMENTS	MAKE	MODEL
	Gas Chromatography/Mass Spectrometry		
1	GC/MS	Agilent	5973N
1	GC/MS	Agilent	5973
1	GC/MS	Hewlett Packard	5970S
6	GC	Hewlett Packard	5890A
2	GC	Hewlett Packard	6890
	Gas Chromatograph Detectors		
3	Mass Spectrometer Detectors		
3	Flame Ionization Detectors		
2	Electron Capture Detectors		
1	Photo Ionization Detectors		
1	Hall Detector (Electrolytic Conductivity)		
1	Flame Photometric Detector		
1	Nitrogen-Phosphorus Detector		

Instrumentation (continued)

#	ORGANIC INSTRUMENTS	MAKE	MODEL
	Sample Introduction		
2	Purge and Trap	OI	4460/MPM-16
1	Purge and Trap	OI	Eclipse/4560
2	VOC Autosampler	OI	4552
	Spectrophotometers		
1	Infrared Spectrophotometer	Buck Scientific	404
1	UV/Visible Spectrophotometer	Hach	DR3000
	TOC Analyzer		
1	TOC Analyzer	Tekmar-Dohrman	DC190
	Miscellaneous		
1	Accelerated Solvent Extractor	Dionex	ASE 200
1	Accelerated Solvent Extractor	Dionex	ASE 300
1	GPC Cleanup System	Waters	717
1	Nitrogen Blowdown System	Zymark	TurboVap

In addition to the above listed organic chemistry and inorganic chemistry laboratory equipment, EMA maintains a full wet chemistry laboratory for performing spectrophotometric, titrimetric, and gravimetric analysis and a microbiology laboratory.

Appendix G
Professional Profiles of Key Personnel

Key Personnel

Leland Stanton Pitt, B.S., M.S.
President

Education: **Master's of Science in Chemistry, 1981**
Delta State University, Cleveland, Mississippi

Bachelor of Science Degree in Biology and Physics, minor in Mathematics, 1969
University of New Mexico, Albuquerque, New Mexico

Professional Experience:

Certified Industrial Hygienist: Southland Labs, Inc. #4303
Certified Marine Chemist: Pacific Chemical Labs, Inc. #654
Certified Asbestos Consultant: Southland Labs, Inc. #97-2209

President
EnviroMatrix Analytical, Inc., San Diego, CA
2002-Present

Responsible for overall business management, business development and strategic planning. As the President EnviroMatrix Analytical, Inc. he is responsible for directing the activities of the business. Responsible for the strategic direction of the laboratory and business development. He provides consultation and recommendation to various clients to determine the specifics of project requirements.

President and Manager
H.M. Pitt Labs, Inc., San Diego, CA
1986-Present

H.M. Pitt Labs, Inc. is an analytical lab specializing in environmental studies and industrial hygiene. Mr. Pitt is currently the consulting CIH for The Port of San Diego, Ninyo & Moore, an environmental and geotechnical science group, and Westair Technologies. As the consulting CIH, Mr. Pitt typically reviews and approves abatement plans (both asbestos and lead, as well as other programs), and is responsible for monitoring and inspections. H.M.Pitt Labs does the monitoring and abatement review for Pacific Ship Repair and Southwest Marine, which removes insulation and asbestos on Navy ships. As a Marine Chemist, he certifies Navy ships and land tanks in the San Diego area and elsewhere when requested. He was the primary Marine Chemist and CIH on the Exxon Valdez ship repair.

Leland Stanton Pitt, B.S., M.S.
President (Continued)

Chemist and Gas Free Engineer
Long Beach Naval Shipyard, Long Beach, CA
1983-1986

Program Manager responsible for certifying spaces and shipboard as safe for production work in shipbuilding and repair. Work required knowledge of general safety and health regulations of CFR 1910, 1915, and 1926, as well as the pertinent Federal, State and D.O.D. regulations. Responsible for technical supervision of 15-25 technicians. Required knowledge of instrumentation associated with analytical chemistry. Civilian equivalent of this position is a Marine Chemist. Required to sample, identify, and quantify typical work place stressors associated with the industrial hygiene-monitoring program. Worked in the chemistry department at the shipyard doing analytical viscosity determinations, flashpoint, fire point, pH, water concentration, particle count, etc. Performed environmental analysis of industrial hygiene samples, i.e., asbestos, lead, organic solvents, etc., utilizing gas chromatography (GC), atomic absorption spectrometry (AA), and infrared spectrophotometers (IR).

Chemist
Office of Safety and Health, Mare Island Naval Shipyard, Vallejo, CA
1981-1983

Responsibilities included monitoring ships and industrial areas for potentially hazardous environments, and enforcing federal safety regulations. Use of various detection equipment: gas chromatography**,** infrared spectrophotometer analysis (qualitative and quantitative), as well as other methods. Functioned as an assistant gas free engineer and was responsible for certifying confined spaces on ships, fuel tanks, cofferdams and other voids. Began work in industrial hygiene department assisting CIH, IH and IH technicians in survey work on various shipyard stressors: asbestos, lead, solvents, ventilation, noise, etc.

Research Biologist
Stauffer Chemical Company, Greenville, MS
1975-1981

Assigned to Stauffer's experimental research station. Responsible for insecticide, fungicide, plant growth regulators, antidote and insect growth regulators.

Leland Stanton Pitt, B.S., M.S.
President (Continued)

AREAS OF SPECIALTY:

Effects of insecticide, fungicide, plant growth regulators, etc. on soybeans, milo, corn, with some work on barley and wheat. Soybean work has been centered on Verman and other related thiocarbamate herbicides. Corn research responsibilities included varietal testing with Stauffer's proprietary herbicides Sutan, Eptam and Vernam. Also basic antidote work on experimental corn antidotes and herbicides were performed.

Small plot techniques for insecticide screening. These techniques for insecticide screening were developed in order to cope with small technical samples.

Cotton insecticide work with pesticide interaction in both the antidote and insecticide field program.

Research efforts with Imidan on cotton, vegetable crops and fruit trees.

Soybean fungicide work with Captan and other coded experimental biocides.

Paint biocide screening of coded materials for use in commercial paints. Interest in these tests is centered on fungal discoloration and chemical compatibility. Both weathered and new wood surfaces are used.

ADDITIONAL DUTIES:

Respirator coordinator, 1980-81. Solely responsible for Stauffer's respirator program at the Mississippi field station. This included selecting the appropriate DOT and NIOSH certified respirators in accordance with federal regulations and Stauffer's own respirator program.

In January 1981 I attended and graduated from the Occupational Health Services respirator course given by John Pritchard and was certified.

Safety coordinator at the Mississippi field station 1975-78. Responsibilities included respirator monitoring and insuring the compliance to Stauffer's safety program (chemical exposures and handling machinery safety; EPA and OSHA regulations, etc.).

Head of Stauffer's synergist program January 1973 to September 1975. Responsible for developing new and sophisticated bioassay techniques which opened new leads in search of broad spectrum (field crop) synergists beyond household use. Developed ovicide program in two diverse areas: insect growth regulators and formamidine insecticides.

Assigned to Stauffer's Western Research Center Mt. View, Ca. Helped improve screening techniques, which lead to new classes of selective slow acting insecticides. Developed statistical interpretation of joint action.

Screened experimental compounds for insecticidal/miticidal activity, October 1969 to January 1973. Following this initial testing, more extensive testing was initiated on those leads which seemed both novel and potentially profitable.

Worked as a technician from1968-1969 in rearing insects and functioned as a lab technician in the biochemistry lab.

RELATED EXPERIENCE:

Master's Thesis work done in "Insecticidal Activity of several benzamides and nicotinamides on the Tobacco Budworm (Heliothis virescens).

Graduate work in Chemistry in synthesizing analogs of Dimilin to determine structure/activity relationships and possible new chemical properties of related ureides.

General laboratory experience including radioactive tracing techniques (TLC and liquid scintillation work).

UNITED STATES PATENTS:

#4,123,526

Patented October 31, 1978

THIONOPHOSPHATE INSECTICIDE ACTIVATORS

Assignors Stauffer Chemical Company

George B. Large and Leland S. Pitt

#4,096,251

Patented June 20, 1978

DIETHYL 2-PYRIDINE THIONOPHOSPHONATE AS AN INSECTICIDE ACTIVATOR

Assignors, Stauffer Chemical Company

Leland S. Pitt, George B. Large, Alan MacDonald

#4,083,970

Patented April 11, 1978

ACTIVATED INSECTICIDE COMPOSITION EMPLOYING A CERTAIN PHOSPHORODITIOATE AND AN ACTIVATOR

Assignors Stauffer Chemical Company

George B. Large And Leland S. Pitt

Leland Stanton Pitt, B.S., M.S.
President (Continued)

#4,072,745

Patented July 12, 1977

SUBSTITUTED VINYL THIOPHOSPHATE ACTIVATORS

Assignors Stauffer Chemical Company

Leland S. Pitt and George B. Large

#4,035,490

Patented July 12, 1977

INSECTICIDAL PHTHALIMIDOTHIOPHOSPHATES ACTIVATED WITH CERTAIN PHOSPHOROTHIONATES

Assignors Stauffer Chemical Company

George B. Large and Leland S. Pitt

#3,830,887

Patented August 20, 1974

O,) –DILOWERALKYL-O-(1-METHYL-2-PHENYL VINYL) THIOPHOSPHATES

Assignors Stauffer Chemical Company

George B. Large and Leland S. Pitt

PROFESSIONAL ORGANIZATIONS:

Marine Chemists Association

Industrial Hygiene Association

American Chemical Society

Daniel Verdon, B.S.
Laboratory Director

Education: **Bachelor of Science in Chemistry, minor in Computer Science, 1990**
Westmont College, Santa Barbara, California

Professional Experience:

Laboratory Director
EnviroMatrix Analytical, Inc., San Diego, CA
2003 – Present

Responsible for overall management of analytical laboratory production. Selection, training, and directing activities of chemistry laboratory personnel including compensation and termination. Extensive experience with current state, local and federal regulations. Oversees laboratory operations to ensure quality data reduction and review, and ensures that project specifications are met. Holds weekly status meetings to discuss current project status, analyses schedule, and any potential problems or irregularities with laboratory operations.

Senior Chemist
EnviroMatrix Analytical, Inc., San Diego, CA
1993 - 2003

Responsible for all volatile organic compound analyses by Gas Chromatography (GC) and Gas Chromatography Mass Spectrometry (GC/MS), following methods EPA 601, EPA 8010, EPA 624, EPA 8240 and EPA 8260 . Performs all systems maintenance and method development. Responsible for data review and systems management. Ensures that all volatile GC and GC/MS work is performed in compliance with all local, state and federal regulations, and quality assurance program requirements. Additionally, responsible for method and procedure development, and training other analysts.

Environmental Specialist
IT Corporation, Irvine, CA
1992 - 1993

Responsible for operation of mobile chemistry laboratory. Perform field Gas Chromatography analysis. Management and tracking of all CLP data validation projects. Performed CLP data validation (Levels C and D) for HAZWRAP and Comprehensive Long-Term Environmental Action Navy (CLEAN) projects.

Field Analytical Specialist
IT Corporation, Irvine, CA
1990 - 1992

Responsible for sampling and monitoring of ground-water wells, soils, and air at potentially contaminated sites. Performed on-site physical and chemical analyses. Sampled and monitored ground-water wells, industrial discharge, and contaminated soils at various commercial and military facilities.

Daniel Verdon, B.S.
Laboratory Director (Continued)

Consultant
G.V. Industries, Santa Barbara, CA
1990

Development of hazardous waste conformance plan to meet local, state and federal regulations. Development and implementation of emergency response program for G.V. facilities that met local and state regulatory requirements.

Research Assistant
Chemistry Department at Westmont College, Santa Barbara, CA
1989

Development and testing of microprocessor controlled pulse train generator and photon counter for application in optically detected magnetic resonance spectroscopy.

Laboratory Technician
Whittaker Corporation Research Laboratory, Colton, CA
1987 - 1988

Development, testing and formulation of industrial coil coatings (paint) for new product lines.

Training and Certificates:
OSHA 40 Hour 29 CFR 1910.120, November 1990
OSHA 8 Hour 29 CFR 1910.120 Refresher, (Annually)
Chemical Hygiene & Laboratory Safety OSHA and 29 CFR 1910.145C, February 1993

Jennifer Beyer, M.S.
Q.A. Director

Education: **Master of Science in Physical Chemistry, 2005**
San Diego State University, San Diego, CA
Thesis: Kinetics of Hydrogen Desorption from the Si (100) Surface

Bachelor of Arts in Chemistry, 1997
University of Northern Iowa, Cedar Falls, IA

Professional Experience:

Q.A. Director
EnviroMatrix Analytical, Inc., San Diego, CA
2005 – Present

Responsible for establishing and maintaining the laboratories working budget and approving all purchases and expenditures. Acts as liaison for all regulatory agencies. Responsible for maintaining and implementing the Quality Assurance Manual, QA/QC policies, Standard Operating Procedures, and corrective action documents. Performs data validation and review for adherence to QA requirements. Conducts internal quality audits. Reviews all project and/or contract specific QA requirements for laboratory implementation.

Senior Metals Chemist-Department Supervisor
EnviroMatrix Analytical, Inc., San Diego, CA
2003 - 2005

Responsible for performing ICP and ICP-MS metals analyses following method EPA 6010/6020 and EPA 200.7/200.8 and atomic absorption spectrophotometric analysis using cold vapor generation on a variety of matrices using method EPA 245.1, EPA 7470, and EPA 7471 for mercury. Ensures that analytical data complies with Quality Assurance Program requirements. Performs all aspects of analysis including those relating to troubleshooting instrument problems, detecting analytical interferences due to complex sample matrices, performing system maintenance and method development. Supervises the metals digestion department and the metals extraction department.

Independent Contractor
SDSUF/SPAWAR Systems Center, San Diego,CA
2002 – 2003

Provided technical and analytical support in the field of materials science for the Film Implementation of a Nuetron Detector (FIND) Project.

Teachers Assistant (Masters Candidate)
San Diego State University, San Diego, CA
2000-2002

Organized and taught laboratory classes for SDSU Chemistry Department.

Jennifer Beyer, M.S.
Q.A. Director (Continued)

Organic Laboratory Technician
TestAmerica (NET, Inc.), Cedar Falls, IA
1997-1999

Performed laboratory extractions and analyses of environmental contaminants in water and soil samples utilizing EPA test protocols. Performed daily quality control procedures.

Laboratory Technician
AG Processing, Inc., Manning, IA
1997

Perofrmed extensive work on NIR. Wet lab analyses included crude fiber determination, residual oil testing, urease activity, pH, moisture and volatiles testing.

Jamey A. Cote
Sales/Marketing Manager

Education: **Bachelor of Science in Environmental Science, 1996**
Florida International University, Miami, Florida

Professional Experience:

Sales/Marketing Manager
EnviroMatrix Analytical, Inc., San Diego, CA
2005 - Present
Sales/Marketing, client development, project proposals and project management Activities.

Project Manager
ATC Associates, Inc., Miami, FL
2004 – 2005
Supervision of initial remedial action activities, and preparation of remedial action plans, monitoring only plans and site assessment reports for both hazardous and non-hazardous sites. Coordinate and perform Phase I and II Environmental Site Assessments. Sales/Marketing, client development, project proposals, and project management activities.

Project Scientist / Project Manager
Universal Engineering and Sciences, Lake Worth, FL
2002 – 2004
Coordinate and perform Phase I and II Environmental Site Assessments including: historical document research and review, EPA and FDEP environmental records review, personal interviews and site walkover inspections, subsurface explorations, testing of soil, groundwater and air for priority pollutants, delineate underground contaminant plumes, and preparation of reports containing assessment findings and recommendations. Client development, project proposals, and project management activities.

Project Scientist / Project Manager
ATC Associates, Inc., Miami, FL
1998 – 2002
Conducted over 250 various environmental site assessments as part of due diligence for commercial property transactions. Conducted over 50 assessments in accordance with the National Environmental Policy Act (NEPA) for several communications firms. Conducted numerous soil and groundwater quality assessments including, but not limited to: monitoring well installation, underground storage tank/source removal, data interpretation and report writing. Responsible for sample collection and preservation of various soil and groundwater quality samples.

Jamey A. Cote
Sales/Marketing Manager (Continued)

Field Director / Safety Supervisor
Savannah Laboratories and Environmental Services, Inc., Deerfield Beach, FL
1997 – 1998

Responsible for sample preservation and collection of Volatile Organic Contaminants, Extractable Organics, Inorganics, Microbiological, and Metals. Also responsible for decontamination of equipment, sample custody and supervision of staff.

Mike Giangiordano
Wet Chemistry/ Microbiology Supervisor

Education: **Bachelor of Science in Exercise Nutritional Sciences, 2001**
San Diego State University, San Diego, CA

Professional Experience:

Wet Chemistry/ Microbiology Supervisor
Enviromatrix Analytical, Inc., San Diego, CA
2003 – Present

Responsible for overall management of WET Chemistry and Microbiology Departments. Involved in selection and training of personnel in both departments as well as overseeing and performing analytical work designated to such departments. Responsible of for reviewing all data to ensure results are in control and project specifications are met for the above departments. Involved in creating and editing departments S.O.P.'s. Project manager to specific microbiology clients. Responsible for method development and implementation.

Head Microbiologist
Enviromatrix Analytical, Inc., San Diego, CA
2002 – 2003

Responsible for scheduling and executing work load for entire microbiology department. Creating and editing department S.O.P.'s including total and fecal coliform for both drinking and waste waters, Colilert®, Enterolert®, fecal streptococcus, enterococus, and heterotrophic plate count (HPC). Ensures that all quality controls and assurance procedures are followed and meet requirements dictated by government regulations. Additionally, responsible for method development and training other microbiological personnel. As well as, performing all aspects of analysis including those relating to troubleshooting equipment problems, detecting analytical interferences, and conducting department wide maintenance.

Microbiologist
Enviromatrix Analytical, Inc., San Diego, CA
2001 – 2002

Involved in daily analysis and scheduling of microbiological work including total and fecal coliform for both drinking and waste waters, enterococus, and fecal streptococcus using multiple tube fermentation (MTF). Also, setting up and executing procedures for Colilert® and heterotrophic plate count (HPC). Carrying out numerous daily quality assurance procedures including the use of control organisms, sterility checks and controls, and surveillance and maintenance of equipment set temperatures and other necessary functions.

Dennis Hickey , B.A.
Senior Organics Chemist

Education: **Bachelor of Arts in Biology, Minor in Organic Chemistry and Sociology, 1985**
University of California, San Diego, CA

Professional Experience:

Senior Organics Chemist
EnviroMatrix Analytical, Inc., San Diego, CA
02/2003 – Present

Responsible for semi-volatile organic compound analyses by Gas Chromatography (GC) and Gas Chromatography Mass Spectrometry (GC/MS), following methods EPA 608, EPA 8015, EPA 625, EPA 8270, EPA 8141, and EPA 8081/8082. Performs systems maintenance and method development. Responsible for data review and systems management. Ensures that semi-volatile GC and GC/MS work is performed in compliance with all local, state and federal regulations, and quality assurance program requirements. Additionally, responsible for method and procedure development, and training other analysts.

Staff Research Associate II
UCSD, San Diego, CA
01/1999 – Present

Provides technical support for undergraduate teaching laboratories. Maintains and troubleshoots laboratory equipment. Supervises pre-runs of experiments and works with faculty to revise and update experiment protocols. Maintains computers in the teaching laboratories. Establishes financial needs of classes and keeps records of financial expenditures.

Staff Scientist & Project Manager
Ceimic Corporation / S-Cubed (A Division of Maxwell Laboratories), San Diego, CA
1986-1998

Operated and maintained automated gas chromatography instrumentation for high precision measurement of volatile and semi-volatile compounds operating in a contract laboratory setting. Was responsible for GC/MS training and troubleshooting. Performed EPA Methods 8270, 8260, 8080, 625, 525, PAH by SIMS, and Isotope Dilution by EPA Method 1625c. Assited in the validation of method EPA 8141 for the EPAs Office of Research and Development, Las Vegas, Nevada. Assited in the validation of a multianalyte methodology for human adipose tissue for the EPAs Office of Research and Development, Las Vegas, Nevada. Performed beta testing of the Hewlett-Packard Enviroquant Chemstation Software. Assited the software developers with recommendations for improvements and quality related functions as it related to GC/MS analyses.

Dennis Hickey, B.A.
Senior Organics Chemist (continued)

Extraction Chemist
Analytical Technologies, Inc., San Diego, CA
1985-1986

Prepared samples in the extraction laboratory for determination of a variety of pollutants including pesticides, herbicides, dioxins, PCBs, and BNAs. Responsible for sample receiving and sample log-in.

Publications:

Hatcher, M.D.; Hickey, D.M.; Marsden, P.J.; and Betowski, L.D.; "Development of a GC/MS Module for RCRA Method 8141"; final report to the U.S. EPA Environmental Protection Agency on Contract 68-03-1958; S-Cubed, San Diego, CA, 1988.

Taylor, V.; Hickey, D.M.; Marsden, P.J. "Single Laboratory Validation of EPA Method 8140"; U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Office of Research and Development, Las Vegas, NV, 1987; EPA-600/4-87-009.

Mona Hanna, PhD
Senior Organics Chemist

Education: **Doctor of Philosophy in Inorganic Chemistry, 1986**
Ain Shams University, Cairo, Egypt

Masters of Arts in Inorganic and Analytical Chemistry, 1982
Ain Shams University, Cairo, Egypt

Bachelor of Arts in General Chemistry, 1978
Ain Shams University, Cairo, Egypt

Professional Experience:

Senior Organic Chemist
EnviroMatrix Analytical, Inc., San Diego, CA
2003-Present

Perform ICP metals analysis following EPA 6010 methods. Also analysis of volatile organic compound following EPA 8260, 8021 methods by using GC and GC/MS. Perform all aspects of analysis including troubleshooting instrument problems, detecting analytical interferences, system maintenance, and method development.

Chemistry Lab Instructor
Mesa College, San Diego, CA
2002 – Present

Teaching fundamental principles, laws of chemical behavior, and the properties of matter. Topics included: techniques of data analysis, auto titrators, UV/Vis spectrophotometer, HPLC, atomic theory, molecular geometry, and gaseous behavior.

Assistant Professor of Inorganic Chemistry
Ain Shams University, Cairo, Egypt
1996-2001

Carried out new research on the complexation and thermal properties of uric acid with some divalent and trivalent metal ions of biological interest. Characterization by FTIR, UV/VIS, and HPLC. Taught analytical, electroanalytical, and inorganic chemistry.

Research Assistant II
SDSU Foundation, San Diego, CA
1994-1996

Responsible for coordinating and analyzing water, soil, and plant tissue samples. Used a Lachat auto-analyzer to measure nutrient content, and a Dorman Organic Carbon Analyzer to assess organic matter content of estuarine waters.

Mona Hanna, PhD
Senior Organics Chemist (Continued)

Organic Chemist/Group Leader
Analytical Technologies Inc., San Diego, CA
1991-1994

Performed environmental analysis on soil, water, and air samples using separator funnel extraction, continuous liquid-liquid extraction, soxhlet extraction, and sonication. Extractions were cleaned using gel permeation chromatography, and alumina, florisal columns.

Corinne Krier, B.S.
Senior Microbiologist

Education: **Bachelor of Science in Human Biolgoy, 2006**
University of California San Diego, San Diego, CA

Professional Experience:

Senior Microbiologist
EnviroMatrix Analytical, Inc, San Diego, CA
2007 – Present

Responsible for scheduling and executing work load for entire microbiology department. Creating and editing department S.O.P.'s including total and fecal coliform for both drinking and waste waters, Colilert®, Enterolert®, fecal streptococcus, enterococus, and heterotrophic plate count (HPC). Ensures that all quality controls and assurance procedures are followed and meet requirements dictated by government regulations. Additionally, responsible for method development and training other microbiological personnel. As well as, performing all aspects of analysis including those relating to troubleshooting equipment problems, detecting analytical interferences, and conducting department wide maintenance.

Lab Technician
EnviroMatrix Analytical, Inc, San Diego, CA
2006 – 2007

Assisted chemists with laboratory experiments, managed waste, and cleaned glassware. Performance escalated to microbiology department whereby identification of the presence/absence of various bacterium, MPN calculations, heterotrophic plate counts, and inoculation of media and media preparation became routine duties.

Appendix H
External Certification

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

ENVIRONMENTAL LABORATORY CERTIFICATION

Is hereby granted to

ENVIRO MATRIX ANALYTICAL, INC.

4340 VIEWRIDGE AVENUE., SUITE A

SAN DIEGO, CA 92123

Scope of certification is limited to the
"Accredited Fields of Testing"
which accompanies this Certificate.

Continued certification status depends on successful completion of site visit, proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **2564**

Expiration Date: **09/30/2008**

Effective Date: **09/01/2006**

Richmond, California
subject to forfeiture or revocation

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program